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R.B. Singh *Editor*

# Urban Development Challenges, Risks and Resilience in Asian Mega Cities

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R.B. Singh
Editor

# Urban Development Challenges, Risks and Resilience in Asian Mega Cities

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# Preface

Cities are complex human systems and serve as magnets for people, enterprise, and culture. The world's population in 2011 reached 7 billion, of which 3.6 billion, i.e., more than 50 %, resided in urban areas. It is projected that the population living in urban areas is to gain an additional 2.6 billion during 2011–2050 and will reach 6.3 billion. While the proportion of people living in small cities is expected to decline, the million-plus cities accounting for about 40 % of the total urban population in 2011 is expected to increase to 47 % by 2025. This rise in the urban population is not, however, evenly distributed in the world. By 1970, the world had two megacities (10 million + population), i.e., Tokyo and New York. However, most new megacities in recent years are in developing countries. In 2011, the world counted 23 megacities, with Asia having 13 of them. The number of megacities is expected to rise to 37 by 2025, with Asia adding 9 more megacities to its share. This clearly indicates the trend of accelerated urban growth in Asia. According to the United Nations, the largest cities in Asia include Tokyo, Delhi, Mumbai, Kolkata, Shanghai, Beijing, Hong Kong, and Singapore. Tokyo, the capital of Japan, is the most populous urban agglomeration in Asia. Its population was estimated at 37.2 million in 2011. It is followed by Shanghai in China, with 28.4 million inhabitants. In India, Mumbai, with almost 18.4 million inhabitants, is the largest megacity, followed by Delhi with 16.3 million inhabitants. In India, million-plus cities have increased from 12 in 1981 to 23 in 1991, 35 in 2001, and 53 in 2011. In 2011, the Indian urban population had increased to 377 million with a decadal growth rate of 31.80 %.

According to traditional conceptions of growth and development in cities, the city is seen as a catalyst of economic growth. However, recent conceptions of urban development challenges express concern about unsustainable development and its negative consequences such as urban sprawl, deteriorating inner-city infrastructure, traffic congestion, and the waste of natural and human resources. Cities provide 80 % of the economic base and are essential components of growth. City regions exert centripetal forces on people and investments, but with rapid and haphazard urbanization, the worst form of visible poverty becomes prominent. Cities generate significant environmental footprints, including contamination of air and water, as

well as contributing approximately 75 % of the greenhouse gas (GHG) emissions. Asia's projected global share of $CO_2$ emissions for energy consumption will increase from 30 % in 2006 to 43 % by 2030. The Asian region remains host to over half of the world's slum population, as in 2010 slum population amounted to an estimated 505.5 million people compared to the world slum population of 828 million people in 2010. Mumbai is host to the world's largest slum, Dharavi. Dispersed urban development in Asian developing countries has led to environmental deterioration, increased energy consumption for transportation, and pollution. In terms of GHG emissions in 2005, China ranked first, followed by India and Japan. The industrial centres of Beijing and Shanghai contribute 64 and 43 % of total emissions, respectively. This is because of China's continued reliance on coal for its energy requirements.

Cities are facing multiple risks in recent times. Cities in developing countries of Asia tend to have thriving inner city areas. These are usually the oldest parts of the city and are subject to physical deterioration and decay. Since these are deteriorated physically, they have attracted poor urban residents seeking cheaper rent. To accommodate rising populations, the Asian cities are growing outward encroaching on fertile agriculture lands. As per World Health Organization norms, a city should have a minimum of 9.0 $m^2$ green open space per dweller. Green spaces are known as the lungs of a city and act as carbon sinks and help in carbon sequestration. Most South Asian cities are far behind in per capita urban green space availability in comparison to the developed world. Environmental pollution and waste management due to vehicularization and industrialization pose risks to urban growth. Combinations of urban problems have led to a rise in urban poverty and degradation of social well-being.

The Asian urban scenario is dynamic. The rapid growth of metropolitan cities has changed the urban landscape, urban fabric, urban shelter, urban society, urban environment, urban economy, urban governance, urban infrastructure, and services. In light of changing urbanisation patterns in recent times, there is a need for innovative research for resilience building in the context of Asian megacities. These issues are: inner city redevelopment; controlling urban sprawl and developing peripheral areas; regulating land use; increasing green spaces; controlling environmental pollution; managing urban transport and urban waste; community participation; and alleviating urban poverty and promoting social well-being. The study of these changes requires a comprehensive spatial planning approach for achieving urban sustainability.

To improve the well-being of urban populations and to achieve healthy cities, a number of activities have been promoted on the Asian continent. India's largest cities, Mumbai and Delhi, have adopted a regional plan to control urban sprawl. Similar initiatives need to be adopted by other megacities also. Strict norms for carbon emissions need immediate implementation. Delhi, the capital of India, implemented conversion of all public vehicles with CNG. Such steps need to be replicated elsewhere. The Government of India started focussing on urban areas during the 7th Five-Year Plan (1985–1990) by framing the National Housing Policy along the line of adoption of global shelter. In the successive 8th Five-Year Plan

(1992–1997) Indira Awas Yojana was started. The role of government was identified as facilitator for urban development during the 9th Five-Year Plan (1997–2002). During the 10th Five-Year Plan (2002–2007) the main emphasis was on infrastructure development in both rural and urban areas. The 11th Five-Year Plan (2007–2012) emphasized inclusive growth through development of social infrastructure and eradication of poverty by generating more jobs. Subsequently many programmes were launched for development of urban areas. Some of the continuing landmark projects are the National Urban Information System scheme to develop a GIS database for 137 towns/cities of India; the Indian National Capital Region plan; adoption of an Energy Conservation Building Code; use of solar, wind, tidal, biomass, and other renewable forms of energy; rainwater harvesting; afforestation; introduction of CNG vehicles, battery-operated rickshaws, and promotion of cycles. These are some of the many steps undertaken.

Urban growth and change have a significant effect on various dimensions of cities, including land use, transportation, environment, economic growth, housing, and infrastructure. Therefore, for better understanding of the impact of urban growth and change, there is a need for an integrated approach. Urban sustainability deals with economic, environmental, and social aspects of cities in a holistic way. Urban sustainability is a multidimensional phenomenon which needs to recognize the complex set of relationships influencing urban governance and sustainability. Any improvement of one aspect of the city needs to be weighed against other benefits or losses. It has been argued that there are strong relationships between urban planning, governance, and sustainable development. The idea of the compact city has been advocated as a solution.

Solutions for sustainable urban development have to meet specific local needs. Thus, for every city striving for sustainable development, specialized analyses must be made, and an appropriate bundle of necessary measures to be taken by national, regional, and local governments must be gathered. The value of local communities and the importance of public participation are vital for strengthening governance. Effective urban planning and governance will help in achieving better health and well-being in megacities of Asia.

In the context of the gamut of issues of Asian urbanisation and its dynamicity, this book focuses on urban development challenges, risks, and resilience in Asian megacities. The work on this volume was started during my stay at Hiroshima Jogakuin University, Japan, as a JSPS Fellow and completed at my home institution, the University of Delhi. I would like to express my sincere thanks and gratitude to the officials of the University of Delhi, the Japan Society for the Promotion of Science (JSPS), and Hiroshima Jogakuin University for providing support and the best working environment to complete this work.

The book is divided into four parts together with an introduction and contains 24 chapters. The first part deals with the Indian experience, comprising case studies from Delhi, Mumbai, Kolkata, Chennai, and Hyderabad. The exposure to risk of the vulnerable populations is discussed with the probable solutions. Part II is devoted to the Chinese experience. It deals with the impact of rapid urbanisation in Shanghai, Beijing, Wuhan, and other growing cities like Kunming. Part III focuses attention

on the Japanese city of Tokyo, and the last part comprises studies of other Asian megacities such as Singapore, Bangkok, Manila, and Dhaka. The book is comprehensive and discusses a wide range of issues ranging from trends of population growth to urban sprawl, urban heat islands, urban governance, housing, nutritional status, informal economic activity, issues of migration, urban disasters, and urban services for Asian cities. The book is an attempt to combine theoretical and academic understanding with empirical evidence of the urban development challenges together with a policy perspective in Asian megacities. This work will be useful for students, researchers, scientists, and teachers in the areas of urban geography, urban studies, urban planning, environmental studies, urban climate, and policy science.

Delhi, India R.B. Singh
14 April 2014

# Contents

**Part IV Other Asian Mega Cities Experiences**

# Chapter 1
# Megacities: The Asian Era

**Elfie Swerts and Eric Denis**

**Abstract** Asian megacities concentrate 60 % of world megacities population in 2010. The demographic trend which lead to this current situation since the 1960 is exposed. Then the population mass of these megacities is compared to their economic weight opening on a reflexion on their position within the world cities system. The analyse is supported by an original geodatabase in which all the 2010' 100 largest cities in the world are defined as physical agglomerations, using remote sensing images and census data series in order to assess their population size.

Using methods developed for detecting the trends in complex systems, we classify world megacities regarding their demographic trajectories, then Asian megacities individual trajectories are related to the evolution of all other cities of their respective countries. Demographic trajectories of world cities appear partly related to their location and dominated by the shift from the Atlantic to the Asian shores. However, the Asian megacities trajectories remain very diverse. Their weight in their respective urban system do not grow up. Moreover, Asian megacities become bigger by expanding functionally in metropolitan region marked by polycentrism and tend to form huge Mega Urban Region that shares an important part of Asian population and national economy. The analyses of a harmonized database of city's GDP highlight the wealth concentration by Asia's megacities. It significantly vary according to the country size, and are much more important at a regional scale, where these Mega Urban Regions emerge. As GDP, the income polarisation among Asian Megacities is not acute. A transitional disequilibrium in population growth and inequities remain, but it don't constitute a factor of economic stagnation.

**Keywords** Asia • Demographic trajectories • GDP • Inequality • Mega Urban Region • Megacities • Productive system

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## 1.1 Introduction

Mega-city word comes from the Ancient Greek μέγας (megas, "great, large, mighty"). It should have remain associated to polis, like in megapolis or megalopolis, but since the 2000' Anglicisation leads to the common use of megacity.

Megacities are commonly cities larger than ten million inhabitants (UN Habitat 2011). We identified some 31 megacities in 2010, among them 17 were situated in Asia. Asia here is defined according to the UN's geographical classification which gathers all East Asia, Southeast Asia and South Asia countries except Iran and Afghanistan.

Our measure is based on an harmonized appraisal of continuous built-up area. Ranking of largest cities at world scale is much depending of the geographical extent considered. Beside the physical agglomeration approach used here, some countries and studies consider metropolitan areas based on governance and functional criterias. Urban region, city region, Mega Urban Region and desakota are also used to indicate even larger complex, diverse, functional and multipolar extra large urbanized territory or XXL metropolis (Lorain 2013).

The existing megacity lists and hierarchies are based primarily on population size but they can be established or complemented by the evaluation of their concentration of wealth, flow of merchandises and people they polarize, private and public power, innovative capabilities and international influence. . .? We aim to give a clear ranking of largest urban agglomeration of the world and place Asia's megacities within. Our measure associates an independent assessment of the physical extension of the continuous built-up harmonized worldwide to the detailed population census data.

We will start by explaining the reason to develop our own methodology and database to assess urbanisation worldwide and more specifically megacity dynamics. It shows how with the diversity of urban definitions from country to country megacity hierarchy can differ widely and associate falsely very different geographical objects.

After having localised precisely the actual megacities, we will point the Mega Urban Region (MUR) that emerge rapidly (Jones 2002). The largest, around Shanghai, could gather more than 80 million inhabitants, two time Tokyo megacities. After McGee and Robinson (1995), we consider MUR as "an extension of mega-cities beyond the city and metropolitan boundaries". McGee (2009) considers that MUR is equivalent with Extended Metropolitan Region (EMR) and it could be also, in some extends, considered close from the edgeless city model. It's an area of concentration of wealth, information, skills and powers economically integrated but no single authority is responsible for its overall planning and management. High population density encompassing urban and rural environment is a distinctive element (Jones and Douglass 2008). Integration of intensive and often irrigated agriculture (paddy fields notably) with urban expansion is a key feature. In other words, the ecological context matters. Areas like deltas are hosting the major MURs.

Then, in a second part, we will describe and analyse the population dynamics of the Asia's megacity. What are the trends which brings 60 % of megacity population

in Asia? How they are distributed and how far they dominate the regional urban hierarchy and at the world scale? and where are emerging MUR in Asia?

Since Asia's megacities will be clearly identified and weighted, we will be able, in a third part, to interrogate their functional position within the world cities system (Hall 1966). The economic megacities landscape exposure will be supported by the analysis of harmonized GDP data by city. Where Asia's megacities are placed in term of wealth concentration and polarization of productive systems?

Population size is already a strong and synthetic describer of urban hierarchy. Population gathers around jobs opportunities, access to services which generates systemic richness concentrations associated to more and more advanced production systems and extended organisational capability lead by highly specialized and financial services. Nevertheless, it's important to balance the megacities hierarchy obtained using population only by other qualitative dataset on functional and economic aspects. Doing so we can distinguish between megapolis and metropolis facets of megacities. How far the concentration of population is proportional to their metropolis capability to concentrates the strategic, political and decision-making functions?

## 1.2 City Size and Megacity Comparison Across Countries

### *1.2.1 How to Define and Measure Megacities*

The common criteria used to identify and rank megacities is population. Until the end of the 2010' metropolis with more than eight million inhabitants were considered as megacities but since then ten million becomes the limit (Oxford dictionary UN; United Nations: Department of International Economic and Social Affairs 1986, 1987, 1989; Fuchs 1994; Chen and Heligman 1994; Kraas et al. 2014)

What ever the size chosen, the megacity identification are based on city population given by census series. In many extend, the use of urban classification given by census is insufficient to study urban issues and inadequate to capture the spatial changes of the urbanization process (Bretagnolle et al. 2012). Regarding the very large cities, the major difficulty is that their administrative boundaries correspond rarely to their "real" extension, whether morphological (continuous urban built up) or functional (area of intense exchanges within their hinterland) (Fig. 1.1).

A second difficulty is that each country has its own definition of cities that are sometime very different between countries or for the same country over time, biasing comparisons. The construction of a database based on a unique and harmonized city's definition overcomes these difficulties and allows to measure the evolution of cities over long periods and compare their size (Denis and Marius-Gnanou 2011). The major challenge is to find a definition that allows to compare cities in space and time while being applicable to all countries studied, whatever the available data sources.

Pumain (1997) and Harmonie-cités et al. (2011) proposed a definition of functional area corresponding to the territory of daily activities defined in each time period by the isochronous of hour from the city center (Bretagnolle 2009;

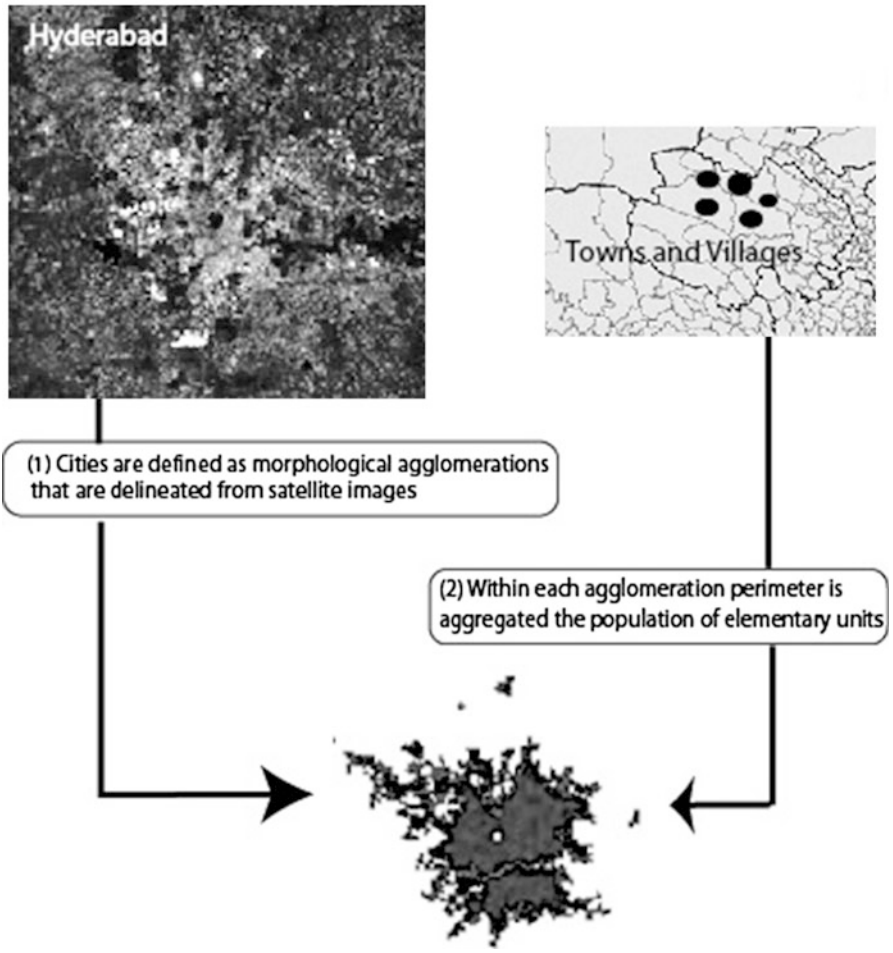


**Fig. 1.1** Association of the population of towns, villages and district within the perimeter of polygones. *Sources*: Elfie Swerts (2014)

Bretagnolle et al. 2012). However, because of the lack of systematic data, it remains difficult to draw city limits based on the commuting flows.

Another way to define city is morphological, where the city is defined according to criteria of continuity of the urban built up. This definition has two advantages : (i) it can generate an estimate of city boundaries dissociated of the administrative limits and (ii) the resources to delineate cities, satellite imageries, are independent from local administration and universally accessible.

The definition used here is morphological: As recommended by the United Nations, a city is defined as a continuous urban built up with less than 200 m between construction, and bringing together more than 10,000 inhabitants. Megacities are defined as agglomeration with at least ten million inhabitants. The base is constructed

in the frame of e-Geopolis project which constitutes a world harmonized population database using a single definition of the city, the morphological agglomeration (Moriconi-Ebrard 1993).

To construct this database, the first step is to define and to georeference the perimeter of each city, delimited according to the referent "morphological agglomeration", using Google Earth tools. The acquired city polygons are then integrated into a Geographic Information System (GIS). In a second step, population figures for localities, villages, towns, cities and districts, are extracted from census series, geolocalized and associated to the polygons using GIS tools (Fig. 1.1).

The largest units encompass vast areas which include several cities, towns and villages. The total population of the morphological agglomerations add all the local administrative units within the polygon. First, large cities are determined based on the morphological criteria only. Then the built up area of the largest agglomeration are reworked and controlled by adding a density norm. Continuous agglomeration are cut following a density break Vis the national density. This method has been used in China for cities like Guangzhou and Shanghai, which are located in some of densest regions in the world, over 450 inhabitants per $km^2$.

The question related to the extent and size of megacities remains open as they organize wide hinterlands in continuous built up or/and in multinodal combination bringing together multiples city nodes and countryside. These various extended dimensions around Asia megacities are explored in the following section.

### *1.2.2 From Megacity to Mega Urban Region*

In functional terms, very large cities extend beyond their urban core and continuous built up. In the early 1960s, Jean Gottmann proposed the concept of Megalopolis to describe an "urban area of several tens of millions of people, including several cities and major urban centers, and extending continuously over several 100 km". These spaces result of the networking of a group of metropolitan areas deployed around very large cities. They are characterized by high densities and the "symbiosis between urban and rural areas" creating "new models of multiple land use," that give these regions a unique character, which could be identified in other parts of the world where the urban fact is expanding rapidly.

In Asia, two megalopolises can be identified: in Japan, around Tokyo, Nagoya, Osaka, Kyoto and Kobe, and in China, around Guangzhou, Hong-Kong and Shenzhen. They have in common with the other megalopolises to be articulated around a world-class city, located near a major port and to congregate major coordination activities, non-material service industry, innovative high tech centres and dominant financial institutions.

Urban corridors, that describe cities of various sizes expanding along major communication axes, can also be identified in Asia. Their centrality were historically based on their key position on major fluvial axis, estuary and delta interconnecting long distance sea trade and major inland commercial road. Their centrality have

been since that reinforced by road and rail infrastructures. Stimulated by a strong interconnectivity, urban corridor growth promotes the development of regions in which they linearly consolid (Choe 1998). The urban corridor differs of a megacity because it is not organized around a very large city like a megalopolis. It merges cities of various size and scope. Nevertheless, major urban corridors can be constituted by a twin megacities' connection which forms a land-sea interface, like in the case of Beijing-Tianjing, Ghanzhou-Hong-Kong or Tokyo-Osaka. Or they can constitute the anisotropic extension of a megacity, like for the duo Shanghai-Nanjing, Seoul with Pusan or Jakarta, Bandung and Surabaya. They can constitute also quasi-megacity by merging in a powerful functional region two or more large cities and their hinterlands, like Kuala Lumpur and Singapore or Shenyang and Dalian. Public policy willing to institute corridor, like in the case of Mumbai-Delhi, is not necessarily of sufficient condition, even if some infrastructure investments occur. The two Indian megacities remain non integrated and distant, they don't turn to each other and have yet a huge discontinuous urban gap between them.

A specific urban form has been identified in Asia, with the "*desakota*". *Desakota* are dense regions, extending over 30 km and characterized by a mixture of agricultural and urban activities and the competitive complementarity of formal and informal activities associating large scale industries and chain of subcontracting as a huge share of self employed and daily wage workers. They are also characterized by the diversity of activities, pluri-activities and intensity of commuting. Desakota are deployed along corridors linking major dense urban centers. They include major cities with their periurban surrounding, which correspond to the functional area of the city, plus extensive areas developed along transport corridors and incorporating villages, where agricultural and urban activities are intermingled (McGee 1991). Desakota concept shares many characteristics with the more universal notion of Mega Urban Region but it insists on the very dense and particular settlement conditions observed in Asia. It encompasses a particular attachment to the delta and agriculture irrigated region where agricultural and nonagricultural activities mingled much before urban sprawl occurs.

## 1.3 Asia's Megacities Size and Dynamics

In 2010, half of the hundred largest cities in the world and, among them, 17 of the 31 megacities (i.e. more than ten million of inhabitants) were located in Asia, representing 60 % of the 511 million inhabitants of megacities.

### *1.3.1 Urbanization and Large Cities in Asia: An Ancient Phenomenon*

Throughout their evolution, cities acquire more or less important positions within exchange networks, forming systems from local to global scale. In these systems,

cities tend to take up more resources than those corresponding to their site capacities, and because they maximize social interactions that foster creativity, they create and accumulate new wealth and population. Over the long run, these exchanges and interactions lead to the concentration of wealth and population into major cities, which grow significantly faster than the rest of the cities of a considered system. It generates asymmetric statistical distributions verified in time and space for all regional contexts (Pumain 1982; Pumain and Moriconi-Ebrard 1997; Pumain 2006; Bretagnolle et al. 2008).

As Europe and the Middle East-Levant, Asia has an old urbanized civilisation and most of its major cities possess deep historical roots. Among the most urbanized civilizations, the Indo-gangetic, along the Indus River from the Harappan, hosted some of the world largest cities, like Sravasti and Champa 400 BC and Pataliputra (Patna today) 250 BC. In China, Chang'an capital of the Han dynasty and Loyang were also among the most important cities of their time.

Since the thirteenth century, Asian cities have been gradually connected, through long distance trade roads and, with harbours and trading places in Europe (Abu-Lughod 1989; Heitzman 2008). Lo and Yeung (1996) point out that at that time, Hangzhou (in Fujian Province) was equivalent to Constantinople (Istanbul) and one of the greatest cities in the world. Angkor Wat was also a major urban complex.

In 1500, the population of Asia was three times bigger than Western Europe (140 million vs 44). It forms a very large market with traders operating between East Africa, India and Middle East, and dominated by China merchants and ships. Jinling (Nanjing today) joins Hangzhou among the world largest cities, then Beijing dominated the world urban hierarchy from 1450 to 1825 (Chandler and Fox 1974). Only Cairo and Constantinople were gathering a comparable amount of population, craftsmen and long distance trade. The port cities surrounding the Indian Ocean structured a much bigger world-economy than the Mediterranean sea (Chaudhuri 1990). In 1500, Asia's GDP was estimated to be 5 times larger than Western Europe (Maddison 2001). After 1550, Moghol conquerors unified a very large network of rich merchant cities to control the Indian subcontinent; among them were Delhi and Dhaka.

From the mid-sixteenth century, marked by European scientific exploration and colonization, Asian large cities expanded greatly. Most of them were associated with port facilities connecting the region with the world economy (Lo and Yeung 1996). In China context, Shanghai and Canton (Guangzhou) were developed has trading post linking Chinese and foreigner merchants (Gipouloux 2009).

When the colonization was deeper, like in India, trade and control have been some time supported by ancient cities but more often by new towns like Bombay or Calcutta, adapted by the colonizer to access and export the local production, raw or manufactured. In this last case, the colonization could significantly alter the existing cities' network without erasing it completely, as in India were many secondary town felt in disarray (Durand-Dastès 1995; Ramachandran 2011).

During the nineteenth century, the Industrial Revolution, the engine of urban transition in Europe, by increasing the demand for raw material, has intensified the population concentration in the Asia's colonial cities. At the beginning of the twentieth century, for some countries, like India or Philippine, the level of

urbanisation was already high; 13 % of urban population for Philippine in 1903 (Bruneau and Taillard 1995), XX % in India. In the *"Géographie Universelle"* (1882), Elisée Reclus indicates that Pékin (Beijing), Canton (Guangzhou), Singan (Xian) and Siangtan (Xiangtan) already exceeded one million inhabitants, and Tchoungtching (Chongqing), Tchingtou (Chengdu), Foutcheou (Fuzhou), Tientsin (Tianjin), Soutcheou (Suzhou), and Hankou (one of three cities that formed Wuhan) already exceeded 500,000 inhabitants (Reclus 1885).

At the end of the Second World War, the decolonization led to the gradual independence of Asian countries. Developing an endogen industrial base becomes the central objective of Asian country leaders. Even each country went its own way of development, the trend was that after the import substitution strategy of industrialization, they turn toward export-oriented development. It was particularly the case in South East Asia. The industrial and economic development of Asian countries has been accompanied by the rapid growth of megacities through heavy industry conglomerates and then through Special Economic Zone (SEZ) dedicated to exportation. Many Asian megacities have furthermore benefited from national development policies, such as Seoul and Bangkok (Lo and Yeung 1996). Heartland national capital expansions were particularly supported to counter coastal ex-colonial metropolis; in particular, Delhi and Beijing trajectories of development were reinforced after the Independences. Dhaka arose dramatically after the Partition. The creation of Islamabad as national capital antagonised the growth of Karachi, like Delhi induced the decline of Calcutta.

Tokyo became the world's largest megacity from 1965. In other words, Asia has hosted the greatest metropolis in the world since the antic period, larger than Athena, Rome or Alexandria: at first in India, then in China, followed by Japan, and currently re-shifting toward China. The world's largest metropolis was always in Asia, excepted during the imperial period from 1850 to 1980, when their development was stifled by colonial interests. Today Asia's megacities have deep historical roots. They are not spontaneous giants surging from an excessive and contemporary urbanization. Only few megacities, like Kolkata and Mumbai, are of colonial ascendance without a previous urban and long history, and few others are the product of a recent and very specialized industrial boom like Shenzhen.

### *1.3.2 Asia's Megacities Experiment High Growth Rates*

The framework of the 100 world largest cities is very stable since the second half of the twentieth century (Fig. 1.2). Their dynamics are continuous and consistent. It can be explained by the strong interconnectedness of the large cities' system and the trend toward increasing primacy within the urban concentration of population. Despite this stability in growth, we observe, between 1960 and 2010, a shift from the Atlantic to the Asian shores. On the one hand, the population of Asian megacities has considerably increased during the second half of the twentieth century and secondly, the general increase of the Asian cities' population has

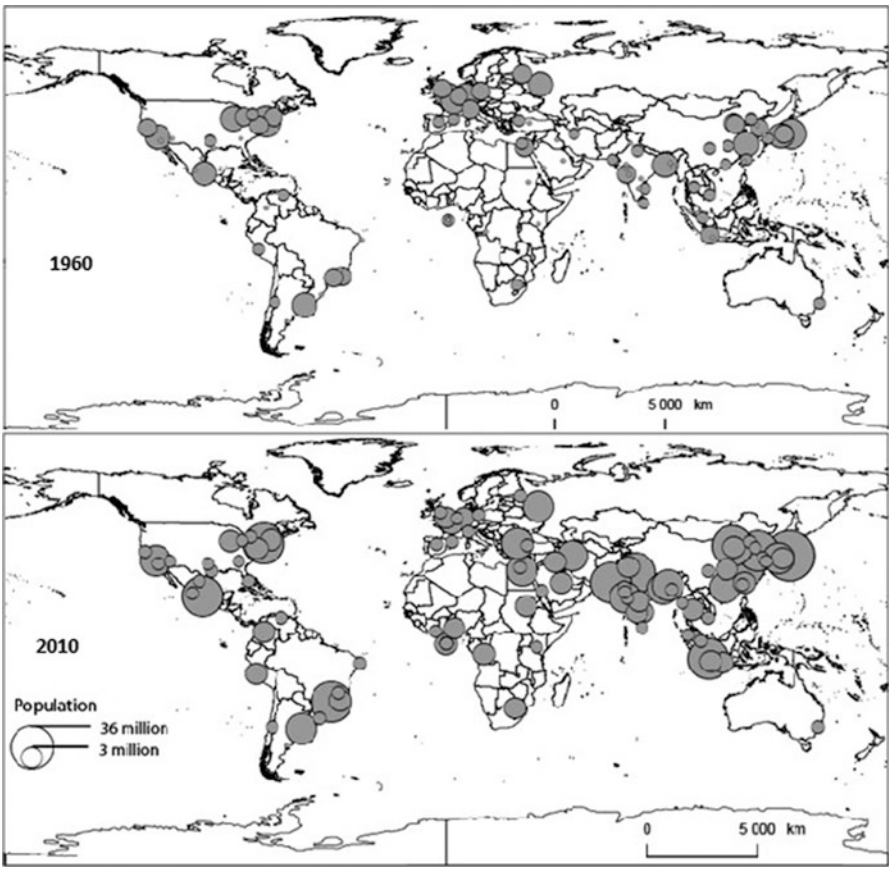


**Fig. 1.2** World's distribution of the 100 world largest cities in 1960 and 2010. *Sources*: Various harmonized national census data, Elfie Swerts (2014)

promoted the emergence of new megalopolis, which have strengthened the ranks of megacities.

Beyond the effects of hierarchical selection, which tend to reinforce the contrast between larger and smaller cities, remains a wide diversity of trends. To differentiate the trajectories of the 100 largest cities, we rely on a method developed in the framework of the ERC GeoDiverCity which compares the evolution of their population profiles during time using a correspondence analysis of a hierarchical clustering using Chi-square distance. The method regroups cities with a similar pattern of evolution independently of their size. These analyses are conducted via the script "TrajPop" created by Robin Cura.

Three classes describes the evolution of megacity sets between 1960 and 2010. The types of profile issued through the classification are shown in Fig. 1.3 where the mean curve of each class is represented in absolute value (all curves are then growing due to the distributed growth) and in relative value, by dividing the average population of the class by the total population of all the 100 largest cities at each date.

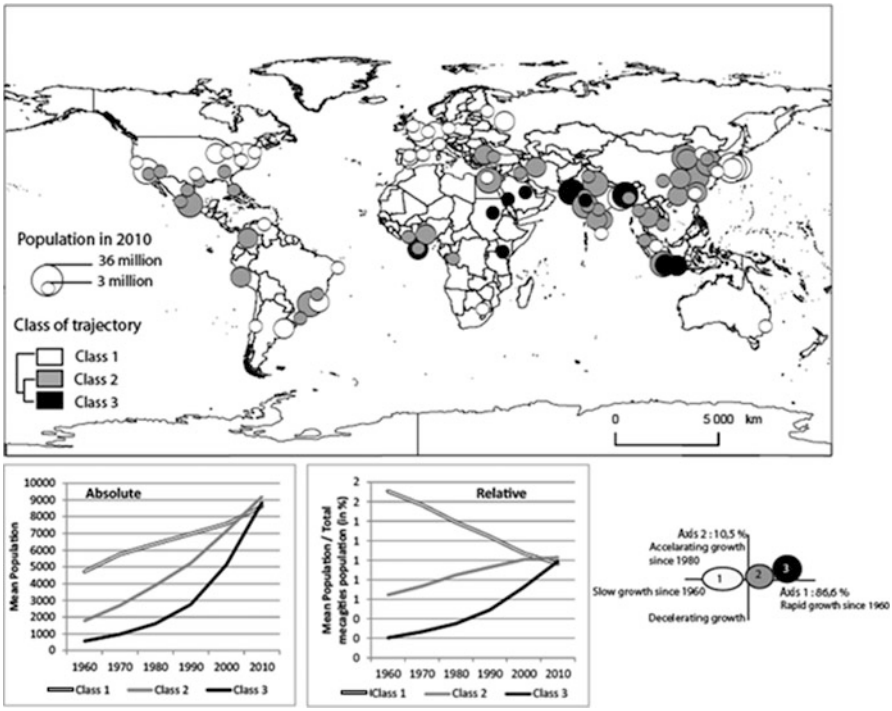


**Fig. 1.3** Hundred largest cities trajectories since 1960. *Sources*: Various harmonized national census data, Elfie Swerts (2014). This type of analyse have already been done on the million plus cities based on UN Data (Pumain 2013)

The first class (38 cities) group cities that lost weight regarding to the demographic evolution of all Megacities between 1960 and 2010. It gathers cities whose weight among the 100 largest cities decreased between 1960 and 2000. These cities are mostly located in the world regions which have completed their urban transitions: Europe and North America. Some Asian cities (9 cities), whose growth has slowed sharply during the second half of the twentieth century, are also included in this class: the large Japanese cities (Tokyo, Osaka, Nagoya and Fukuoka), the large cities of Northern China (Shenyang and Harbin), Singapore, Taiwan, and Kolkata (India). The second class (51 cities) regroups cities whose weight has increased. Asian cities constitute more than 50 % of this class—and South American cities 40 %. This class encloses the vast majority of Chinese cities (Shanghai, Beijing, Guangzhou, Wuhan, Tianjin, Chongqing, Chengdu, Xi'an, Changchun, Nanjing, and Dalian), Indian cities (Delhi, Mumbai, Chennai, Bangalore, Hyderabad, Ahmedabad and Pune) and South Korea cities (Seoul and Pusan). Jakarta (Indonesia), Bangkok (Thailand), Ho Chi Minh City (Vietnam), Pyongyang (North Korea), Lahore (Pakistan), Chittagong (Bangladesh) and Rangoon (Burma) are also in this vigorous class. Finally, the Class 3 includes 11 cities whose weight increases very sharply and whose growth was stronger than those of the other large cities. It mainly

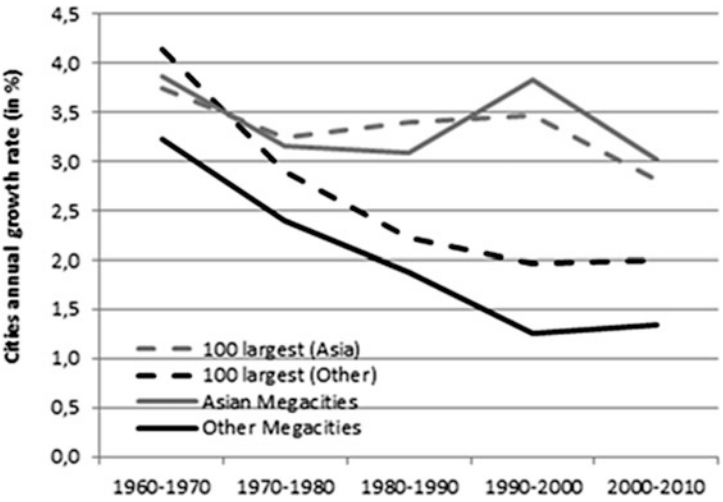


**Fig. 1.4** Annual growth rate of the 100 largest cities and the megacities between 1960 and 2010. *Sources*: Various harmonized national census data, Elfie Swerts (2014)

concerns cities located in Africa and the Middle East. Asian cities that belong to this category are Shenzhen and Dongguan in China, Surabaya and Bandung in Indonesia, Dhaka in Bangladesh and Surat in India. They are characterized by a huge and fast expansion of their industrial concentration.

### *1.3.3 Evolution of Asian Megacities in Their Urban Systems*

The emergence of large Asian cities in the second half of the twentieth century is the result of their continued growth during this period. Among the 100 world largest cities, between 1960 and 2010, Asia's large cities experiment an average annual growth rate of 3.4 %, that goes up to 3.7 for megacities, when in the rest of the world, the growth was 2.6 % (and 2 % for megacities), and 1.3 only for the large cities of the ancient industrialized country (Western Europe and North America), this growth rate dropping to 0.7 for megacities.

The Asian cities growth rate became significantly highest during the 1980–1990 with an height during the 1990–2000 decade. Although this trend continues until 2010, the annual growth rate of larges cities tend to converge (2.8 % in Asia again 2 % for other cities between 2000 and 2010) (Fig. 1.4). However the megacities growth rate remains more differentiate.

Thus, the emergence and the development of megacities in Asia is not indicative of an *overurbanization*, but it complements the rapid and secular increase of the number and size of cities in Asia. Asia trend is conform to the standard increased differentiation of cities/size rule observed elsewhere. In the regions of the world that have already been analysed with reference to the evolutionary theory of cities

(Pumain 1997), such as Europe and the United States (Bretagnolle et al. 2012), a trend toward a greater growth of large cities is observed. It results from the dynamics of competition between cities where large metropolis gain advantages. A comparable process of hierarchical differentiation is observed in India. Less accentuated than in Europe or the United States, a gradual differentiation of city sizes yet appears (Swerts and Pumain 2013). In China since 1980 a growth rate convergence is observed for all the system of cities, only the largest metropolis experiment a stronger growth rate (Swerts 2013).

Among Asian Megacities, a wide typology of urban developments remains. To differentiate their demographic evolution, and compared each of them to the evolution of the system to which they belong, we applied the same method used to distinguished larges world cities trajectories (Fig. 1.5). The relative trajectories of megacities, i.e. compared to the urban population of their country, revealed important contrasts.

Tokyo and Osaka in Japan, as Kolkata in India and Jakarta in Indonesia are less dynamic than the other Asian megacities all along the 1960–2010 period. These four cities are also the only megacities whose weight in their respective system of cities decrease slightly over time. The fact that Japan has completed its urban and demographic transition, marked by fertility decline and ageing, explains the slower growth of the two great Japanese megacities (Oe 2006). Jakarta slow growth has to be understood within the desakota configuration, where periurban dynamics are more and more diffused and overcoming the saturated Jabodetabek metropolitan region (Rukmana 2008). It encompasses a large part of the north coast of Java in a semi-urbanized corridor going up to Surabaya and incorporating Bandung. These two cities experiment yet a robust demographic growth.

The weight reduction of Kolkata in the Indian system of cities can be explained by both the slowdown in the pace of urban growth in India since 1960, and by its own history of decline. Kolkata was the capital of the British Empire in India from 1772 to 1911 (Berthet 2010), experimenting a strong growth during this period. In 1901, Kolkata was the only Indian city to have more than one million inhabitants and it dominated the Indian system until the mid-twentieth century.

After the transfer of the capital to Delhi, Kolkata growth has slowed. From 1981, Kolkata was gradually overtaken by Delhi, which population growth was exploding since Independence (Swerts et al. 2014). The trajectory of Delhi is among the most dynamic, as Dhaka (Capital of Bangladesh) and Karachi (Pakistan) between 1960 and 2010. However, while the weight of Delhi in the Indian system increases steadily between 1960 and 2010, the weight of Dhaka increases slowly from the 1980s and the weight of Karachi from 1990. The strong growth of Dhaka result of its emergence as the capital of the independent Bangladesh and the attraction of an important share of the rural population of the new State (Hossain 2008), as Karachi, which channeled - with Lahore - much post independence migration (Gazdar and Mallah 2013), and became a commercial and manufacturing center (Lieberman 1982).

Seoul (capital of South Korea), Mumbai (economic capital of India) and Bangkok (capital of Thailand) also experiencing in a lesser extend a more increasing trajectory than those of other Asian megacities, with variations over time: the

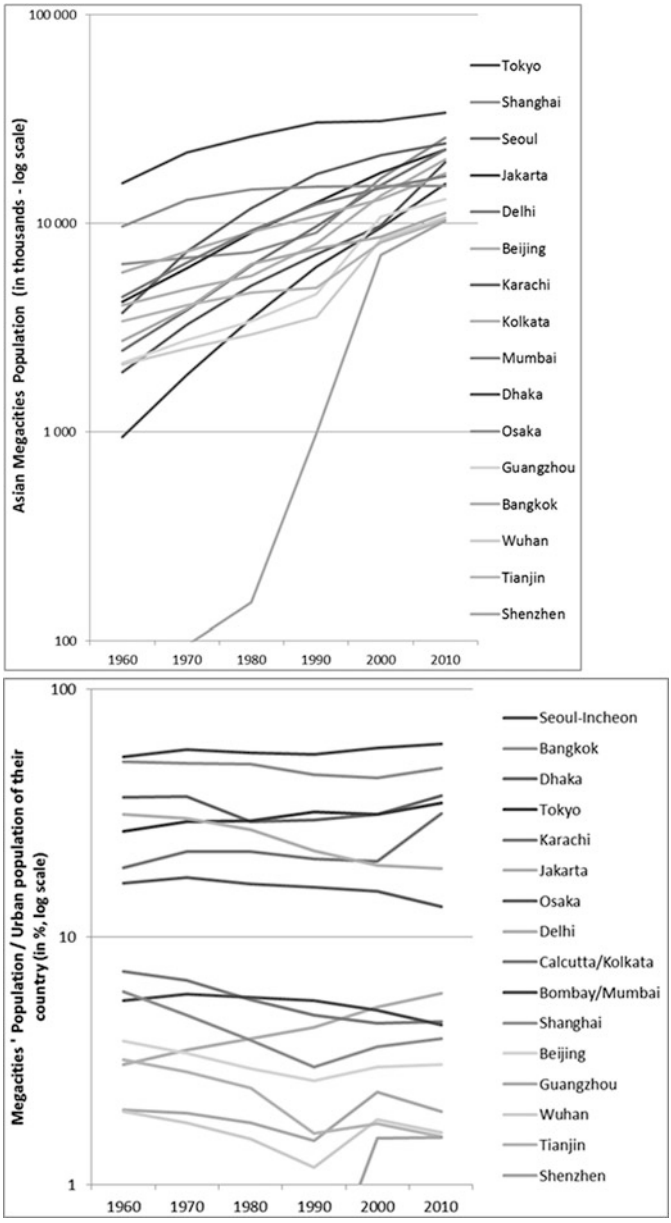


**Fig. 1.5** Asian megacities trajectories since 1960. *Sources*: Various harmonized national census data, Elfie Swerts (2014)

population of Seoul and Mumbai has increased more strongly than other cities until 1990, and those of Bangkok until 1980. However, unlike Delhi, Dhaka and Karachi, the weight of Seoul and Mumbai does not increase in their respective systems. The weight of Bangkok decreases in the Thailand's system of cities.

Until the 1990s, the weight of megacities has sharply decreased within the Chinese system of cities, and increased only after the implementation of the "open door policy". As a completely new industrial town induced by the Special Economic Zone policy, Shenzhen have a unique and explosive growth—from 40,000 inhabitants in 1960 to ten million in 2010.

### *1.3.4 Slowing Down Growth but yet Heavy Demographic Pressures*

The trend toward Asia's megacities growth rate decelerations shouldn't hide the persistence of a high demographic pressures. In absolute term, the number of inhabitants added each year in those megacities is yet tremendous, except in Japan where Tokyo expand of 150,000 inhabitants only. Between 2000 and 2010, Karachi had to accommodate a surplus of 990,000 inhabitants per year, Shanghai 925,000 or Delhi 730,000 and Beijing 660,000. In the case of China, when national population growth rate is falling below 0.5 % per year—159th in the world—the growth is only supported by migrations, that could dry up rapidly. But at the moment, notably for megacities in India, Bangladesh and Pakistan, the population burden is yet of a major concern. Housing, infrastructure, employment is not coping ideally with it even major investments are done.

Yet megacities regroup an important share of the total urban population of their respective countries. Seoul and Bangkok regroup about half of the urban population of their country. Dhaka, Jakarta, Karachi and Tokyo includes between 20 and 30 % of the urban population. In India and China, each megacities regroup a smaller percentage of the urban population, about 10 %, but they are also more numerous than in other Asian countries, especially China. If the population of these megacities is added, the proportion of urban population they contain is similar to other Asian countries (Fig. 1.5).

Another way to measure megacities demographic domination of urban system is to compare their population size with those of the following cities. If we rank the cities of a country or a region in descending order based on their population size, we can establish two indicators to appreciate their peculiarity within their system of cities. The first one is the index of "primacy" (Jefferson 1939), which measures the ratio between the populations of the two largest cities of the distribution. The second one is the "macrocephaly" index (Moriconi-Ebrard 1993), which measures the ratio of the population of the two cities between which the difference in size is the highest in absolute terms.

In Asia, primacy index are not particularly high as compared to those of other countries and regions of the world, as Europe (Index Primacy of 7 in France and), South America (9 in Argentina, 5 in Mexico), or Africa (5 in Ivory Coast, 4 in Egypt). The most striking phenomenon is that, in Asia, the primacy index tends to remain stable or decrease between 1950 and 2010, except in Bangladesh and Indonesia where this index increase slowly.

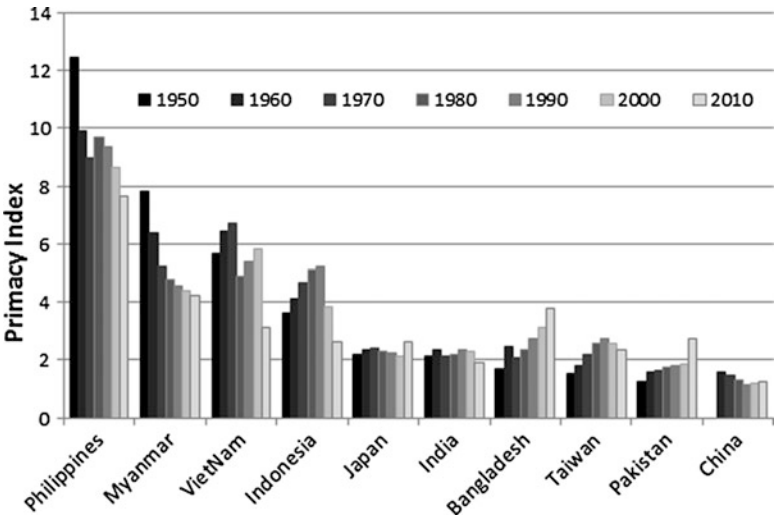


**Fig. 1.6** Primacy index in Asian countries hosting Megacities. *Sources*: Various harmonized national census data, Elfie Swerts (2014)

Extreme cases of primacy are observed between Bangkok and Samut Prakan in Thailand, Manila and Davao in Philippines, Yangon and Mandalay in Myanmar, Jakarta and Surabaya in Indonesia, and Dhaka and Chittagong in Bangladesh. In Thailand and Philippines, the largest cities is on average around ten times most populous than the second. This index is of 6 in Myanmar, of 4 to 5 in Indonesia, of 2 to 4 in Bangladesh, where primacies are less significant. India, as Pakistan, presents a typical case of macrocephaly. In India, the largest relative difference in population is evidenced between the third city (Mumbai, according to e-Geopolis database, 16 million) and the fourth city (Chennai, eight million). In Pakistan, the maximal size difference is not between the first two cities, Karachi and Lahore, although the size ratio between these two cities increased between 1960 (1.3) and 2010 (2.8), but between the second and the third largest cities, Lahore (seven million inhabitants in 2010) and Faisalabad (4.3 million inhabitants in 2010), except in 1960, when the third city was Hyderabad. In Vietnam, South-Korea and Japan, the situation was fluctuating over time. In Vietnam, the largest gap in size is between the second (Hanoi) and the third (Can Tho), varying from 6.4 in 1960 to 3.1 in 2010. However, the gap between the first city (Ho Chi Minh City) and the second largest city (Hanoi) comprised between 5 and 3, remains notable. In South-Korea, the largest difference is between the second city (Busan) and the third (Incheon); Busan being almost three times larger in terms of population between 1950 and 1970. After the 1970s, the largest gap is between the first two cities, Seoul and Busan, being always close to a gap of 3. In Japan, the major difference appeared between the second and third city, Osaka being on average four times greater than Nagoya (Fig. 1.6). Finally in China, neither situations of primacy nor macrocephaly are observed. This appears to be unique, and could partly be the

result of Chinese policies aiming to control urbanization, particularly to limit the increase of population in very large cities.

This last point could revive the debate about the Chinese city hierarchy. We can't state that China's megacities are too small (Xu and Zhu 2009). We shouldn't avoid the prism of delineation and the necessity to take into account the Mega Urban Region and Desakota forms encompassing megacities (Florida et al. 2008).

Among the 17 urban objects identified as megacities using Geopolis database, some are already composing vast urban regions, like Jakarta and Tokyo due to their dense and continuous built up, while the boundaries of cities like Mumbai or Shanghai are strictly those of urban agglomerations.

The most obvious Mega Urban Region in Asia is the Pearl River Delta Urban Region, stretching from Guangzhou to Hong Kong, including Shenzhen and adding Macao and Zhongshan, for a population of around 38 million peoples in 2010. Chinese authorities are planning to integrate the Delta in a "one hour living zone".

The region developed around the Shanghai would rather correspond to a desakota. The agglomeration formed by the continuous urban built up with less than 200 m between construction forms a very sparse (4.176 p/km$^2$) but very populous set, which includes 94.5 million inhabitants in 2010. This region concentrates a large part of Chinese industry established as well in urban and rural area. The weight of Shanghai desakota on the Chinese city system has drastically increased between 1960 and 2010, due to the growth of both Shanghai city and all smaller cities and villages incorporated in it.

Beside the emblematic Indonesian case and its China's counterparts (McGee and Robinson 1995), India is also concerned. In particular, the coastal Kerala constitutes the archetype of an Asian desakota. In 2011, it gathers more than 17 million inhabitants in a single linear, functional and continuously coastal urbanized region from Thiruvananthapuram/Trivandrum to Kochi. It is also one of the largest India's economic engines with the best human development indicators. It is important to notice that even more than megacities, extended urban regions, corridors and desakotas are not bound by a common institutional setting. They depend of multiple local governments, but can eventually be structured and supported by regional frameworks, industrial and infrastructure strategies.

In a very near future, several other Asia cities will complete the current set of megacities and the urban regions they form. Thus, the cities of Surabaya in Indonesia already have nearly ten million inhabitants, and its average annual population growth rate is 7 % since the 1990s. Other cities, like Nagoya or Taipei, experiment slower growth rate, respectively about 2.5 % and 1.5, but already reached 8.5 million inhabitants. We can also cite the case of the Indian cities of Chennai (8.7 million inhab.), Bangalore (8.5 million inhab.) and Hyderabad (seven million inhab.), which annual growth rate oscillate between 3.5 and 4.5 %, or of Bandung (Indonesia, 8.6 million inhab.) and Lahore (Karachi, seven million Inhab.) which experiment yet similar growth rate. Finally, the high growth rate of Dongguan (China, 5.5 million inhabitants, annual growth rate of 7.5 % between 1960 and 2000) in the Pearl River Delta or Nanjing (China, 4.4 million of inhabitants, growth rate higher than 3 % since 1990) in the Yangtze Delta could come consolidate the weight of the mega region articulate around Guangzhou and

Shanghai. The growth of Pune (India, 5.3 million of inhab., annual growth rate of 4 % between 1960 and 2000), located near Mumbai, could lead to the formation of a mega urban region in Maharashtra.

## 1.4 Placing Asian Megacities in the World cities' Economic, Coordination and Command Network

Urban studies have rejected the idea of "urban bias" framed by Lipton (1977). Cities, especially metrocities and megacities, are recognized as motor engine of growth (Harris 1988). Asia's megacity arising and primacy we presented above are based on population concentration. Demographic size of city is considered as an universal and compact indicator which incorporates market potential, productive capability and wealth concentration. Notwithstanding, metrocity weight has to be balanced in term of economic productivity and capital accumulation.

In almost any national context, metrocity productivity appears structurally higher than secondary and small cities. It becomes equivalent in the more mature system of cities due to convergence. Economy of scale is at stake here. System of cities, their distribution and evolution, are the balanced product of a spiraling growth of agglomeration and trade-off between specialization and diversification, which induces economy of scale and knowledge/technology spillover. The notion of spillover is at the core of economies of agglomeration. Two levels of positive externalities have to be considered: (i) interfirm externalities within the agglomeration and (ii) the firm-city/agglomeration externalities. In effect, the model implies that the larger urban agglomeration is, greater are the benefits. Larger agglomerations are self propelling. Larger the agglomeration is with a solid and diversified manufacturing sector, greater the market potential is, which spur intermediaries to locate in the region. In other words, bigger a city is, further companies are attracted to setup. Subsequently, infrastructure investments are cumulatively easing the economic capabilities. Following that virtuous pass, it leads to flourishing job opportunities and higher salaries which attract skilled and unskilled workers. Megacities can continue to attract population and expand physically as banal activities are moving outside pushed away notably, by transport congestion, labour cost and regulations related to pollution. Negative externalities counterbalance the growth potential, but there is no maximum or equilibrium size for megacity. They become bigger not only in concentrating command and innovative function in their core area, but also by expanding functionally in metropolitan region marked by multipolarities and, ulteriorly, in edgeless mega urban region.

Asia's megacities are not an exception in that regard, especially since the economy of the country they belong is growing extremely fast. Only Tokyo and Osaka megalopolis have a productivity equivalent to the national one. Japan constitutes the archetype of a mature system of cities with one of the world's highest productivity. This productiveness is equally diffused within all the coastal extended conurbation of its east coast. Tokyo have the second GDP per Capita after New York. Not far from the whole India's GDP.

The fast growing metrocities are usually those who experiment a higher productivity than the rest of the country. The megacity over-productivity indicator (Table 1.1) assesses the productiveness primacy. Shanghai GDP per Capita is, for instance, 2.7 time larger than China average and it's GDP was expanding at 9.1 % per year between 2007 and 2011. Subsequently, Shanghai demographic annual growth was 4.6 between 2000 and 2010. In contrary, Tokyo demographic growth was almost atone during the last decade and its GDP growth negative (−5.6 %) between 2007 and 2011, heavily impacted by the global crisis and Japan debt. Tokyo gains inhabitants only by aggregating new localities in its continuous built-up area, but none of these places are significantly growing. Tokyo Prefecture with its 13 million inhabitants in 2010 has an annual growth of 0.45 only. Osaka is stagnant.

The share of national wealth concentrated by megacities is depending at first of the country size. As expected, 75 % of South Korea GDP is centered on Seoul. Japan with is very dense and continuous coastal urbanisation has also a large amount of its production generated within the megacity conurbation, 39 % between Tokyo and Osaka and 44 % adding Nagoya. The Japanese coastal mega urban region merging Tokyo and Osaka is polarizing 43 % of the Asian megacities GDP for 16 % of their population only.

In the largest countries, China and India, megacities weight is lower. Shanghai annexes 5 % of the Chinese GDP when Mumbai have 5.6 of India's one. The cumulatative share of production of the three indian megacities is 12.6 and for the 6 chineses 18.2 %. United States, another large country, experiments a comparable level of concentration, with New York megalopolis and Los Angeles creating 19 % of the GDP. Concentration exists within these big countries but at a regional scale, where Mega Urban Regions expand and merge. The chinese coastal urban system is of this type incorporating in a functional system the whole East China and Guangdong, plus Hong Kong. The club of fast growing and converging regions in India, is composing another form of diffused concentration associated to megacities and metrocities.

It's not necessary to accumulate a large amount of indicators in order to question further the place of Asian megacities within the global city hierarchy as debated by P. Taylor (2004) and the Globalization and World Cities Group after Saskia Sassen (1991) seminal work which insists on the importance of a dominant class of megacities that control a very large amount of global affairs. Global cities distinguish themselves, notably London, New York and Tokyo, by their high level of economic control over the global chains of value and unique capabilities of coordination. But yet, after collecting large battery of indicators about nodality, control of flows and power concentration to generate sophisticated benchmarking of cities like Global City Index, Global Economic Power Index, Global Power City Index, the Wealth Report or the Global City Competitiveness Index, the hierarchy given is never far from a ranking of the biggest cities by their GDP per Capita, especially for the top one, even for Asia only. If Shanghai's GDP, third in urban's Asia, is five time smaller than Tokyo one, it's nevertheless equivalent to the whole Greece's GDP. Shanghai concentrates a powerful productive machine.

**Table 1.1** GDP (nominal) and productivity of Asia's Megacities in 2010

| | | Megacity GDP | Country GDP | GDP per capita | GDP per km$^2$ | Share NGDP | Megacity over productivity | Megacity annual growth GDP | |
|---|---|---|---|---|---|---|---|---|---|
| | | Billion USD | Billion USD | USD | Million USD | Percent | | 1993–2007 | 2007–2011 |
| 1 | Tokyo | 1,340 | 5,498 | 40,617 | 385 | 24.4 | 0.9 | 0.9 | −5.6 |
| 2 | Seoul | 758 | 1,014 | 31,512 | 557 | 74.8 | 1.5 | 3.9 | 0.1 |
| 3 | Osaka | 521 | 5,498 | 34,496 | 180 | 9.5 | 0.8 | 0.7 | −5.6 |
| 4 | Shanghai | 294 | 5,879 | 11,471 | 57 | 5.0 | 2.7 | 9.1 | 4.7 |
| 5 | Beijing | 238 | 5,879 | 11,797 | 165 | 4.0 | 2.8 | 8.7 | 4.3 |
| 6 | Guangzhou | 196 | 5,879 | 15,109 | 186 | 3.3 | 3.6 | 12.0 | 10.2 |
| 7 | Jakarta | 160 | 706 | 7,102 | 73 | 22.7 | 2.4 | 1.2 | 3.2 |
| 8 | Shenzhen | 143 | 5,879 | 13,930 | 346 | 2.4 | 3.3 | 9.9 | 6.2 |
| 9 | Tianjin | 111 | 5,879 | 10,783 | 284 | 1.9 | 1.8 | 11.9 | 10.5 |
| 10 | Bangkok | 105 | 319 | 9,383 | 33 | 32.9 | 1.6 | 2.0 | −2.4 |
| 11 | Bombay/Mumbai | 98 | 1,729 | 5,828 | 210 | 5.6 | 4.5 | 6.1 | 3 |
| 12 | Wuhan | 90 | 5,879 | 8,405 | 234 | 1.5 | 1.4 | 12.3 | 12.1 |
| 13 | Delhi | 68 | 1,729 | 3,040 | 48 | 3.9 | 2.1 | 5.1 | 8.7 |
| 14 | Manila | 55 | 199 | 2,719 | 50 | 27.4 | 1.1 | 3.5 | −1.4 |
| 15 | Calcutta/Kolkata | 53 | 1,729 | 3,065 | 29 | 3.1 | 2.2 | 5.0 | 4.5 |
| 16 | Karachi | 27 | 175 | 1,401 | 34 | 15.7 | 1.4 | | |
| 17 | Dhaka/Dacca | 23 | 100 | 1,465 | 21 | 22.5 | 2.0 | | |

*Sources*: India, Planning Commission (GDP per district); China Statistical Yearbook (GDP per city), UN (GDP per Country), and National accounts for other countries; Brooking Institute (GDP Growth)

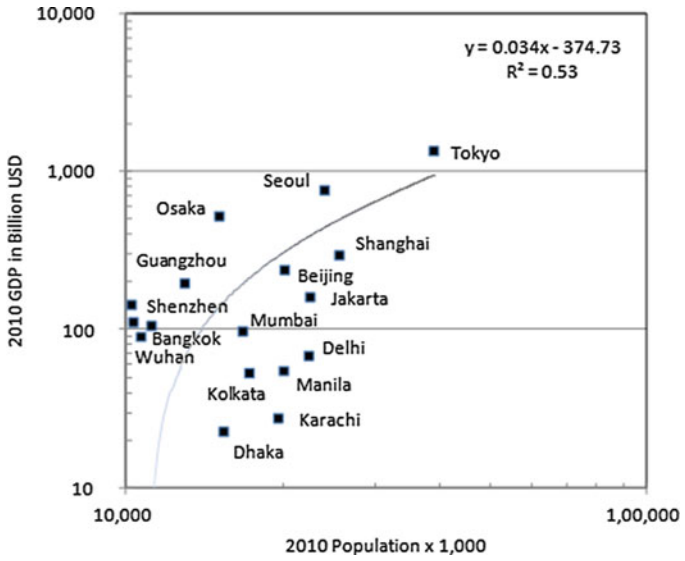


**Fig. 1.7** Asian megacities population and GDP relation. *Sources*: India, Planning Commission (GDP per district); China Statistical Yearbook (GDP per city), UN (GDP per Country), and National accounts for other countries; Brooking Institute (GDP Growth)

The eight to ten largest Asia's megacities belong to the places generating more goods and value in the world. They aggregate major factory combinations, first rank export facilities and the biggest capitalized banking systems. All of them, except Beijing, are located on the coast and host some of the biggest port facilities in the world. Shanghai concentrated the largest container traffic around the globe with 32.5 million tonne equivalent units (TEUs) transported in 2012.[1] Guangzhou ranked 7th. Shenzhen stands 4th and Tianjin 10th, afront of Rotterdam the biggest European port complex. Keihin ports associated to Tokyo positions 18th and Jakarta appears at the 22nd rank.

China's world factory experiments a strong intrication of production and export facilities which expand in wide city regions. Tianjin, for instance, should be seen as the sea gate of Beijing. The Pearl River Mega Urban Region (MUR) hosts, between Hong Kong, Shenzhen and Guangzhou, the largest port complex in the world with 37.8 million TEU in 2012. With Hong Kong, the Pearl River MUR activities are supported by the 6th stock exchange place in the world capitalizing 2,258 billion USD in 2011. Shenzhen matters too, ranking 16th. Shanghai hosts the 5th one. Tokyo is the second with a 3,325 billion USD capitalization, just behind New York. Without multiplying the indicators we can strongly assert that the demographic size of the megacities at the top of the hierarchy is well correlated to their level of concentration of wealth, either at the level of the physical agglomeration or their

[1] Source: World Shipping Council 2014.

extended urban region. They cummulate a gigantic industrial and advanced services' dynamism with a huge financial, command and control capability (Fig. 1.7).

Nevertheless, the mathematical relationship between megacity wealth polarization and population concentration is not linear ($r^2 = 0.53$ in 2010). As indicated by Glaeser (2013), urbanization and economic growth are no more so positively correlated as they were in 1960. A partial disconnection is observed, in particular for the poorest country and among the largest cities. Some of them experiments accelerate demographic growth even they cumulate negative externalities coping with a lack of infrastructures, of housing, transport facilities, fresh water and drainage. In an open and globalized world, megalopolis can continue to accommodate more and more population even the national agriculture system they belong remains underdeveloped and rural deprived without generating enough or any surplus (Bourdeau-Lepage and Huriot 2006). The country is able to tape the international market to feed population and in that context, it's better to join the megalopolis to access scarce resources.

When the megacity GDP fall below 100 billion USD and GDP per capita under 10,000 USD, a disequilibrium spurs between the wealth generated and the population accumulated. Poverty arise among the residents. The share of inhabitants living in substandard settlements and slums rise tremendously. In 2011, 41 % of Mumbai's dwellers were living in slums, in Kolkata they were 30 % and in Delhi 14. One quarter of Jakarta population lives in kampungs or slum neighborhoods, and in addition to that 5 % cope with illegal settlements found under and next to public infrastructures (i.e. bridges and train tracks) and along riverbanks. One third of Dhaka population has to endure terrible living condition of housing in flood prone lowland and marsh. Slum dwellers of Manila reached 34 % and is yet expanding without alternative. When in Karachi, half of the citizens is leaving in *Katchi Abadis*, substandard and illegal settlements. This poor state of living condition and slow improvement is correlate and proportional to the share of population living below the poverty line. Without entering in the rich literature on the relation between social inequalities and city size, notably on the increasing spectrum of possible wages larger the city is (Baum-Snow and Pavan 2013), and the reason why poor's move or stay in large cities, we can observe that Asian megacity internal inequalities are differing.

Inequalities among our Asia's megacities appreciated using an income distribution gini index[2] are varying, but yet income's polarisation is not acute. Most of the megacities are below or near 0.45 which is considered by UN Habitat (2008) as a level of alert; when inequality are approaching a dangerous high level that could discourage investment and leads to urban unrests. It denotes dysfunctionalities in the labour markets, inadequacy of public investments and the absence of pro-poor social programmes—above 06 the wealth concentrates among a privileged group

[2] The Gini index measures the extent to which the distribution of income among households within an economy deviates from a perfectly equal distribution. It measures the area between the Lorenz curve and the hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. A Gini index of zero represents perfect equality and 1, perfect inequality.

and the majority becomes excluded, like in the extreme cases of Johannesburg at 0.75. Bangkok and Hong Kong are the most unequal cities megacities of the region, standing at 0.53 in 2009. All the others are standing around 0.3: Delhi and Dhaka at 0.37, Karachi, 0.33 like Kolkata and Shanghai. Shenzhen and Manila are around 0.4. Nevertheless, inequalities tends to increase following the global integration within the global network of large cities: Beijing for instance who were one the most equal large city worldwide at 0.22 in 2002 stood in 2012 at 0.47. In India, like in many developing countries, the appearance of income distribution fairness is also the product of the unaccounted income and the gray/black or shadow economy well exposed in the case of Mumbai (Weinstein 2008). If they could be integrated the index will surely goes up further.

The cost of housing gives a complementary idea of the living difficulties in those megacities. It can be compared based on the number of years necessary to acquire a standard apartment expressed with the median annual salary (source: numbeo.com). Beijing is among the most expensive city in the world in 2013: 30 years of the median salary are needed to possess a flat (35 in Shenzhen, 28 in Guangzhou and Shanghai), only Manila stands at the same level. Then come Taipei and Singapore, respectively at 27 year and 25, followed by Bangkok and Hong kong at 20. It's a cost level comparable with megacities like Rio de Janeiro (22 years) or Moscow (24). Below 20 years, we find Mumbai at 19 and Karachi at 16. They are yet above the most expansive megacities of the developed world. There real estate is still associated with speculative and financial capitalization practices. London and Paris stand at 15 years like Tokyo, Delhi and Jakarta. Kolkata is at 13 years and Ho Chi Min City at 11. Kuala Lumpur at 8.8 years falls below the 10 years. It belongs to the most affordable megacities, like Dhaka, close to Istanbul (7.5 years) or New York (9 years), but yet at the double cost of Los Angeles median housing.

Nevertheless, transitional disequilibrium in population growth coupled with inequities are not leading to a complete trap of poverty and economic stagnation. Local weakness can eases precisely because those cities becomes competitive in an open world. Due to lower salaries and availability of workers, those underprivileged megacities becomes appealing. It's the reason for instance why Bangladesh with Dhaka only and its 4,500 factories and two million workers is on the eve to become the largest ready-made garments manufacturer. It gains on the global externalisation market on China competitors as wages increase. Relocation is not limited to unskilled and manpower intensive manufacturing, it concerns more and more back office activities or Business Process Outsourcing (BPO) in fast growing computer, insurances, banking and net industries. Manila is rapidly became the most attractive destination worldwide for service providers based in North America (Tholons 2013). Only Indian cities are competing with it—Mumbai, Delhi but also, Pune, Bangalore and Chennai where are working some 2.8 million young skilled professionals. When in China BPO is yet only an internal market due to language barrier.

If Asia's megacities are yet appearing for their growing concentration of sweatshops and at the core of the outsourcing nation, the relocation strategies in global chain of values are more and more investing smaller towns, where lower wages and less environmental regulation can be negotiated. In India for instance, industry

tends to move away from the main urban centres (Ghani et al. 2012). It confirms the general trend indicating that if "cities are important for FDI and growth: more medium-sized cities stimulate growth but congestion, pollution and overcrowding associated with megacities seem to depress economic performance" (Poelhekke and van der Ploeg 2009).

Notwithstanding, megacities are yet concentrating a large share of the FDI, but with different patterns. In 2013, China and India where attracting respectively 1,816 and 1,045 projects representing in value 31 and 10 % of foreign investments in Asia, only Japan was doing better, 34 %. But the level of megacity's concentration differs, Mumbai is only capturing 12 % of the new projects in India and Delhi less than 8 %, when Shanghai attracted 24 % for China and Beijing 12.5. Tokyo is polarizing further with 53 % of new foreign projects; a level of concentration comparable to Seoul or Taipei, and more than Dhaka at 43 %. Karachi stands at 21.6 % only, Manila 25 %, Ho Chi Minh, 27.5 %, Kuala Lumpur 31 % and Jakarta, 35 %.

On the long run megacities will be able to maintain their rank and enhance their attractivity only if their governance is able to foster innovation and counter the growing negative externalities related to congestion and pollution (Pandey et al. 2006). It passes certainly through the multipolar redeployment of population and activities within the Mega Urban Region in genesis.

## 1.5 Conclusion

The present Asia's megacities surge is not a factual inflection, but the continuation and renewal of a plurisecular history of urbanisation in Asia. Qualifying the contemporary trend toward an Asia's era of world urbanization dominated by very large cities and city-region has been possible after the crafting of an harmonized geodatabase. It avoids to depend upon the disparate national definitions of urban units. The analysis of this strictly comparative database of megacities defined by their extension appreciated in term of continuous built up gives a clear appraisal of the weight of Asian megacities in the global network of the largest cities worldwide: In 2010, half of the hundred largest cities in the world and, among them, 17 of the 31 megacities were located in Asia. This megacity landscape reflects the swing of world economy toward Asia. They command this reversal. It should be understand as an Asia's recentering. Only during colonial time, between 19th and 20th Centuries, Asia wasn't the world region where the largest cities were rising.

It's worth to emphasize that Asia's megacities are not the product of an explosive and purely contemporary urbanisation. Most of the actual megacities have deep historical roots among the city who structured the history of long distance trades through Indian Ocean or inland.

Three type of demographic growth trajectories since the 1960' have been differentiated. First, the megacities belonging to the developed country where urban transition is achieved. Their weight is declining. Second, the megacities of emerging countries which have a fast growing economy. Their weight alleviates.

In third appear the megacities that are literally exploding. Mainly new industrial cities and also the national capital of recently independent countries, like Dhaka.

The demographic size of megacities is much correlated to their productive capacity. We assessed it by composing an harmonised database of local GDP for the 100 largest city in the world. It shows that the demographic uprising is correlated to the relocation and expansion of industrial production and IT services toward Asia in the wake of Japan. Tokyo led the world economy centring toward Asia and started a process of industrial relocation toward China and Korea, followed by all the large companies of the old industrial democracies. The urban centering of economy can be appreciated at the scale of the largest Mega Urban Region which, in China, are by far the most productive machine in world, notably around the Pearl River Delta with some 40 million inhabitant but also the biggest port and banking system. Shanghai MUR is even oversing it with it's 90 million inhabitants associated in a complex and giant manufacturing network. Global competition leads to a regional and national redistribution of growth to cope with cost reductions and access to new markets. It has for effect to reduce the weight and primacy associated to megacity in all the national system of cities. They experiments a trend toward convergence.

If at the top of the megacity hierarchy, the relation between population size and economic system weight is well balanced, below the demographic growth is relatively disproportionate Vis the value they generated. It reflects in the share of population living in slums and the difficulties to improve infrastructures due to a lack of revenue. Nevertheless, they bear to attract outsourcing activities as they concentrated a large workforce with low wages, and they can yet offer ecological and work regulation dumping. Counterbalance within the system of megacities can be already observed with companies relocating, for instance textile production, from China toward Bangladesh or India. But in that global process, megacities and Mega Urban Region are competing with smaller urban centres and also fast rising region, like East Africa.

## Appendix

**Table A1** The 50 largest cities in the world in 2010 with their population in 1960 and 2000

| | | | Population × 1,000 | | | Annual growth rate | |
|---|---|---|---|---|---|---|---|
| | | | 1960 | 2000 | 2010 | 1960–2010 | 2000–2010 |
| 1 | Tokyo | JPN | 15,535 | 31,850 | 33,000 | 1.4 | 0.4 |
| 2 | New York | USA | 20,548 | 26,476 | 27,764 | 0.5 | 0.5 |
| 3 | Shanghai | CHN | 6,377 | 16,408 | 25,661 | 1.9 | 4.6 |
| 4 | Seoul | KOR | 3,705 | 21,097 | 24,066 | 3.5 | 1.3 |
| 5 | Jakarta | IDN | 4,185 | 17,422 | 22,551 | 2.9 | 2.6 |
| 6 | Delhi | IND | 2,441 | 15,135 | 22,425 | 3.7 | 4.0 |

(continued)

**Table A1** (continued)

| | | | Population × 1,000 | | | Annual growth rate | |
|---|---|---|---|---|---|---|---|
| | | | 1960 | 2000 | 2010 | 1960–2010 | 2000–2010 |
| 7 | Mexico | MEX | 5,849 | 19,259 | 20,631 | 2.4 | 0.7 |
| 8 | Beijing | CHN | 4,033 | 13,569 | 20,172 | 2.5 | 4.0 |
| 9 | Manila | PHL | 3,621 | 16,490 | 20,078 | 3.1 | 2.0 |
| 10 | São Paulo | BRA | 4,005 | 17,064 | 19,649 | 2.9 | 1.4 |
| 11 | Karachi | PAK | 1,932 | 9,678 | 19,589 | 3.3 | 7.3 |
| 12 | Calcutta/Kolkata | IND | 5,815 | 13,041 | 17,251 | 1.6 | 2.8 |
| 13 | Bombay/Mumbai | IND | 4,435 | 14,697 | 16,743 | 2.4 | 1.3 |
| 14 | Cairo | EGY | 3,870 | 11,878 | 15,688 | 2.3 | 2.8 |
| 15 | Los Angeles | USA | 7,157 | 14,020 | 15,449 | 1.4 | 1.0 |
| 16 | Dhaka/Dacca | BGD | 939 | 9,501 | 15,391 | 4.7 | 4.9 |
| 17 | Osaka | JPN | 9,661 | 15,039 | 15,096 | 0.9 | 0.0 |
| 18 | Istanbul | TUR | 1,678 | 10,079 | 13,460 | 3.7 | 2.9 |
| 19 | Buenos Aires | ARG | 6,789 | 11,434 | 13,333 | 1.0 | 1.5 |
| 20 | Guangzhou | FRA | 2,134 | 10,711 | 12,962 | 3.3 | 1.9 |
| 21 | Moscou | RUS | 6,848 | 11,685 | 12,918 | 1.1 | 1.0 |
| 22 | Teheran | IRN | 2,235 | 9,211 | 12,131 | 2.9 | 2.8 |
| 23 | Rio de Janeiro | BRA | 4,638 | 10,997 | 11,350 | 1.7 | 0.3 |
| 24 | Essen-Rhur | DEU | 9,688 | 10,015 | 11,316 | 0.1 | 1.2 |
| 25 | Bangkok | THA | 2,733 | 8,602 | 11,190 | 2.3 | 2.7 |
| 26 | Wuhan | CHN | 2,098 | 8,313 | 10,679 | 2.8 | 2.5 |
| 27 | Paris | FRA | 7,602 | 9,850 | 10,516 | 0.5 | 0.7 |
| 28 | Tianjin | CHN | 3,393 | 8,044 | 10,321 | 1.7 | 2.5 |
| 29 | Shenzhen | CHN | 38 | 7,009 | 10,246 | 11.0 | 3.9 |
| 30 | London | GBA | 9,476 | 9,160 | 10,223 | 0.1 | 1.1 |
| 31 | Lagos | NGA | 659 | 8,053 | 10,006 | 5.1 | 2.2 |
| 32 | Surabaya | IDN | 963 | 5,030 | 9,924 | 3.4 | 7.0 |
| 33 | Bogota | COL | 1,376 | 6,895 | 9,730 | 4.0 | 3.5 |
| 34 | Chicago | USA | 7,602 | 8,308 | 9,389 | 0.4 | 1.2 |
| 35 | Lima | PER | 1,646 | 7,462 | 8,950 | 3.4 | 1.8 |
| 36 | Taipei | TAI | 2,357 | 7,972 | 8,854 | 2.7 | 1.1 |
| 37 | Nagoya | JPN | 4,085 | 6,994 | 8,852 | 1.6 | 2.4 |
| 38 | Madras/chennai | IND | 1,873 | 6,344 | 8,731 | 3.1 | 3.2 |
| 39 | Bangalore | IND | 1,171 | 5,557 | 8,593 | 4.1 | 4.5 |
| 40 | Bandung | IDN | 1,011 | 4,539 | 8,585 | 4.4 | 6.6 |
| 41 | Khartoum | SDN | 347 | 4,157 | 7,472 | 6.3 | 6.0 |
| 42 | Boston | USA | 4,262 | 6,175 | 7,278 | 1.1 | 1.7 |
| 43 | Kinshasa | ZAR | 451 | 5,139 | 7,209 | 5.7 | 3.4 |
| 44 | Hyderabad | IND | 1,248 | 5,435 | 7,151 | 3.6 | 2.8 |
| 45 | al-Riyâdh | SAU | 138 | 3,955 | 7,143 | 8.2 | 6.1 |
| 46 | Lahore | PAK | 1,243 | 5,279 | 7,094 | 3.5 | 3.0 |
| 47 | Hong Kong | CHN | 3,130 | 6,708 | 7,071 | 1.6 | 0.5 |

(continued)

**Table A1** (continued)

| | | | Population × 1,000 | | | Annual growth rate | |
|---|---|---|---|---|---|---|---|
| | | | 1960 | 2000 | 2010 | 1960–2010 | 2000–2010 |
| 48 | Baghdad | IRQ | 639 | 5,063 | 7,055 | 4.9 | 3.4 |
| 49 | Johannesburg | ZAF | 1,993 | 6,104 | 6,959 | 2.5 | 1.3 |
| 50 | Washington | USA | 2,460 | 6,085 | 6,945 | 2.1 | 1.3 |

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# Part I
# Indian Experiences

# Chapter 2
# Urbanization Trends of Indian Metropolises: A Case of Delhi with Specific Reference to the Urban Poor

**Debolina Kundu**

**Abstract** The proposition of a sluggish urban growth received empirical backing from the population figures released for 2011 Census. Most of the cities with population of a hundred thousand-plus for which data are available have recorded a significant decline in their population growth, more so for the million plus cities, suggesting that they have become less welcoming to migrants. A process of sanitisation and formalisation seems to be discouraging the inflow of rural poor in these cities. Delhi, the hub of socio-economic and political life of India, a symbol of ancient values and aspirations and capital of the largest democracy, is assuming increasing eminence as a global city. The low population growth in Delhi can be attributed to the massive Jhuggi-Jhonpri removal as a result of the construction of flyovers and metros and sanitization drives associated with the launch of JNNURM in 2005. Strict policing of public spaces have restricted further growth of slums in the city in a bid to make the city Slum Free. The Basic Services for the Urban Poor programme under JNNURM have addressed the issue of provision of basic services to the urban poor in a cosmetic manner basically by relocating the poor to the urban fringes resulting in their economic dislocation. This may account for the decline in the number of squatter settlements in the city during the last decade.

**Keywords** Degenerated peripheralisation • Disparity • Privatisation • Rural–urban differentials • Sanitisation

## 2.1 Introduction

During the past few decades, the Indian economy has shown interesting features in its pattern of urbanization seeking stronger integration with the global system. Although the basic structure inherited from the colonial regime has dominated and dictated the processes and growth pattern since independence, planned

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interventions by the central and state government policies have led to some significant departures from the trends witnessed in the past. Also the policies of liberalisation and structural adjustments sought to determine the pattern of urbanization by bringing about the dominant role of market forces. Although the success of these policies can at best be described as limited, the country did see a number of growth nuclei and corridors along with the emergence of a number of new towns. Understandably, further opening up of the economy since the late 1990s has had additional impact on the pattern and process of urban growth.

India, which is one of the fastest growing economies of the world, recorded an average growth rate of over 8 % per annum during the Eleventh Plan period. Much of this growth is attributed to the robust urban sector performance, which contributed over 60 % of the national GDP. The launch of the new economic policy with structural adjustments started paying dividends since the later years of the Tenth Plan which also recorded a growth rate of over 7 %. However, most of the growth has been concentrated in a few regions and large cities. This disparity in the economic growth is evident in the pattern of demographic growth as well (Kundu and Samanta 2011).

Notably, urban India experienced a deceleration in the growth of population during the last three decades, dismissing the spectre of over-urbanization or urban explosion. This made policy-makers at national and state levels concerned about the slow pace of urban growth, particularly at a stage of rapid economic growth that accentuated rural–urban (RU) disparities in economic and social spheres. The annual exponential growth rate of urban population in the country during 1950s was 3.5 %. This was the highest the country had seen until that time which led to the emergence of theories of 'over urbanization'. Formalization of the criteria for identifying urban centres in the 1961 Census resulted in a dramatic decline in urban growth figures in the 1960s. The 1970s, however, following the same methodology for identification of urban centres, saw a very high urban growth of 3.8 %. The growth rate, however, came down to 3.1 % in the 1980s. It went down further to 2.73 % in the 1990s. Correspondingly, the percentage of population in urban areas has gone up from 17.3 in 1951 to 23.3 in 1981 and then to 27.78 in 2001 (Fig. 2.1).

The consistent decline in the growth rate of urban population over the past two decades of the last century has led to the Tenth Plan expressing concern over "the moderate pace of urbanisation". The Eleventh Plan admitted that "the degree of urbanisation in India is one of the lowest in the world" and considered planned urbanisation through new growth centres in the form of small and medium towns its major challenge. The Twelfth Plan also recognises the need for promoting spatially-balanced urbanisation.

The paper is organized in sections. The second section, which follows the present introductory section, analyses the demographic growth of metropolitan cities in India. The third section analyses the dynamics of demographic change and socio-economic development in Delhi. The fourth section analyses the availability of basic services and overviews the government programmes in basic services and their impact on the urban poor. The final section discusses the policy changes required at the city level.

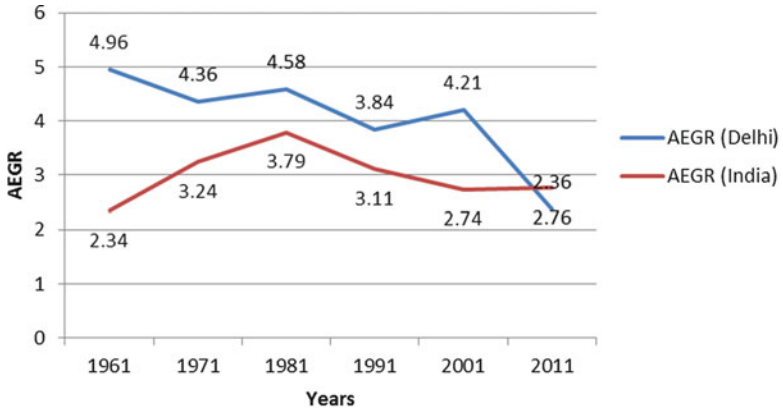


**Fig. 2.1** Trends of population growth in Delhi vis-à-vis India (urban). *Source*: Population Census of India, various decades

## 2.2 Demographic Growth of Metropolitan Cities

The level of urbanization in the country increased to 31.16 % in 2011 and the urban population recorded an annual growth rate of 2.76 % during 2001–2011. The 2011 Census reported a dramatic increase in the number of urban agglomerations (UAs), 91 new UAs came up in the past one decade. The Class I UAs/towns accounted for 70 % of the urban population, their number increasing by 74 during 2001–2011, from 394 in 2001 to 468 in 2011. The 2011 Census also recorded an increase of million-plus UAs/cities from 35 in 2001 to 52 in 2011. These accounted for 42.6 % of the urban population. The largest UA in the country is Greater Mumbai followed by Delhi UA. Kolkata UA which held the second rank in 2001 Census has been replaced by Delhi UA.

It may be noted that in 2011, 45 municipal corporations have recorded population over one million accounting for 30.3 % of the urban population living in such cities. Also, the growth rate of existing metros have reported a sharp decline. It is only the new urban agglomerations which are reporting high growth rates. Incidentally, these UAs are formed by merging together small statutory towns with new census towns. These UAs lack clearly demarcated cores and are characterized by an extended peri-urban area which is administered by a governance structure which is essentially rural. In fact, the Malappuram, Thrissur, Kannur and Kollam UAs in Kerala reported the highest growth rates of over 10 % per annum with the only exception of VasaiVirar municipal corporation which too recorded high growth rates.

The proposition of a possible slowdown of urban growth received empirical backing from the population figures of predominantly urban Union Territories and select metro, released for 2011 Census. Most of the cities with population of a hundred thousand-plus for which data are available have recorded a significant

**Table 2.1** Growth rate of Metro & Class I cities in India by common towns (1991–2011)

| Size class of city | AEGR | |
|---|---|---|
| | 1991–2001 | 2001–2011 |
| All India | 2.74 | 2.76 |
| (4 Million plus) | 2.35 | 1.35 |
| (1 Million–4 Million) | 3.17 | 2.18 |
| (1 Lakh–1 Million) | 2.78 | 1.31 |

*Source*: Provisional population totals, urban Agglomerations and cities Class I and above 2011 and 2001

decline in their population growth, more so for the million plus cities, suggesting that they have become less welcoming to migrants. A process of sanitisation and formalisation seems to be discouraging the inflow of rural poor in these cities (Kundu 2013a, b).

Mumbai district, comprising the island city, has also reported a decline in population in absolute terms during 2001–2011. The story is similar for Delhi where the present population growth is less than that of any decade in the last century. Here, New Delhi zone and central Delhi have lost one quarter and one tenth of their population respectively. Among the large states, Maharashtra, where the percentage of the urban population is over 40 and where an influx of migrants is an explosive political issue, too, has recorded a significant reduction in its total and urban population growth.

An attempt has been made to work out the growth of Class I cities using the 2011 Census data (Table 2.1). Computation of population growth rate of class I cities keeping common towns for both the initial and terminal years, reveals an interesting pattern, as presented below. The population of the cities/towns (municipal corporations and municipalities) have been considered only. The growth rate of 300 cities in 1991–2001 and 441 in 2001–2011 have been calculated by grouping the cities in size class of one lakh to one million, one to four million and four million plus. The table below indicates that the growth rate has come down in general for all classes of cities in 2011 compared to the previous decade. However, the size class of one to four million has recorded the highest growth rate for both the decades. Importantly, the growth rate of metro cities, those in the category of one to four million is similar to the growth rate in the category of one to five million as indicated by the High Powered Expert Committee projection for the same period. Greater Mumbai Corporation recorded the highest population in both the decades followed by Delhi. Kolkata was the third populous metro city in 2001. In 2011, the Bangalore Municipal Corporation occupied the third position displacing Kolkata to the fifth position. In fact, the Corporation underwent an increase in its municipal limits, which explains the increase in the share of urban population.

It is important to note that many individual cities reported a negative growth during 2011, indicating a decline in the absolute population in 2011 as compared to 2001. This trend is most obvious in the state of Kerala, which has reported an increase in the level of urbanization from 25 to 47.74 % and a corresponding increase in the number of Census towns. An analysis of the growth rates of

individual cities shows that the lowest annual growth rate was experienced in Kolkata UA (0.66 %) followed by Kanpur UA (0.73 %), Greater Mumbai UA (1.14 %), Dhanbad UA (1.15 %) and Durg-Bhilainagar UA (1.37 %). The average growth rate of all the 53 UA is 4.12 %.

In fact, all the Class I cities have reported a decline in their growth rates. In contrast, the UAs have reported phenomenal growth during the past decade, six UAs registering the highest population growth. Interestingly, most of these cities do not have a city corporation and have been formed by merging of a statutory town with newly designated census towns.

An important feature of urbanisation in India in the past few decades was the relatively small contribution of migration to the increase in urban population in India. Net migration from rural areas contributed about 21 % to the increase in urban population in the 1990s, a little less than its contribution of 22.6 % in the 1980s. Importantly, natural increase has been by far the largest source of increase in urban population (62.7 % in the 1980s and 59.2 % in the 1990s). The 2011 Census has marked a significant departure, as a substantial amount of increase in the level of urbanization would be accounted for by reclassification of rural areas into Census towns.

India's heavily protectionist trade policy regime until the 1990s had encouraged capital-intensive industrialization in the country. This may be one of the reasons for the decline in the share of migrants. Rigid labour laws and reservation for small scale units in production also encouraged capital- intensive industrialization by restricting labour- intensive industrialization. There was much slower growth in employment in the industrial sector in the past decade. As per the latest employment round (66th round), the share of regular employment in the public sector has registered a decline. The low share of manufacturing, no sizable shift in workers moving out of agriculture and the phenomenon of jobless growth has serious implications for migration in India and partly accounts for the decline in the pace of migration.

Structural transformation is typically associated with reduced dependence of the population on agriculture and increased migration from low-productivity agriculture to high-productivity sectors of industry and services in search of employment. Since these sectors are based in urban areas, rapid economic growth is normally associated with urbanization. It may be noted that in India, the decline in the agricultural sector's share in employment in the last decade was small.

Also, the industrial sector failed to attract the workforce from agriculture. Indeed, the share of industry in total employment in the economy actually declined as mentioned earlier. The service sector recorded a sharp increase in the share of total employment. Since growth in GDP took place in highly skilled services such as information technology (IT), telecom, and banking, or in sophisticated manufacturing industries like engineered goods and pharmaceuticals, it did not draw much labour from rural areas (HPEC 2011). This may explain the decline in the growth of urban population in the recent decades.

The percentage of persons below the Poverty Line has registered a decline in 2011–2012 and been estimated as 25.7 % in rural areas, 13.7 % in urban areas and

21.9 % for the country as a whole. The respective ratios for the rural and urban areas were 41.8 % and 25.7 % and 37.2 % for the country as a whole in 2004–2005. It was 50.1 % in rural areas, 31.8 % in urban areas and 45.3 % for the country as a whole in 1993–1994. In 2011–2012, India had 270 million persons below the Tendulkar Poverty Line as compared to 407 million in 2004–2005, that is a reduction of 137 million persons over the 7 year period.

The rural–urban differentials in productivity have widened since 1993–1994 in the country, indicating that there is considerable scope for migrants to take advantage of the higher-productivity non-agricultural sectors. This, however, would demand the higher skills and education level of the migrants in urban areas. The economy seems to be far from reaching saturation point in migration and it is reasonable to expect a hastening in the pace of urbanisation. The McKinsey Report (2010) on India's urbanisation prospects estimates that over the period 2010–2030, urban India will create 70 % of all new jobs in India and these urban jobs will be twice as productive as equivalent jobs in the rural sector. These would, however, require higher educational level and higher skills for the migrants. In fact, the latest round of the NSSO (64th round) shows that migration has gone up for the educated and better off sections of the population or those who have attained at least certain degree of skills.

## 2.3 Dynamics of Demographic Change and Socio-Economic Development in Delhi

Delhi was a fast growing urban agglomeration until 1991. The unique feature of Delhi urban agglomeration (UA) is that it has grown by over 4.0 % per annum in every decade since 1931, which is not the case of any other metropolis. Delhi (NCT) experienced very high rate of population growth of 6.4 % per annum during 1941–1951, which can be explained in terms of influx of migrants from across the national boundaries at the time of partition of the country. During the 1950s and 1960s too, Delhi registered high demographic growth. The main reason for rapidly increasing population is the high rate of growth of development works including residential and commercial establishments, which in turn attracted large numbers of people from all parts of the country. 1970s saw further acceleration in the growth of urban population, which was maintained during the 1980s and 1990s as well. (Table 2.2). In fact, the decade 2001–2011 reported a substantial decline in the annual growth rates.

Delhi NCT has exhibited for the first time after 1931, a growth below 4 % per annum (Table 2.2). The natural growth in population remaining unaltered over the decades, this clearly reflects deceleration in the rate of migration. It may be argued that urban Delhi has recorded an increase in population growth in the 1990s, despite an all around deceleration in growth in towns and cities in the country. One however must not give undue importance to this fact since this high growth is

**Table 2.2** Growth of urban local bodies in Delhi UA

| | Annual exponential growth rates | | | | |
|---|---|---|---|---|---|
| | 1961–1971 | 1971–1981 | 1981–1991 | 1991–2001 | 2001–2011 |
| Urban India | 3.24 | 3.79 | 3.11 | 2.74 | 2.76 |
| UA | 4.36 | 4.57 | 3.84 | 4.20 | 2.39 |
| DMC | 4.67 | 4.39 | 3.75 | 2.86 | 1.11 |
| NDMC | 1.43 | −1.00 | 0.98 | 0.04 | −1.59 |
| Cantonment | 4.63 | 3.96 | 1.03 | 2.80 | −1.24 |

*Source*: Census of India, various decades

primarily due to significant areal expansion. The decade 2001–2011 reported a substantial decline in the annual growth rates, when all the three ULBs reported a drastic decline in their growth rates. Interestingly, both NDMC and the Delhi Cantonment registered negative growth rates highlighting depopulation (Table 2.2).

The demographic growth has been extremely uneven in space. The rural hinterland and a number of small and medium towns in Delhi have absorbed a substantial proportion of the migrants. This has been responsible for a large number of villages being classified as towns in successive Censuses. Immigration of people from outside the state to the rural areas of DMC has been significant while that to the NDMC and Cantonment has shown a distinct decline. Importantly, population growth has been faster in a large number of colonies of Municipal Corporation of Delhi (MCD) that were already overpopulated. In comparison, the Cantonment registered a negative growth. Likewise, the NDMC, on the other hand, has registered a negative growth in two of the past five decades. The low population growth in Cantonment and NDMC, that had low population densities, can be attributed to the large scale infrastructural development and beatification programmes adopted in the city which has resulted in eviction of the poor.

Understandably, this spatially differentiated growth has increased the inequality in density within the urban segment. The rapid population growth in many of the wards in MCD, on the other hand, would have an adverse effect on the quality of micro-environment since they already had high density and serious pressure on their limited amenities. The same is true for a large number of peripheral urban and rural settlements where dearth of basic amenities is leading to systematic decay in the living standards.

Computation of population growth in rural and urban areas of Delhi does not appear meaningful as this is fraught with classification problems. Delhi UA has expanded enormously over geographical space. The area under MCD has increased from 240 $km^2$ in 1961 to 360 $km^2$ in 1971. It went up further by 25 $km^2$ during 1971–1981 and over 45 $km^2$ during 1981–1991. The areal expansion of urban Delhi has been noted to be 206 $km^2$ in the 1990s. In 2011, urban Delhi increased to 1,113.65 from 924.68 $km^2$. The growth dynamics since independence of the country has, thus, brought in a number of villages within the urban fold.

This movement pattern within Delhi seems to have an implicit policy framework, resulting in launching of schemes and interventions by public and private

agencies, pushing the poor out in different directions except the south. There are, however, a few distinct pockets for well-to-do even within the eastern or western periphery that have emerged through posh housing schemes of the public and private agencies. In the process of creating high income colonies and providing high quality facilities, the city population has been segmented and massive sanitisation efforts have taken place in the past decade wherein major developmental projects were taken up under the Commonwealth Games and JNNURM. Understandably, it has become extremely difficult for the new slums and squatters to find place within the formal segments in the agglomeration, especially in the New Delhi. Mostly, these have been forced to get located either in the peripheral towns and villages or in marginal lands within the city. In fact, the JNNURM has resulted in massive dislocation of the poor which resulted from cleaning drives initiated all across the NCT in a bid to create a global city.

The trend of immigrants from outside the state being absorbed in the degenerated periphery or marginal settlements within the city has put tremendous pressure on infrastructure such as drinking water and sanitation, housing, power, transport, health care facilities etc. that are available to the poor. In addition, the process of territorial expansion of the metro cities has created tensions between the locals and the immigrants as the former have lost their traditional jobs and the latter have been able to capture the newly created job opportunities in the peri-urban areas and rural hinterland. Industrial dispersal, particularly of non-conforming and hazardous industries in the peri-urban around the metropolis has significantly altered population composition, employment, housing conditions in the city and its hinterland (Ghani et al. 2012). This has put tremendous pressure on the existing basic amenities and infrastructure in smaller towns within the agglomeration and its rural hinterland, resulting in a process of degenerated peripheralisation.

Delhi is among the top three most prosperous states and union territories of India and has emerged as the major focal point of industrial, commercial and residential activities in the post Independence period. The growth rate in per capita income during the past decades has been higher than that in the country, leading to slight increase in the relative gap between the NCT and national figures of per capita income (Fig. 2.2). The per capita income of Delhi at 2004–2005 prices (at constant prices) was Rs. 105,195 as compared to Rs. 36,342 in 2009–2010. It increased to Rs. 120,414 in 2012–2013 as compared to Rs. 39,143 for India. The growth rate of income was much higher in Delhi compared to all India. Understandably, the percentage of people below the poverty line which was as high as 52.2 % in 1973–1974 has declined systematically over the decades, coming down to 27.89 % in 1983, 16.03 % in 1993–1994 and 9.9 % in 2011–2012. (Planning Commission 2012). The decrease in incidence of poverty is partly due to higher income growth and partly to deceleration in the immigration of poor into NCT. This decline in poverty ratio is also reflected in the declining share of slum households, which stands at 11.8 %—as compared to the national share of 17.4 %, as per the Population Census of 2011. The respective shares during the previous decades were 17.4 and 23.09 %.

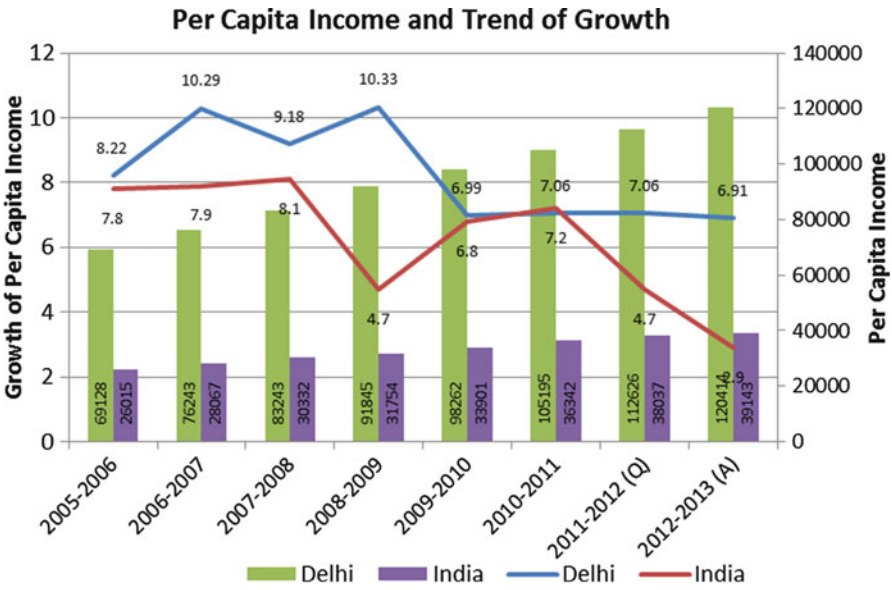


**Fig. 2.2** Per capita income and trend of growth. *Source*: Directorate of Economics and Statistics, Government of NCTof Delhi. *Note*: *Q* Quick Estimates, *A* Advance Estimates

A more important question to ask for Delhi would be whether the metropolis and National Capital Territory (NCT) has been able to create alternatives to the creation of slums by providing access to land and basic amenities to the poor. One must find out if the decline in the incidence in poverty is due to improvement in their quality of life or merely because the city has become increasingly resistant to the inflow of migrants, thereby discouraging their entry into the city. It may also be mentioned here that the Census data and the latest round of the NSSO (64th round) brings out the fact that both intercensal and lifetime migration has increased for the highly educated people while the figures have declined for illiterates and undergraduates. This again would tend to corroborate the argument that the development dynamics in Delhi is discouraging migration of economically and socially disadvantaged sections of the population.

### *2.3.1 Overview of Intra-Urban Disparity and Spatial Segmentation*

The analysis of demographic data over the past six decades suggests that Delhi city and its surrounding towns and villages have attracted large-scale migration. This is primarily due to its strong economic base, which has gone stronger over the years. The central city, however, has partially succeeded in diverting migrants to marginal lands and peripheral areas. This has led to widening of intra-city inequality in

employment and income opportunities. The disparity in terms of access to basic amenities has also accentuated. Delhi has off and on relocated informal settlements and pollutant industries to its periphery, using instruments such as Master Plans, Industrial Policy Declaration, Environmental legislation etc. Well-meaning policies and programmes of the state and local government to implement the norms of town planning have unfortunately ushered in a process of socio-economic segmentation and unequal sharing of environmental costs.

Despite this macro scenario, it would be important to note that government policy with regard to slums and in-migration of poor has fluctuated from time to time providing some political space in decision making. Political leaders with different ideological disposition have often rallied with the poor and slum dwellers, partly because the later constitute their vote bank. They have often stalled evictions and raised voices to give land titles and basic amenities. Not only that, in certain periods particularly on the eve of elections, they have demanded regularization of slum colonies. Some of the PILs have resulted in Courts deciding against eviction and urging the local governments to provide basic services. All these have increased the perceived sense of tenurial security of the poor, boosting their confidence to invest in housing and micro-environment. Often, officials have demolished hutments in slums for executing developmental projects, but permitted the evicted people to rebuild their units in nearby locations irrespective of their formal entitlement or period of stay, to avoid public unrest or interventions by court. Such administrative orders or informal permissions to rebuild the huts have been seen as official recognition of the colony, inviting investment in housing and basic services.

It is thus clear that during certain periods, the policy regime in Delhi has shown benevolence towards the poor. Industrial lobby also has time and again exerted pressures for demanded permission to locate industries within the central areas of the city providing employment to the poor, providing them a foothold in inner city. They too have designed ingenious ways of finding shelter in slums, violating or bypassing the rules and administrative orders. They have also come to enjoy a sense of perceived security, due to no major relocation or eviction taking place during two decades after 1977. Consequently, slum population have grown rapidly taking advantage of the wide-scale violation in the Master Plan and relaxed attitude towards legal controls. This has enabled them to partake in some of the benefits that accrue to regular city dwellers. They have benefited from the income opportunities in the city as also access to basic services due to their proximity to formal colonies or extension of the services.

The scene, has, however changed dramatically during the past few decades. Court orders favouring the land owning agencies and large-scale evictions of industries and slum colonies have shattered the perceived security of tenure of the poor. There is a growing realisation that social and political connections, informal assurances, host of semi-legal documents etc. are not of much use in the event of a court order. In fact, many of the industrial units had to close down or move to neighbouring towns or villages, despite their having approvals from the different departments of the local government and paying certain fees thereof.

Understandably, this has had serious environmental impact on the peripheral areas where the dislocated industries and slums have been relocated. This has led to an accentuation of core-periphery differential in terms of economic and social wellbeing and microenvironment.

## 2.4 An Overview of the Programmes of Provision of Basic Services for the Poor

This section briefly overviews the major urban development programmes currently in operation in Delhi with a focus on the urban poor.

### *2.4.1 Urban Development Department*

#### 2.4.1.1 Swaran Jayanti Shahri Rozgar Yojna (SJSRY)

The key objective of the Scheme was to provide gainful employment to the urban unemployed or underemployed through the setting up of self-employment ventures or provision of wage employment. Swaran Jayanti Shahri Rozgar Yojna is being implemented through 11 revenue districts of Delhi especially in slum and JJ Cluster. It has four components viz Urban Self Employment Programme (USEP), Urban Women Self- Help Programme (UWSP), Skill Training for Employment Promotion amongst Urban Poor (STEP-UP), Urban Community Development Network (UCDN). The Government of India has revised the guidelines in 2009, which is assisting in the effective implementation of SJSRY. It is proposed to upgrade the skills of 60,000 unemployed youth from the vulnerable sections under the Swaran Jayanti Shahri Rojgar Yojana (SJSRY) which will open up several employment opportunities for them. The annual plan outlay Rs. 7.50 crore for the year 2013–2014.

### *2.4.2 Delhi Urban Shelter Improvement Board (DUSIB)*

Delhi Urban Shelter Improvement Board (erstwhile Slum & JJ Department) is primarily responsible for improving the quality of the life of Slum and JJ Dwellers in the capital city of Delhi by implementing a number of plan schemes on behalf of Government of National Capital Territory of Delhi (NCTD).

Under the approved Plan Scheme of Construction of Community Hall/Basti Vikas Kendra (BVK), DUSIB is providing the facilities of BVKs in all existing JJ Clusters. These units of BVK are allotted to non governmental organisations, voluntary organisations or Charitable Trusts for extending the facilities like health care, adult literacy, skill upgradation, educational, vocational programmes etc. to the slum dwellers. There are about 264 BVKs, out of which 48 BVKs are vacant.

The plan outlay for the year 2013–2014 for the construction of community halls and Basti Vikas Kendra was Rs. 10 crore.

Environmental Improvement in Urban Slums includes the areas which have been notified under Slum Areas (Improvement & Clearance) Act, 1956. It aims at provision of basic amenities in the slums and JJ Clusters. These include internal lanes and drains within the cluster, community toilets and play fields for children. The scheme focuses mostly in walled city and its extensions. Apart from this, as per orders of GNCTD, large number of JJ Clusters having population of about 22 lakhs have to be covered under the purview of this scheme. During the financial year 2012–2013, an expenditure of Rs. 2,017.14 lakh has been incurred on construction of road, drains, bricks pavement etc. For the financial year 2013–2014 the plan outlay is Rs. 10 crore.

Construction of Pay and Use Jansuvidha Complexes scheme takes care of the environmental problems generated through mass open defecation in slums and JJ cluster. They are of varying capacities and run on "Pay and Use Concept" and maintained by such NGOs or agencies who are also assigned the responsibility of Planning & Construction. Annual Plan 2013–2014 outlay is Rs. 2.00 crore.

The Delhi Jal Board implemented a scheme of Augmentation of Water Supply in JJ Clusters. The scheme includes laying of pipelines, installation of handpumps and tubewell, repair and supply of water through tankers, construction of Tube wells and hand pumps in JJ Clusters. The annual plan outlay for the year 2012–2013 is Rs. 80 lakhs.

### *2.4.3 Housing*

Under JNNURM Sub-Mission for Basic Services to the Urban Poor (BSUP) component, the Government has approved 16 low cost housing projects for construction of 67,800 flats with a total project cost of Rs. 3,083.37 crore out of which about 14,844 flats have been constructed.

Three agencies are involved namely Delhi Urban Shelter Improvement Board (DUSIB), Delhi State Industrial and Infrastructure Development Corporation (DSIIDC) and Delhi Development Authority (DDA). TheGoI has approved 6 projects for the construction of 18,204 houses for the JJ clusters. Clusters at an estimated cost of Rs. 883.66 crore are to be constructed by DUSIB. DSIIDC is responsible for eight projects which include construction of 44,616 flats for weaker sections at an estimated cost of Rs. 2,101.98 crore.

#### 2.4.3.1 Rajiv Awas Yojana (RAY)

Under the Rajiv Awas Yojana (RAY), a 'Slum-free India' is envisioned by encouraging states to tackle the problem of slums by ensuring tenure security of slum dwellers. Under this scheme, funds are being released by GoI for undertaking

preparatory activities of slum survey, mapping the slums, developing the slum information system, undertaking community mobilization etc. An outlay of Rs. 10 crore has been approved for this plan scheme in Annual Plan 2013–2014.

#### 2.4.3.2 Night Shelters

The GNCTD of Delhi decided to provide a safe, secure and comfortable environment to the homeless people in Delhi by providing Night Shelters to the homeless. The Night Shelters are managed by Delhi Urban Shelter Improvement Board. At present DUSIB is running 150 night shelters in all parts of the city. This includes 66 permanent and 84 temporary shelters having capacity of about 9,085 persons. These night shelters provide basic facility of toilets. In the night shelters, the inmates are provided blankets, jute mattresses and durries for night stay by charging Rs. 6 per inmate. An outlay of Rs. 12 crore is approved for this scheme in 2013–2014 for operation and maintenance of existing shelters and construction of three new shelters.

## 2.5 Access to Basic Services, Shortages and Financial Requirements for the Poor

An analysis of the data from Population Census reveals that the percentage of households having access to tap water facility in urban Delhi has increased from 77.02 to 81.86 % during 2001–2011. The respective shares for urban India worked out to be 68.66 and 70.63 respectively (Table 2.3). It may, however, be pointed out that the Census definition of "coverage" is static, so that once a colony or household has water connection; it is considered covered, regardless of increase in the number of persons, decline in hours of supply, quantity of water etc. in subsequent years.[1] Also, it provides information on households having drinking water facility but not

**Table 2.3** Percentage of households having access to basic amenities (2001–2011)

| | Percentage of HHs having access to tap water | | Percentage of HHs having bathroom facility within premises | | Percentage of HHs having toilet facility within premises | |
|---|---|---|---|---|---|---|
| India/Delhi | 2001 | 2011 | 2001 | 2011 | 2001 | 2011 |
| India | 68.66 | 70.63 | 70.40 | 86.9 | 73.72 | 81.36 |
| Delhi | 77.02 | 81.86 | 71.71 | 91.28 | 79.03 | 89.85 |

*Source*: Census of India 2001a, 2011a, b, c

[1] The Seventh Five Year Plan document admits that the official figures of "households being covered" reflect neither the adequacy of volume of water supplied nor the duration of supply.

**Table 2.4** Access to drinking water and percentage change in urban areas

| | Percentage of HHs having tap water | | | | Decadal change | | |
|---|---|---|---|---|---|---|---|
| | 1981 | 1991 | 2001 | 2011 | 1981–1991 | 1991–2001 | 2001–2011 |
| India | 63.24 | 65.00 | 68.66 | 71.00 | 1.76 | 3.66 | 2.34 |
| Delhi | 68.14 | 78.37 | 77.02 | 82.00 | 10.23 | −1.35 | 4.98 |

*Source*: Household Tables Census of India 1981, 1991, 2001b, 2011a, b, c

on volume and quality of water. This implies that the Census figures grossly underestimate the deficiencies in water supply situation. Importantly, about 13 % of HHs in the city depend on tube wells or hand pumps as a supplementary source for their drinking water. All these suggest that there exist serious inadequacies in the provision of water in the national capital that could not be taken care of, despite concern being expressed at policy level. In view of India being a signatory to the UN declaration of the 1980s as the Water and Sanitation decade and launching specific programmes to meet the objective, the performance can only be considered as modest. The developments in the 1990s, however, appears to be a bit more disturbing. The access to tap water had declined from 78.37 to 75.3 % during 1991–2001 in Delhi (Table 2.4).[2] Also, the average hours of water supply in case or Delhi compares very unfavorably with many of the capital cities in Asia, where several report 24 h of water availability.

The availability of toilet facilities has improved during the previous decade, the access improving from 79.03 per to 89.85 % in the city between 2001 and 2011. The respective shares for urban India worked out to be 73.72 and 81.36 respectively. About 60.5 % of the toilets are attached to the water closet, 24.7 are connected to septic tanks and 1.7 % of the HHs use pit latrines. All these suggest that there has been improvements in both water supply and sanitation facilities in the city.

The poor and slum dwellers mostly draw water from public stand posts (PSP) in the city of Delhi. Here, water is available for short durations, at a low pressure and the supply is erratic. These corroborate the findings from the NSS data, as well. Moreover, the number of persons dependent on one PSP or tube well is high, resulting in long queues and hours of waiting. The per capita water consumption for these people works out as extremely low. Consequently, the monthly subsidy works out to be not low, even when they get water free. The rich, on the other hand, get a smaller subsidy per unit of water (as they have to pay a higher rate) but since their total consumption is very high, their total subsidy works out as very high. Moreover, many among the poor do not get water through PSPs and have to depend on public tube wells, hand pumps and private tankers, often paying a high price. The quality of water is also not very unsatisfactory, often causing water borne diseases, sometimes resulting in epidemics (Kundu 1993).

[2] A recent World Bank study of 27 Asian cities with populations of over one million each reveals that Chennai and Delhi share the same rank as the worst performing cities in terms of water availability and hours of supply.

The problem of the poor is not of non-affordability of the current expenses but of capital expenditure for obtaining a new water connection or toilet facility. The user charges, in general, are very low and do not show significant progressivity. In fact, pricing of water and other basic services has not been applied as an instrument to rationalise their use, generate funds for the local bodies and cross subsidise the slums and other low income colonies. The user charges collected by these bodies for providing sanitation and sewerage facilities, from the handful of covered households, are extremely low that do not meet even the maintenance cost. The subsidies provided through the public agencies in basic services in urban areas, often justified in the name of the poor, are, thus, cornered by richer sections that can afford to pay. Any increase in the user charges is resisted by people, often belonging to upper and middle classes. Of late, Resident Welfare Associations have become powerful pressure groups capable of stalling any moves to rationalise the rates.

## 2.6 Conclusion

An overview of the programmes and schemes undertaken by the central, state and local governments, for providing basic services reveals that the major concerns and areas of emphasis have changed significantly during recent years with the changing policy perspective at the macro level. Most of the programmes pertaining to basic services were financed primarily by the central government during the 1970s and earlier. Currently, however, there is a distinct shift of responsibility from the central to the state governments and local bodies. Also, the Tenth Plan onwards, there has been a greater reliance on private capital, institutional finance and resource mobilisation by community for the provision of basic amenities. All these are likely to have a bearing on inequality in the availability to drinking water within urban community.

The capacity of the urban poor to pay for the full cost of providing water would remain low in the neo-liberalism eras. The prospect of an increase in their real income does not seem very bright. Reduction in government grants, increased dependence of the public agencies in this sector on borrowing from institutional sources, hikes in the rate of interest etc. are likely to further affect the access of the poor adversely. It is nonetheless true that much of the subsidised water provided through the governmental programmes during the 1970s and 1980s have gone to high and middle income colonies. It would, therefore, be necessary to restructure these programmes and schemes and ensure that the subsidies are made explicit and, through strict stipulations, targeted to vulnerable sections of population.

In many of the water supply schemes, government funds constitute only a part of the total resources, much of it coming from institutional sources, private entrepreneurs and consumers. This automatically gives greater authority in the hands of the agencies or people, providing substantial funds, in designing the details of the project, its exact location etc. Understandably, the organisations providing loans would have an interest in recovering their money in a short time. For that, they can

dictate the terms in a manner that the original objectives of the programme get undermined. Within this framework of decentralisation, urban poor who can contribute their labour and a small part of the expenses, would have very little say in working out the details of the projects or their implementation. It is, therefore, important that designing the framework and implementation of the scheme plan is done keeping in view the basic objectives. It would also be important to ensure that the private agencies, financing the projects, are obliged to function within that framework.

The role and functioning of the central/state government and public sector institutions sharing the responsibility of providing basic services in urban areas need to be altered to bring in pro-poor bias. During the past three decades of existence, they have not exhibited a sensitivity in favor of urban poor in their functioning. In view of this and also the resource crunch in the economy, privatisation, partnership and community based projects have become necessary. There is, however, an apprehension that this changed perspective and consequent decline in public investment can create serious disparity between rich and poor localities. It would, therefore, be important that the minimum standards for provisioning of basic services are determined in realistic terms and the state and local governments take the overall responsibility of providing these to all sections of population, irrespective of their income or affordability. This, they may fulfill the task by engaging or supporting private organisations, NGOs and CBOs.

The Delhi government had systematically encouraged the RWAs to get involved in the management of services. This has certainly resulted in greater accountability in the service delivery in areas where they are vocal. . Many of these have asked the government to strengthen the Bhagidari system through legislation, giving RWAs a legal status or giving them control over a part of the budget so that their participation in developmental activities becomes real. Importantly, their functioning has been restricted largely in the middle income and posh colonies. Also the RWAs have been very effective in not allowing any informal housing by the poor to come up in and around the colonies and do patrolling of the land, this in the long run will make access of land to the poor increasingly difficult.

On the other hand, the Ward Committees (WCs) which are the statutorily created third tier of government have not been strengthened by creating effective local representation. Many of them are functioning as mere extension of the central municipal government. In case these can have representation from the poor and slum and there are attempts to empower them in decision making, it should be possible to ensure better delivery of services and a faster realisation of the MDGs.

It is important the problem of degenerated peripheralisation are analysed seriously and immediate steps taken to deal with them. The city authorities should be urged to provide formal or informal tenure like license to occupy, limited lease, tenure to co-operative etc. The story of Delhi through five decades since Independence has the moral that the slum dwellers can improve micro environment through their own resources, if they get certain minimal support from public agencies. This approach is likely to be effective in a strategy for improving slums and micro environmental in Delhi as also other cities in the Third World to counter the forces of exclusionary urbanisation.

The city authorities may further be persuaded to launch, through financial and institutional support, measures for generating employment and income opportunities in the periphery while ensuring compliance of environmental controls in location of industries. Also, regional authorities should be set up to provide reasonable levels of basic amenities in the towns and villages in the fringe so that the process of degenerated peripheralisation can be stalled.

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# Chapter 3
# Is It Sprawling Yet? A Density-Based Exploration of Sprawl in the Urban Agglomeration Region Around the Mega City of Delhi

**Debnath Mookherjee and Eugene Hoerauf**

**Abstract** Sprawl is recognized as one of the distinctive features of the urbanizing landscape in almost all countries irrespective of their urban developmental status; but despite a growing volume of literature on this subject the concept continues to elude us. In the context of the changing urban landscape such as the declining growth rates of the metro cities, the spatial expansion of their peripheral urban land into the surrounding countryside, and the sudden growth of the newly reclassified former villages as 'census towns' in the last decade, sprawl studies—primarily in the context of individual city regions—have gained momentum in India in recent years. This paper aims to make a small contribution to the literature by focusing on the Delhi Urban Agglomeration (DUA), one of the dynamic city-regions of the world. Given the universal emphasis on density as one of the major dimensions of sprawl, we used a simple and measurable density index based on census data to compute the density levels of 'census towns' around the core city in the DUA during 2001–2011. The results show an incremental change towards scattered low-density settlements across the study area that may portend future sprawl. The study points to the suitability of using simple measurable indices based on easily available and nationally applicable data for detailed multi-dimensional empirical studies on sprawl. Apart from theoretical interest, such studies at national and regional scales across India would be of value to planners from the standpoint of sustainable development in the urban agglomeration regions of mega cities.

**Keywords** Census towns • Delhi mega city • Sprawl • Urban agglomeration

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## 3.1 Introduction

In contrast to the fact that Mega cities with populations over ten million population were virtually non-existent in the Asian scene until the mid-twentieth century, currently seven of ten such cities are located in Asia. Their rapid growth over the last decades, along with their associated socioeconomic and spatial changes, including the formation of sprawling and often haphazard, low-density population settlements around the core cities have emerged as some of the significant characteristics of contemporary Asian Urbanization. India houses three such mega-cities, Mumbai (18.4 million), Delhi (16.3 m), and Kolkata (14.1 m). Although it is difficult to draw generalizations from the urbanization traits evident in such a vast continent exhibiting a variety of socioeconomic and political environments and the varied roles assumed by the respective countries in managing urban development (UN-Habitat 2008), the Indian pattern is perhaps illustrative of many of these traits. Over the past decade, the million-plus cities of India grew from 35 to 53, increasing their share of the urban load from 38 to 43 %, while their rates of growth declined over the decade; all three mega-cities in India have experienced this declining growth rate over 2001–2011. The declining growth rates of the very large metropolitan centers, relative to the higher growth rates of other cities adjacent to the regions outside the boundaries of the core cities are reshaping the urban territorial landscape akin to the "doughnut effect" (as described in UN-Habitat 2008). Nationally, a 'new generation' of dispersed large centers has begun to challenge the historically dominant, very large monocentric cities that are being transformed into the mega-cities of today (UN-Habitat 2008). The recent growth of the "census towns," formerly rural settlements now meeting certain census-defined 'urban' threshold characteristics and estimated to account for between 26 and 30 % of the urban growth in the 2001–2011 decade (Pradhan 2013)[1] is an example of the changing face of urbanization in India that has gained much recognition in the current academic literature (e.g., Pradhan 2013; Denis et al. 2012) as well as in the popular press (see, for example, a serious of six articles on census towns published in the Hindustan Times 2012). In this process, along with the continued territorial expansion of urban land and acquisition and designation of previously non-urban places as urban, sprawling low-density settlements spatially extended into the peripheries of the large cities are fast becoming an increasingly noticeable feature of the urban landscape in India. Overall, it has been argued that improvements in economic conditions and infrastructural and other linkages coupled with relative success or failure of the spatial development policies may explain at least some aspects of this evolving phenomenon (Satterthwaite 2007) that are also applicable in India.

Sprawl in its many interpretations (e.g., sprawl, fringe, edge-city, leap-frog settlements etc.) has been almost ubiquitous in the urban scene elsewhere in the

[1] The growth rates of the Census Towns over the 2001–2011 decade appear to have wide regional variations (e.g., about 90 % of the urban growth in the southern state of Kerala can be attributed to the growth of the Census Towns whose number increased from 99 to 461 during this period).

developed, and some developing countries, but is just beginning to gain momentum in India. Similarly, extensively researched in the developed world, sprawl as a phenomenon, a feature, or a complex amalgam of features (depending on how it is viewed), is now gaining attention in the developing countries and a sizable body of significant empirical work (primarily relying on GIS and remote sensing technology), have emerged in the context of India in the recent years (e.g., Asif 2014; Asif and Rahman 2013; Rahman et al. 2011; Sudhira et al. 2004; Basawaraja et al. 2011; Jat et al. 2008; Fazal 2001). The purpose of the current study is to add to this emerging literature with a brief report on our effort to utilize Census population data in measuring urban density of census towns around the core city in the Delhi Urban Agglomeration (DUA) during 2001–2011. We will start with a brief discussion of the research context, followed by methodology, research findings and a few concluding thoughts on possible future research implications.

## 3.2 Research Context

The definition of sprawl has eluded researchers long before the beginning of this century (e.g., Harvey and Clark 1965) when researchers labelled it as an 'elusive concept' (e.g., Galster et al. 2001; Fulton et al. 2001) that meant "different things to different people" (Brueckner 2000, pp. 160–161). A decade later, described and analyzed in a variety of ways depending on the perspectives, interpretations, and disciplinary orientations of the researchers, the concept of sprawl continues to be marked by ambiguity and lacking in clarity, coherence, and consensus (e.g., Arribas-Bel et al. 2011; Bhatta et al. 2010; Kew and Lee 2013; Jaeger et al. 2010). As numerous researchers have acknowledged, one of the reasons for this ambiguity lies in its complexity. Based on their perusal of the literature in the social sciences and planning fields, Galster et al. (2001) grouped the prevailing definitions of sprawl in six general categories, namely, as an example that embodies the *characteristics* of sprawl (e.g., scattered or low-density patterns of urban development such as Los Angeles), *aesthetic judgment*, *cause[s]*, *consequence[s]*, *patterns* (e.g., low density, leapfrogging), and finally, as *process*, and remarked that the definition was "lost in semantic wilderness". The literature is replete with studies of sprawl and its associated issues from diverse disciplinary and interdisciplinary perspectives (for overviews on the literature, see for example, Ewing 1994, 1997; Burchell et al. 1998; Arribas-Bel et al. 2011: 2–5). But, despite many innovative and significant contributions to define sprawl, the 'semantic wilderness' continues to this day. In addition, every observation, concern, and recommendation on the nature, causes and consequence of sprawl continues to be filtered through the positive or negative viewpoints of the observer, which has added to the general feeling of equivocality. However, as Arribas-Bel et al. (2011) put it:

> "one can interpret this situation in at least two positive ways: first, it is an unmistakable proof that urban sprawl, whatever we refer to by those two words, is a relevant issue that is present and affects many people's lives; second, this apparent chaotic situation also represents an opportunity to obtain a much richer understanding of what it really is about.

> *The problem does not come from the great number of interpretations per se, but because of the lack of agreement about the meaning and structure of the term.*" (2011, p. 1) [Emphasis added.]

In their effort to bring such meaning and structure, researchers have offered, and are continuing to offer, a wide range of measures, constructs, indices, and definitional parameters of sprawl and its associated issues (e.g., Altieri et al. 2014; Jaeger and Schwick 2014; Kew and Lee 2013; Ewing 2003; Ewing et al. 2002; Galster et al. 2001) that, although beyond the scope of discussion in this short paper, have made significant contributions to the literature.[2] Suffice to say that although most have recognized sprawl to be a multi-dimensional phenomenon, density has come up as one of the most commonly used measures of sprawl (e.g., Ewing et al. 2002; Galster et al. 2001; Torrens and Alberti 2000; Frenkel and Ashkenazi 2008).

Among the researchers that Wolman et al. (2005) noted for making a contribution by focusing on density in order to operationalize the definition of sprawl such as Fulton et al. (2001), Lopez and Hynes (2003), Lang (2003), and Nasser and Overberg (2001), (as cited in Wolman et al. 2005), Lopez and Hynes have offered a number of strong arguments in favor of their proposed density index utilizing census data that we would like to discuss more at length as a number of their arguments resonate with the purpose of our study.

Lopez and Hynes (2003) considered density to be "perhaps the most important dimension of sprawl," but agreed with Galster et al. (2001) that it was more than a matter of density: 'sprawl also contains the dimension of concentration,' and claimed that their proposed index was based on both of these dimensions (2003, p. 332).[3] According to them (2003, pp. 330–331), 'a good sprawl index should strive' to be *measureable* and *applicable*, *objective* (based on 'quantifiable data' 'collected without bias'), and *independent of scale* ('. . . not be skewed by the size of an individual metropolitan area'). Then, drawing from Coulter's (1989) 'indexes of inequality,' they added four other criteria, namely, *definition, information use, interpretability*, and *simplicity* (Coulter 1989 as cited in Lopez and Hynes 2003). They considered the "technologically reliant methodologies [e.g., GIS]" to be "limited by problems of scale and financial cost," and decided to utilize the U.S. Census data for their sprawl index. They deemed the census to be 'one of

[2] Viewed together, they are remarkable as much for their commonalities, as for their differences. The former underscores an almost intuitive universal understanding of the essence of sprawl, what a sprawl is (reminiscent of the now-famous statement in context of pornography), as well as for an almost universal acceptance of the relevance of density in any consideration of sprawl. The later has arisen primarily due to the differences in the disciplinary backgrounds of the researchers, research focus (e.g., theoretical, empirical, or both), research techniques/variables used (e.g., use of remote sensing/GIS, demographic data, or both), and the perpetuation of the aforementioned 'semantic wilderness' (Galster et al. 2001) by including issues such as examples, characteristics, causes, consequences, patterns, and process of sprawl in defining this concept.

[3] Lopez and Hynes used their Sprawl Index ($SI_i$) on 330 out of 331 metropolitan areas in the USA., and came to the conclusion that while sprawl increased in many metropolitan areas, there were "important geographic variations in sprawl, implying that it is neither inevitable not universal" (2003, p. 325).

the best data sources on population'. Their argument in favor of the census rested on its reliability, regularity (every 10 years), and the fact that it is "generally accepted as an authority on a number of demographic and geographic issues including the definition of U.S. metropolitan areas themselves" (2003, p. 332). As mentioned above, we found much in the reasoning offered by Lopez and Hynes (2003) that would be equally applicable in the context of India.

## 3.3 Study Area

Before introducing our study area (Fig. 3.1)—the land within the Delhi Urban Agglomeration but outside of the Delhi core—a brief account of the concept of the rural-urban dichotomy and the definition of urban agglomeration in the Indian Census is in order. Census of India defines the term "urban" on the basis of a set of criteria (towns and cities) that set them apart from rural areas (villages). Places with a minimum threshold of 5,000 population, 75 % male workers in non-agricultural occupations, and a density of 400 people per square kilometer would qualify settlements as urban.[4] The urban places are divided into two groups according to their status, namely, statutory towns (ST) (e.g., municipalities, corporations, cantonment board, notified area), and census (or non-municipal) towns (CT). The urban places of over one hundred thousand population (Class I) are termed 'cities'; rest are termed as "towns" and are divided into five classes on the basis of their population size categories (Classes II–VI).

The urban agglomeration (UA) concept evolved from the initial recognition of the "clustering of municipal and non-municipal localities" or "Town Groups". Criticized for its 'lack of spatial cohesion and contiguity,' the concept of 'Town Group' was replaced by that of the Urban Agglomeration in 1971. It was further modified in 2001 when two new criteria that are in effect to this day, were introduced.[5] The Census of India (2011) defines the Urban Agglomeration thus:

An urban agglomeration is a continuous urban spread constituting a town and its adjoining outgrowths (OGs) of two or more physically contiguous towns, together with or without outgrowths of such towns. An urban agglomeration must consist of at least a statutory town and its total population (i.e., all the constituents put together) should not be less than 20,000 as per the 2001 Census. In varying local conditions, there are similar other combinations which have been treated as urban agglomerations satisfying the basic condition of contiguity. Examples: Greater Mumbai UA, Delhi UA etc.

Delhi Urban Agglomeration (DUA) comprises the three adjoining statutory cities of Delhi Municipal Corporation (DMC), New Delhi Municipal Council

[4] Per the Census definition (Census of India 1991, p. 7), some places that do not fully meet the above criteria but show some 'distinct urban characteristics' would also qualify.

[5] See Ramachandran (1989, p. 112) for a discussion of the concept.

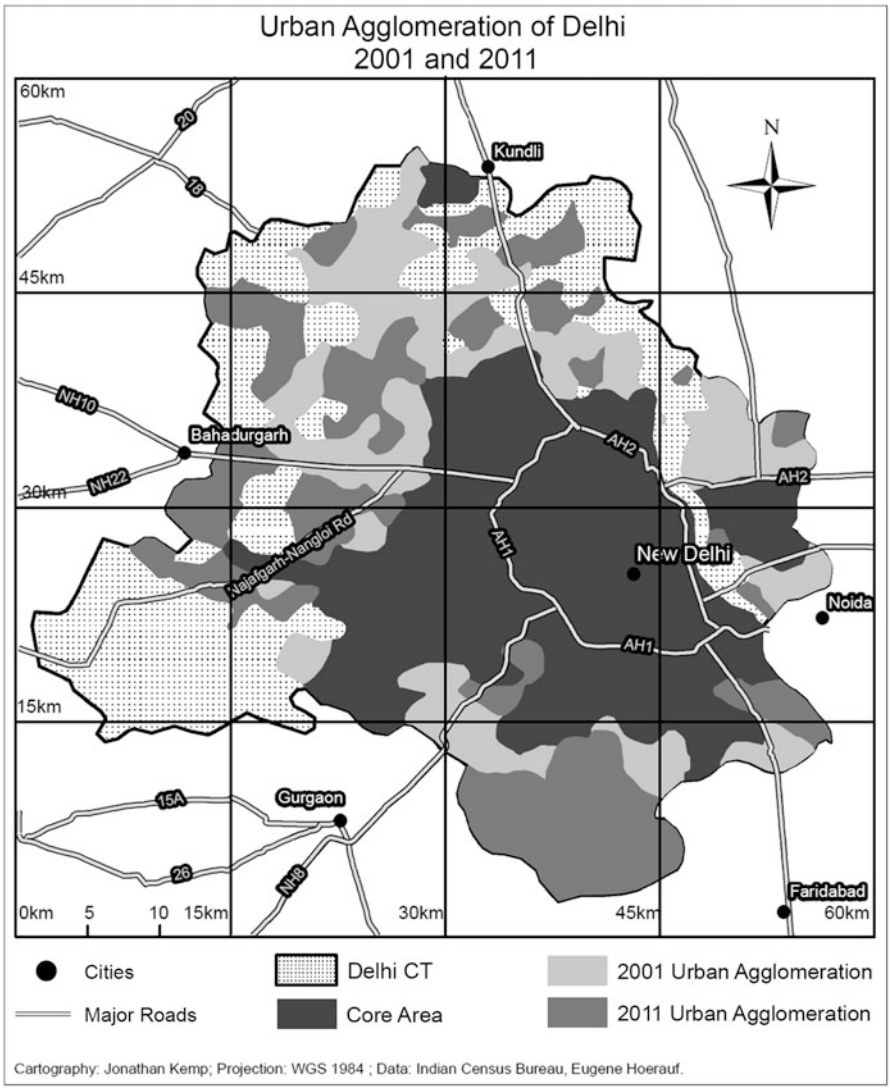


**Fig. 3.1** Urban agglomeration of Delhi 2001 and 2011

(NDMC) and Delhi Cantonment (DC) at the core (henceforth referred to as Delhi Core/Core) surrounded by [census] towns and outgrowths[6] as described above. The DMC, comprising approximately 85 % of the area and 97 % of the population

[6] Per Census of India (2011), an "Out Growth (OG) is a viable unit such as a village or a hamlet or an enumeration block made up of such village or hamlet and clearly identifiable in terms of its boundaries and location".

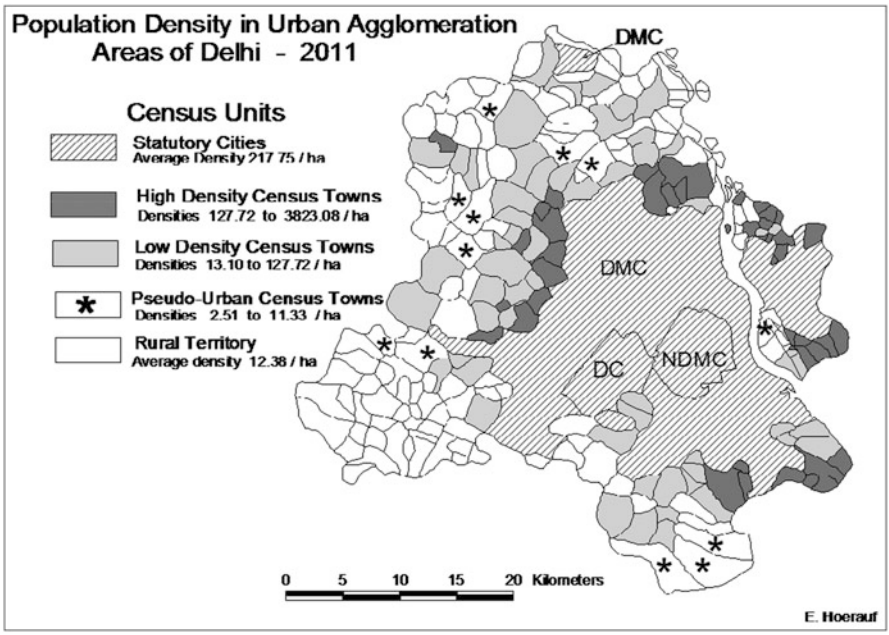


**Fig. 3.2** Population density in urban agglomeration

of the Delhi Core, is the primary city of the Delhi Urban Agglomeration (Fig. 3.2). For our purpose we felt that the census-defined Urban Agglomeration is an ideal area for observing the changing characteristics of an urbanizing territory comprising both urban and rural settlements at different points on the urban-rural continuum. Because of their inclusion of the metropolitan core and other statutory cities as well as the census towns and rural settlements under one umbrella, the urban agglomerations offer wide arrays of locational, demographic, economic, jurisdictional, and other attributes to be of interest to urban researchers. Further, because the concept of urban agglomeration has a uniform census definition with clearly specified characteristics, studies such as ours can be extended to other agglomerations in India.

Deciding on an appropriate spatial scale for the study of urban sprawl has remained a challenge for the researchers. As Wolman et al. (2005) noted, in many of the prevalent sprawl studies, 'over or under-bounding' of the study area may have led to over or under-estimation of the actual occurrence of sprawl. In response to these problems, they proposed an "Extended Urban Area," that included the urbanized core, the adjacent urbanized territory, and additional commuting areas linked to the urbanized area. While we were mindful of these concerns in determining our study area, we felt it important to tailor our study design to the Indian situation. First, we decided to exclude the urban core because we felt that

the disparity between the average densities in the core and the adjoining territory[7] would distort our measure of sprawl. Second, we were especially interested about the demographic transformation of the area within the Urban Agglomeration, but outside of the Delhi Core, and decided thus to limit our focus to only this area. (For the purpose of this paper we will term the study area as AADC or Area Adjoining the Delhi Core). This is an expanding urbanizing territory containing census towns from prior Census decades, as well as new CTs that were uplifted from village to town status by satisfying the minimum census-defined urban threshold criteria during 2001–2011.[8] Altogether, this area contains 103 census towns with a total population of 4,821,421 concentrated in 35,443.2 ha. Only the contiguous CTs adjoining the Delhi Core were included in our measurement of sprawl index. Although these towns share some common locational attributes by virtue of being part of the Delhi Urban Agglomeration (as well as the more narrowly defined study area) they differ considerably in their area size and population that in our estimation add to the suitability of the AADC as the area of focus for our study.

## 3.4 Method

For the purpose of our study we used the density-based Sprawl Index as operationalized by Lopez and Hynes (2003) with some modifications.[9] As noted in a previous section, much of their arguments in favor of their index (e.g., simplicity, objectivity, census-based etc.) resonated with our purpose. In addition, we felt that the L-H Sprawl Index also met at least two of the 13 suitability criteria advanced by Jaeger et al. (2010) for measurement of urban sprawl, i.e., mathematical simplicity and modest data requirement that would add to its usefulness.

The index is defined as: $SIi = (((S\,\%\,I – D\,\%\,i)/100) + 1)) \times 50$

Where, $SI_i$ is the Sprawl index for metropolitan area i
D% is the Percentage of total population in high-density census tracts $_i$
S% is the Percentage of total population in low-density census tracts $_i$.

[7] The average density of the AADC (136/ha) was much lower than that of the Delhi Core (218/ha) comprising all three units; the gap becomes more noticeable (248 vs. 136) when only the DMC, with 97 % population of the Core, is taken into account.

[8] Historically, Indian Census has treated 'urban' and 'rural' as two distinct dichotomous concepts with clear definitional boundaries. Yet, in the AADC (as in the rest of the country in varying degrees) the census towns symbolize an evolving 'hybrid' landscape between urban and rural that can be an argument in favor of a paradigm shift from dichotomy to continuum, as well as for focusing on census towns in future studies.

[9] We used Census Towns instead of census tracts that we divided into different density categories. We also decided to use the density status of the CTs relative to the average density of all the CTs and the rural territory to determine our density-threshold. For a discussion of the importance of determining the appropriate density threshold, and the potentials of distortion with up or downward movement of the high/low density threshold, see Lopez and Hynes (2003, p. 334).

Score values for the index, ranging from 0 to 100, are indicative of the amount of sprawl (high: 50–100; low: 0–50; a score of 50 can be interpreted as equal population distribution in the high and low-density urban situation).

Our calculation of the Index was based on detailed demographic and spatial data from the Census of India for the Census Towns (CTs) and the rural areas surrounding the Delhi Core.[10] The area of each of the census units was obtained by digitizing unit boundaries on published Census maps from the 2001 Census. The Census maps were also used for identifying the CTs that were contiguous to the Delhi Core and thus included in the calculation of the Sprawl Index. We used the population and area tabulations for each census unit (polygon) and for selected groups of census units providing population totals, and individual and average densities in order to place the CTs into appropriate categories. The high and low density categories were determined by their relative status to the average density for all CTs in the AADC; those with densities lower than the average of the rural units we termed "pseudo urban" and excluded from the computation for the index.

## 3.5 Findings and Concluding Thoughts

The results of our analysis are presented in Table 3.1.[11] Per the index score, the degree of sprawl indicating the concentration and dispersion of population among the low and high-density units increased from the previous decade from 17.5 to 26.76. This is a very modest gain, and in view of the parameters set forth by the authors of the index (Lopez and Hynes 2003), both scores are far down in the 0–100

**Table 3.1** Sprawl Index: 2001, 2011

| Year | Number of census towns at different density levels | | | Total population | Proportion of population in low and high density census towns | | Sprawl index |
|---|---|---|---|---|---|---|---|
| | Pseudo-urban | Low | High | | Low (%) | High (%) | |
| 2001 | 10 | 17 | 29 | 2,554,784 | 404,546 (16) | 2,063,505 (81) | 17.5 |
| 2011 | 12 | 51 | 40 | 4,821,421 | 1,235,976 (26) | 3,477,742 (72) | 26.76 |

*Source*: Calculated by authors from Census of India (2011, 2002)

[10] The method we used in the measurement and characterization of urban sprawl benefits from the use of official Census data gathering. In many countries it is conducted in a well-planned process in a regular, periodic schedule (i.e. decadal as in India and the U.S.). The Census units (polygon areas) are established and used for gathering and reporting the results and may be aggregated to polygons as various levels (e.g., national, state, local political subdivisions). In addition to population count, opportunities exist for gathering a wide variety of social, economic and residential characteristics from census reports thus making it a valuable data source.

[11] We had used the L-H Sprawl Index in a previous paper on the same study area (Mookherjee and Hoerauf 2004) in which a computational error resulted the index score for 2001 as 49.5. The correct index score of 17.5 is reported in the present study that is an extension of the previous research.

density continuum. However, viewed from the perspective of a possible urbanization trend, this ten-point gain and the emerging density patterns deserve some attention, especially in combination with the number and distribution pattern of the CTs as apparent in Table 3.1.

In addition to the scores for the Sprawl Index, the table portrays the dispersion patterns of Census Towns across the three levels of density (i.e., high, low, and below-rural), as well as the proportion of total population at the high and low-density CTs. Given the rapid rise of the census towns across the country during the 2001–2011 decade, the fact that the total number of Census Towns almost doubled in a dynamic city-region such as the Delhi Urban Agglomeration was not unexpected. But the fact that the number of *low-density CTs* (13–135 persons/ha) *tripled* during this period is relevant to our study and may be indicative of an incremental change towards more low-density settlements in the AADC.

Figure 3.2 depicts the urban spread of cities within the urban agglomeration. The location of the high-density cities closer to the core city supports the idea of the growth-proximity hypothesis. More to the point, the rather scattered pattern of the low-density CTs throughout the rest of the AADC depicts another characteristic of sprawl.

Our current research, based on a single measure of density in context of one urban agglomeration region is intended to be an exploratory study to be construed as a starting point for future research on the multi-dimensional sprawl phenomenon. Our study in the measurement of sprawl index was designed on the basis of easily available census data. We value the utility of the 'technologically reliant' methods of measuring urban concentrations and sprawl utilizing GIS/remote sensing data (satellite or aerial). Although arguably less accurate on population count, their ability to use visual images in distinguishing between urban and rural settlement patterns and the potential for many other sources of data interpretations and more frequent sampling of spatial changes make such tools assets to sprawl investigations. Nonetheless, because of its regular and periodic data collection regime, unbiased and uniform data sets on a wide range of social, economic and other characteristics, versatility, and applicability at a wide range of scales, we consider the census to be a highly appropriate data source for sprawl studies in the developing countries. We also maintain that ready availability of the census data diminishes the need for additional data collection cost and that the uniformity of the national census allowing researchers to observe regional variations also enhances their usefulness. Our study demonstrates the potential for using a simple, objective, and measurable density-based index on the use of widely available census data towards understanding the sprawl phenomenon in a developing country, providing us with clues for further research on the multidimensional traits of sprawl, especially in the urbanizing landscape in the context of Mega-city growth.

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# Chapter 4
# The Changing Urban Landscape and Its Impact on Local Environment in an Indian Megacity: The Case of Delhi

**Richa Sharma and P.K. Joshi**

**Abstract** This chapter presents urbanizing scenario of the megacity, Delhi. The changing land use land cover (LULC) and various environmental variables are discussed using the conjugation of space remote sensing inputs, geospatial analysis and statistical analysis. The two vital components of LULC viz., urban land use and fraction of green cover are important to demonstrate changing urban landscape and its impact on environmental quality. The environmental quality variables like greenness, imperviousness due to built-up intensity, moisture intensity, and bareness can be retrieved from remote sensing data. A general trend of diminishing greenness, especially along the peripheral areas with depleting moisture intensity of the city surface is a common phenomenon. The new industrial developments in the northern and urban expansion in the south-western parts of the city results in drastic and slight decline in moisture respectively. This is accompanied with increase in imperviousness and bareness in some cases in the same areas. The chapter explains the complex interactions between different land uses over the progression of urbanisation explaining the process in details taking Delhi as an example. Eventually the basis for environmental degradation and formation of Urban Heat Island (UHI) in the city is also explained using LULC and environmental variables and their change statistics. The chapter thus presents the process and impacts of urban land transformations in the metropolitan city of a developing nation, India in this case.

**Keywords** Developing nation • Environmental variables • LULC • Urban Heat Island • Urbanization

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## 4.1 Introduction

Contemporary patterns of urbanization have resulted in the present era to be referred as 'Urban Age'. Urbanisation per say is a phenomenon that is not new but a paced up growth in urban centres of developing countries of Asia is relatively new. Such urbanization is being characterized by rapidly rising population in cities with concomitant rise of new cities from smaller towns. Currently, nearly half of the world's population resides in cities (Grimm et al. 2008). This fraction is expected to increase several folds in recent future, the case is particularly true for developing countries (Firdaus and Ahmad 2011). This has made '*urbanization*' one of the most serious issues of global concern attracting greater attention from planners and policy makers from world over. The existing scale of urbanization is resulting in impacts that are not local but global in nature. In spite of acquiring mere 2–3 % of global land surface (Lambin et al. 2003), urban areas consume approximately 75 % of world's resources. Urban areas thus tend to have multi-scale multiple impacts on environment, such as; fragmentation and degradation of natural habitats, loss of agricultural lands, increased $CO_2$ emissions (Zarzoso and Maruotti 2011), alter urban climates (Zhang et al. 2004), affecting surface hydrology (Carlson and Traci Arthur 2000; Chelsea Nagy et al. 2012) to mention a few.

Situation in India is no different from other developing countries. The country has an urban population of more than 377 million comprising approximately 31 % of the total Indian population (GoI 2011). The urban population in India has been increasing faster than expected with villages turning into towns and towns into cities at very swift pace (Table 4.1). As a result, urban population increase is higher in comparison to rural increase which possesses huge connotations for supply of infrastructure and other civic facilities in urban areas. The urbanization in India is thus, often termed as *over-urbanisation* or *pseudo-urbanisation* (Sastry 2009). Cities in India are experiencing such disproportionate increase in urban population compared to infrastructural growth, which is resulting in collapse of urban services and impact on local urban environment (Chakrabarti 2001). Hence, a regular monitoring and a thorough understanding of such environmental changes are imperative to deal with such issues.

Delhi, the capital of largest democracy, is increasingly attaining majuscule eminence among some of the greatest global cities (Taubenböck et al. 2009). It is the third largest city of the country and the largest metropolis by area (Government of Delhi 2011; United Nations 2012). In terms of population, Delhi is the second largest metropolis in India and stands third in terms of percentage of geographical

**Table 4.1** Number of villages, towns and UA in India over the years (1971–2011)

| | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|
| UA | 231 | 276 | 381 | 384 | 475 |
| Towns | 2,921 | 4,029 | 4,689 | 5,161 | 7,935 |
| Villages | 556,561 | 556,014 | 579,688 | 593,732 | 608,789 |

*UA* Urban agglomeration

area under tree cover. The city thus needs special focus from planning perspectives. But the current relatively ill-planned or even un-planned trends of growth and development are indicting negative bearings on the environment and straining the available natural resources (Firdaus and Ahmad 2011; Mohan et al. 2013). This jeopardizes the sustainability of the city's development. The city thus presents an ideal case for studying impacts of urbanization.

## 4.2 Delhi: The City Profile

Delhi is located in the fertile alluvial plains of Northern India as a riparian city of the River Yamuna, extending from 28°23′17″ N to 28°53′00″ N and 76°50′24″ E to 77°20′37″ E. It nestles at cross boundaries of two neighbouring states, Haryana and Uttar Pradesh covering an area of 1,483 $km^2$. Indo-Gangetic plains in north and east, Thar Desert in west and Aravallis in the south bind the city. The presence of such diverged geological features conveys variation to the city's altitude which ranges from 213 to 305 m.

### *4.2.1 Climate*

The city has a remotely inland location and weather is more of continental type experiencing extreme summers and severe winters. The city is characterized by semi-arid climate with stark contrast in day and night temperatures, high saturation deficit and low to moderate rainfall. There are four major seasons during the year, the summers (March–June), monsoons (June–September), post-monsoons transition (October–November) and winters (November till March). An important attribute of Delhi's climate is the temperature extremes that the city experiences (Fig. 4.1a). The temperature during intense hot summers reaches 47 °C (mean maximum being 40.3 °C) while during winters the temperature may plunge as low as 2 °C (mean minimum is around 18.7 °C). City receives 75 % of this rainfall during the monsoonal months of July, August and September (Fig. 4.1b); IMD 2011; Government of NCT of Delhi 2013a).

### *4.2.2 Environment and Natural Resources*

Out of a total of 1,483 $km^2$, 85 $km^2$ is under forest cover (FSI 2011) covered by the Northern Tropical Thorn Forest type (Champion and Seth 1968). Of this, 92 % is reserved and rest 8 % is protected. The city boasts of possessing few a network of protected areas; ranging from Najafgarh Jheel and city forest, Jahanpanah Forest Reserve and Asola Bhatti wildlife sanctuary. Native flora of the ridge includes

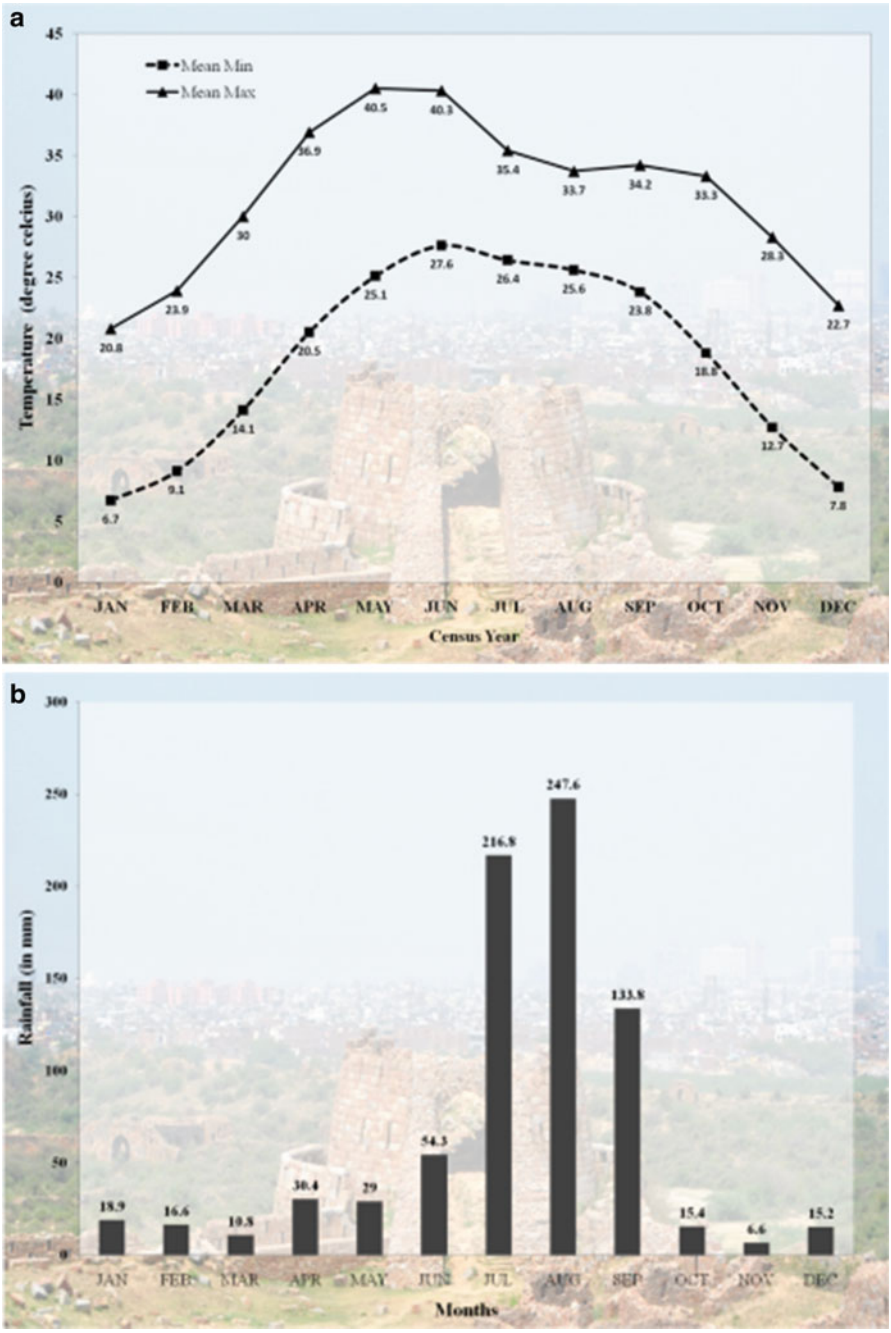


**Fig. 4.1** (**a**) Month-wise mean air temperature (**b**) month wise average rainfall of Delhi (1956–2000)

*Anogeissus pendula*, *Ziziphus mauritana*, *Ehretialaevis*, and *Balanites aegyptiaca* that have been severely invaded by *Prosopis juliflora*. More than 400 bird species have been so far identified in Delhi, including rare ones such as *Pelecanus crispus*, *Leptoptilos javanicus* and *Rynchops albicollis* (Urfi 2003). Of these some 250 species have managed to live through the adversity of urban alterations in the environment. Apart from these, Delhi also has a lot of migratory avian visitors during winters such as ducks pintails, shovellers, common teal, garganey, leaf warblers, lesser white throats, and red starts. Developmental activities such as construction and operation of metro, airport, mobile towers in ecologically sensitive areas are creating havoc to avifaunal diversity in the city. The Ridge forms an important part of the forest cover in Delhi. It is an extension of Aravallis into the city. Delhi ridge, often referred as green lungs (Mann and Sehrawat 2009), has been adopted as an integral component for almost all development plans of the city. There are four extensions of the ridge inside the city. The ridge is collaboratively managed by different governmental agencies which include Delhi Development Authority (DDA), Municipal Corporation of Delhi (MCD), Central Public Works Department (CPWD), Land and Development Office (LDO) and the Forest Department of Delhi (Government of Delhi 2011).

Yamuna provides major proportion of surface water supply in Delhi, which constitutes nearly 86 % of the total water supply. Delhi only shares 4.6 % of river's resources as per the interstate agreements. The cleanliness of the river is a major concern for the government as industrial waste gets accumulated in the river. Ground water resources have been important source of water in some of the administrative blocks of Delhi, e.g. Alipur, Najafgarh, Kanjhawala, etc. Delhi is poor in its mineral resources. The ridge mainly comprises of quartzite rocks. Some deposits of building and road making materials, Kaolim, Quartzite rocks and China clay.

### *4.2.3 Demography*

The population of Delhi was less than a million during pre-independence times. But after the independence and partition, there was massive immigration into the city with millions of immigrants taking the refuge. These were the times (1941–1951) when the annual average exponential growth rate for population was highest (6.63 %). This resulted in a sudden jump in the population of the city during the post-independence era. Delhi has been exploding with population since past few decades. The city recorded a population of 9.42 M in 1991, which increased by 0.85 million in 2001, finally reaching 16.7 million in 2011. Though the decadal population growth for the city has dwindled from 90 % in 1951 to 20 % in 2011, but the rapid population growth has shot up its population density from 6,352 persons/km$^2$ in 1991 to 9,340 in 2001 and to 11,297 in 2011 (Government of NCT of Delhi 2013a, b, c).

## 4.3 Urbanization and Delhi

Delhi has been expanding as a city since seventeenth century when it was called Shahjahanabad called the Walled City. In 1913, the British announced New Delhi as the capital city, and changed its face to that of a well-planned urbanized city. Next major event is history of Delhi's urbanization took place during 1947 when partition of India was done. With influx of partition refugees in huge numbers, the city's urbanization got immensely pushed up (Figs. 4.2 and 4.3). Afterwards, the city became the centre for employment opportunities and people started migrating into the city from neighbouring states of UP, Haryana and Rajasthan. 52.76 % of total population in Delhi was urban in 1901, which has increased to 97.5 % in 2011. The urban area in Delhi on the other hand has increased from 22 % in 1961 to 62.5 % in 2001 (GoI 2011).

The urban expansion of city over the years is firmly established by gradual engulfment of several villages by the city. The number of villages has decreased from 231 in 1981 to 165 in 2001 to 112 in 2011 (Mishra 2011). The expansion within Delhi has been well represented by development of sub-cities like Rohini and Dwarka (MDP 2013). Other than that million plus cities in adjoining states such as Faridabad, Gurgaon, Ghaziabad and Noida also symbolize the expansion of city beyond its borders (Dutta and Bandyopadhyay 2011).

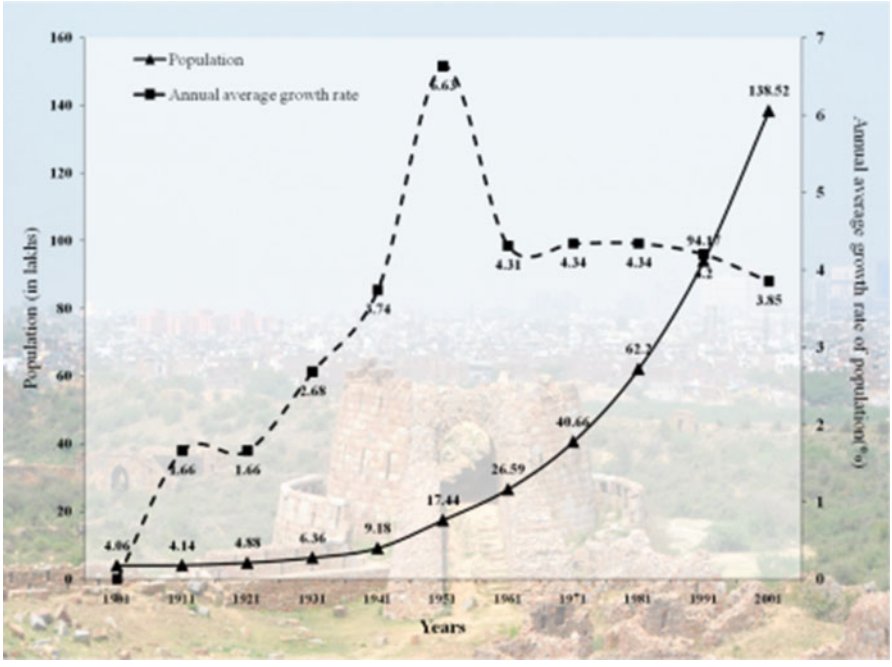


**Fig. 4.2** Annual average growth rate and population increase (GoI 2011)

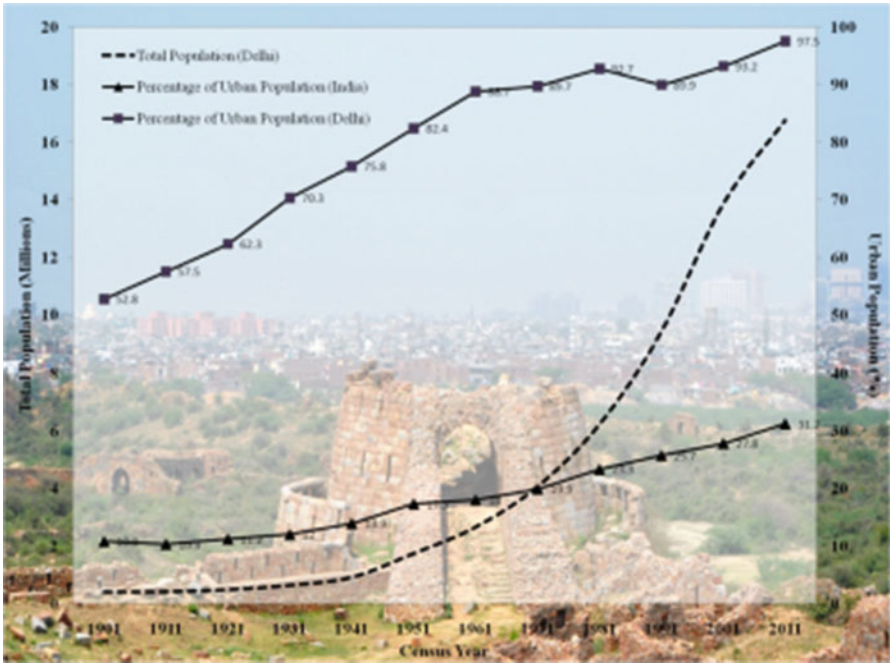


**Fig. 4.3** Urbanization in India vs. Delhi (GoI 2011)

**Table 4.2** Trends of migration in Delhi

| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| Migration (lakhs) | 0.55 | 0.62 | 0.6 | 0.56 | 0.67 | 0.76 | 0.77 | 0.67 | 0.8 | 0.78 |

The increase in Delhi's population is not only due to natural increase but nearly 25 % increase is due to migration (Table 4.2). More than 50 % of migration takes place from neighbouring states of Uttar Pradesh (UP) and Haryana. Another 14 % of total migration is from Bihar, 3 % from West Bengal and 2 % from Madhya Pradesh. Punjab and Rajasthan each contribute 5 % each to the migration in Delhi. UP is the leading contributor adding migrating population to the city.

## 4.4 The Changing Landscape of Delhi

Urbanization in Delhi is achieving unprecedented pace and enormity modifying the city's landscapes massively. The most important manifestation of such alterations is changes in land use and land cover (LULC) across the city (Sharma and Joshi 2012; Sokhi et al. 1989). LULC changes across globe have direct and indirect implications on the ecosystem. Some explicit impacts of LULC change include

fragmentation and degradation of forests resources (Freitas et al. 2010) due to conversion to urban or agricultural uses of land. Further implied repercussions of such LULC changes include contribution to soil degradation (Tolba and El-Kholy 1992), affecting biodiversity (Sala et al. 2000), and affecting regional climate altering the earth system functioning (Zhang et al. 2010). All such factors cumulatively tamper the ecosystem functioning and thus affect the ecosystem's capability to support human needs (Vitousek et al. 1997). Monitoring, mapping, studying and documenting LULC changes thus becomes imperative for managing natural resources (Loveland and DeFries 2004) and dealing with altering micro-climate of the cities (Carlson and Traci Arthur 2000). In the present scenario, two important components of LULC transformation considered are; conversion to urban land use (Seto et al. 2010) and proportion of green or vegetation cover (Jiang et al. 2006).

Interpretation of satellite remote sensing inputs [Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper plus (ETM+)] for 1998, 2003 and 2011 were used for explaining the annual LULC. Season (rabi, kharif and zaid) data based on prevailing cropping practices are useful to extract the insights in LULC pattern. Additional information about elevation, slope and aspect derived from ASTER GDEM data was also used. These LULC classes namely agriculture, forest, plantation, scrub, sparse built-up, dense built-up, exposed area and water are shown in Table 4.3. The information on these eight class seasonal information was combined together to form annual composite map consisting of eleven LULC classes (Fig. 4.4). Table 4.3 presents the classification scheme followed for mapping annual LULC maps. The change detection for the three annual maps provides statistics for from-to changes in LULC.

The built-up area in 2003 (504 $km^2$) increased by 15 % from 1998 (440 $km^2$) and again in 2011 (521 $km^2$), it further increased by 17 $km^2$. Forest lost by 5 % area from 1998 (122 $km^2$) to 2003 (116 $km^2$), and again by 32 % (37 $km^2$) from 2003 to 2011. Agriculture suffered major loss of 17 % from 1998 to 2003 but gained very little (4 $km^2$) during 2003–2011 phase. Overall agriculture was found to decrease from 1998 to 2003 and then slightly improve from 2003 to 2011. Huge dynamics was observed within agricultural classes; Double crop (DC), Rabi crop (RC), Kharif crop (KC) and Zaid (ZC). Double and rabi crop exhibited very complex mutual dynamics with marked inter-conversions. From 1998 to 2003, classes that had maximum gain from rabi crop lands are exposed land (32 $km^2$) and kharif crop (7 $km^2$). Kharif's loss was mainly due to conversion to sparse built-up lands (28 $km^2$). This is the category that contributed the biggest chunk of land to sparse built-up. Zaid crop has no major contribution to any other class during this time period. But it suffered major loss at hands of sparse built-up (10 $km^2$). The trend during 2003–2011 was more or less similar to previous years, except a few cases. The mutual interchanges of double crop and rabi crop were observed similar to previous 1998–2003 analysis. Sparse built-up and Kharif crop were major gainer from rabi crop. Each class increased by 21 and 23 $km^2$ respectively due to rabi crop. Kharif crop's loss during this phase is mainly to double cropping (6 $km^2$). Kharif and zaid crop did not act as major contributors to any category. But zaid suffered major loss at hands of other two agricultural classes; double and kharif crops (7 $km^2$ each).

**Table 4.3** Comprehensive LULC classification scheme

| LULC classes mapped | | Description |
|---|---|---|
| Agriculture | Double crop | Land under agriculture that is cropped two or more than two times a year |
| | Rabi/winter crop | Areas under cropping during November/December and February/March months |
| | Kharif/summer crop | These lands are cropped during south-west monsoon season, from months of June/July to September/October |
| | Zaid/monsoon crop | Zaid crop areas are areas cultivated during summers, from April to August/September |
| Exposed area | | Exposed lands include categories of land covered by sand (e.g. river beds), barren rocky area, current fallow lands etc., which are bright due to high reflectance |
| Vegetation | Forest | Forest area includes dense tree vegetation e.g. areas of central and northern ridge in Delhi |
| | Plantation | These include areas under tree crops of agricultural or non-agricultural significance (part of policy and management processes) and tree vegetation along the roads as well |
| | Scrub | Scrub lands are mainly dominated by scrub (shrubby) vegetation and are highly erosion prone areas and are often mixed with cropped lands |
| Built-up | Sparse | Area that is mainly covered with human settlements and built-ups but has some proportion of vegetated and open lands in between. Thus these areas have relatively lesser density of built-up |
| | Dense | Areas that have higher density of built-up and are characterised by lesser proportion of vegetation or open lands |
| Water | | Water bodies like river or smaller impoundments in form of tanks or reservoirs |

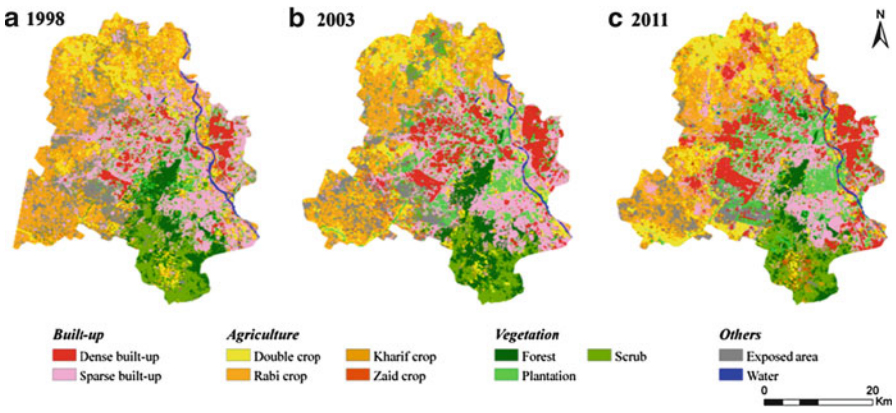


**Fig. 4.4** Land use land cover results for (**a**)1998, (**b**) 2003 (**b**) and (**c**) 2011 (Sharma 2013)

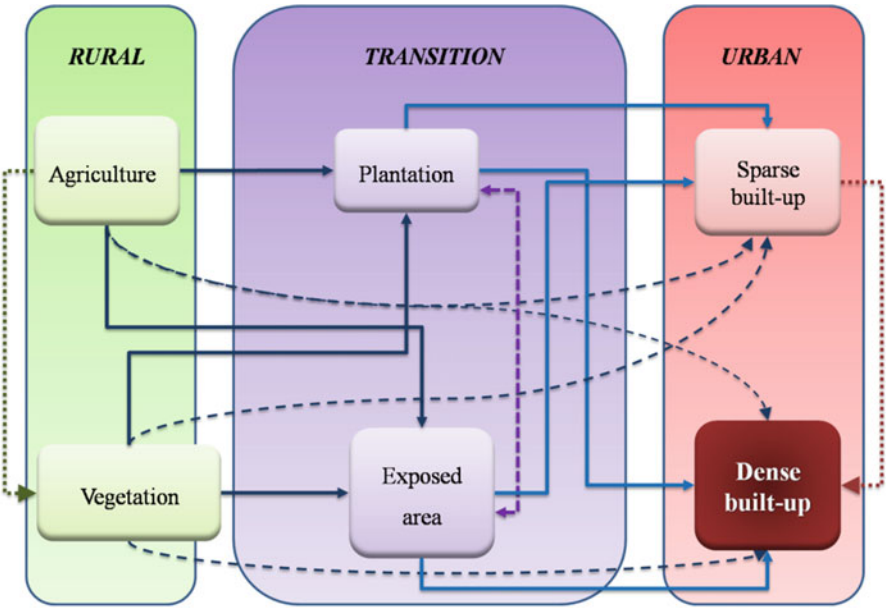


**Fig. 4.5** Urbanization—the process and dynamic implications for overall LULC pattern (Sharma 2013)

Vegetation (comprising of forest, plantation and scrub) is another class that exhibited within subclass dynamics. The class increased in area by 13 and 7 % during each interval. Forests decreased by 6 and 37 $km^2$ during each time period. Similarly 8 and 11 % fall was observed for scrub class. Plantation was the only vegetation class that kept expanding during both intervals by 94 and 66 % due to massive spread in the horticultural plantation on Yamuna river beds and also rise in sparse built-up area which is characterised by scattered vegetation like roadside plantation and small community parks.

Dense built-up was found to double up from 1998 to 2003 and further increased by 44 %. Sparse built-up initially increased slightly by 3 $km^2$ and then it fell down by 40 $km^2$. Exposed area initially did not exhibit any change but it decreased by 29 % during 2003–2011 interval. Water covered area shrivelled by more than one-fourth during 1998–2003, and further diminished by 4 % from 2003 to 2011. These statistics support the complete tract of land conversions and inter-conversions acting in the course of urbanisation (Fig. 4.5). Process of urbanisation has been split in three phases; Rural, Transition and Urban. Rural phase comprises of two classes, viz., agriculture and vegetation. The vegetation class is not restricted to rural only as it includes forest and scrub, both. The forest part is restricted to rural phase while scrub spans across from rural phase to transition phase. Transition phase covers plantation and exposed area. Built-up classes strictly fall under urban phase.

The diagram (Fig. 4.5) explains the complex interactions between different land uses over the progression of urbanisation. It is illustrated that agriculture gets

converted to vegetation (scrub), plantation, and exposed area entering the transition phase. Apart from this, agriculture also contributes directly to urban phase (built-up classes). Another rural phase class vegetation (forest) is conducive to urbanisation by getting transformed to transition (plantation and exposed area) and urban (sparse built-up and dense built-up) phases. Thus, the land cover flow from agriculture to vegetation is ultimately flowing into transition and urban phases. The transition phase demonstrates conversion of plantation to built-up. Intra-stage land transformation is illustrated by exposed area and plantation. The final stage is urban stage, where sparse built-up engulfs massive land masses from transition phase (plantation and exposed area) and rural phase (agriculture and vegetation). Along with other classes, sparse built-up also contributes to dense built-up. Dense built-up is thus the final category where all '*to*' land use transformations occur culminating the process of urbanisation.

## 4.5 Urbanizing Delhi and the Changing Environment of City

The environment of an area is governed by a myriad of factors and processes displaying an inter-play at hierarchical scales of space and time. LULC is one such prime factor that has its influence at all spatial scales from global to regional or local levels. Considering the case of cities, the local scale, LULC and land surface temperature (LST) plays imperative role in shaping of the environment due to pronounced anthropogenic activities and their entrenched impacts (Mallick et al. 2008). Thus it is only a prudent step to monitor LULC, LST and their relationships to keep a track of any implied changes in the environmental status of the region.

Land use in cities is characterised by built-up covers. More specifically in cities of developing nations, Delhi in this case, apart from built-up cover, LULC is also characterised by the presence of agricultural lands in peripheral parts and some forest patches in the city. This indicates that vegetation represents another important land use category in the cities. The crucial balance of built-up and vegetation in the city determines the status of LSTs and other variables of environmental quality. The proportion of green or rural and built-up or urban cover governs the city's thermal environment and hence governs its urban heat island distribution. 'Urban Heat Island' or UHI is the area of city or city itself ('*Urban*') where the temperature is relatively higher ('*Heat*') than their surrounding comparatively rural or green environs ('*Island*').

Environmental quality is viewed as a latent characteristic that is synergistically determined by a number of variables. Thus, for monitoring environmental quality, apart from LST, four other prominent indicators were chosen; greenness, imperviousness, moisture intensity and intensity of bareness. Of these, *greenness* was estimated using NDVI or Normalised Difference Vegetation Index (Gallo et al. 1995; Goetz 1997; Maxwell and Sylvester 2012; Weiss et al. 2004; Zhou

et al. 2004), Normalised Difference Built-up Index (NDBI) was used to assess imperviousness, Normalised Difference Water Index (NDWI) was used to estimate moisture intensity and finally intensity of bareness was assessed using Normalised Difference Bareness Index (NDBaI). LST retrieval was retrieved using Qin et al's monowindow algorithm (Qin et al. 2001; Sun et al. 2010). NDVI based emissivity estimation method was employed for emissivity correction (Zhang et al. 2006).

### 4.5.1 Changing Distribution of Biophysical Variables and the Dynamics of Their Inter-Relationships

*Greenness*—NDVI distribution in the city indicates the pattern of diminishing greenness, especially along the peripheral areas. The south-western parts of Najafgarh and Dwarka, north-western suburbs of Rohini and industrial patches of Bawana and Narela noticeably exhibited a degrading vegetation cover that was due to expansion of industrial and residential land uses in these areas. Major agricultural portions of these areas have been converted to built-up for industrial sites. Thus, transitional fall in NDVI is seen providing a direct indication of the diminishing green cover (Fig. 4.6).

*Moisture intensity*—Water index images illustrate a depleting trend in moisture intensity of the city surface (Fig. 4.6). The peripheral agricultural lands and central and southern ridge areas present better status of moisture intensity as compared to the urban areas. Over the years, drastic decline in moisture status is observed for new industrial developments in northern parts of the city and slight decrease in the gradual south-western urban expansions. With conversion of agricultural land to built-up area, the land loses its vegetation cover, which in turn results in loss of huge amount of moisture. This resultantly brings down the moisture intensity of such transformed land.

*Imperviousness*—NDBI is computed using difference of band 4 (NIR) from band 5 (MIR), the bands that are sensitive to vegetation and moisture. The southern parts of city are dominated by scrub forest. Such forests are tropical dry forest with xeric shrubland vegetation. Since the forest is an extension of the Aravallis (the mountain ranges running into Rajasthan), at some places, it contains semi-desert soil. Thus, these forest lands have high sensitivity in MIR and low in NIR bands compelling these to exhibit high NDBI in spite of being non-built-up land. With the exception of the southern ridge, high NDBI was observed in built-up areas. NDBI results for the year 1998, 2003 and 2011 indicated an increasing expansion in built-up surface of the city (Fig. 4.6).

*Intensity of bareness*—Intensity of bareness of the surface was estimated using NDBaI. MIR and thermal bands were used to retrieve information regarding the bareness. The areas that got highlighted are majorly open or exposed lands and to some extent, the scrub forest lands. Huge chunks of land in suburban areas is captured and left exposed for succeeding construction activities. Such lands

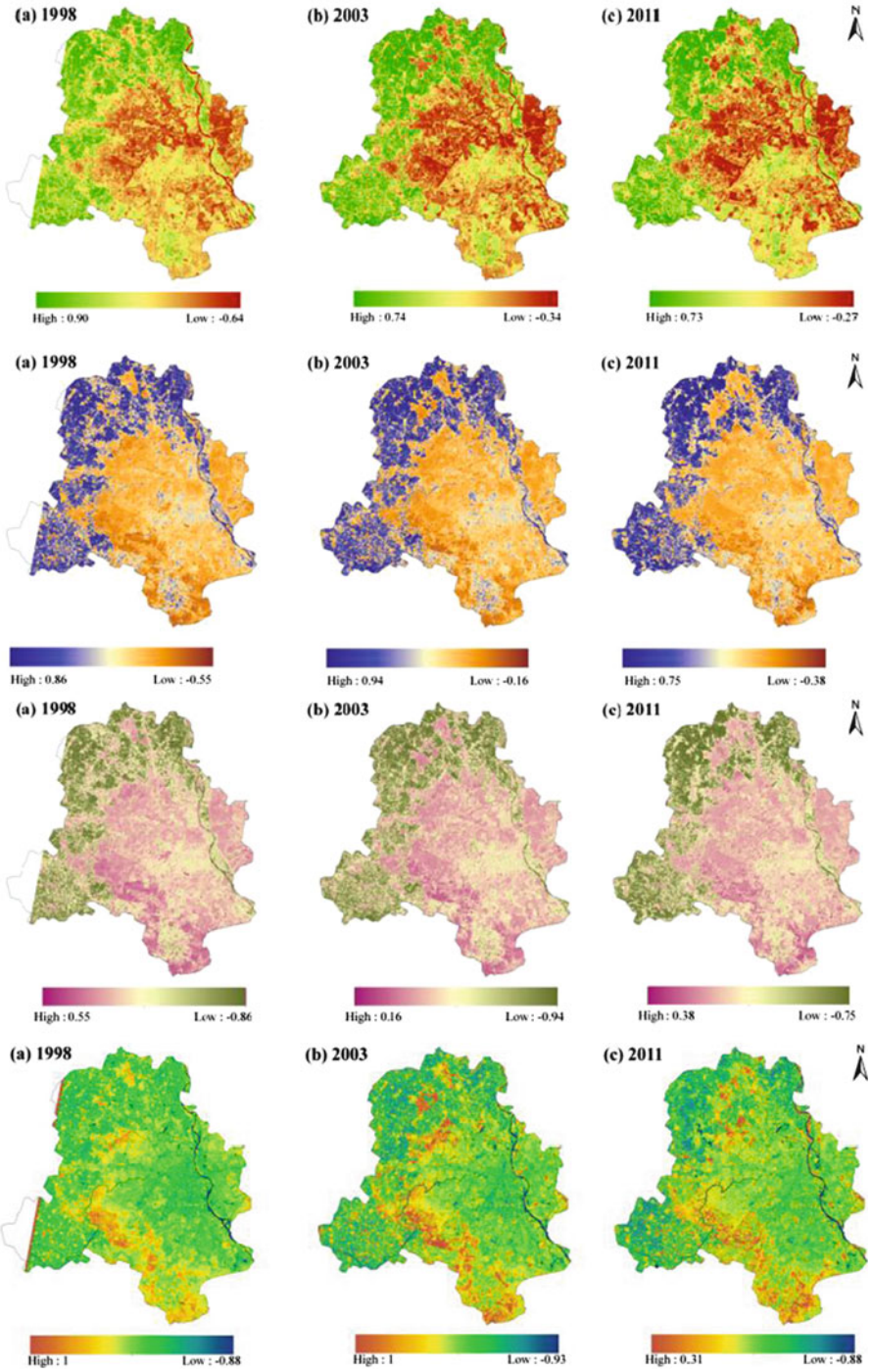


**Fig. 4.6** NDVI, NDWI, NDBI, NDBaI and LST maps for 1998, 2003 and 2011 (Sharma 2013)

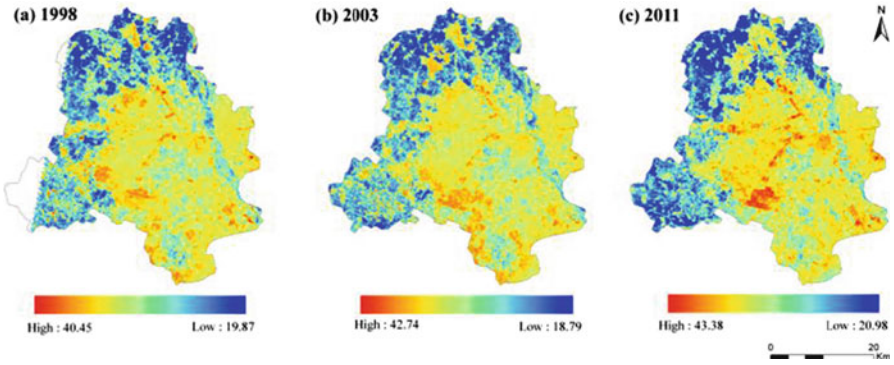


**Fig. 4.6** (continued)

illustrate high bareness intensities. But as they get converted to built-up, their NDBaI values fall down. The NDBaI trend for the three images show that bareness was minimum for the year 1998, for 2003 more and more suburban lands exhibited very high bareness intensities, with some of these then subsiding in 2011 after their conversion to built-up areas. Southern scrub forest due to predominance of exposed rocks demonstrated high NDBaI (Fig. 4.6).

*Land Surface Temperature (LST)*—LST distribution across the city for 3 years (1998, 2003 and 2011) was also mapped. High LST values were found to have spread out from city centres. Very high LST values were observed for 2011 along the major industrial centres and notably in the IGI airport area along with central parts of city that include Old Delhi. Newly built-up patches of Bawana and Narela in north and Dwarka and Najafgarh in south-west exhibited a progressive elevation in LST with increased built-up in these areas over the years (Fig. 4.6). The two areas recorded an increase of about 5–15 °C and ~2 °C respectively.

Strong positive or negative correlations were observed among various variables, except with NDBaI. LST was negatively related to with NDVI and NDWI. LST-NDVI exhibited negative correlation values of −0.75, −0.81 and −0.71 for 1998, 2003 and 2011 respectively. At the same time, the correlation values for LST and NDWI were −0.89, −0.88 and −0.74 during 1998, 2003 and 2011. The relationship for LST-NDVI is directional from NDVI to LST. NDVI represents the abundance and status of health of vegetation, thus higher the NDVI, the better is the vegetation. Vegetation contributes in bringing down the surface temperature in various ways; for example, their shadow results in lesser incident radiation, therefore, less heating while the vegetation cover maintains a more pervious surface which absorbs more moisture, thereby, bringing down the temperatures by evaporation. Evapo-transpiration is an important way by which plants bring about cooling of the surrounding. All these culminate in bringing down the LST. Thus, higher is NDVI, lesser is the LST. However, the NDVI for water is negative but owing to evaporation, it brings about cooling effect. Thus, in spite of negative (very low) NDVI, water has low LST as well. This exceptional phenomenon can be observed

in the correlation graph of LST vs. NDVI where, the curve shows minimum NDVI (water) values not for maximum LST but for lower LST values.

Relationship of LST with NDWI is negative with −0.89, −0.88 and −0.74 in 1998, 2003 and 2011. This relationship is apparent from the fact that water causes cooling through the process of evaporation. This relationship is bi-directional unlike relationship of LST with other variables. Thus it is not only NDWI influencing the LST, but LST also controls the NDWI. As LST increases, it evaporates the water available in the surface, bringing down its moisture status, thus lowering the NDWI. LST's correlation with NDBI is similar to NDWI but opposite in direction with correlation coefficient being 0.89, 0.91 and 0.74 for years 1998, 2003 and 2011. NDBI being sensitive to moisture and vegetation highlights built-up areas that are typically devoid of vegetation cover and have very low moisture content due to their imperviousness. Since built-up areas lack both vegetation and do not hold moisture, they tend to exhibit elevated temperatures; therefore, as NDBI moves up or down, the LST moves in lockstep in same direction.

NDBI had a negative correlation with both NDVI and NDWI with high correlation coefficient values for each year. Built-up area is typically characterised by low or no green cover and high or very high imperviousness, a distinctive property of urban materials such as concrete. This explains the negative correlations existing between NDBI-NDVI and NDBI-NDWI. Since vegetation cover lands tend to retain water and also their leaves contain huge amounts of moisture, a high positive correlation is observed between NDVI and NDWI. NDBaI with NDBI and NDWI had respectively positive and negative correlations of the order 0.3. Since NDBaI had neither strong nor any consistent relationship with other variables, NDBaI has not been used for analysing its relationships with LULC.

The complex and dynamic relationship among these biophysical variables helps in identifying both the explicit and implicit impacts of process of urbanisation in Delhi on the environmental quality. The Fig. 4.7 illustrates this phenomenon based on the correlation results and theoretical analysis discussed so far.

For urban sprawl to take place, the first major change in land use is loss of vegetation cover. This brings down the NDVI, as well as NDWI. The negative correlation of NDVI and NDWI with LST suggests that a fall in these two indices results in an increase in LST. The next eventual transition of land is conversion to built-up, which increases NDBI. NDBI's negative correlation with NDWI and positive one with LST insinuates a drop off in NDWI and intensification of LST. Fall in NDWI further implies a rise in LST. Thus urbanisation of an area via dual pathways brings about massive changes in the environmental quality. The figure also explains the development of UHI with context to mere land use changes and also helps to understand the remotely sensed science behind its development. For example, in case of Indira Gandhi International (IGI) Airport (Fig. 4.8), the LST range in 1998 was around 34–36 °C with few patches of higher LST of order of 36–38 °C. In 2003, major portion is covered with higher 36–38 °C LST range. 2011 image reveals, that complete airport area exhibits higher LST of around 38 °C with new patches of highest LST values ranging between 38 and 40 °C. The results clearly demonstrate the impacts of alterations in LULC of Delhi, on surface temperatures and gradual culmination of the city as an island of heat.

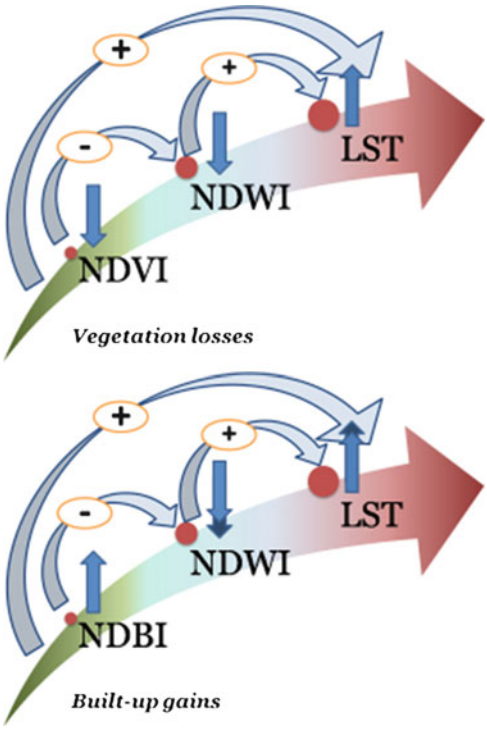


**Fig. 4.7** Synergies of environmental health indicators driving the environmental changes in response to process of urbanization (*Minus* represents a negative or diminishing effect, and *plus* represents a positive or elevating effect) (Sharma 2013)

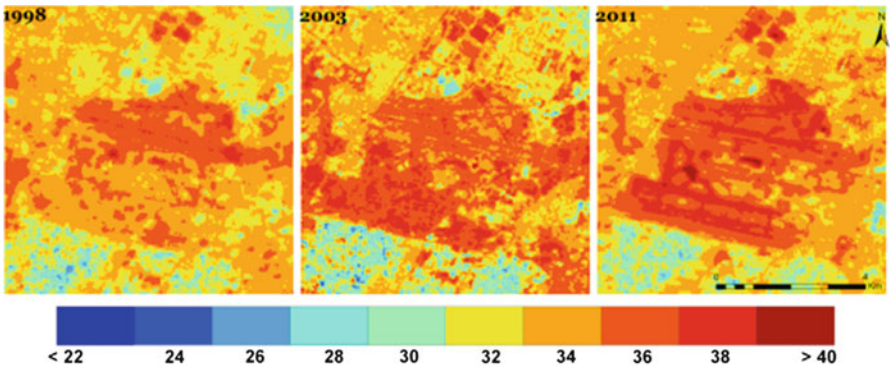


**Fig. 4.8** Zoomed in view of LST distribution in and around IGI airport area

### *4.5.2 LULC (Green Cover and Urban Fraction) and LST*

The discussions so far indicate that changing land use of Delhi altered the various biophysical variables determining environmental quality. LULC is a significant governing factor of environmental quality status. Another major highlight of the discussion is that, all the variables that were altered had their additive impact on

LST distribution patterns. LST is thus the ultimate receiver of the impacts incurred upon various environmental variables. This eventually elevates the LST culminating in formation of Delhi as an urban heat island.

Since, LST is majorly governed by greenness (NDVI) and imperviousness (as indicated by NDBI and NDWI). Thus, vegetation class (comprising of plantation, forest and all agricultural classes viz., double crop, rabi, kharif and zaid crops) and urban class (sparse and dense built-up) were analyzed to study impact of urbanizing LULC on city's LST. A very high negative correlation was observed for LST with green cover percentage with $r = -0.97$. This indicates that as the proportion of green cover increases, LST follows it in steplock in the same direction. The grids that were covered mainly with water had low green cover percentage as well as low LST. A positive correlation with $r = 0.96$ was observed for LST and urban (built-up) percentage. The plot illustrates that an increase in built-up fractions of the area drag the LST upwards (Fig. 4.9).

### *4.5.3 'Urban Heat Island' Development in Delhi Over the Decades*

Qualitative analysis of urban area coverage versus LST categories revealed that the total area under 32–34 °C has increased over the years from 656 $km^2$ in 1998 to 660 $km^2$ in 2003 to finally reaching 774 $km^2$ in 2011 (Fig. 4.10). Similar trend is observed for built-up area statistics recording an increase in the 32–34 °C category from 236 $km^2$ (1998) to 274 $km^2$ (2011). It establishes a convergence of high LST areas with high built-up, and also revealed a simultaneous upward trend for both. This established the fundament for UHI development in Delhi supported by the fact that high heat areas majorly occurred in high urban or built-up lands of the city.

## 4.6 Conclusion

Land use type greatly influences the quality of the environment in the region. The notion is strengthened by the correlation analysis between different environmental biophysical variables analysed; viz., greenness, imperviousness, moisture intensity, intensity of bareness and surface temperature. This exercise provides an understanding of how LULC changes influence the environment and what are crucial factors that were influenced. This also helped in identification of prime factors governing environmental quality and their inter-relationships. This section quantified the qualitative and quantitative relationship of different environmental biophysical variables and hence gave a better understanding of their fundamentals. In next section, these observations were used in background to analyse LULC change

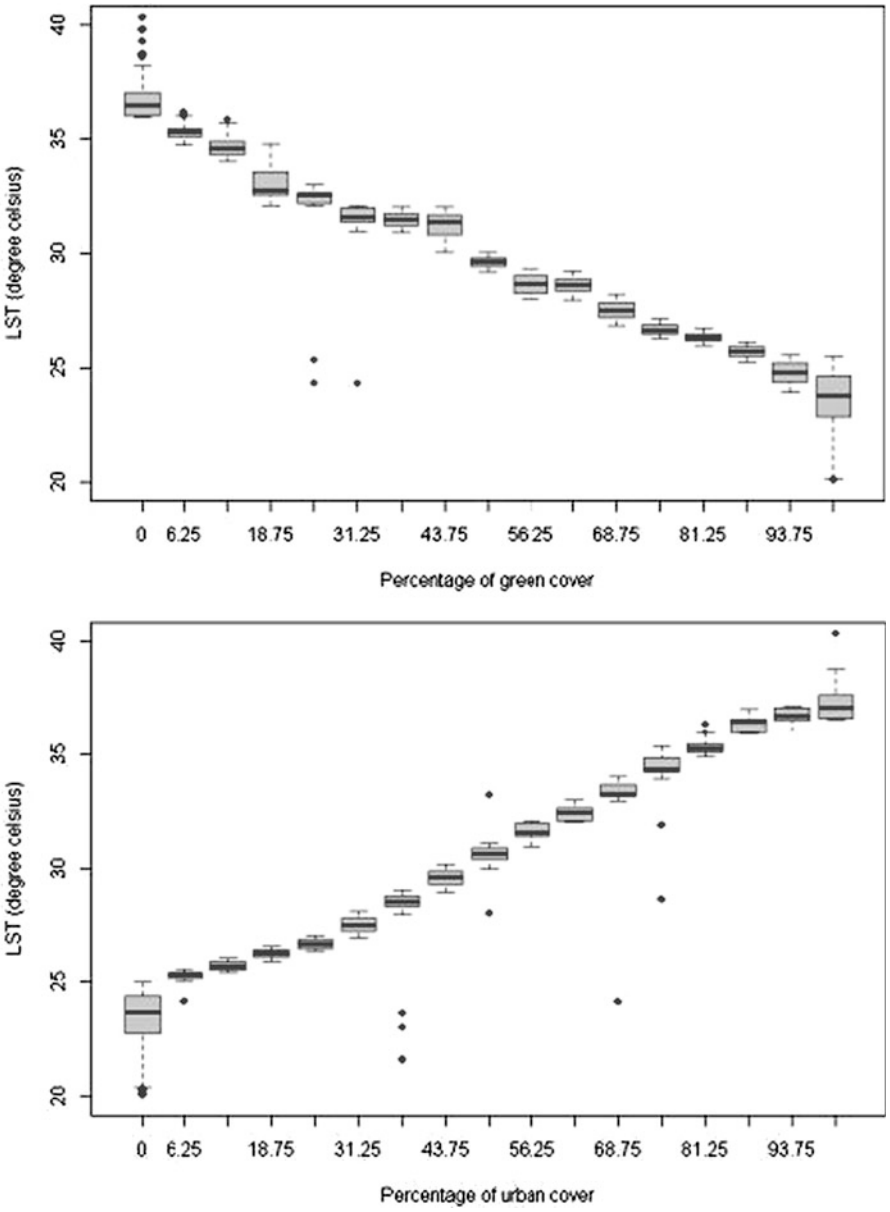


**Fig. 4.9** Boxplot curve of green cover & LST and urban cover & LST. (Sharma 2013)

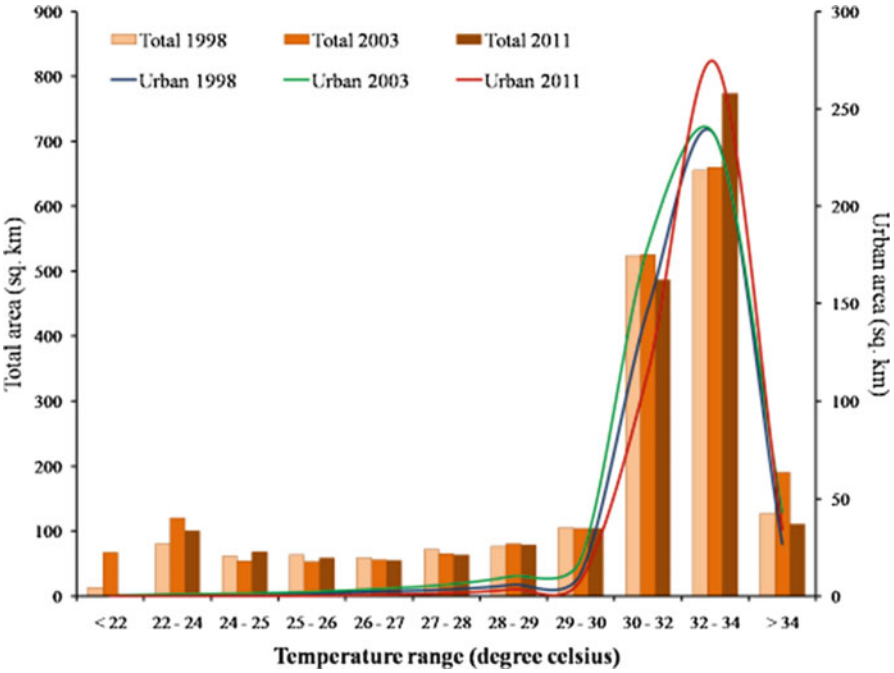


**Fig. 4.10** Distribution of urban area by LST categories over the years (1998, 2003 and 2011) (Sharma 2013)

statistics specific to Delhi and their impacts on the environment. The statistics also formed the basis of understanding the progression of UHI in Delhi.

It is evident from the study that rapid and rampant urbanisation has taken place in Delhi over the years. The process has massively modified the land use and land cover patterns in the city, which in turn have their repercussions on environmental variables. An analysis of the inter-relationship of these variables illustrated that LST is uni-directionally related with other variables, where LST served as the variable which bears the ultimate impacts of the change. It is the most important variable. The crucial factors which designed the LST distribution over the city were built-up and green cover fractions. From 1998 to 2011, Delhi witnessed tremendous increase in built-up and decrease in green cover, which has resulted in high LST patches within the city creating archipelagos of heat.

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# Chapter 5
# Spatial Correlations of Changing Land Use, Surface Temperature (UHI) and NDVI in Delhi Using Landsat Satellite Images

**R.B. Singh and Aakriti Grover**

**Abstract** Urbanization has brought major changes on the land use/cover pattern, urban heat balance and environmental status of cities across the world. Hence, spatial relationships of changing land use/cover, surface temperature and NDVI were studied using Landsat 5 TM satellite data. Study reveals that built up and green spaces have increased in the city of Delhi on the cost of adjoining agricultural and marshy lands. The surface temperature has also increased for the all the land use/cover categories during the study period (2000–2010). The NDVI has increased for central Delhi, indicating improvement in forest and tree cover. The fringe, however, reveals the negative changes in NDVI values. The surface temperature and NDVI correlation does not show strong correlation. The NDVI does not explain the surface temperature conditions properly. In view of improvement of vegetation, the surface temperature was expected to decrease; instead it has increased irrespective of land use/cover. The highest temperature was found in agricultural land unlike other urban areas where urban areas show high temperature. Therefore, there is weak heat island in Delhi. It may be associated with patterns of land use/cover.

**Keywords** Delhi • Surface temperature • Urban heat island • Urban micro-climate • Vegetation index

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## 5.1 Introduction

There has been an apparent change in the land use/cover of urban areas across the world. It is associated with expansion and intensification of concrete areas in the surrounding areas including the forest cover and agricultural lands etc. The concrete areas of Delhi have also experienced unprecedented horizontal and vertical growth, leading to the major modifications of previously occurring land use/cover. As per the records of Census of India (2011), Delhi with 11,297 persons/km$^2$, has maximum density in India. In 1901, Delhi was a small city with total population of only 0.4 million and urban population of 52.76 %, which increased to 16.75 million total and 97.50 % urban population by 2011. During this process of urban growth and development, substantial significant transformations in land use/cover of Delhi have taken place.

The process of urban growth has multiple consequences on socio-economic development and environmental conditions. The outward expansion of city consumes large areas of agricultural and forest land, pushing the fringe further. This urban sprawl is unavoidably accompanied with concretization, industrial growth, traffic congestion, air pollution, emission of volatile organic compounds etc., thereby modifying the urban heat budget and raising the temperature of the city core (Roy et al. 2011; Yang and Lo 2002; Singh et al. 2014; Lo and Quattrochi 2003). The phenomenon wherein the temperature of urban centers is higher than the rural hinterland is called Urban Heat Island (UHI). There are three types of Urban Heat islands—Surface Urban Heat Island, Canopy Layer Urban Heat Island and Boundary Layer Urban Heat Island. The latter two types of UHI belong to atmospheric heat islands. Surface heat islands are greatest in the day and atmospheric heat islands in the night (Lo and Quattrochi 2003). The land use/cover and surface temperature are positively correlated owing to albedo and moisture content of the respective surface type (Lo and Quattrochi 2003) and hence UHIs can be identified on the basis of surface temperature differences (Lo and Quattrochi 2003; Oke 1995).

The assessment of land use change as a field of enquiry is decades old but the methodologies have changed over time. The remote sensing satellite data has been extensively used in recent years (Torres-Vera et al. 2009; Muttttanon and Tripathi 2005). The land use/cover change studies using the satellite images are abundantly available. Torres-Vera et al. (2009) analyzed the urban growth for a period of three decades (1973–2000) in Mexico City utilizing the Landsat MSS, TM and ETM+ data. Muttttanon and Tripathi (2005) observed the changing pattern of coastal zone of Ban Don Bay of Thailand using Landsat 5 datasets for 1990, 1993, 1996 and 1999. The change detection analysis was carried out using supervised land use/cover classification and correlating the results with NDVI values in order to highlight the changes from vegetation to other land uses and vice versa. Li and Zhao (2003) evaluated the urban land use patterns spanning over a period of 14 years for the city of Mississauga in Ontario by utilizing the Landsat TM images of 1985 and 1999. They concluded that the drastic changes in urban land use/cover had resulted

in depletion of vegetative cover that is replaced by buildings, roads, malls and other concrete structures. The results were validated using vegetation-impervious surface-soil model. Similar results were presented by Mundia and Aniya (2005) in understanding of urban expansion of Nairobi city using Landsat images, Yuan et al. (2005) for Twin Cities of Minnesota Metropolitan Area, Jiang and Tian (2010) for the capital city of Beijing, Yang and Lo (2002) for the Atlanta, Georgia metropolitan area in the United States. Suribabu et al. (2012) used IRS satellite images and CARTOSTAT-1 images to examine the process of urbanization in Tiruchirapalli City from 1989 to 2010.

Change in surface temperature with reference to land use/cover change has been performed with the help of thermal infrared satellite images of various satellites' sensors at different spatial resolutions. The thermal infrared sensors primarily used for mapping and analysis of surface temperature are Geostationary Operational Environmental Satellite (GOES), NOAA-Advanced Very High Resolution Radiometer (AVHRR), Moderate Resolution Imaging Spectro-radiometer (MODIS), Terra-Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), Synthetic Aperture Radar Imager (SAR), Satellite Pour l'Observation de la Terre (SPOT) and Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM+) (Kant et al. 2009; Muttttanon and Tripathi 2005). While the GEOS data have 4 km resolution, AVHHR and MODIS—1 km and ASTER—90 m, the Landsat TM have 120 m and ETM+ have 60 m spatial resolution that makes it efficient in providing minute details and variations. Among the available thermal satellite data, the Landsat TM is the oldest, hence is available for longer time series (1987–2011). Research on changes and impact of urbanization in altering thermal balance has been conducted all over the world e.g. Lo and Quattrochi (2003) on Atlanta Metropolitan Area, Li et al. (2011) on Shanghai and Bagan and Yamagata (2012) for Tokyo, Zhang and Wang (2008) in different parts of China and Chen et al. (2006) on Pearl river delta. The magnitude and extent of UHIs have been found to be positively correlated with the size of cities, level of urbanisation and population size, indicating the significant impact of urban growth on creation of micro-climates (Hung et al. 2006).

NDVI values range between +1 and −1 and higher NDVI indicates a higher degree of greenness and healthy vegetation (Lo and Quattrochi 2003; Curran 1980). Since surface temperature and NDVI exhibit inverse relationship, it acts as a chief indicator of land use/cover change. The works on UHI and NDVI are immense e.g. Zhang et al. (2012) presented the case study on Wuhan City, Weng et al. (2004) on Indianapolis, Zhang et al. (2010) on Beijing, Julien et al. (2011) on Iberian Peninsula, Yue et al. (2007) on Shanghai, Amiri et al. (2009) on Tabriz urban area, Iran and Kawashima (1994) on Tokyo. However, in context of Delhi, literature on the related theme is sparse. Pandey et al. (2009) examined daytime and night-time thermal data in association with distribution of Aerosol Optical Depth observing that areas with high AOD levels and low temperature and vice versa. Rahman et al. (2011), Mohan et al. (2011), Sharma and Joshi (2012) and Mohan et al. (2013) have used satellite based platforms to analyze land use/cover and associated temperature changes in Delhi.

Due to modification of urban land use/cover and associate changes in area covered by vegetation, water bodies and built-up areas cause the surface temperature to increase. With higher percentage of population now living in the cities, these alterations are much more evident there. UHI is responsible for increased heat events and mortality related to heat wave. The higher temperatures bought by urban heat island also has adverse effect on the air quality. According to Lo and Quattrochi (2003) volatile organic compounds and nitrogen oxides, emitted from industries, power plants, vehicles and combustion of fossil fuels, in presence of sunlight react to form ground level ozone (Cardelino and Chameides 1990). The ground level ozone is a public health hazard that causes various respiratory and cardiovascular problems. Increased pollution levels strongly associated with amendments in surroundings and urban lifestyles is the prime cause of degrading heath in urban areas. Respiratory illness, skin and eye infections are on a rise. Considering the negative impacts of the changes in land use/cover, this paper focuses on (1) Status of changing land use/cover in the capital of India, Delhi from 2000 to 2010, (2) to understand the pattern of changing surface temperature 2000–2010 and (3) to understand the relationship between changing land use/cover and surface temperature using NDVI for the same period.

## 5.2 Study Area

Delhi is the administrative and national capital of India. It is located between the latitudinal extent of 28°23′17″–28°53′00″ N and longitudinal extent of 76°50′24″–77°20′37″ E (Fig. 5.1) and covers an area of 1,483 $km^2$ with average altitude of 213–305 m above msl. It is bordered by Haryana in the north, west and south and Uttar Pradesh in the east. Delhi has two main physiographic features viz. the Yamuna river and Delhi ridge. Apart from this, the city is largely a plain area. The length and average width of river Yamuna in Delhi are 48 km and 1.5–3 km respectively. It divides the city in two parts, popularly known as east and west Delhi. The ridge, which is an extension of Aravalli Range, borders the Delhi in southern side and extends upto central Delhi. It is popularly known as Lungs of Delhi, as it functions like thermal moderator and cooling agent of climate. Delhi has extreme continental climate with annual temperature ranges from 3 °C in winters to 45 °C in June and average rainfall ranges from 400 to 600 mm.

For the purpose of governance and management, Delhi city is divided into nine districts and 27 tehsils/sub-divisions. Unlike many large growing cities of the Asia, Delhi posses mixed land use/cover comprising of built up area interspersed by layers of tree cover. As per the estimates of the Forest Survey of India the total forests cover in Delhi was about 22 $km^2$ (1.5 %), which increased to about 176.2 $km^2$ (11.88 %) in 2011. Besides, lush green tree cover has grown that cover about 120 $km^2$ (8.09 %). The vegetation on the ridge mainly belongs to thorny scrub type, representing semi-arid conditions.

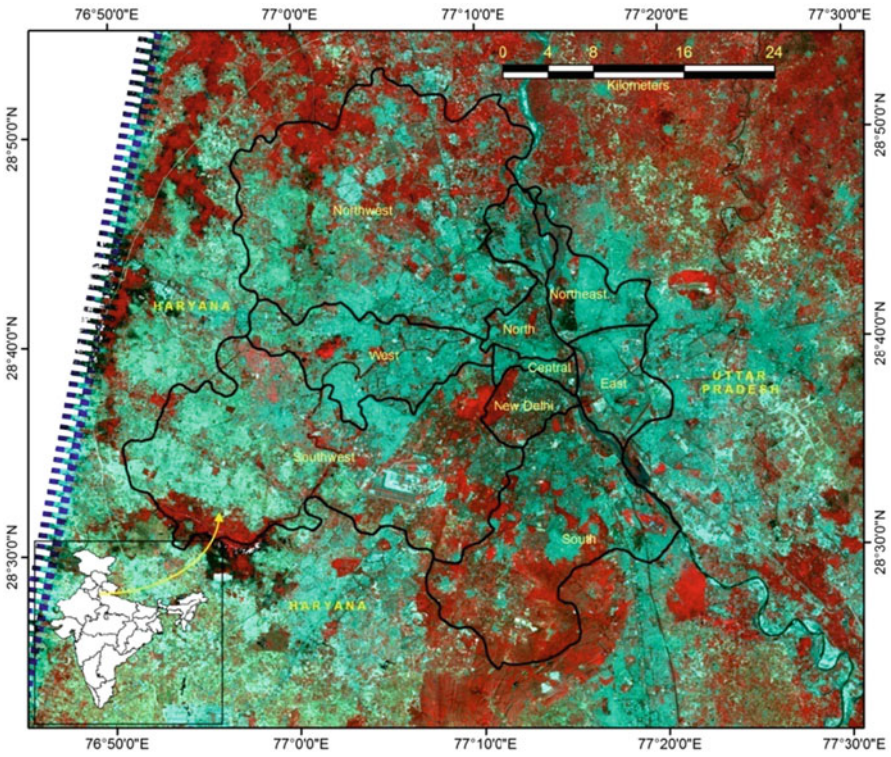


**Fig. 5.1** Location of study area i.e. Delhi in India. Background: Landsat 5 TM standard FCC (4, 3 and 2)

## 5.3 Database and Methods

To understand the changes in micro-climate viz. land use/cover, NDVI and surface temperature of Delhi, Landsat 5TM satellite images were acquired from www.earthexplorer.usgs.gov (Table 5.1). The Landsat 5 satellite following a Sun-synchronous, near-polar path revolves around the earth at an altitude of 705 km with 16 days temporal resolution. It overpasses the Delhi at local time of approximately 10:30 am. The data is obtained in seven spectral bands. The 6th band is thermal infrared band and is mainly used for mapping of surface temperature. The other bands are used for land use/cover information with different combinations of bands usually known as false color composites (FCC). The spatial resolution of the 6th band is 120 m, while the other bands are obtained at 30 m resolution (Chander et al. 2009; Murayama and Lwin 2010).

**Table 5.1** Satellite data used in present study

| Satellite | Sensor | Acquisition date | Path and row | Spatial resolution[a] |
|---|---|---|---|---|
| Landsat 5 | TM | 5/5/2000 | 146/040 | 30 m |
| Landsat 5 | TM | 9/5/2010 | 146/040 | 30 m |

[a]120 m for thermal data (6th band)

### *5.3.1 Image Pre-Processing*

The satellite images were raw in nature and radiometric corrections were to be applied to make them usable for further research. After identifying the area of study (Fig. 5.1), the image (all bands except 6$^{th}$) was converted to reflectance image for further analysis. Following image pre-processing steps were taken to convert raw image to reflectance image based on Chander et al. (2009).

**Step 1.** Conversion of the Digital Number (DN) to Spectral Radiance (L)

$$L_\lambda = \text{LMIN} + (\text{LMAX} - \text{LMIN}) * \text{DN}/255 \tag{5.1}$$

where: $L_\lambda$ is the Spectral radiance, LMIN is the 1.238, LMAX is the 15.600 and DN is the Digital Number

**Step 2.** Conversion of Spectral Radiance to Reflectance

$$\rho\lambda = \pi d^2 L_\lambda / E_{0\lambda} \cos\theta_s \tag{5.2}$$

where: $\rho_\lambda$ is the Reflectance, d is the Earth-sun distance (astronomical units), $L_\lambda$ is the Radiance, $E0_\lambda$ is the Mean solar exoatmospheric irradiance, $\pi$ is the 3.14159, $\theta_s$ is the Angle of solar zenith(degrees).

### *5.3.2 Land Use/Cover Classification, Mapping and Change Detection*

Delhi is an amalgamation of multiple land use/cover types and hence broadly six categories were identified including, built-up land, vegetation-green space, water bodies, agricultural area, bareland and sand bars on the satellite images of 2000 and 2010 using Erdas Imagine 9.2. Supervised classification method was applied for mapping of land use/cover classes. Over 25 signatures from each land use/cover type were acquired with the help of field based knowledge, current topographical sheet and google earth. These were further cross-checked at field, hence the maps were prepared. Both the maps were further compared to understand the land use/cover change.

### 5.3.3 Mapping of Surface Temperature: Pre-processing, Conversion and Change Analysis

The raw thermal band (6th band) was converted to spectral radiance (L) using Eq. (5.1). The spectral radiance was then converted to temperature in Kelvin (using Eq. (5.3)) and thereafter in degree Celsius scale (using Eq. (5.4)) following Chander et al. (2009), Murayama and Lwin (2010) and Jiang and Tian (2010).

**Step 1.** Conversion of the Digital Number (DN) to Spectral Radiance (L) using Eq. (5.1)

**Step 2.** Conversion of Spectral Radiance to Temperature in Kelvin

$$T_B = K2/In((K1/L_\lambda) + 1) \tag{5.3}$$

where: K1 is the Calibration Constant 1 (607.76), K2 is the Calibration Constant 2 (1260.56),

$T_B$ is the Surface Temperature

**Step 3.** Conversion of Kelvin to Celsius

$$T_B = T_B - 273 \tag{5.4}$$

The north–south and west–east surface temperature profiles were calculated for both the years i.e. 2000 and 2010. The profiles were created in such a way that they cross the central Delhi and cover most land use/cover types. One thousand four hundred thirty four sample pixels for north–south profile and 1,271 sample pixels for west–east profile from thermal image of each year were taken into consideration. The profiles were further compared using simple line graph.

### 5.3.4 NDVI Estimation and Change

The NDVIs of processed satellite image were calculated using Eq. (5.5).

$$NDVI = (band4 - band3)/(band4 + band3) \tag{5.5}$$

Further, NDVI change was computed and relationships between land use/cover and surface temperature and NDVI established. The profiling of NDVI for the same sample pixels was done using line graphs as for the surface temperature.

The profiles of NDVI and surface temperature representing land use/cover classes for both the years were then compared using line graphs. The comparison has also been done using the maps of land use/cover, surface temperature and NDVI (Fig. 5.2).

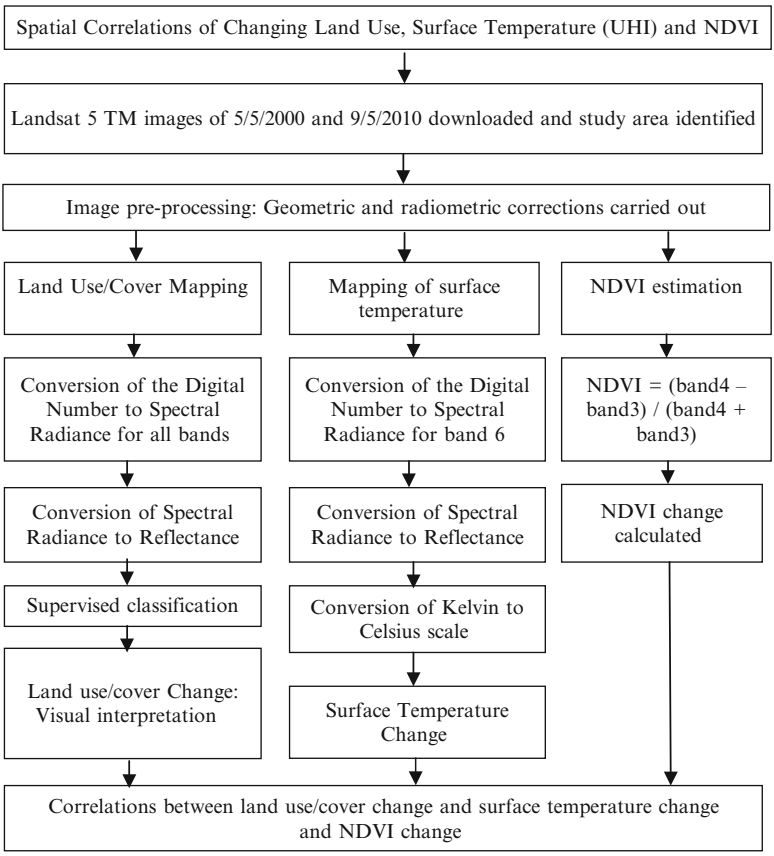


**Fig. 5.2** Methodological framework

## 5.4 Results and Discussion

The visual correlations between land use and cover and surface temperature of 2000 and 2010 show that there is strong positive relationship among the two. As the surface characteristics change the temperature also alters (Fig. 5.3). The forested areas and vegetation cover have minimum surface temperatures. This is for the reason that vegetation absorbs incoming solar radiation, thereby reduces the heat. Water bodies like presence of river Yamuna and lakes like Bhalaswa, Sanjay Gandhi Lake moderate the temperature around it. This is due to differential heating of water bodies, difference in albedo and high absorption power of water. On the other hand, higher temperatures are associated with non-porous materials like building, roads made of concrete, asphalt and metal (Yue et al. 2007; Lo et al. 1997).

The surface temperature for south west part of Delhi is maximum owing to the presence of fallow land and sandy soil. As perceived, in central part of Delhi and in areas of high built up density, the temperatures are not very high. Unlike many other

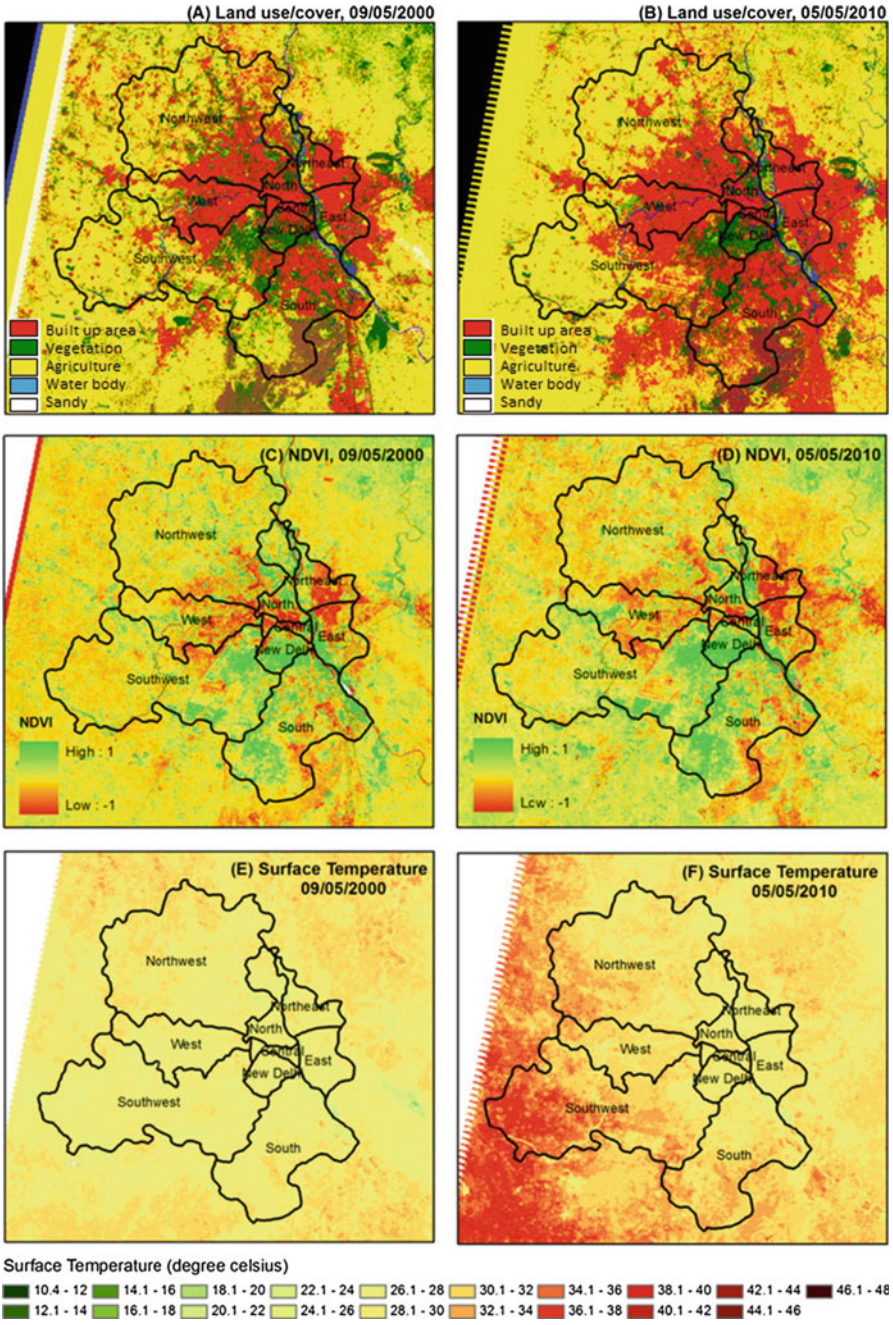


**Fig. 5.3** Spatial distribution of land use/cover, surface temperature and NDVI in Delhi (2000 and 2010)

large cities of the world, like Tokyo, Shanghai, Georgia, Beijing and many Asian cities, this pattern is an atypical phenomenon. Delhi is exceptionally unique as over the past few years, along with accelerated concretization, there has also been expansion in tree cover of Delhi leading to creation of mixed land uses. Most of the highly compact built up areas are accompanied with dense tree cover, thereby, fostering a balance in the surface temperature. Added to this is the minimizing role of the Yamuna River that crosses through seven of total nine districts of Delhi. Another possible factor is the building size. Delhi city has grown more horizontally in comparison to vertical growth and therefore the occurrence of heat trap is minimal. As a result very strong heat island does not exist in the centre of Delhi, but, it may be noted that there is clear distinction and variation in thermal properties according to the land use/cover type.

To further investigate on association between land use/cover and surface temperature, NDVI was calculated (Fig. 5.3). There exists inverse relationship between NDVI and surface temperature. In 2010, sections of South Delhi, New Delhi and North Delhi have experienced an increase in NDVI values in comparison to May 2000. Increase in green cover is striking in the districts of South and New Delhi. On the other hand, the values decreased in North–East, East and North–west Delhi. It is clearly visible that the geographical city of Delhi has expanded last census decade. As per the results of NDVI, higher temperatures should be in North–East, East and North–west Delhi but such is not the case, for the reason that greenness in the city has been maintained judiciously along with horizontal expansion of the city. The presence of river Yamuna in these districts has also contributed in lowering the temperature. The surface temperate pattern depicts a varied scenario. The city temperature was much lower for the hottest month of the year in 2000 and 10 years later the surface temperature for the same month increased significantly for all districts.

As per the records of Survey of Forest in Delhi, 2001, total forest cover in Delhi was 111 $km^2$, that is, 7.6 % of the total geographical area of Delhi. This comprised of 38 $km^2$ dense forest cover and open forest of 73 $km^2$. New Delhi (27.88 %) had maximum forest cover followed by South Delhi (21.02 %) and Central Delhi with 9.20 % in 2001. All other districts had less than 5 % forest cover. However, in 2011 Report of Forest Survey of India, the total forest land increased to 176.2 $km^2$ which is a rise of 4.32 % in a decade. South Delhi recorded maximum forest cover with 78.32 % followed by South-West Delhi with 41.8 % and minimum of 4.1 and 2.99 % for North-east and East Delhi.

The decadal change in surface temperature (degree Celsius) and NDVI are represented in Fig. 5.4. The change in surface temperature ranges from −6 to 10 °C, an enormous difference of 14 °C. Apart from the border areas of west, south west and south central areas, the change ranges between 0 and 2 °C except a few pockets. The maximum change has taken place in South–west district. NDVI has increased in North, Central, South and New Delhi. The east, north and western Delhi are the areas where the city expansion has taken pace and hence the NDVI values are lesser there.

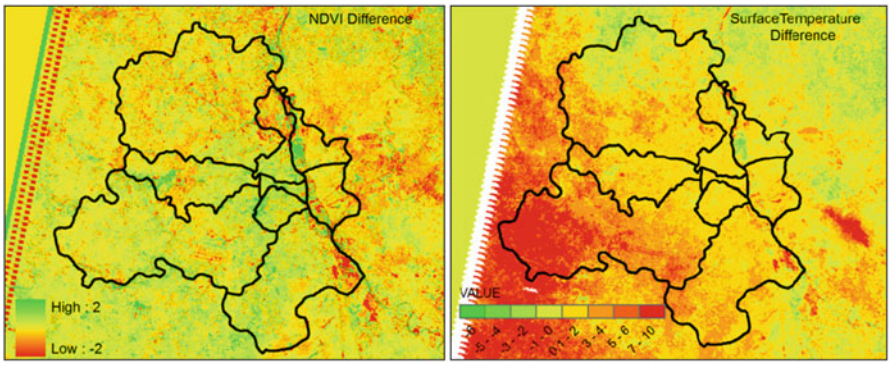


**Fig. 5.4** Changes in NDVI and surface temperature in Delhi (2000 and 2010)

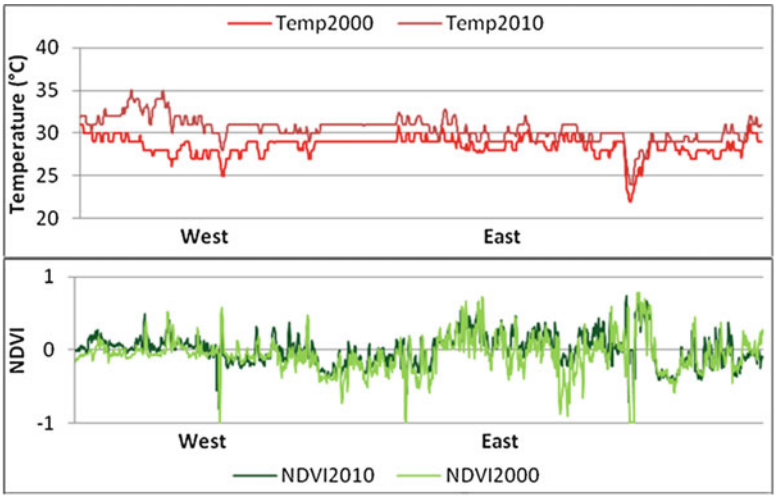


**Fig. 5.5** West–east profile of temperature and NDVI

The north–south and west–east profile lines were drawn cutting across Delhi and land surface temperature and NDVI values correlated along the profile lines (Figs. 5.5 and 5.6).

The west–east profile shows that overall the temperature has increased in Delhi. In 2010, the temperature gradually decreases from west to east and the Central Delhi experiences 27–32 °C temperature. It reaches a maximum of 35 °C in West Delhi and minimum of 24 °C in east at the river Yamuna. Most of the east Delhi areas have maximum temperature of 30 °C except the border areas. In 2000, temperature was much lower in the western portion. The average temperature of river Yamuna has also increased. NDVI results of west–east profile is highest in East Delhi, moderate in West Delhi and least in Central Delhi that is in contrast to temperature pattern. These results are attributed to low height of building and the existence of perennial river Yamuna that flows across the city.

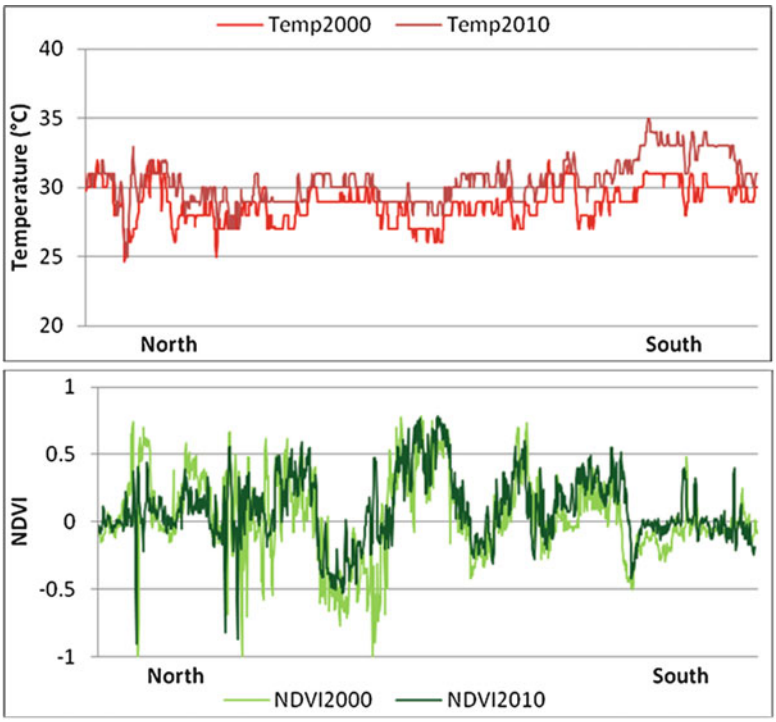


**Fig. 5.6** North–south profile of surface temperature and NDVI

The north–south profile lines pass through the districts of North Delhi, Central Delhi, New Delhi and South Delhi. The temperature increases as we move towards the extreme South and in Central and New Delhi it is low (Fig. 5.6). The thermal conditions have observed an increase from 2000 to 2010, and the NDVI also experienced gain at many places. The NDVI is largest in New Delhi despite large congregation of buildings. In extreme north and south, however, the NDVI values are much lower. There is clear correlation between surface temperature graph and NDVI values as areas having higher vegetation index have comparatively low temperature conditions and vice versa. The high level of greenness in the capital city is accountable for maintaining relatively low temperature and the absence of clear urban heat island even during the hottest month of the year in May.

## 5.5 Conclusion

Delhi has physically grown phenomenally in recent past. Ever increasing population and urban growth has led to many changes in its environmental conditions. Unlike other Asian cities, it has unique land use/cover distribution. It has large area under forests and tree cover and that too in central part of city, which is unusual for

any city. The ridge covered with forests penetrates in the central parts from the southern sides acting as the moderator of its climate. The agricultural areas are distributed well outside the cities, however large tract were noticed along the river Yamuna that divides the city in two parts. The presence of agricultural land in middle of city is also rarely seen in many cities of the world. All of these phenomena moderate the heat intensity of the central part of city. The surface temperature is well correlated with land use/cover categories. The highest temperature is not observed in built-up land, as there are healthy forests, tree and green cover within the built-up land. It mitigates the heat intensity and albedo. Presence of perennial river in middle of the city also has mitigating influence. The NDVI does not properly explain the distribution of temperature in Delhi, suggesting there are other un-understood factors. The temperature has however increased for all the land use/cover categories. The study concludes that there is absence of prominently large scale heat island in Delhi, rather there exist small scale heat islands spread across the city.

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# Chapter 6
# Role of Local Level Relative Humidity on the Development of Urban Heat Island Across the Delhi Metropolitan Region

**Shouraseni Sen Roy and R.B. Singh**

**Abstract** In the present study we have analyzed the spatial patterns of local level atmospheric humidity levels across the Delhi Metropolitan Region (DMR). Hourly measurements of temperature and humidity conditions were collected over a 1 year period from May 2007 to June 2008 across 13 stations in the DMR. The results of our study revealed substantial variations in the spatial distribution of humidity levels, with pockets of higher humidity clustered around the River Yamuna and central sections of the DMR. Relatively lower levels of humidity were observed in the west and eastern sections of the DMR. The spatial patterns of humidity across the study area were determined by the local level land-use as well as the seasonal level atmospheric conditions. For instance, the minimum spatial variations in humidity levels were observed during the monsoon season due to predominantly cloudy conditions, compared to the summer months when maximum spatial variations were observed due to predominantly clear sky conditions. Lower levels of humidity also overlapped with dense built-up multi-family residential areas in the east and western sections of the DMR.

**Keywords** Humidity • New Delhi • UHI

## 6.1 Introduction

The existence of urban heat islands (UHI) have been extensively studied for different major mid latitude cities of the world, with majority of them focusing on the more developed world such as Vacouver, Canada (Voogt and Grimmond 2000), Malmö, Sweden (Bärring et al. 1985), Phoenix, USA (Brazel et al. 2005),

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Krefeld, Germany (Kuttler et al. 2007). There are a limited number of observation based studies in tropical cities located in Asia, which include New Delhi, India (Padmanabhamurty 1979; Padmanabhamurty and Bahl 1982; Padmanabhamurty and Bahl 1984; Sen Roy et al. 2011), Mumbai (Mukherjee and Daniel 1976), Pune City, India (Deosthali 2000), Kuala Lumpur, Malaysia (Sham 1987), Kuwait city, Kuwait (Nasrallah et al. 1990), Singapore (Nieuwolt 1966; Wong and Yu 2005; Chow and Roth 2006). While all of these studies highlight the profound role of urbanization on long term local level climate conditions, there are substantial spatial variations in the development of UHI based on location and local topography. For instance, in inland cities like New Delhi, there was no clear large heat island in the center of the city; rather there were several dispersed pockets of high and low temperatures. In coastal urban locations such as Mumbai and Singapore, the most intense development of UHI occurred in the dense built-up commercial areas (Mukherjee and Daniel 1976; Chow and Roth 2006). The results from previous studies focusing on tropical cities indicate that in general the UHI intensities are lower compared temperate cities, and the peak UHI occurs later near dawn in tropical cities (Padmanabhamurty 1979; Jauregui 1986, 1997; Oke et al. 1991; Deosthali 2000; Chow and Roth 2006).

The most widely used definition of UHI is the occurrence of higher air temperatures in urban areas compared to the surrounding rural areas (Oke 1987). The UHI is commonly a result of the existence of higher heat absorbing urban surfaces, which trap the heat within the urban canopy layer. As a result of which there is often reduced vertical exchange as a result of reduced wind speed and anthropogenic heat release (Yow 2007). The development of UHI varies with the morphology and size of cities (Oke 1973) as well as the local seasonal meteorological conditions (Arnfield 2003). The strongest UHI usually occur about 2–3 h after sunset on a cloudless day (Hoffmann et al. 2012). Generally the nocturnal UHI maximum occurs near the heavily built-up city centers, such as in case of Tokyo the temperature decreases constantly with increasing distance away from the maximum observed temperature of about 14 °C to an observed minimum of about 10 °C in open and rural outskirts (Yamashita 1996). Similar spatial of decreasing temperatures with increasing distance away from the city centers were also observed in case of Kula Lumpur by Sham (1991), where a distinct drop in temperatures were observed away from the built up area.

Other than the morphology and size of the city, the local level meteorological conditions such as relative humidity, cloud cover play a distinctive role in the UHI development, which mainly modulates the diurnal cycle of temperature variations across the city. Due to the surface characteristics in the form of paved surfaces and lesser vegetation, lower levels of humidity in urban areas compared to adjacent rural areas have been observed. This results in lower rates of evapotranspiration in urban areas (Chandler 1967; Landsberg 1981). Contrasting results of higher humidity levels were observed during clear and calm summer nights in Chicago (Ackerman 1987) and Krefeld, Germany (Kuttler et al. 2007). Additionally, the occurrence of a higher nocturnal humidity in urban areas due to continued evaporation, compared to lower humidity levels in the lower layers of the rural air

depleted by dewfall was noted by Chandler (1967) and Hage (1975). In addition, the results of several studies revealed the positive correlation between air humidity, in the form of vapor pressure, and nocturnal UHI intensity (Sundborg 1951; Lindqvist 1970). This is related to the radiative forcing of water vapor leading to increased sky long wave irradiance over the city by 20–40 $W/m^2$ (Oke and Fuggle 1972; Kobayashi 1982; Estournel et al. 1983; Lindgren 1997).

Majority of the studies analyzing UHI intensity in Asian tropical cities in the recent past, have focused on temperature variations. This is particularly critical in view of the increasing population in large metropolitan areas of Asia, accompanied with the rapid spread of urbanization in adjacent rural or non-urban areas such as forested lands. It is already widely validated that more than half of the world's population are living in urban areas, with more than 20 megacities (cities with more than ten million population). Furthermore, it is estimated that 16 of the world's 24 megacities will be located in Asia by 2015. There are more than 400 cities with a million or more population. Furthermore, it is estimated that the urban population in the developing world will rise from 0.5 million to 3 billion by 2030 (UNFPA 2009). This is apparent from the rapid increase in urban population occurring in large metropolitan areas in Asia, majority of which do not necessarily have adequate infrastructure to absorb this population increase. Most of these mega cities in South and Southeast Asia are located in tropical and subtropical climates, which are notable for the hot and humid conditions, and in some cases extreme continental climate. Additionally, there is mixed land use with industrial areas often located within or close to residential areas with limited emission control or environmental standards. Many of these tropical cities also experience weak winds and limited air circulation of air which results in the accumulation of pollutants. Furthermore, high temperatures raise the production of secondary, photochemical pollutants along with high humidity add to a hazy atmosphere (Roth 2002).

In this context Delhi Metropolitan Region (DMR) is an ideal example of such a city, which has experienced an exponential increase in population over the years from 405,891 persons in 1901 to 2.7 million in 1971 to 16.7 million in 2013, accompanied by rapid urban sprawl (Census of India 2011). As a result of this rapidly growing population density, there is immense stress on the limited resources, leading to shortages in basic amenities such as water and power supply. Therefore, in the present study the spatial patterns of relative humidity and its relationship with the prevailing near surface air temperatures in the Delhi Metropolitan Region (DMR) within the urban canopy have been examined. The existence of several small warm pockets due to the agglomeration of houses, based on observations collected on two clear winter nights in Delhi was found by Padmanabhamurty and Bahl (1982) is relevant. However, the urban landscape of the DMR has changed vastly over the past two decades, with substantial expansion of densely built-up high rise residential areas, especially in the northwest, southwest, and to the east of the River Yamuna (Fig. 6.1).

More recently, the entire metropolitan area underwent large-scale infrastructural expansion in the form of new roadways, public transport lines, and other infrastructural expansions. The distinct spatial patterns of UHI development have recently

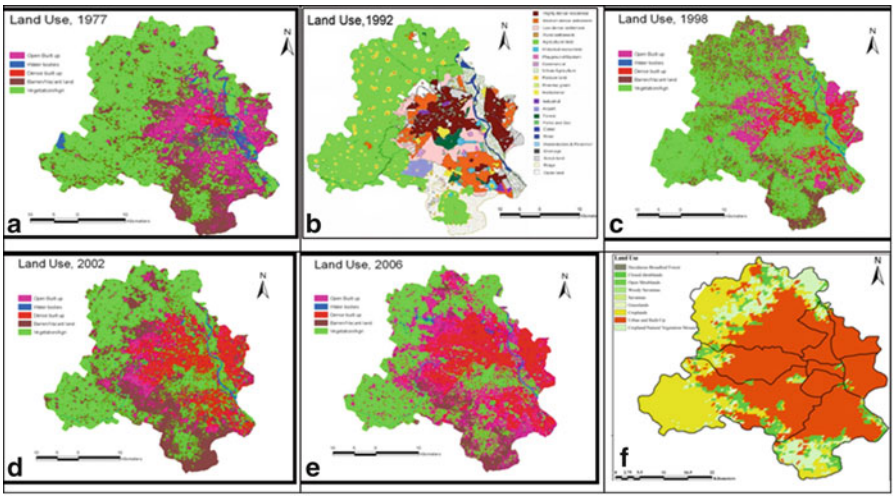


**Fig. 6.1** Change in land use across the DMR during (**a**) 1977; (**b**) 1992; (**c**) 1998; (**d**) 2002; (**e**) 2006 (*Source*: Kumar 2008); and (**f**) 2008 land use derived from MODIS satellite imagery (*Source*: http://daac.ornl.gov/cgi-bin/MODIS/GLBVIZ_1_Glb/modis_subset_order_global_col5.pl Accessed 18 Nov 2013)

been documented by several field based studies, such as a month long field campaign conducted during May 2008 across 30 sites around the DMR, showed the dominance UHI effects in the dense built up commercial and residential areas in central and northwest DMR (Mohan et al. 2009). The results of their study also indicated the presence of a two peaks in the occurrence of UHI intensity in the afternoon at 3 p.m., and at 9 p.m. in night. Additionally, the authors of the present study also conducted a field based study, related to the current study, and revealed the existence of higher temperature during in north and west districts of the DMR and the occurrence of highest temperatures in the afternoon (Sen Roy et al. 2011). Other than field based observations, recently the use of remote sensing techniques have enabled the mapping of spatial variations the spatial variations in land surface temperatures and Normalized Difference Vegetation Index (NDVI) across the DMR (Kant et al. 2009). The results of their study showed significant variations in vegetation cover particularly in east, central, and northern districts of the DMR, with higher NDVI values concentrated over the ridge area in the northwest and southwest (Mallick et al. 2008). In a subsequent study by Mallick et al. (2012), showed the spatial distribution of land surface temperatures across the DMR that ranged from 22 to 46 °C, with the highest temperature observed in the west and southwest. This was attributed to the fallow land, scarcity of vegetation. Higher land surface temperatures were also observed in the central and southeastern parts of the DMR due to the concentration of impervious surfaces and higher density of buildings.

## 6.2 Study Area

The DMR is located in the interior of the Indian subcontinent, in north central India, between 28°23′17″–28°53′00″ North latitude and 76°50′ 24″–77°20′37″ East longitude, at an altitude between 213 and 305 m. As a result of its location in the interior of the subcontinent, it experiences typical continental weather with very hot summers followed by rainy season during the months of July and August, followed by very cold winters with minimum temperatures getting close to freezing (Table 6.1). Majority of the precipitation occurs during the south west monsoon season with average annual amount of precipitation at about 600 mm. The dry summer months are characterized by convective thunderstorms and dust storms, which blow in the sand from the adjacent Thar Desert. The predominant wind direction during the monsoon months are from the southeast, while it is replaced by westerly wind circulation during the winter months.

Geographically, DMR is located on the right bank of the River Yamuna at the periphery of the Gangetic plains. The remnants of the Aravalli range, locally called the Kamala Nehru Ridge, are located in the western section of the DMR, which is constantly under pressure of being converted into urban land uses. Ecologically, the ridge is critical for the DMR not only in the form of a protected natural reserve, commonly referred to as the "lungs" of the city, but also it acts like a barrier by slowing down the transport of the sand from the Thar Desert. As a result there have been active efforts on the part of the local government to protect the ridge area, which has resulted in the increase of total forest cover in the ridge from 0.76 % in 1980–1981 to 1.75 % in 1994–1995. The DMR is administratively divided into nine districts (Fig. 6.2).

As mentioned above the population of Delhi has been increasing at a rapid rate, with a decadal rate of 21 %. Locally, the maximum population increase between 1961 and 2011 took place in northwestern Delhi, as a result of conversion rural agricultural lands to dense high rise residential areas for the rapidly increasing

**Table 6.1** Average annual temperature and rainfall in DMR

| Months | Max temperature (°C) | Min temperature (°C) | Rainfall (mm) |
|---|---|---|---|
| January | 21 | 7 | 25 |
| February | 24 | 10 | 22 |
| March | 30 | 15 | 17 |
| April | 36 | 21 | 7 |
| May | 41 | 27 | 8 |
| June | 40 | 29 | 65 |
| July | 35 | 27 | 211 |
| August | 34 | 26 | 173 |
| September | 34 | 25 | 150 |
| October | 35 | 19 | 31 |
| November | 29 | 12 | 1 |
| December | 23 | 8 | 5 |

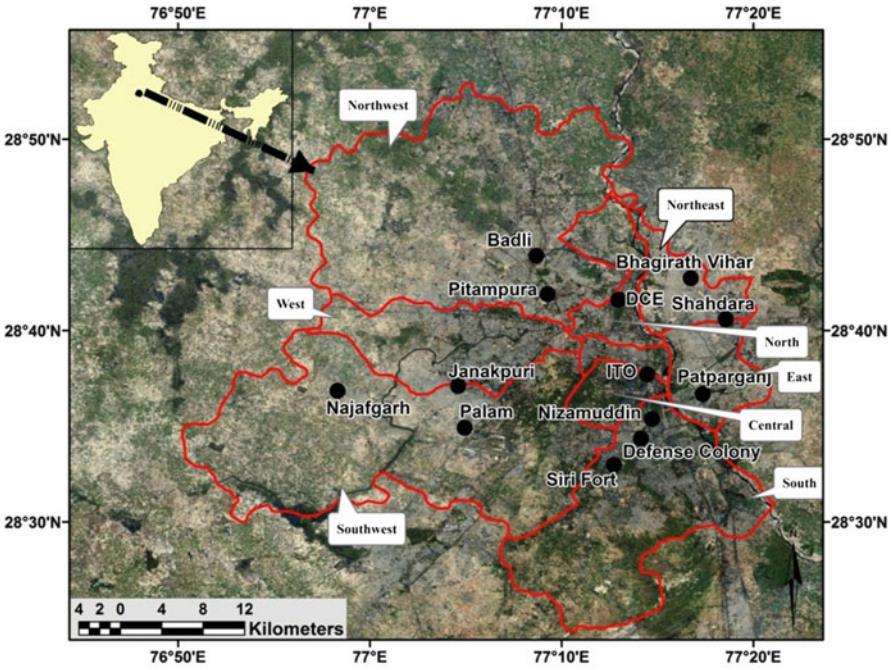


**Fig. 6.2** Location of 13 automated temporary field stations set up across the DMR between May 23, 2007 and June 15, 2008

urban population of the DMR. On the other hand New Delhi and Central Delhi experienced almost a steady to decreasing population over the years. These two districts constitute the most planned part of the metropolitan area, with relatively low density population. The south district includes predominantly well-planned residential neighborhoods. The entire west district of DMR consists of dense multi-unit residential neighborhoods, interspersed with industrial and commercial land uses. The western outskirts of the DMR are in the process of changing from rural to urban land uses. Therefore, in certain areas there are still pockets of agricultural land use. The east and northeast districts of the DMR consist of mixed land uses of industry and multi-unit residential units, and are frequently prone to flooding during the monsoon season, and include unregulated land uses (Sen Roy et al. 2011). As a result of the urban sprawl, the rural areas inside the DMR have been shrinking rapidly from 345 villages in 1921 to 165 in 2001 census. The population density increased from 9,340 persons/km$^2$ in 2001 to 11,297 persons/km$^2$ in 2011, with higher population density in the eastern part of the study area (Census of India 2011). This growth in population has resulted in both horizontal expansion of urban built up areas in adjacent agricultural lands as well as vertical expansion in the form of high rises. The proportion of urbanized area in DMR has increased from 22 % in 1961 to 62 % in 2001. The territorial expansion of the DMR has taken place in a linear configuration along major radial interstitial spaces, increasingly filled in by both planned and unplanned residential and industrial uses (Singh et al. 2002).

## 6.3 Datasets and Methodology

The most widely used research methodologies used to study detailed characteristics of UHI development, such as diurnal variations in large urban areas involve the collection of micro-level climate data at fine temporal and spatial scales over a significant period of time. This is predominantly important for capturing the role of local level variations in weather conditions and its interactions with local surfaces, which are not captured by the limited network of long-term meteorological stations. For instance in the case of the DMR, there are only two long term meteorological stations, which are inadequate for capturing the widespread variations in local climatic conditions across the study area. As is evident from the review of literature on the spatial variation across the city landscape, it is important to gather more local level information on weather conditions including humidity and temperature. Furthermore, in this study the focus is on the urban canopy layer (UCL), defined as the atmospheric layer between ground level and roof level (Oke 1976). It is widely validated that the atmospheric circulation within the UCL is largely determined by site-specific characteristics. Therefore, in order to determine the role of variations in local environmental factors on near surface atmospheric conditions, observations were recorded at one-hour intervals at 13 sites within the DMR (Fig. 6.2). These sites were carefully selected in order to represent the different land uses and environmental conditions around the study area (Table 6.1). At each site, automatic weather data loggers in the form of HOBO Pro RH/Temperature sensors, with an accuracy of $\pm 0.2$ °C at 21 °C, were installed at approximately 2 m above the ground level. In order to conduct comparisons between the data collected at each site, efforts were made to make the sites in identical conditions. Some of these measures included placing them on open ground in order to avoid temperature biases from immediate surrounding objects, such as walls and metal fencing. In order to ensure uninterrupted monitoring at the different sites, three of these stations were placed on the grounds of educational institutions, while seven were installed alongside local pollution monitoring stations, and the remaining three were spread out across the study area. The advantage of placing the sites alongside the local pollution monitoring stations ensured a good spread across the city as well as site specific characteristics. All of these sites were in operation for more than a year, from May 23, 2007 to June 15, 2008. The observed data were analyzed at hourly, daily, and seasonal intervals. The seasonal classifications taken into consideration were January to March for winter season, April to June for summer season, July to September for the southwest monsoon season, and October to December for the northeast monsoon season. The local level spatial variations in the local level variations in humidity were plotted using spatial interpolation techniques (Figs. 6.3 and 6.4), mainly ordinary kriging, wherein the basic formula used is:

$$Z(s) = \mu + \varepsilon(s)$$

The predicted values Z(s) are calculated with μ as the mean, s as the location, and ε is the spatially autocorrelated error. Ordinary Kriging is a stochastic interpolator

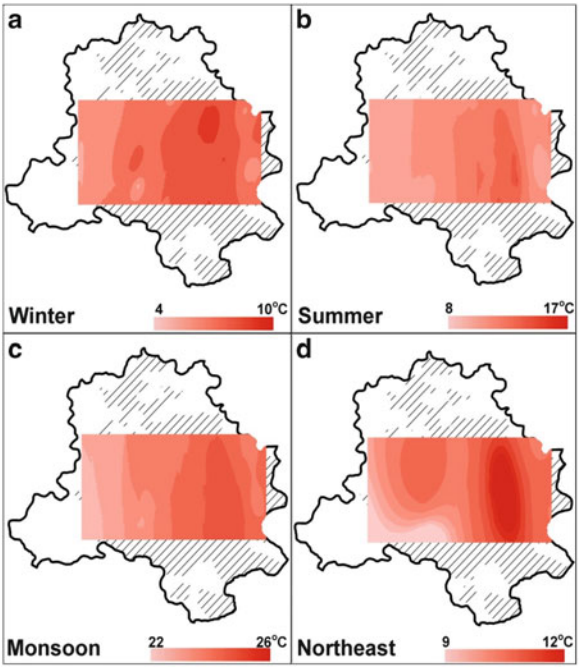


**Fig. 6.3** Seasonal patterns of Dew Point Temperatures across the DMR (**a**) Winter; (**b**) Summer; (**c**) Monsoon; (**d**) Northeast Monsoon seasons

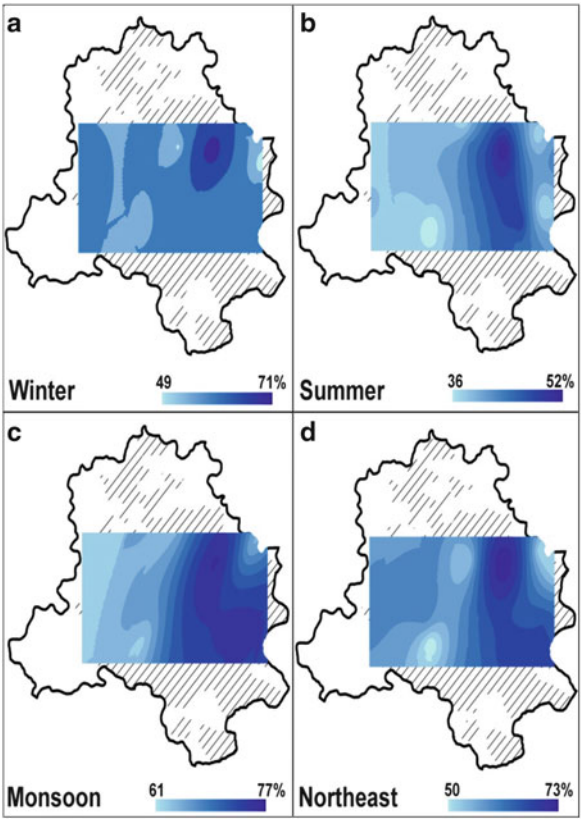


**Fig. 6.4** Seasonal patterns of Average Relative Humidity across the DMR (**a**) Winter; (**b**) Summer; (**c**) Monsoon; (**d**) Northeast Monsoon seasons

that takes into account the statistical relationships between the different observations while generating the final surface interpolations. It involves the use of data from known points, and its performance is dependent on the sample size (Hughes and Lettenmaier 1981). This technique was employed for spatial interpolation mainly due to its more accurate interpolation of temperature patterns across the DMR and lower root mean square error than other surface interpolation techniques such as the Inverse Distance Weighting Method (IDW) and kriging. Detailed information about the comparative uses of various spatial interpolation techniques for UHI spatial analysis is provided in Szymanowski and Kryza (2009) (Table 6.2).

Finally, we obtained seasonal scale land surface temperatures from MODIS data from May 2007 to June 2008 from Oak Ridge National Laboratory Distributed Active Archive Center. Specifically the data were retrieved from the level-3 MODIS global Land Surface Temperature (LST) and Emissivity 8-day data (Figs. 6.9 and 6.10). These images are composed from the daily 1-km LST product (MOD11A2) and stored on a 1-km Sinusoidal grid spatial resolution as the average values of clear-sky LSTs during an 8-day period (Wan 2006). The MOD11A2 are comprised of daytime and nighttime LSTs, quality assessment, observation times, view angles, bits of clear sky days and nights, and emissivities estimated in Bands 31 and 32 from land cover types. The day/night LST algorithm involves a pair of daytime and nighttime L1B data in seven Thermal Infra-Red (TIR) bands, atmospheric temperature and water vapor in the MODIS atmospheric product MOD07_L2. The LST data products are produced as a series of seven products. The structure begins as a swath (scene) at a nominal pixel spatial resolution of 1 km at nadir and nominal swath coverage of 2030 or 2,040 lines (along track, about 5 min of MODIS scans) by 1,354 pixels per line (Wan 2006).

## 6.4 Results and Discussion

One of the driving forces in the development of UHI is the role of local level land use and land cover, on the local level energy balance. In this context the DMR has experienced unprecedented changes in land use, such as the building of large residential areas in sub cities of Narela and Rohini in the northwest, and Dwarka in the southwest districts of Delhi. There are also reports of shrinking water bodies as a result of water shortages during the dry summer months, leading to high demands for water not only daily needs but also agricultural activities in southwest DMR. The changing patterns of land use are shown in Fig. 6.1, which reveals the rapid expansion of built-up area can be seen through the years. Until, 1971 only about 15 % of the total area in DMR was built-up, while more than half of the land area was under natural vegetation and agriculture. By 1992 there was a significant increase in built-up area, with vegetated and agricultural areas still covering 65 % of the land area. The majority of the expansion in built-up area took place to the east of the River Yamuna, locally known as the trans-Yamuna region. Most of the expansion in urban built up area took place in the form of unauthorized residential

**Table 6.2** General description of immediate surroundings of the 13 temporary automated weather stations across the DMR (adopted from Sen Roy et al. 2011)

| Station name | Local climate zone classification[a] | Surroundings local scale ($10^2$–$10^4$ m) |
|---|---|---|
| Badli | Compact low rise | Dense built up area, consisting of mixed urban land uses including residential and industrial land uses. Unplanned residential areas with single family houses mostly one to two floors. Mostly single family houses with 2–4 floors. Approximately 60 % impervious surface |
| Pitampura | Compact mid rise | Dense urban multi-unit residential areas. Multiple storied apartment buildings. Relatively planned area with small parks located at regular intervals. Most of the buildings have 3–6 floors. Approximately 70 % impervious surface |
| DCE | Sparsely built | Low density urban residential land uses. This is almost in the rural urban fringe area, undergoing rapid transformation in the form of new buildings taking over preexisting agricultural areas. Mostly single family houses with 2–4 floors. Large open lots. Approximately 40 % impervious surface |
| Bhagirath Vihar | Compact mid rise | Located east of the river Yamuna. Dense low rise one to two storied buildings with mixed urban land uses including both commercial and residential. Most of the buildings have 1–3 floors. Approximately 80 % impervious surface |
| Shahdara | High-energy Industrial | Located east of the river Yamuna. Dense industrial land uses. Many industries has been relocated here from the core of the urban areas to reduce the levels of pollution inside the DMR. Most of the buildings have 3–5 floors. Approximately 80 % impervious surface |
| ITO | Compact high rise | High rise commercial buildings, which have 5–15 floors. This area is the hub of activity during the weekdays, because of the numerous government office buildings located in the general vicinity. Greater than 90 % impervious surface |
| Patparganj | Compact midrise | Located east of the river Yamuna. Dense low rise mixed urban land uses consisting of residential, commercial, and industrial activities. Greater than 90 % impervious surface in the immediate vicinity in the east and surrounded by agricultural land on the banks of River Yamuna. Very much flood prone area due to low altitude and proximity to the River Yamuna |
| Najafgarh | Sparsely built-up | Located in the rural urban fringe of the DMR. It has been undergoing rapid urbanization with agricultural areas being replaced brick and concrete buildings. Most of the residential neighborhoods are unauthorized and unplanned buildings. Most of the buildings have 1–3 floors. There are a lot remaining agricultural fields closer to the boundary of the DMR. Approximately 50 % impervious surface |
| Palam | Compact high rise | This is where the Delhi International airport is located. The station is located in the midst of one of the largest |

(continued)

**Table 6.2** (continued)

| Station name | Local climate zone classification[a] | Surroundings local scale ($10^2$–$10^4$ m) |
|---|---|---|
| | | planned high density multiunit residential neighborhoods, started by the local government in the early 1990s. Most of the buildings have 1–3 floors. Approximately 70 % impervious surface |
| Nizamuddin | Compact low rise | Located close to the well planned administrative core of New Delhi, this area mainly consists of single family residential units. Most of the buildings have 1–3 floors. Approximately 60 % impervious surface |
| Defense Colony | Compact low rise | Representative of the administrative core of New Delhi, consisting of well laid out streets and predominantly low density residential neighborhoods and government office buildings. Most of the buildings have 1–3 floors. This area also constitutes the seat of British colonial power. Approximately 60 % impervious surface |
| Janakpuri | Compact mid rise | Dense built up area, consisting of mixed urban land uses including residential and commercial areas. Most of the buildings have 3–5 floors. Approximately 80 % impervious surface |
| Siri Fort | Compact mid rise | Representative of the southern Delhi region. This area mainly consists of urban 2–5 storied residential buildings interspersed with green areas or green belts. There are isolated pockets of industrial activity in certain parts, with major efforts being undertaken by the local government to move them to the outskirts of the DMR. Approximately 70 % impervious surface |

[a]Local Climate Zone (LCZ) classification is based on the system developed by Oke (2004) and Stewart and Oke (2010)

buildings, which later got recognized as legitimate urban areas by the local government. Since 1998, the proportion of built up area has increased rapidly particularly in the west and northwestern districts, where vast agricultural lands have been converted into high rise residential areas to accommodate the rapidly increasing population in the DMR. As a result there have been significant changes in the local level energy budget in the DMR, with substantial variations in the intensity of UHI development across the DMR. As mentioned above, in a previously published research article, the authors of this study have documented the variations in near surface air temperatures across the study area. The variations in the land use patterns have a significant impact not only on the air temperatures but also humidity levels.

The two commonly used measures of humidity include dew point temperature and relative humidity. Both of these variables were analyzed at the seasonal scale. The spatial patterns of the dew point temperatures showed substantial variations at the seasonal scale (Fig. 6.3). The minimum spatial variations in the range of

observations were observed during southwest monsoon season (22–26 °C) and the northeast monsoon season (9–12 °C). This is caused by the predominance of cloud cover in the study area. The spatial patterns were more varied during the summer, which can be attributed to the greater frequency of clear sky days leading to increased amount of evapotranspiration. The highest dew point temperatures were expectedly during the monsoon season (22–26 °C), while the lowest temperatures were observed during the winter season (4–10 °C). During all the seasons the relatively higher temperatures were always observed over the River Yamuna.

Next we plotted the relative humidity patterns across the study area (Fig. 6.4). The results of the analysis showed similar patterns to that observed in case of dew point temperatures. However, the range in the observed values of relative humidity was greater during the winter and northeast monsoon season. At the seasonal scale, the levels of relative humidity were expectedly highest during the monsoon season. Majority of the days during these two seasons, particularly the monsoon season, are cloudy under the influence of regional weather systems causing widespread rainfall. Spatially, during all the seasons the levels of humidity were highest along the River Yamuna. In the case of both variables the spatial patterns showed a gradient of decreasing values with increasing distance from the River Yamuna. Furthermore, during the winter season the spatial variations were the least, due to the excessive fog that masks the entire metro during this season, which in turn are related to very calm near surface conditions. The spatial patterns for dew point temperatures in winter season showed more variations, in terms of small pockets of relatively higher values overlapping with green areas such as parks and reserved green areas. The spatial variations in the humidity are also in conformity with the findings of previous studies, based on the analysis of limited data by Murty and Bahl (1982).

From the analysis of the spatial patterns in humidity related variables, it is evident that the River Yamuna dominant role in elevated levels of humidity in all seasons in the DMR. Additionally, similar to the spatial patterns usually observed for mid latitude cities in the developed world, a concentric zonation pattern in humidity levels were evident. However, contrary to the patterns observed in other mid latitude cities, the highest levels of humidity were located relatively in middle of the city with declining values with increase in distance away from the city center. This pattern is a result of the location of more planned regulated zoning with designated green areas in the central part of the city, compared to higher density built-up area land uses away from the city center in the form of dense residential and industrial land uses. Furthermore, the horizontal gradient in the humidity patterns across the DMR is also a result of the prevailing near surface wind conditions, with predominantly easterly winds during the monsoon season and westerly winds during the cooler months. There is also a drop in the relative humidity levels, just west of the raised ridge area in the south central part of the DMR. Similar results were also reported in the case of near surface air temperatures (Sen Roy et al. 2011) and in the case of land surface temperatures (Mallick et al. 2008; Kant et al. 2009).

The results of the average hourly seasonal patterns in humidity levels were next compared to the temperature patterns during the course of the day (Figs. 6.5, 6.6, 6.7, and 6.8). The variations in humidity and temperature patterns

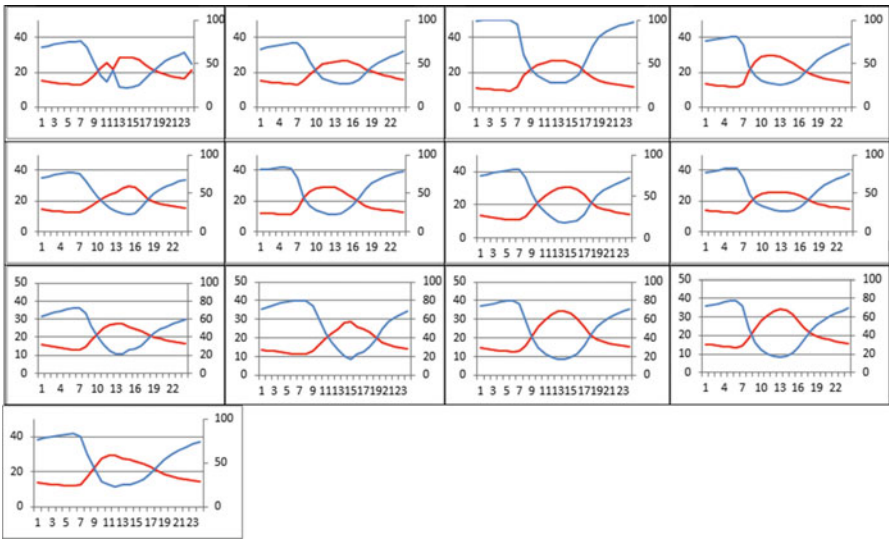

**Fig. 6.5** Winter season average temperature (*red line*) and relative humidity (*blue line*). *Left Y axis* represents temperature, *right Y axis* represents relative humidity in percentage, and *X axis* represents the 24 h of a day (**a**) Badli; (**b**) Bhagirath Vihar; (**c**) DCE; (**d**) ITO; (**e**) Janakpuri; (**f**) LIS Jr.; (**g**) Najafgarh; (**h**) Nizamuddin; (**i**) Palam; (**j**) Patparganj; (**k**) Polytechnic; (**l**) Shahdara; (**m**) Siri Fort

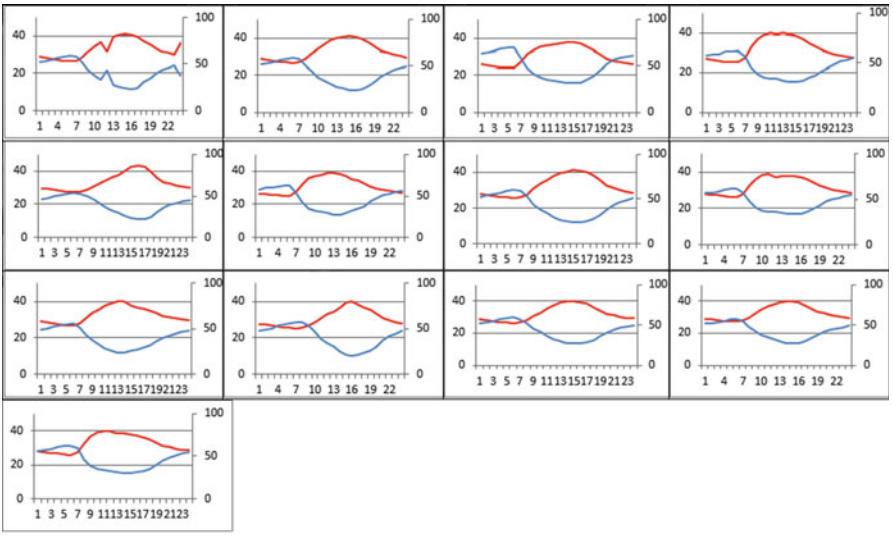

**Fig. 6.6** Summer season average temperature (*red line*) and relative humidity (*blue line*). *Left Y axis* represents temperature, *right Y axis* represents relative humidity in percentage, and *X axis represents* the 24 h of a day (**a**) Badli; (**b**) Bhagirath Vihar; (**c**) DCE; (**d**) ITO; (**e**) Janakpuri; (**f**) LIS Jr.; (**g**) Najafgarh; (**h**) Nizamuddin; (**i**) Palam; (**j**) Patparganj; (**k**) Polytechnic; (**l**) Shahdara; (**m**) Siri Fort

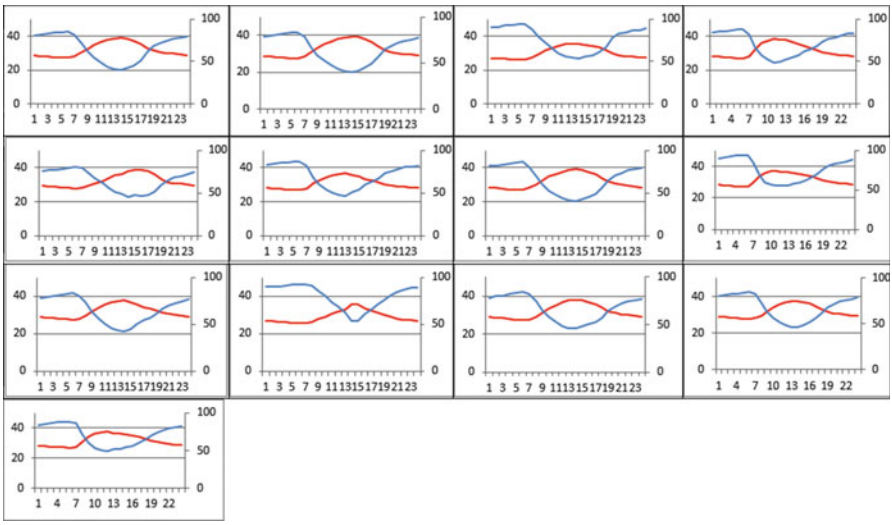

**Fig. 6.7** Monsoon season average temperature (*red line*) and relative humidity (*blue line*). *Left Y axis* represents temperature, *right Y axis* represents relative humidity in percentage, and *X axis* represents the 24 h of a day (**a**) Badli; (**b**) Bhagirath Vihar; (**c**) DCE; (**d**) ITO; (**e**) Janakpuri; (**f**) LIS Jr.; (**g**) Najafgarh; (**h**) Nizamuddin; (**i**) Palam; (**j**) Patparganj; (**k**) Polytechnic; (**l**) Shahdara; (**m**) Siri Fort

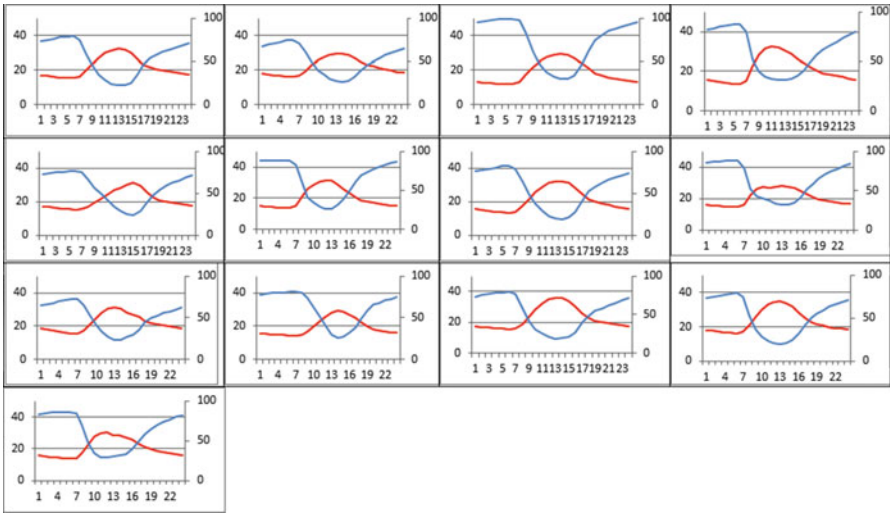

**Fig. 6.8** Northeast monsoon season average temperature (*red line*) and relative humidity (*blue line*). *Left Y axis* represents temperature, *right Y axis* represents relative humidity in percentage, and *X axis* represents the 24 h of a day (**a**) Badli; (**b**) Bhagirath Vihar; (**c**) DCE; (**d**) ITO; (**e**) Janakpuri; (**f**) LIS Jr.; (**f**) Najafgarh; (**g**) Nizamuddin; (**h**) Palam; (**i**) Patparganj; (**j**) Polytechnic; (**k**) Shahdara; (**l**) Siri Fort

were expectedly greatest during the middle of the day and inversely related to each other, with substantial spatial variations among the different stations. The inverse relationship between humidity and temperature patterns were in the form of maximum temperatures observed around noon to late afternoon hours, while the maximum humidity conditions were during the nocturnal hours, with maximum levels observed right before sunrise coinciding with the minimum temperatures. This is in conformity with the findings of previous studies noting a nocturnal maximum in humidity levels in urban areas such as in Paris (Champollion et al. 2009). As mentioned above the highest humidity levels were during the monsoon season, while the lowest humidity levels were observed during the preceding summer season. The diurnal variations in humidity and temperature patterns were the least during the monsoon season, which can be attributed to predominantly overcast sky conditions in the DMR. The diurnal variations were relatively more pronounced during the cooler months of northeast monsoon and winter season. The humidity levels were higher after midnight to just before sunrise hours at all the stations. Spatially, higher levels of humidity during all seasons were mostly observed in the stations located in central DMR, including Najafagrh, Nizamuddin, and Siri Fort. Additionally, there were higher levels of humidity in Najafagarh compared to that observed at nearby Palam and Janakpuri stations, during all the seasons. This may be attributed to the high density of builtup areas in Palam and Janakpuri. This nocturnal high in urban humidity patterns have been noted in previously published studies (Chandler 1967; Hage 1975; Nunez and Oke 1977). For instance, it has been noted that the presence of UHI induces a pressure gradient directing the flow of rural air into the city (Okita 1965; Schreffler 1979; Wong and Dirks 1978; Goldreich and Surridge 1988; Eliasson and Holmer 1990). Additionally, Hage (1975) and Ackerman (1987) explained that as a consequence of rural humidity inversion an advection of humid air aloft into the urban area and a downward mixing would result in increased urban surface air humidity. Furthermore, Holmer and Eliasson (1999) found a positive correlation between the development of UHI and urban moisture excess in Göteborg, Sweden.

Finally, we also mapped the spatial variations in land surface temperatures (LST) across the DMR during the study period (Figs. 6.9 and 6.10). Despite the coarse resolution of MODIS satellite imagery (1 by 1 km resolution), there were substantial spatial variations in the LST across the DMR. The average day time LSTs were higher, along with greater spatial variations compared to night time LSTs. At the seasonal scale, the lowest LSTs were observed during the northeast monsoon season, while the highest LSTs occurred during the summer months which are in conformity with the near surface air temperature patterns (Sen Roy et al. 2011) and humidity patterns in near surface atmospheric conditions. At the spatial scale, the higher daytime LSTs were concentrated in the southwestern and northern regions of the study area. There was incomplete coverage for daytime LSTs during the summer months. There was a relatively gentle spatial gradient in the nighttime LSTs across the study area with the highest temperatures observed east of River Yamuna and the lowest temperatures observed in the southwest

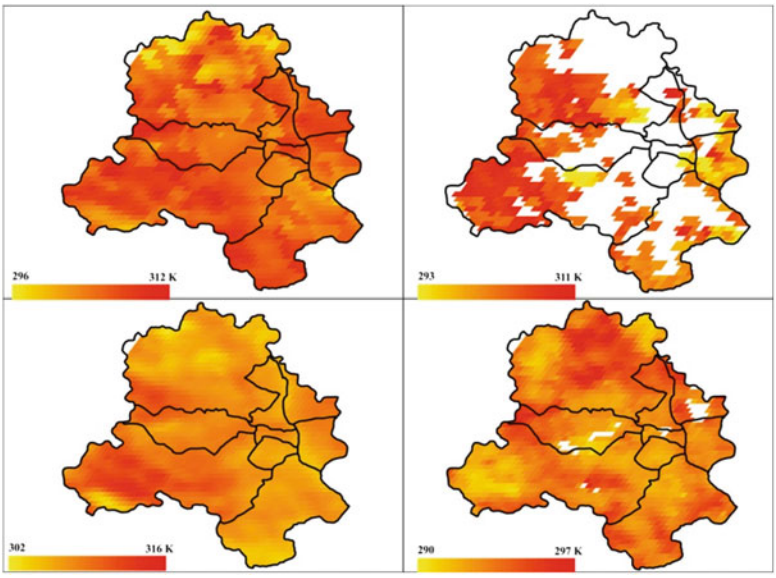


**Fig. 6.9** Distribution of daytime Land Surface Temperatures (LST) across DMR

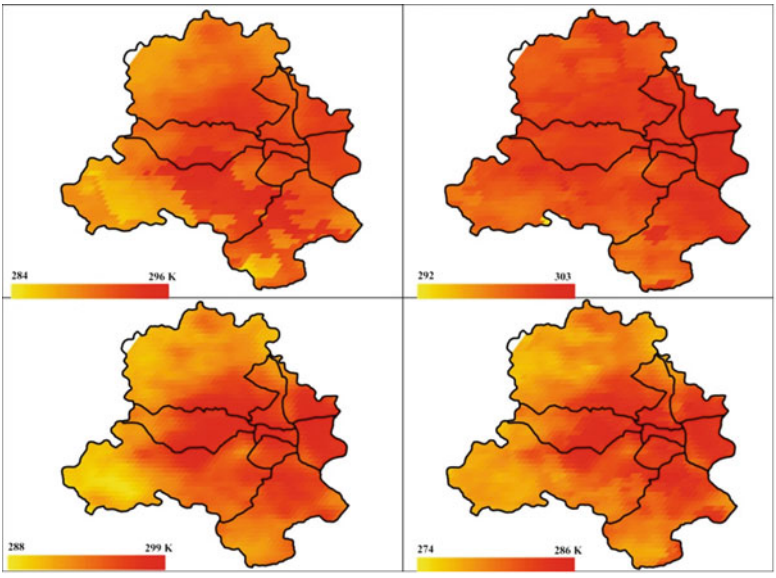


**Fig. 6.10** Distribution of nighttime Land Surface Temperatures (LST) across DMR

region. The areas of higher nighttime LSTs correspond with the dense urban built up areas identified in Fig. 6.1f, which indicates the high heat storage capacity of urban builtup areas. Additionally, the near surface temperature and humidity patterns also showed greater diurnal variations during the cooler months of winter and northeast monsoon seasons. These patterns are in conformity with previous studies examining the spatial patterns of LST in the DMR by Kant et al. (2009), who reported higher levels of LST over urban built up areas, with lower levels of LST in vegetated areas.

## 6.5 Conclusion

In the present study we have analyzed the local level variations in the near surface humidity conditions across the DMR. We also compared the spatial variations in humidity levels to air temperature conditions and LSTs at the seasonal level. The results of our study showed substantial variations across the study area. The main findings of our study are listed below:

At the seasonal scale, the lowest spatial variations in humidity were observed during the southwest monsoon and northeast monsoon seasons, which may be attributed to the prevalence of cloud cover. During the winter months also there were limited spatial variations in humidity levels due to excessive fog conditions in the DMR.

The greatest variations in humidity were observed during the summer months, which was a result of clear skies and local level land use cover. Overall, relatively higher levels of humidity were observed in the city center with declining values with increasing distance from the city center, due to more planned land use in the city center. Another area of higher relative humidity was located in Najafgarh located in the southwest, which consist of predominantly agricultural land-use.

The relationship between humidity levels and temperature patterns were expectedly inversely related, with the maximum difference in the middle of the day when the maximum air temperature and minimum humidity levels were observed. The highest levels of humidity were observed during the nocturnal hours among all the stations.

Finally, the spatial patterns of LST showed substantial variations across the DMR between day and night temperatures. Additionally, the areas of higher LST in the west overlapped with lower levels of humidity in the DMR. In the present study, we have made an attempt to map the spatial variations in humidity levels across the DMR. While majority of the studies on UHI concentrate on local level differences in temperature patterns, the present study focuses on the variations in humidity levels across the study area. The results of this study can be further used to expand the role of different land-use covers on the spatial characteristics of UHI development across the study area.

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# Chapter 7
# Urban Political Ecology in Megacities: The Case of Delhi's Waste Water

**Anna Zimmer**

**Abstract** Megacities in Asia face tremendous environmental challenges. One of these is the drainage and treatment of waste water—a problem which ironically grows when access to water supply and water-borne toilets improves, leading to increasing per capita water consumption as well as water pollution. In Delhi, the overall waste water problem is huge with an estimated 1,800 million litres per day being disposed of without treatment in the Yamuna river. However, the various residential areas differ greatly in the magnitude of related problems they face. This inequality leads to a situation where mostly informal settlements have to bear the brunt of exposure to waste water. Against this background, this chapter investigates which waste water-related services informal settlements receive, who is providing them, and how residents struggle on a daily basis to obtain them. The case discussed here is of an informal residential area, or JJ cluster, in West Delhi. To study the presented problematic the approach of Urban Political Ecology (UPE) is introduced. This approach looks at environmental problems in their relationships with social, political as well as economic dynamics and processes. In the last years, UPE has started opening up to a more thorough investigation of the role of everyday practices in the production of uneven urban environments. Looking into the day to day interactions of residents with different state actors in the attempt to solve waste water-related problems allows furthering this avenue. By doing so, the chapter aims to contribute to a better understanding of how unequal urban environments are produced in today's megacities.

**Keywords** Delhi • Everyday practices • Informal settlements • Urban political ecology • Waste water

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## 7.1 Introduction

Today's megacities in India face severe environmental problems (Singh 2000). One of these problems is the drainage and treatment of waste water. In Delhi, insufficient drainage makes headlines during each monsoon, when large arteries get flooded and hour-long traffic jams ensue. Water pollution is framed most importantly in the discourses that surround the river Yamuna and its pitiful state in the capital. Significantly less attention is focussed on the day-to-day problems with waste water in residential areas that are informal and lack access to the sewer lines.

Academically, too, while the struggles of inhabitants of Indian megacities who are not connected to the water supply network have been studied in depth (see for example Anand 2011; Connors 2007; Kacker and Joshi 2012; Raghupathi 2003; Selbach 2009; Truelove 2011; Zérah 2000), the issues that residents who are not connected to the sewer network have to grapple with have been explored with much less frequency (Singh 2009; Zimmer 2012b). Yet, the impact of insufficient or unsuccessful waste water management and governance on humans' lives is huge, and endangers not only the health and lives, but also educational goals, household incomes, and the dignity of citizens (Corcoran et al. 2010; De Albuquerque 2013).

In megacities, these problems can be particularly acute: on the one hand, population numbers, industrial development and consumption-oriented lifestyles produce large amounts of heavily polluted waste water. Moreover, the diversity of settlements challenges conventional sewerage solutions, while the sheer extension of megacities makes underground sewers extremely costly. On the other hand, governance set-ups and the politics and negotiation processes around these are diverse and fragmented, and might even appear messy (Zimmer 2012c; Zimmer and Sakdapolrak 2012). This paper therefore aims to throw light on the complex and contested dynamics of waste water governance in Delhi as an example of environmental governance in one such megacity in Asia.

A fair deal of research has documented the (lack of) access to toilets in informal residential areas (e.g. Mohanty and Mohanty 2005). In this context, community-led options, namely toilet blocks and their maintenance, have received significant attention as a way forward (see among others Burra et al. 2003; Kar and Chambers 2008; McFarlane 2008). While infrastructural aspects can be assessed relatively easily (though here, too, often a patchwork-like situation prevails to cater to various needs, see e.g. McFarlane et al. forthcoming), the services required to maintain a clean environment are much more difficult to understand. Waste water-related services are included in the wider term of environmental, or total, sanitation services. The WSSCC and WHO (2005) define environmental sanitation as "a range of interventions designed to improve the management of excreta, sullage, drainage and solid waste". Access to environmental sanitation thus not only means having access to toilets. It is also about safe excreta disposal, storm water drainage channels and dustbins. It stands for getting provided with road sweeping, drain clearing, and garbage collection services. Having access to sanitation, in sum, is

being able to live in an environment without unsafe excreta disposal, without overflow in streets and houses, and without garbage lying around in the neighbourhood.

Service provision beyond infrastructure is a very dynamic interplay of different state and private actors, involving elected representatives, administrative staff, communities and individual households. The concrete set-up of service provision is specific for each ward or even residential area, depending on negotiation skills and power relations between the relevant actors. Moreover, access varies greatly on a temporal scale, often making it an ongoing struggle. Sanitation-related services are therefore highly political, and more work is needed especially to understand how "sanitation is created, maintained, threatened and contested within informal settlements" (McFarlane et al. forthcoming). In order to contribute to such a research agenda, this paper investigates the processes of interaction in which access to waste water-related services is realised, but also constantly renegotiated and struggled over.

The next sections look into the following questions: What services are accessible to slum residents, and who is providing these? How and when is service provision achieved by slum residents? In which interactions do slum residents have the power to claim service delivery by the state?

The paper investigates these questions using the example of one slum cluster in West Delhi. In Delhi, the parastatal Delhi Jal Board is responsible for sewerage (Zérah 2006). The remaining aspects of environmental sanitation, drainage and waste management lie with the municipality. As the slum cluster is not connected to the sewer line, this paper focuses on the interaction between slum residents and the municipal authorities, as well as political representatives of the Municipal Corporation of Delhi (MCD) and the Government of the National Capital Territory of Delhi.[1]

The next section discusses Urban Political Ecology, the theoretical approach chosen to analyse the findings. Section 7.3 presents the methodology that has been used in investigating the above research questions. Section 7.4 then introduces the research area with its infrastructural equipment, current set-up of service provision and waste water-related problems. The main part of the paper describes how slum residents struggle for service provision in a variety of relationships with different state actors. The conclusion then highlights how everyday negotiation processes around service provision contribute to the production of highly problematic and uneven urban environments.

[1] As the research for this paper has taken place between 2008 and 2010, the trifurcation of the MCD since December 2011 is not taken into account in the following.

## 7.2 Urban Political Ecology for the Study of Mega-urban Environmental Problems

The political nature of waste water-related services, highlighted in the introduction, requires a theoretical framework that permits understanding politics as an integral and constitutive part of the urban water cycle. Such an approach has been followed in the field of Urban Political Ecology (UPE) through concepts such as the hydro-social cycle, the waterscape, and urban metabolism (Bakker 2003; Keil and Boudreau 2006; Swyngedouw 1999, 2006, 2009).

UPE is an interdisciplinary research field with roots in (predominantly rural) Political Ecology as well as Marxist and neo-Marxist urban studies. Its field of enquiry is centred on environmental change and problems, but also mundane urban environments that are not perceived as problematic, in their relationships with social, political and economic processes and dynamics (Heynen et al. 2006; Swyngedouw and Heynen 2003; Zimmer 2010). The underlying assumption is that urban nature is the historically specific product of social relations of power (Lefebvre 1991; Smith 1990; Swyngedouw and Heynen 2003). As such, urban nature is not neutral: it constitutes a "politicised environment" (Bryant and Bailey 1997). In this environment, actors are differently powerful, and there are winners and losers to the urban environmental transformation and the urbanisation of nature (Swyngedouw and Heynen 2003). Accordingly, urban ecologies may be 'read' in terms of inequalities, conflicts and cooperation between actors (Baviskar 2007; Lawhon et al. 2013), and in terms of power struggles over the interaction that actors entertain with their environment (Bryant and Bailey 1997).

The contested character of water in particular has been studied with the help of the concept of the waterscape. The waterscape refers to the flows (quantities and directions) and characteristics (quality) of water through a certain space (e.g. a city)—i.e. the local water cycle. Yet this local water cycle is understood to be determined not only by physical forces like gravity or sunlight, but to a large extent by social power. UPE therefore also uses the term of "hydro-social cycle" (Bakker 2003; Swyngedouw 2009) to express that the flow and quality of water are socially produced. Cities are assumed to have a metabolism (Gandy 2004)—to transform matter and energy—through all the processes that take place in them, and this metabolism is largely dependent on social, political, economical, and cultural factors such as production systems, life styles, consumer choices, or governmental regulations. As these factors are the result of power relations and struggles within societies, the waterscape is "not only a physical geography and a material landscape, but also a symbolic and cultural landscape of power" (Swyngedouw 2004). Major work has been done to understand how water is accessed or denied, how it is commodified, regulated and fought over. In this chapter I seek to complement such works with a study of the 'dirty' part of the water cycle: the flow of household waste water once it has exited people's bodies and houses, or in short, the waste waterscape (Zimmer 2012b).

At the same time, I seek to further ongoing discussions within UPE on the role of everyday practices. Despite Keil's (2003) statement that UPE is fundamentally about (democracy, governance, and) "the politics of everyday life", scholars inspired by feminist theories, postcolonial urban studies, and anthropological studies of the state have found that UPE so far neglects to a very large extent the role everyday practices play in producing uneven urban environments. Everyday practices are seen as useful entry points that permit understanding how urbanisation takes place outside or beneath state control (Lawhon et al. 2013), and how material flows depend more crucially on urban residents than on infrastructural hardware—something for which Simone (2004) has coined the catch phrase of "people as infrastructure". Moreover, it is recognised that everyday practices allow investigating social processes of differentiation beyond economic concepts of class, as well as the "politics of difference and inequality" that shape (access to) urban nature at a variety of scales (Shillington 2012; Truelove 2011). Putting such practices centre stage may also further insights into the role marginalised populations play in shaping urban environments in their diversity (Shillington 2012). Such an approach finally makes the situated knowledge of different actors visible and thus furthers insights into urban politics as well as into potential for change (Loftus 2007). In sum, a focus on everyday practices promises to complicate narratives of how the waterscape, or more generally speaking urban nature, is produced, and of how benefits and disadvantages of this process are distributed through constant negotiation processes.

Following this line of thought, this contribution uses insights into day to day negotiation processes between "street-level bureaucrats" (Lipsky 1980), local politicians and residents of an informal residential area to explain how local environments that are highly detrimental to the health, welfare and dignity of (certain) urban citizens are constantly reproduced.

## 7.3 Methodology

The data presented in the following case study have been gathered through series of interviews, participative methods and personal observations. They have been carried out over 11 months between February 2008 and December 2009 in an informal residential area (JJ cluster) in West Delhi.[2] In total, 61 interviews were conducted with inhabitants, one with the caretakers of the public toilet block, eight with members of the Department for Environment and Management Services (DEMS) of the Municipal Corporation of Delhi (MCD), three with members of the Slum and JJ Department of the MCD, one with a representative of the Engineering Wing of the MCD, and three with the Member of Legislative Assembly (MLA). Apart from

[2] This research has been carried out as a PhD project from the University of Bonn, funded by the Heinrich-Böll-Foundation.

that, 15 rankings of problems and strategies were conducted, and data have been compiled through Participatory Urban Appraisal methods (Kumar 2002) such as mappings, balloons and stones diagram and daily activity schedules as well as personal observations over the months. To maintain anonymity of the respondents, the JJ cluster's or individual respondents' names shall not be disclosed.

## 7.4 Waste Water Inequality in Delhi

Delhi is a highly diverse city in terms of housing stock and living conditions (GNCTD 2006). At least 64 % of the city's residents live in informal areas (Zimmer 2012a), and so-called "slums" have experienced a higher growth rate than the city itself (Ali 2006b; Water Aid India 2005). The term "slum" is however extremely vague, with different definitions that abound. In Delhi, it is used for *jhuggi jhompri* clusters (informal settlements on private or public land without land titles), unauthorised colonies (informal settlements on formal rural land purchased on the basis of power of attorney), urban villages, resettlement colonies, and notified slum areas (formal, dilapidated housing stock) (Ali 2006a). It thus does not correspond exclusively to the shanties usually associated with this term. Due to lack of uniform criteria for definition of slums, poor records, and the count of slum households rather than individual residents in the surveys, estimated numbers of slum population vary widely (UN Habitat 2003; Water Aid India 2005). For Delhi, figures oscillate between 18.5 % of the population of the NCT of Delhi (or 1.9 million) (GoI Ministry of Home Affairs 2001), and 53 % (Singh 2000). In the following I will use the terms slum, *jugghi jhompri* cluster (JJ cluster) and informal residential area synonymously, referring to informal housing without land titles. The most recent estimate of those living in such areas in Delhi counts around 418,000 households (DUSIB 2011).

Inequality at the level of housing reflects strongly in the waste water situation. The particular legal status of informal settlements plays out in several ways: regulations may inhibit government spending or prescribe different standards of service provision, thus contributing significantly to producing spaces where amenities lack and living standards are poor.

Expansion and maintenance of sewers to provide the urban area with services in an equal manner for instance needs not only huge financial investment and organisational excellence—it also requires conceiving all urban colonies as legitimately entitled to public infrastructure and as integral parts of the city. Despite the Delhi Urban Environment and Infrastructure Improvement Project (GoI Ministry of Environment & Forest and GNCTD Planning Department 2001) as well as the National Urban Sanitation Policy (GoI Ministry of Urban Development 2008) doing this, it holds true until today that "if the water supply system is unequal and unjust, being highly biased in favour of the rich, the sewerage system is even more unjust" (Water Aid India 2005) (see also Chaplin 2011). On the ground, this translates into the fact that only 71 % of the population in Delhi is connected to the

sewerage system (NIUA 2005).[3] Areas where informal settlements have come up are mostly not connected to the network. At the level of service provision, slums are often assigned lesser numbers of staff, or no staff at all; staff might also be less qualified or only temporally employed, thus being underpaid for their work. Moreover, the fact of being in the best of cases tolerated by the city authorities makes for a specific kind of social relations between slum residents as citizens, and other actors, including state representatives, which hinder successful negotiations for better service delivery. Bapat (2006) therefore describes operation and maintenance of drainage facilities in slums as "an ongoing battle".

Lack of infrastructure, and poor maintenance of existing one, are thus general features of slums. As a result, the situation of sanitation in slums is overall highly problematic (see among others Ali 2003; Banerji 2005; Bapat 2006; Dhar 2004; McFarlane 2008; Mohanty and Mohanty 2005; Water Aid India 2005). One consequence of this is that WaterAid India (2005) found that more than half of the inhabitants of the investigated informal settlements in Delhi were "not at all satisfied" with the condition of the drainage system in their colony. Against this background, the next section presents in more detail such an unsatisfying situation.

## 7.5 A Threat to Health, Welfare and Dignity: Waste Water in a West Delhi Slum Cluster

The investigated JJ cluster lies in the West zone of Delhi and is divided between two wards. The Member of Legislative Assembly (MLA) as well as both Municipal Councillors are from the same family; in fact it is the MLA who looks after waste water-related issues, while both Councillors have been unavailable for interviews throughout the research period.

The settlement exists since around 30 years and figures on the 1994 MCD Slum and JJ Department list, conveying it at least some kind of state recognition. Mapping done in 2009 in the context of my PhD counted 886 houses.[4] The area of the cluster is $170 \times 114$ m approximately. The population density amounts then to a staggering 246,111 inhabitants/km$^2$.

The population in the cluster is very heterogeneous in terms of regions of origin, religion and castes, with people from Gujarat and Rajasthan dominating, and a relatively large Muslim minority. Due to this heterogeneity, the cluster has four different informal leaders, but relationships between them and the inhabitants are generally distrustful. There is no CBO in the slum, and an NGO project that had

[3] The GoI Ministry of Environment & Forest & GNCTD Planning Department (2001) estimates even that only 55 % of the population are covered.

[4] According to an MCD official, house numbers are usually multiplied by five to estimate the number of inhabitants; in that case the cluster counts around 4,430 inhabitants. On the 2008 voter list, it counted 2,221 voters.

been handed over to the community was given up around 10 years ago due to internal conflicts. Social cohesion and collective action are thus difficult to achieve, which certainly affects the success of daily struggles for waste water-related services to a degree that is not negligible.

At the level of physical infrastructure, all houses with the exception of a handful are semi-pukka or pukka houses, i.e. their walls are built with bricks. Likewise, the persistence of the cluster as well as the support of changing MLAs has allowed its inhabitants to achieve a number of basic facilities such as concreted lanes, metered electricity, street lighting and water supply through public taps. With regard to sanitation, a number of infrastructural features are important:

Drainage facilities consist of open waste water drains of around 1 ft width, which are made of concrete. These internal drains in the Eastern part of the cluster are connected to a larger covered drain along the Southern end of the cluster which is silted and full of solid waste. A second covered drain lies under the main road towards the West of the cluster, and internal drains in the Western part discharge into it. Connection to the Southern drain is established through three mouths, to the Western drain by two more.

The slum is provided with the service of three municipal scavengers (*safai karamchari*, S.K.). The work of the S.K. is supervised by a Sanitary Guide, which in turn is under supervision of a Sanitary Inspector. All belong to the Department of Environment Management Service of the Municipal Corporation of Delhi (MCD). The appointed scavengers are temporal workers which are paid much less then the permanent workers, namely 3,783 Rs/month. Scavengers dig out muck and waste of the small open drains, leave it on the side of the lane to drain and dry for 1–3 days, and then pick it up and dump it in a dumping ground outside the cluster. The scavengers come every day, but according to the inhabitants, the individual drains are not cleaned every day, but rather in 2–3 days intervals.

The main drains, into which the smaller open drains are discharging, are under the responsibility of the Engineering Wing of the MCD. All covered drains are exclusively desilted by manual labour. Manual desilting should take place twice a year according to a new policy issued on the 22nd of August 2008. According to a representative of the Engineering Wing, however, "[w]e are not able to clean it properly, because of this densely populated jugghi cluster" (personal communication, 5 Jan 2009). He commented that apart from manual cleaning the only other option would be "to dismantle the whole slab, and redo it; that would cost around 20–30 lakh [Rs] minimum".

For excreta management, there is a pay and use toilet block outside the slum's premises since around 1995. The history of this toilet block already reveals how state services have to be actively claimed by residents. A man in his 40s recalled how a group of 50–60 people went to see the former MLA: "We told him that we wanted a toilet; that it was a shame for the women to have to go in the open" (personal communication, 16 Nov 2008). The MLA agreed to help them, but as the only available area was a former Muslim graveyard, the idea was hotly contested within the settlement. Negotiations with the Muslim community of the cluster took 3 weeks to settle, but were finally successful.

Today, this public toilet block has 17 operational seats for ladies and 17 for gents (or one toilet per 130 persons on average) and is open from 4 a.m. to 11 p.m. It is looked after by a private contractor who, in turn, has appointed a slum family as caretakers who supervise the payment by the users and the cleanliness. A private scavenger is cleaning the toilets of the block twice a day. The contractor does not usually come to supervise his work as long as he receives his monthly fixed payment.

The toilet block is connected to the covered drain along the main road in the West. Excreta are therefore mainly disposed of into this drain. However, internal drains are also used as toilets by small children in the Southern part of the cluster. Some adults too, squat on them, especially during the night when the public toilet is closed. A limited number of households have constructed makeshift latrines either on the internal open drains or on the covered drain in the South by removing the manhole lids.

No public dustbin exists inside the slum and neither private nor municipal sweepers come to the area. Hence, garbage is not being collected from households. Instead, people sweep the lanes in front of their houses themselves. Household garbage is often swept into the open drains at the same time as garbage and dust lying on the lanes. Some households, especially in the Northern part, use polythene bags though to collect household waste which they then throw in most cases in the nearest dumping ground located next to the public toilet block. Garbage is also dumped on top of the covered drain towards the South, on one small open plot in the cluster, or over the compound wall that delimits the cluster to the East.

Despite the network of open drains and the public toilet block, waste water-related problems prevail. Since the Southern drain is silted, water stagnates, especially before the South Eastern mouth, or flows back into the cluster even in the dry season. On the Western mouths, too, stagnation occurs, yet only during the rainy season. Stagnation leads to overflow of the internal drains, so that waste water stands in the lanes, and at times enters the huts. Overflow problems vary in their occurrence throughout the year, throughout the day, as well as in terms of their duration. Also, the area is not affected in a homogeneous manner. First, the North Western part lies higher than the rest, while the South Eastern part is lowest; second, some houses are immediately next to an open drain, while others can be at several meters distance; and third, houses have individual height of their doorsteps and ground floor levels, with some being lower than the street, while others are at the same level or higher then the street. A few huts are also built on the roof of others, and are thus located in the second floor. Obviously, those houses located in the South East, which are close to an open drain, and with low ground floor will be hardest hit, while those located in the North West, further away from open drains, and with higher ground levels or even on the second floor will never experience overflow in the houses. Overflow in the lanes also lasts much shorter, and water levels are lower in the North West than in the South East, where water can reach the level of one-two feet in the streets during the rainy season. In the South East, overflow in the dry season occurs during those hours when water is supplied, as most taps have no keys to close them. If the running water is not collected, the

drains fill up quickly and water gathers first on the streets, and in more severe cases, in the houses. An overflow calendar kept by a shop keeper in the South East part during the month of December 2008 revealed that on 12 out of 26 days overflow occurred twice a day. On 10 more days it occurred either in the morning or evening. The duration varied between one and eight hours.

While overflow in the streets makes commuting difficult, overflow in the houses can prevent the inhabitants from the most basic life sustaining activities such as cooking, eating and sleeping, as life has to take place on beds and cupboards during these hours. As excreta mix with waste water to some extend, and more so, as a hospital is located 'upstream' of the cluster which disposed of its waste water through the same covered drain at least until 2008, serious health risks for inhabitants ensue.

Apart from overflow, there are other sanitation-related problems named by interview partners: One of the major problems are mosquitoes, especially during the rainy season. A second set of problems concerns mainly people living in the lower area of the cluster. These include worms that come out of the open drains when they are full, and out of the garbage which is taken out of the open drains and left on the streets; flies that travel between open drains and food which is prepared on the side of the open drain; bad smell; and the overall dirtiness. Next to the Southern covered drain, people have serious problems with rats that dig tunnels from the main drain to houses with earthen floors. Finally, contamination of drinking water through broken pipes has been reported in two occasions. While mosquitoes, flies and rats are dangerous disease vectors, unpleasant smells and dirtiness affect residents at a more emotional level and deprive them of a dignified living standard and overall wellbeing.

As problems are so prevalent, especially waste water drainage is a constant struggle. The next section therefore looks into how residents cope with the situation, and negotiate with various state actors to obtain better drain cleaning services by the municipal scavengers.

## 7.6 Everyday Struggles for Waste Water Evacuation

In fact, the major strategy that people choose to solve their drainage problem is self-help. This includes preventing overflow in lanes by cleaning of open drains and de-blocking the mouths into the covered drains with long bamboo sticks, or in houses by raising doorsteps and huts, and using sand, soil, and rags. They also cope with overflow by using buckets and other vessels to throw water out of the house. However, as this is often unpleasant, not always successful, and involves direct as well as indirect costs, residents' goal is to obtain reliable, frequent, and good quality drain cleaning services by the scavengers allocated to the area. These services are embedded in a network of relationships which are part of the social relations of power that undergird the ways waste water flows or stagnates.

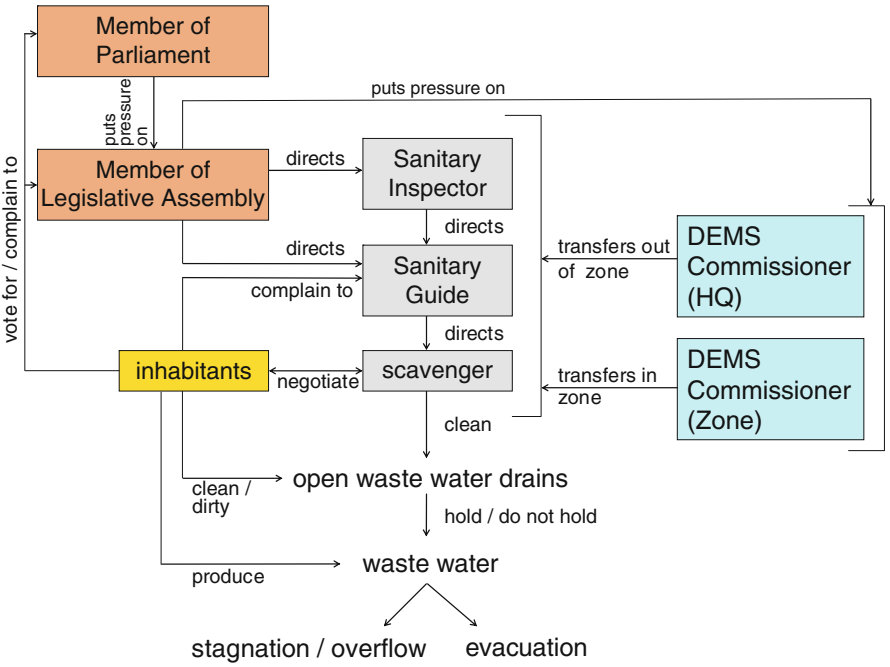


**Fig. 7.1** Social relations of waste water service delivery

Inhabitants of the JJ cluster can choose between a variety of strategies to reach their goal, as indicated in the above chart (see Fig. 7.1).

The figure shows that residents can negotiate with the scavengers directly; they can try to influence their work by complaining to the Sanitary Guide; they can use the MLA to put pressure on the Sanitary Guide or Inspector which in turn will get the work done from the scavengers; and finally they can put pressure on the MLA by complaining to the Member of Parliament. The next section will discuss how these options are perceived and used by the inhabitants in their everyday struggles for waste water evacuation, and which means of putting pressure on different actors are employed within these networks of requests and commands.

### *7.6.1 Direct Relationships with the Safai Karamchari*

In the interviews, inhabitants stated that the scavengers followed their regular duties of cleaning the open drains, letting the waste dry, and taking it outside the area with a wheelbarrow. Yet, respondents deplored lack of reliability of the S.K. and stated that cleaning in front of their hut was done only every 3–4 days, and in a superficial manner. "It depends on his mood how often he comes", a resident of the North Western part criticised (personal communication, 16 Nov 2008). In the North East,

the scavenger did not come at all, as people would not allow him to leave the garbage on the streets to drain, and residents had partly covered the open drains making the difficult or impossible to clean. Respondents all over the cluster bemoaned that neighbours did not allow the S.K. to take out the silt in front of their house as the drying heap would be lying around for several days. Residents were dissatisfied with this set up. Also, none of the scavengers had a mobile phone, so that once the work was done and they had gone home, there was no way of calling them for emergencies.

Ways to alleviate the situation included building a friendly relationship with the scavengers through small talk, offering of water to drink etc. Other respondents had decided to pay the S.K. extra money, and felt that this had become an obligation over time: "He picks up the garbage only if we give him money, otherwise he leaves it in front of the house" (personal communication, 30 Oct 2008). At the other end of the spectrum, verbal aggression was rather common, and could be observed during field work. In an extreme case, people had even resorted to physical violence. In one incident, neighbours of the South East part had beaten up the S.K. who was then replaced by another one. "The scavenger took money from each house, and he didn't pick up the waste, so when we found out, my father gave him a thrashing", a young woman narrated (personal communication, 12 Nov 2008). With the old S.K. quarrelling had been a daily issue, but the new scavenger, intimidated by his predecessor's fate, was more careful, as she explained: "He is doing the work much better, because he knows that [. . .] was hit by my father (. . .), he tries his best".

Scavengers, in turn, were irritated that some people kept throwing their waste in the open drains when sweeping their houses. One of them commented: "Few people don't have common sense, and sweep their houses and put the garbage in the drain, even in front of my own eyes it can happen" (personal communication, 7 Nov 2008). They perceived this as disrespectful and quarrelling on the issue was common. If really offended, they decided to leave the area on the spot without completing their tasks. Sometimes, they also chose to punish residents by taking out the garbage mounds from the drains and depositing them right in front of someone's house.

In general, however, muck needed to be deposited somewhere. Asked why the waste from the drains was not picked up every day, one scavenger explained: "if it is still wet, I am spoiling my trousers, and I am wearing my own clothes" (personal communication, 7 Nov 2008). Scavengers however offered to pick up the waste the same day in case there was a function in a certain house.

The scavengers perceived that some people were looking down on them as doing a "dirty job" (personal communication, 7 Nov 2008). While one scavenger had the hope of receiving a permanent job with the department soon, as his mother already had had one, the two others had given up that hope after long bureaucratic battles. Interestingly, their own perception of their social status in comparison with the slum residents varied enormously. The scavenger hopeful to get a permanent post stated: "My status is much, much better. They are beggars, they beg to eat, but I am eating well, and I have better clothes. (. . .) I have a government job" (personal communication, 4 Nov 2008). However, the two scavengers who had no hopes of becoming permanent staff members insisted in the vulnerability of their position in

comparison to the slum residents who they felt were of equal social status. "People threaten me and say they will complain about me (. . .) and then I have to go and apologise", one of them said (personal communication, 7 Nov 2008).

Relationships were thus full of conflicts and mutual lack of understanding. As the scavengers' position within the municipal department was very vulnerable and their pay scale very low, the motivation of the temporary staff to enhance service provision to more than a required minimum was understandably dampen. Also, service provision through the S.K. seemed to hit a ceiling because technical means were very limited, so that the muck could not be taken out of the cluster immediately, and lanes were so narrow that the drying piles became a nuisance.

Finally, both groups suffered from having to clean open drains manually, a task which was perceived as humiliating and embarrassing and leads to further social ostracism, apart from being in fact physically dangerous due to exposure to health hazards. Often, aggressive negotiations among those two groups aimed at improving the own status by obliging the other to clean. It therefore seems that the problematic governance set-up with regard to infrastructure provision, staff policies, equipment, and service organisation and more generally the tensions that ensue in society due to social inequalities lead to conflicts that are openly waged between those at the lower end of the social ladder: the scavengers and the slum residents. At the same time, more friendly everyday bargaining was used by both sides to achieve either better public services or more cooperative behaviour and a less unpleasant work experience. The ebb and flow of relationships, and the variations from household to household then reflected in the exact location of waste piles, the duration of their presence on the lane, or the blockage of parts of the drains.

### *7.6.2 Relationships to the Higher Hierarchies of the Sanitary Department*

Turning to the higher hierarchies in the Sanitary Department it becomes obvious that a holistic approach towards city-wide sanitation is lacking. The Sanitary Inspector saw service provision to the slum not as part of his duty, but rather a humanitarian act. "The JJ cluster is not *under* me, it just happens to be inside my area. (. . .) We are not obliged to provide service, but when people come and occupy [an area], waste is being generated, so it is my duty in a way because otherwise others will complain that it gets dirty" (personal communication, 7 Nov 2008). He was therefore appointing scavengers to the cluster not for the sake of its inhabitants themselves, but out of fear of surrounding areas' inhabitants complaining about him. The MCD officers therefore do not follow any planned or structured approach to JJ cluster cleanliness, but do the minimum needed to keep the public opinion at bay.

The Sanitary Guide added: "The jugghi [slum] people are connected with the MLA, (. . .) he is a powerful person, if he's not satisfied, he can get us transferred"

(personal communication, 10 Nov 2008). He seemed to be motivated more by his fear to lose his own position and through hierarchical pressure. Moreover, on a personal level, his opinion on the slum residents was extremely low: "They are used to living in a dirty environment, they are illiterate, they don't know anything about cleanliness" (personal communication, 10 Nov 2008). According to him, the inhabitants "don't listen to anyone" in matters of cleanliness. Referring to the fact that some inhabitants had been allocated resettlement plots but decided to sell them and keep living in the JJ cluster, he added: "Like worms and donkeys that you can take out of the dirt are coming back to the dirt. Those people behave the same way." This rather shocking phrase indicated how to him slum residents did not even seem to be fellow human beings, but rather resembled animals.

Respondents, in turn, complained that supervision of the S.K. was not serious, and mentioned that a positive example by the Sanitary Guide would encourage the S.K. to do their work more properly. One interview partner also explained that the Sanitary Guide should take up the responsibility to raise the awareness of residents to stop sweeping their household garbage into the open drains. This could not only contribute directly to a cleaner environment, but avoid conflicts among the inhabitants and the scavengers, too, thereby easing the latter's duty and enhance their motivation.

Against this background, how did the contact between the JJ cluster residents and the Sanitary Guide and Inspector look like? Most complaints about cleanliness reached the DEMS staff through the MLA. The political representative related that the Sanitary Inspector had a complaint register but would ask people for money if they came, whereas he said to provide the same service free of cost, acting thus as an effective link between the electorate and the DEMS. The Sanitary Guide however also insisted that face to face contact played an important role when addressing complaints. "I contact people face to face, then there is a personal satisfaction to that person (. . .), this is a more appropriate way. I want to see the complaining person by face" (personal communication, 10 Nov 2008).

Such direct contact existed also through the regular rounds of the Sanitary Guide, on which he was rarely accompanied by the Sanitary Inspector. During these rounds, both negotiated the relationship with the slum residents, trying to get control over their solid waste-related behaviour and the way they had built own infrastructure that made service delivery difficult.

The Sanitary Guide for example showed people that enhancing their relationship with him would result in gaining leverage over the scavengers. A woman recounted:

> "One day the scavenger and *daroga* [Sanitary Guide] passed by and I got the chance to talk. I said: 'I have a problem, I want to talk'. Then they said: 'Listen first, our trolley can't pass because of your toilet', so I said: 'Ok I can break it and make it narrower but you should also listen'. So he said: 'What is the problem?' I said: 'The new scavenger is not listening and there are so many quarrels' and he said: 'Yes I got so many complaints, I will try to make him understand'."
> (personal communication, 19 Nov 2009)

By agreeing to listen to her only after she promised cooperation, the Sanitary Guide thus not only achieved to get her to arrange her toilet in such a way that work for his staff would get easier; he also showed her that accommodating his needs would help her get power over the scavenger. Trying to gain control over her was thus bargained against allowing her control over the scavengers, further demonstrating the vulnerable position of these staff members within the department.

### *7.6.3 Interactions with the Engineering Wing of the MCD*

No respondent mentioned the Zonal Office of the Engineering Wing of the MCD, although it was located at around 15 min walking distance from the cluster. It therefore seemed inhabitants were unaware that this Department was responsible for the root cause of waste water-related problems: the silting of the covered drain in the South. No direct contact appeared to exist between inhabitants of the cluster and the Zonal Office, although an interview partner of the Engineering Wing stated that any person could file an application for emergency desilting of covered drains outside the regular exercises undertaken before the onset of the monsoon.

With regard to the activities of this department, people in the JJ cluster held that manual cleaning was not effective, as not all of the silt could be taken out, and the distance between the manholes was such that there were stretches which could not be cleaned as the scavengers would suffocate. In contrast, the representative of the Engineering Wing held that this was the regular procedure for all covered drains. Residents were aware that desilting by machines would be very expensive, and felt that they were powerless to achieve this. Even the MLA was said to only manage to provide for cleaning around the manholes; only once a letter from the Member of Parliament had put some pressure on the MLA, so that cleaning was done more properly, although still manually.

According to the MCD official, the cause of overflow was in fact that connections of the households to the open drains in the streets (or their use for disposal of household waste water) were "illegal" (personal communication, 5 Jan 2009), as they were meant for storm water only. Accordingly, the slope in all storm water drains, including the covered drain, was only 1:150–200 in., as no solids were supposed to be transported. This was 5–10 times less steep than what was required for the transportation of sewerage, and clogging was the logical consequence. "We don't know how to disconnect them, it would mean filing FIRs [First Information Reports] against hundreds of people", the Engineering Wing representative complained (personal communication, 5 Jan 2009). He added: "If the people can be disconnected then most problems will be resolved". His statement made it thus clear that from his perspective slum residents were not entitled to use the infrastructure provided by the municipality. He framed the problem exclusively from the perspective of the infrastructure to be maintained, and ignored that access of citizens needs to be achieved. This point of view therefore showed that even if direct contact was established slum residents would not be able to gain sympathy or

understanding for their waste water-related problems from the representative of this department.

### *7.6.4 Interactions with the Elected Representative*

As the MLA is elected in general elections every 5 years, the responsiveness of the MLA towards his or her vote bank is naturally higher than the one bureaucrats can be expected to show. Most respondents, however, had faced the double nature of this relationship by noting that support had been given during election times, but was much harder to get in between. Inhabitants of the cluster perceived the MLA as a powerful actor who could make a difference in their lives. Yet, many interview partners also knew that his power was limited, noting that he did things faster than the administration, but less effectively. In particular, they were aware that he was not able to achieve the complete desilting of the covered drain in the South.

The most important role in waste water governance that the MLA played seemed to lie in his capacity to push the DEMS to allocate scavengers to the slum. The MLA admitted that scavengers were not supposed to clean the JJ cluster. However, "if the safai karmcharis come in the JJ cluster depends on the power of the politicians; if he is powerful he can manage to send them there" (personal communication, 30 Dec 2008). He also explained that "the government has given silent acceptance that you should go by the backdoor to apply for money without mentioning if it is to be done in an authorised colony or not, and the contractor too should not tell it, then the work can get done". This indicated that provision or maintenance of infrastructure was possible, though difficult to achieve. The MLA also held that service provision was a right of all inhabitants of Delhi, as "there is a rule in the Corporation Act from the MCD that if there are ten or more people living somewhere they should get sanitation, sewerage, water supply, drainage, roads... But the government doesn't follow this" (personal communication, 30 Dec 2008). A certain interest in servicing informal areas seemed therefore to exist from his part, although it was difficult to understand where political statements intermingled with genuine beliefs.

As the MLA resided at around 5 min walking distance from the cluster, physical accessibility was a fact. Yet, for most respondents it was the act of "listening" that evoked hopes of a responsible leadership by the MLA. People in the JJ cluster were divided between those who talked about the MLA as 'bhai', brother, and believed he acted "like a family member" (personal communication, 25 Oct 2008), and others who had had bad experiences with him. Especially on the Western side, nearer to his residence and the main road, and in the Gujarati community people praised him for his quick reactions on their complaints. In other communities and towards the Eastern part, however, people felt that his support was inconsistent, while others understood that he helped only in cases where many households were concerned by a certain problem and came to him in a group. Inhabitants who supported a different party in the election felt that he only got things done in that

part of the JJ cluster which voted for him, while depriving supporters of other parties from basic upgrading. Still others perceived his support to be bound to people with voter ID cards.

In cases where he denied his help, people had the option to go several times, or go in a bigger group, or to put pressure on him through the Member of Parliament, a possibility that three respondents had used in the past. Only few had given up on the MLA's support completely, saying he made false promises or did not react at all: "I went there ten times (...) he never helped me, so why should I go?", a Muslim woman asked (personal communication, 23 Nov 2008). In an extreme case, people in the South-East corner of the cluster had experienced how he had slapped someone in the face who had come to complain. After the event, the brother of the MLA had come to apologise, but trust had not been re-established. "We avoid going there now, to save our honour and not to take any risks" (personal communication, 24 Oct 2008), a resident described the situation that ensued.

While the MLA was thus easily accessible in terms of distance, the interviews show that slum residents' opinions on him were extremely divided. Personal experiences varied between felt support, perceived neglect, and sensed aggression. This vital link to achieve better waste water-related services was therefore unreliable and not accessible for everybody in a similar way.

## 7.7 Conclusion

Waste water-related problems in informal settlements of megacities are multiple, the most pressing issue for day to day life in the discussed case study being the blocking of drainage channels with subsequent overflow of waste water onto the streets, and sometimes into the houses. While this problem directly interrupts inhabitants' daily schedules and causes disgust, it also has—together with problems such as the presence of rats, mosquitoes, flies and worms—a huge impact on people's dignity and health, and indirectly, working capacity, education and income.

Evidence from fieldwork has shown how the exact extent, shape, frequency and gravity of the problem—in short, the waste waterscape—are not static or evenly distributed even at such a small scale, but rather highly dynamic and uneven. This dynamic waste waterscape is produced and reproduced through myriad everyday negotiation processes between residents and relevant governmental[5] actors. Inhabitants bargain with municipal street-level bureaucrats or their elected representative, or try to put pressure on state actors through various means to have their open drains cleared regularly, frequently and in-depth. Success is always partial and temporal. Hence, obtaining and maintaining state services for drainage remains an

[5] Of course, in other cases, and if the focus of this paper had been on the toilet block, non-governmental actors would play an important role.

ongoing struggle in the slum clusters although the investigated area exists since 30 years and can be considered an established urban colony.

The lack of entitlement and a city-wide approach to sanitation that surfaced in interviews with the bureaucracy moreover point to the reality that Indian slums in most cases are still supposed to disappear from the city centre (Dupont and Ramanathan 2008; Bohle and Sakdapolrak 2008). Concentrating the urban poor at the outskirts of Delhi will however create new and other problems for the urban environment: Expanding the sewerage system over large areas and long distances will require far more capital investment than covering relatively small areas within already connected, legal colonies. More critical still, the two conditions which allowed slum residents to access sanitation services at least to a certain extent would become invalid in such a situation: First, the politicians, representing homogeneous constituencies of resettlement colonies, would not be able to informally use funds and municipal staff meant for better-off colonies to provide services to the slum residents. Second, the administration, worried to please residents of neighbouring better-off colonies in the current heterogeneous situation, would have no incentive to provide services if slum residents lived in homogeneous resettlement areas. The displacement of inner city slums would thus exacerbate urban waste water problems at city level, but especially for the poor section of Delhi's inhabitants.

Beyond the case study, this chapter has shown how Urban Political Ecology contributes to our understanding of megaurban environments. With waste water remaining a huge challenge in many of Asia's large urban agglomerations, the data show that it is not always the lack of financial resources for an expansion of the sewer network or 'bad governance' that upholds the highly problematic status quo. In fact, specific social relations of power maintain unhealthy and undignified urban environments: social relations that lead to direct exposure to waste water by scavengers as well as slum residents, to conflicts between these two groups, and to the fact that residents of informal settlements need to invest much time and efforts into achieving waste water drainage on a day to day basis. In order to target the marginalised when designing urban environmental policies, addressing these issues is vital. Only if relationships between the state and the marginalised and the way they play out in the everyday are better understood can an empowerment of poorer urban citizens be envisaged. This, in turn, can lead to better environmental situations in slums and cities, and substantial democratisation of service provision.

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# Chapter 8
# Nutritional Status of Men and Women in Mumbai: Is There Any Imbalance Across Slums and Non-slums?

**Kunal Keshri**

**Abstract** This article examines the distribution and correlates of nutritional status of men and women in Mumbai, the largest mega city of India. Empirical analyses are based on the Indian National Family Health Survey (2005–2006) dataset. Results highlight the stark division of nutritional status and the consequent dual burden for public health policies to simultaneously manage under and over nutrition in Mumbai mega city. Results show that slightly less than half of men and half of the women population are nutritionally imbalanced. Underweight is a concern for men living in slums. On the other hand overnutrition/obesity among women is much higher in the non-slum areas whereas underweight is key concern in slums. The intensity of income-related inequalities in underweight outcomes is much greater for non-slum areas whereas inequalities in overweight outcomes are higher among slums. The regression analysis confirms that the place of dwelling is not significantly associated with the nutritional status when controlled for other immediate factors. This analysis finds that economic status of household is the main factor affecting the nutritional status. The paper concludes that the existing policies considering slums as the host of all the health related problems needs a critical re-examination. It is confronted that programs and policies can no longer assume that the slums-dwellers are the most vulnerable and there are no health related problems in the non-slums of urban areas. The paper suggests that focus should be on identifying the needs and concerns of specific subgroups of population in both slum as well as non slum areas of Mumbai.

**Keywords** Body mass index • Concentration index • Overnutrition • Slum • Undernutrition

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## 8.1 Introduction

It is widely acknowledged that low economic development has consequences for nutritional status of the population. However, rapid economic growth and urbanisation, in otherwise resource-poor settings need not necessarily favour nutrition. In fact, disparities in regional development can have non-trivial consequences on nutritional profile. While illiteracy and poverty in rural areas disallow the reversal of undernutrition trends, excessive and disproportionate consumption drives the obesity epidemic in urban areas. The latter phenomenon, also referred to as the 'nutritional transition', is partly instigated by changes in consumption patterns and in part is inflated by factors such as unhealthy lifestyle and physical inactivity. In fact, several developing countries are grappling with simultaneous prevalence of undernutrition and obesity, referred to as the malnutrition duality (Mendez et al. 2005; Popkin 2001; Uthman 2009).

In this context, it is equally imperative to probe whether nutritional status varies within urban areas? As is well known, rapid urbanisation coupled with increasing resource pressure is degrading the quality of life in urban centres, particularly mega-cities. In fact, most of the urban centres are increasingly subdivided into precarious slums and, given such intra-urban intricacies, its categorisation as a homogenous entity warrants a close scrutiny. The analysis is based on the National Family Health Survey (NFHS 2005–2006) data on eight Indian mega-cities and indicates that overweight/obesity is relatively more among non-slum men and women whereas the slums are on the verge of transition. Analyses provide a clue for the widespread income-related inequality that, irrespective of slum or non-slum residence, underweight outcomes are heavily concentrated among the poor whereas overweight/obesity although is a concern for the rich but it is spreading quickly to the middle income households. Econometric analysis suggests that household's socioeconomic status is the most significant predictor of malnutrition rather than slum or non-slum residence.

### *8.1.1 The Process of Urbanization and Slum Formation in India*

It is estimated that 95 % of the world's urban population growth over the next four decades will be absorbed by cities in developing countries (UN-HABITAT 2008). India, with world's second largest urban population, is a major contributor to this phenomenon. Interestingly, there has been notable reversal in the declining trends of urbanization (observed during 1980s and 1990s) and urban population grew at an average rate of 2.76 % per annum in the decade of 2001–2011. According to Census of India 2011, the urban population grew from 286 million in 2001 to 377 million in 2011 and around 31 % of India's 1.2 billion persons reside in urban areas (Registrar General of India 2011a, b). The increase in rural population was lower than that for

the urban population for the first time after the independence. It is argued that major factor for this faster urbanization is the geographical expansion through the emergence of small towns and spill over from existing large-cities to peripheral areas. In 2011, there were 53 urban agglomerations[1] of more than one million people where 160.7 million people lived, comprising 43 % of India's urban population (Bhagat 2013). In addition to this, there are large urban agglomerations with more than ten million population such as Mumbai (18.4 million), Delhi (16.3 million) and Kolkata (14.1 million) (Registrar General of India 2011a, b) in the country.

Recent economic performance of India and accompanying changes has transformed the regional as well as socioeconomic fabric and has created new centres of growth. This transformation is characterised by massive rural-to-urban migration as the prime factor underlying rapid proliferation of urban slums in mega-cities (Agarwal et al. 2007). The Census of India, 2011 finds around 65.4 million slum dwellers in India (Registrar General of India 2011a). Undoubtedly much of urban population growth is lopsided with disproportionate increments among slums which are characterized by poor access to civic services, inadequate housing and overcrowding (UN-HABITAT 2003). Therefore, it is reasonable to expect that mega-cities such as Mumbai, Delhi and Kolkata may increasingly confront problems of resource scarcities and diminishing quality of life as a large population in these cities is markedly underserved in basic amenities like housing, transportation, piped water supply, waste disposal, health infrastructure, and other civic services (Gupta et al. 2009).

### *8.1.2 Mega City of Mumbai*

Mumbai, earlier known as Bombay, is demographically the largest city of India which was created during British rule of India. This port-city is situated in the western coast of India and is also financial capital of the country. It has experienced rampant economic and demographic growth over time. Despite numerous governmental efforts Mumbai has failed to deal effectively the problem of urban poverty and providing decent housing and improved quality of life in terms of access to sanitation safe drinking water and health care to its six million slum dwellers (Bhagat and Jones 2013). Some studies have shown that proportion of migrants was a little higher among slum dwellers than non-slum dwellers and a large percentage of migrant originated from the backward states of Uttar Pradesh and

[1] An Urban Agglomeration consists of the population of a core urban centre living within its municipal boundary, as well as the population of contiguous towns and adjoining urban outgrowths (OGs). OGs are areas around a core city or a statutory town that are fairly large and already urbanized such as a railway colony, university campus, port area, military camp, among other examples, but are not included within the municipal boundary of the core city or town (Bhagat and Mohanty 2009).

Bihar live in slum areas compared to intra-state migrants (Singh 2006a, b). Not only in terms of urban population but also in terms of slum proportion the mega city of Mumbai (54 % of Mumbai's population lives in slums) tops among all the mega-cities of the country (Registrar General of India 2001).

## 8.2 Rationale of the Study

The living conditions in mega-cities display substantial inequalities in fundamental determinants of health (Brockerhoff and Brennan 1998). For instance, several studies have emphasized on the fact that morbidity and (child) mortality rates are several times higher in slums and peri-urban areas than privileged neighborhoods (Harpham 1997; Harpham et al. 1988; Stephens 1996). Du et al. (2002) have discussed the nutrition transition in urban areas of China and found that nutrition transition has begun earlier in urban areas. However, in the Indian context, studies have mostly attempted to highlight the intra-urban differentials in reproductive health outcomes (Hazarika 2009). Few recent studies like Gaur et al. (2013) and Swaminathan and Mukherji (2012) have highlighted the malnutrition duality among women in slum and non-slum of the mega-cities. Nevertheless, they did not deal such problems among men. Also, all these studies analysed the eight mega-cities but could not provide detailed analysis of the mega city of Mumbai which is having highest number of slum dwellers in the country.

This paper, therefore, analyses an observable health parameter viz. nutritional status to strengthen the evidence base on non-uniform distribution of nutritional concerns in the mega city of Mumbai by disaggregating the presumed homogeneity of urban centers. It must be noted that this parameter has a close association with potential future challenges for health. For instance, obesity or undernutrition is a well-accepted indicator that pronounces the burden of acute health ailments and Non-Communicable Diseases (NCDs) in a given population. The issue of malnutrition duality has been subject to scrutiny by researchers whereby a few have attempted to comprehend the factors associated with this. For example, Subramanian et al. (2007) note that the increasing malnutrition duality essentially mirrors the distribution of income in the society (also see Bentley and Griffiths 2003; Griffiths and Bentley 2001; Subramanian and Smith 2006; Subramanian et al. 2009). Despite such revelations regarding distributional congruities it is intriguing to note gaps in assessment of income-related inequality in nutritional status of women, particularly in Indian mega-cities. Income-based clustering, physical inactivity and unhealthy consumption are identified as key determinant of nutritional status and are associated with urban factors including resource pressures, stress, congestion, traffic density, environmental pollution, and unavailability of open spaces.

The present work is motivated to address the underlying concerns viz. does living in slum or non-slum areas of Mumbai mega city has any effect on nutritional status of men and women? Empirical evidence can provide much needed insights

on intra-urban distribution of nutritional status and can inform policymaking, especially in mega-cities. Further, income-related inequalities in prevalence of underweight and overweight are computed to comprehend whether its intensity varies across slum and non-slum areas? Finally, the paper engages with a simple econometric analysis to test the hypothesis that people from slums are relatively underweight whereas those from non-slum areas of this mega city are relatively overweight/obese.

## 8.3 Data and Methods

The study analyses the National Family Health Survey 2005–2006, India data (hereafter NFHS). It is a cross-sectional, multi-stage household survey and is designed to provide estimates of key indicators related to fertility, mortality, family planning, maternal and child health both at the national and the state levels. NFHS 2005–2006 covered subsamples from eight mega-cities of India, namely Mumbai, Delhi, Kolkata, Chennai, Hyderabad, Indore, Meerut and Nagpur. These cities have significant slum population and were sampled based on the area classification scheme of the Indian National Census 2001 (Registrar General of India 2001).

The Census of India (Registrar General of India 2001) identified slums on the basis of threefold criteria:

(a) all specified areas in a town or city notified as 'Slums' by State/Local Government and Union Territory administration under any Act including a 'Slum Act',
(b) all areas recognized as 'Slum' by State/Local Government and Union Territory administration, housing and slum boards, which may have not been formally notified as slum under any act,
(c) a compact area of at least 300 population or about 60–70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities.

In order to have a sample large enough to provide reliable information (even at the city level) in each of the eight cities, NFHS selected a representative sample of approximately 2,000 households with about 1,000 households each from enumeration areas designated as slum and non slum areas within the municipal corporation limits of these cities. NFHS collected information on the height and weight of all the women aged 15–49 years and men aged 15–54 years (study has selected men aged 15–49 years for the analysis to match with that of women). Weight was measured using a solar-powered scale with an accuracy of $\pm 100$ g while height was measured using an adjustable wooden measuring board, designed to provide accurate measurements (to the nearest 0.1 cm). This survey based information on weight and height is used to develop the Body Mass Index (BMI), defined as Weight (in kg) divided by Height (in $m^2$) (International Institute for Population Sciences IIPS and ORC Macro 2007). The BMI is a widely accepted anthropometric indicator of adult nutritional status and is useful in classifying individuals as

**Table 8.1** Background characteristics of women respondents, NFHS 2005–2006

| Background characteristics | Men (%) | Women (%) |
|---|---|---|
| *Age group (years)* | | |
| 15–24 | 40.0 | 33.8 |
| 25–34 | 30.6 | 33.0 |
| 35–44 | 21.3 | 25.2 |
| 45–49 | 8.2 | 7.9 |
| *Marital status* | | |
| Never married | 47.9 | 29.6 |
| Married | 51.3 | 65.5 |
| Widowed | 0.4 | 3.0 |
| Divorced/separated | 0.4 | 1.9 |
| *Educational attainment* | | |
| No education | 3.4 | 13.0 |
| Primary | 10.1 | 11.0 |
| Secondary | 69.2 | 59.6 |
| Higher | 17.4 | 16.5 |
| *Work status* | | |
| Not working | 17.1 | 64.2 |
| Non-manual/white collar job | 49.7 | 25.9 |
| Agricultural and manual work | 33.3 | 10.0 |
| *Religion* | | |
| Hindu | 74.2 | 70.3 |
| Muslim | 15.9 | 16.7 |
| Others | 9.9 | 13.0 |
| *Caste* | | |
| Scheduled caste | 13.1 | 11.3 |
| Scheduled tribe | 2.2 | 1.1 |
| Other backward caste | 17.4 | 14.4 |
| Others | 67.3 | 73.2 |
| *Slum status* | | |
| Slum | 58.8 | 55.4 |
| Non-slum | 41.2 | 44.6 |
| N | 1,988 | 2,061 |

*Source*: Authors' computation from NFHS 2005–2006, IIPS and Macro International data

underweight ($BMI \leq 18.5$ kg/m$^2$), normal ($18.5$ kg/m$^2 \leq BMI \leq 25.0$ kg/m$^2$) or overweight ($BMI \geq 25.0$ kg/m$^2$).

The study carefully excludes the cases where the woman respondent was either pregnant or had given birth in the last 2 months from the date of survey because of plausible weight fluctuations expected during pregnancy and birth. The final analytical sample consists of 2,061 women and 1,988 men of Mumbai mega city (see Table 8.1). State sampling weights corrected for oversampling, so that indicators based on these data are representative at the city level, as well as for slum and

non-slum areas within the city (Gupta et al. 2009). The study uses state men's and women's weight for the analysis.

A range of theoretically pertinent demographic and socio economic covariates are examined to comprehend their association with nutritional status. Caste is identified as a critical correlate of health and social status in India (Zacharias and Vakulabharanam 2011). For analytical purposes, caste is categorised into four broad groups namely; scheduled tribes (STs), scheduled castes (SCs), other backward classes (OBCs) and others. In the absence of direct information on income or expenditure in NFHS, the asset ownership status of the household is used to construct a household wealth index using the Principal Component Analysis (PCA). The PCA-based wealth index finds wide applications as a proxy for household economic status and is noted to be consistent with expenditure and income measures (Filmer and Pritchett 2001; Montgomery et al. 2000; Rutstein 1999).

Although the NFHS presents a PCA-based wealth index variable (based on 33 assets) for all-India analysis but while undertaking an intra-regional analysis it is essential to reconstruct the wealth index based on the region-specific asset profile. A direct use of the all-India wealth index is biased and may provide inconsistent ranking. For example, Hazarika (2009) finds that more than 80 % of the slum population in NFHS 2005–2006 is concentrated in the upper two wealth quintiles (defined as richer and richest population groups). To avoid such inconsistencies, a separate PCA-based wealth index is constructed using selected consumer durables, household amenities and housing qualities specifically drawn from the sample for Mumbai (and also separately for slum and non-slum).

In order to assess the socioeconomic inequalities in the distribution of nutritional status, the paper employs concentration index (CI). The CI is defined as twice the area between the concentration curve and the line of equality (the diagonal) and ranges from $-1$ to $+1$. Negative CI values indicate that underweight/overweight is concentrated among the poor whereas positive CI values indicate concentration among rich. CI values close to zero imply greater equality across the income-hierarchy whereas values close to $\pm 1$ infer high inequalities.

A generalized form of logistic regression—the multinomial logit (MNL) model—is employed to understand the risk of nutritional imbalance associated with slum and non-slums and controls for basic socioeconomic and demographic correlates. Men and women with BMI values in the normal range constitute the reference group for the analysis, whereas the underweight and overweight women and men constitute the comparators. For analytical purposes, two separate models are estimated each for women and men sample; in first model, only slum or non-slum residence is considered as the explanatory variable; and in second model control variables are introduced. Results are presented in the form of relative risk ratios (RRR) and significance levels are reported. The RRRs inform regarding the expected risks of underweight or overweight associated with a unit change in a variable given that other correlates in the model are held constant. All the analyses have been performed using STATA 10 (Statacorp 2007).

## 8.4 Results

### *8.4.1 Socioeconomic Background and Nutritional Status*

The socioeconomic and demographic characteristics of the respondents are presented in Table 8.1. These figures reveal that around 58 % of men and 55 % women of Mumbai reside in slums. These trends are largely associated with heavy and continuous influx of rural-to-urban migrants who often, in the absence of adequate employment and resources, find their way into slums. Hence, it is expected that the health profile of the slum population would mirror the rural health profile but could be worsened by urban factors such as environmental pollution, inadequate and unsafe water, sanitation and hygiene.

More than two-third of men belong to young age-group (15–34) while women's proportion in this age group is slightly lower. Among both men and women proportion of Hindus is highest followed by Muslims and others. Interestingly more than 67 % of men belong to others caste group followed by 17 % other backward classes and 13 % of scheduled castes while scheduled tribes proportion is negligible in the city. Educational attainment is better among men than women and almost 13 % of women are illiterate but there is no difference in the proportion of higher educated men and women. Almost 50 % of Mumbai males are engaged in non-manual or white collar job which emphasis the dominance of secondary and tertiary economic activities (particularly services) in this largest megalopolis of country, among women almost 36 % are working.

Table 8.2 indicates that less than half (43 %) of male and just half of female population in Mumbai is nutritionally imbalanced. Among men underweight is higher among slum dwellers (25 %) than their non-slum counterparts (23 %). While overnutrition/obesity is higher among men who are residing in non-slum areas. Prevalence of underweight among women in slum areas is 23 % whereas the same is 21 % in non-slum areas. In slums 25 % are overweight while this figure goes to 30 % in non-slums. In fact, overnutrition among women is much higher in the non-slum areas whereas underweight is key concern in slums.

**Table 8.2** Nutritional status of men and women by slums classification, NFHS 2005–2006

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| BMI categories | Slum | Non-slum | Total | Slum | Non-slum | Total |
| Underweight (<18.5) | 25.5 | 22.7 | 24.4 | 23.2 | 21.5 | 22.5 |
| Normal (18.5–24.9) | 58.0 | 56.3 | 57.5 | 51.6 | 48.3 | 50.2 |
| Overweight (≥25) | 16.4 | 20.9 | 18.2 | 25.2 | 30.2 | 27.4 |

*Source*: Authors' computation from NFHS 2005–2006, IIPS and Macro International data

**Table 8.3** Income related inequalities by Concentration Index (CI) in nutritional status of men and women, NFHS 2005–2006

| | Slum | | Non-slum | | Total | |
|---|---|---|---|---|---|---|
| | CI | SE | CI | SE | CI | SE |
| *Underweight* | | | | | | |
| Men | −0.11 | 0.05 | −0.19 | 0.08 | −0.13 | 0.07 |
| Women | −0.06 | 0.03 | −0.20 | 0.07 | −0.11 | 0.06 |
| *Overweight* | | | | | | |
| Men | 0.26 | 0.06 | 0.25 | 0.03 | 0.28 | 0.05 |
| Women | 0.11 | 0.03 | 0.14 | 0.02 | 0.13 | 0.03 |

*Source*: Authors' computation from NFHS 2005–2006, IIPS and Macro International data

### 8.4.2 Income-Related Inequality in Nutritional Status

An analysis of income-related inequalities in the distribution of nutritional status helps to comprehend the association between income and nutritional health. Table 8.3 reports the CI values of men and women for the slum and non-slum areas of the mega city. The aggregate view indicates that economic inequalities in underweight are higher among men (−0.13) than women (−0.11). Results inform that the intensity of income-related inequalities in underweight outcomes is much greater for non-slum areas than slums irrespective of gender. Also, the overall economic inequalities in overweight remained higher among men (0.28) than women (0.13). Further, results suggest that the inequality in overweight is higher among women who reside in non-slums (0.14) than slum dwellers (0.11) while no significant difference is found among men.

### 8.4.3 Nutritional Status Across Slums and Non-slums: An Econometric Analysis

The results of the multinomial logit (MNL) regression are reported in Tables 8.4 and 8.5. Two equations have been estimated in each model; one compares underweight outcomes relative to normal nutritional status and the other, compares overweight relative to normal nutritional status. The two equations in Model I suggest that place of residence (slum or non-slum) is a significant predictor of nutritional status. The first equation regarding risk of underweight relative to normal BMI status informs that men and women from non-slum areas are less likely to be underweight and more likely to be overweight. The lower likelihood is revealed by the relative risk ratio (RRR) of 0.91 in men sample (Table 8.4). These results so far support the premise that nutritional transition in non-slum areas is perhaps faster and widespread than slums. However, it would be interesting to observe the above association when controlled for other socioeconomic and

**Table 8.4** Multinomial estimates: Relative Risk Ratios for underweight and obesity relative to normal BMI among Men, NFHS 2005–2006

| Covariates | Model I | | Model II | |
|---|---|---|---|---|
| | $RRR^1$ | $RRR^2$ | $RRR^1$ | $RRR^2$ |
| *Residence (slum®)* | | | | |
| Non-slum | 0.91 | 1.32* | 0.96 | 1.01 |
| *Age group (15–24®)* | | | | |
| 25–34 | | | 0.50*** | 1.26 |
| 35–44 | | | 0.33*** | 1.79* |
| 45–49 | | | 0.27*** | 1.78* |
| *Marital status (never married®)* | | | | |
| Married | | | 0.88 | 1.72* |
| Widowed | | | 3.70 | 2.42 |
| Divorced/separated | | | 5.19* | 0.00 |
| *Education (illiterate®)* | | | | |
| Primary | | | 1.33 | 1.02 |
| Secondary | | | 1.14 | 1.38 |
| Higher | | | 0.53 | 1.62 |
| *Occupation (not working®)* | | | | |
| Non-manual/white-collar | | | 0.69* | 1.13 |
| Agriculture and manual work | | | 0.74 | 0.70 |
| *Caste (scheduled castes®)* | | | | |
| Scheduled tribes | | | 1.07 | 0.47 |
| Other backward classes | | | 1.07 | 1.36 |
| Others | | | 0.92 | 1.31 |
| *Wealth quintile (poorest®)* | | | | |
| Poorer | | | 1.52* | 1.58* |
| Middle | | | 1.20 | 1.95* |
| Richer | | | 0.97 | 2.79*** |
| Richest | | | 0.82 | 4.11*** |
| Log likelihood | −1,562.14 | | −1,362.05 | |
| LR $chi^2(2)$: (Prob > $chi^2$) | 5.96 (0.050) | | 323.9 (0.000) | |
| McFadden's Pseudo-$R^2$ | 0.00 | | 0.11 | |

*Source*: Authors' computation from NFHS 2005–2006, IIPS and Macro International data
*Notes*: $RRR_1$ Relative Risk Ratio for underweight, $RRR_2$ Relative Risk Ratio for overweight, *Dependent variable* BMI of men ® Reference category
Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

demographic variables. Particularly, will it be meaningful to pursue different health and nutrition policies for slums and non-slums or is it advisable to adopt a universal approach regardless of directionality? Model II results broadly indicate that policymaking could go astray if slums are assumed to follow rural or backward region undernutrition related concerns whereas non-slum solely reflect NCDs. In other words, it is advisable to devise a universal strategy for addressing malnutrition duality related health concerns.

**Table 8.5** Multinomial estimates: Relative Risk Ratios for underweight and obesity relative to normal BMI among women, NFHS 2005–2006

| Covariates | Model I | | Model II | |
|---|---|---|---|---|
| | $RRR^1$ | $RRR^2$ | $RRR^1$ | $RRR^2$ |
| *Residence (slum®)* | | | | |
| Non-slum | 0.98 | 1.27* | 1.22 | 1.12 |
| *Age group (15–24®)* | | | | |
| 25–34 | | | 0.68* | 2.95*** |
| 35–44 | | | 0.37*** | 4.72*** |
| 45–49 | | | 0.34* | 6.47*** |
| *Marital status (never married®)* | | | | |
| Married | | | 0.62* | 1.94** |
| Widowed | | | 1.06 | 1.41 |
| Divorced/separated | | | 1.37 | 3.32* |
| *Education (illiterate®)* | | | | |
| Primary | | | 1.23 | 0.91 |
| Secondary | | | 1.54* | 1.23 |
| Higher | | | 1.12 | 1.00 |
| *Occupation (not working®)* | | | | |
| Non-manual/white-collar | | | 0.83 | 0.86 |
| Agriculture and manual work | | | 1.00 | 1.02 |
| *Caste (scheduled castes®)* | | | | |
| Scheduled tribes | | | 0.42 | 1.34 |
| Other backward classes | | | 1.05 | 0.85 |
| Others | | | 0.81 | 1.37 |
| *Wealth quintile (poorest®)* | | | | |
| Poorer | | | 0.92 | 1.21 |
| Middle | | | 0.79 | 1.56* |
| Richer | | | 0.56* | 1.60 |
| Richest | | | 0.28*** | 2.24*** |
| Log likelihood | −1,766.45 | | −1,531.24 | |
| LR $chi^2(2)$: (Prob > $chi^2$) | 5.32 (0.0699) | | 449.94 (0.000) | |
| McFadden's Pseudo-$R^2$ | 0.0015 | | 0.13 | |

*Source*: Authors' computation from NFHS 2005–2006, IIPS and Macro International data
*Notes*: $RRR_1$ Relative Risk Ratio for underweight, $RRR_2$ Relative Risk Ratio for overweight, *Dependent variable* BMI of men ® Reference category
Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Model II controls for background factors and estimates that place of residence (slums or non-slums is not significantly associated with the risk of being underweight or overweight. Alternatively, it can be argued that much of the malnutrition duality is an outcome of socioeconomic and individual aspects. To elaborate, the MNL estimation finds that correlates such as age and economic status (wealth quintiles) have a significant and negative association with underweight outcomes while they display significant and positive association with obesity among men.

Results are more or less similar in the MNL estimates of women sample also. The income-related inequalities in prevalence of underweight and obesity are further corroborated with significant RRRs observed for the association between household wealth index and nutritional status.

Compared to younger people (15–24 years), others in the age groups 25–34, 35–44 and 45–49 years have much lower likelihood of being underweight, but are much more likely to be overweight. Working men are less likely to underweight that non working and non-manual/white collar professionals are most likely to be overweight than their counterparts. Almost similar results are observed among women.

## 8.5 Discussions and Conclusion

Health risks significantly increase for individuals who fall short of the optimal nutritional interval (the undernourished) and for those who exceed it (the obese). With rapid nutritional transition the burden of obesity is increasing worldwide particularly in urban areas. Although, nutritional transition is global in nature but greater caution is warranted for the health systems of South Asian countries who confront heavy two-tailed malnutrition. Given the large population base and past health failures of the region, the ongoing nutritional transition, if left unarrested, can jeopardize the quality of life in the region.

It is apparent from the results that the prevalence of overweight is more than underweight women while underweight is found to be more pronounced among men. Researchers have witnessed that among women overweight exceeds underweight in most of the developing countries (Caballero 2005; Doak et al. 2005; Griffiths and Bentley 2001; Mendez et al. 2005) and it is fast emerging trend in India (Subramanian et al. 2007). Sobal and Stunkard (1989) and Monteiro et al. (2004) argued that obesity cannot be considered only as a disease of materially advantaged groups and that the burden of obesity gradually shifts toward poorer groups as countries improve their level of economic development. In this context, it is noteworthy that the differential in the two extremes of malnutrition is much higher in non slum areas with higher prevalence of overweight. However, a negligible difference could be observed among women in slum areas. This evidence shows that the burden of overnutrition is growing in non slum areas and it is yet to be shifted towards the slum areas of Mumbai, as the two subgroups have marginal differences in key determinants. It would, therefore, appear that in the next few decades Indian megalopolis has to shoulder the double-burden of nutrition-related diseases at both ends of the nutrition spectrum. In fact, nutritional health will no longer be a concern of the poor but will progressively be identified as concern of the rich.

Men and women who have crossed 35 years of age are more likely to be overweight whereas younger ones have a higher probability of being under-weight.

This result is not new to the literature in developing countries (Gopinath et al. 1994; Griffiths and Bentley 2001) and points at the quality of nutritional transition with age. In fact, low BMI in the younger ages (15–24 years) may result in the maternal complications among women and have more chances of low birth weight babies.

After adjusting the influence of individual demographic and socioeconomic, there is no significant effect of the slum and non slum-residence on nutritional status. In other words, it is the socioeconomic correlates that determine the nutritional status and not merely the residence. The results using the modified wealth index suggest that the prevalence of underweight is very high among poorest men and women and plummets with an increase in income whereas a steep increase in overweight has been noticed with income. These results are consistent with the earlier studies in which socioeconomic status has been found to be strongly associated with malnutrition (Dhurandhar and Kulkarni 1992; Kamal and Islam 2010; Khan and Kraemer 2009; Popkin 1998; Reddy 1998; Subramanian and Smith 2006). Therefore, this study rejects the hypothesis that place of residence is the cause of malnutrition among both men and women in Mumbai. The most significant predictor is the socioeconomic status in terms of wealth quintile that influence the nutritional status.

Given the experience of other countries, the unchecked trend of overweight and obesity among people of mega cities particularly women may result in epidemic of Non-Communicable Diseases (Mendez et al. 2005; World Health Organization 2004). Undisciplined health practices, dietary intake and behaviors can negate the impact of economic development and nutritional interventions.

Although, prevalence of underweight is more in slum and overweight is more in non-slum areas but results have also indicated wide inequalities in malnutrition irrespective of place of dwelling. It is to be noted that Mumbai city, where almost half of the population lives in slums, has higher inequality in non-slum areas particularly related to underweight. Nevertheless, there are a considerable proportion of low economic profile households which are burdened with the problem of underweight. The regression analysis also confirms that the place of dwelling is not significantly associated with the nutritional status of women when controlled for other immediate factors. This analysis finds that economic status of household is the main factor affecting the nutritional status.

Based on these results, the paper concludes that the existing policies considering slums as the host of all the health related problems needs a critical re-examination. It is confronted that programs and policies can no longer assume that the men and women in slums are the most vulnerable and there are no health related problems in the non-slums of urban areas. If the policy matrix is not revisited, then interventions might not provide the expected results and might only contribute to lengthening of the two tails of malnutrition or the dual burden of nutritional epidemic. Furthermore, the empirical evidence suggests that nutritional policies will be required to comprehend the intricacies by disaggregating the assumed homogeneity of urban areas. In fact, focus should be on identifying the needs and concerns of specific subgroups of population in both slum as well as non slum areas.

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# Chapter 9
# Spatial Dynamics of Population in Kolkata Urban Agglomeration

**Vidya Yadav and R.B. Bhagat**

**Abstract** In a developing country like India metropolitan cities act as a pole where development takes place first, get concentrated and spread to the other geographical regions. As city grows and gets mature this process of development and its internal structure also changes simultaneously. After a certain stage of development, the population of metro cities starts shifting outwards and urbanization spreads over the adjoining areas. In this situation, the population growth either is stagnant or even declines in the core areas of the urban agglomeration. Kolkata city is one such example. Kolkata became the first million city of India in 1901 and experienced fast growth until 1971; afterwards growth rate plunged down. As per the census 2011, the decadal growth rate of the Kolkata UA was just 6.87 %, well below the natural growth rate of West Bengal and India.

**Keywords** Cities • Outgrowth • Urban • Urban agglomeration

## 9.1 Introduction

In demographic term, the process of urbanization is defined as concentration of the population from small to large and from many to few locations. This process takes place with socio-economic transformation of a country. In a developing country like India, the process of urbanization started in the colonial period and still evolving more or less on the same pattern (United Nation Population Division 2010). The emergence of metropolitan cities acquired a dominant feature of such kind of urbanization in recent times associated with urban primacy in many developing countries. So city evolved as a focus of economic activity and a nodal region for the whole area (Bhagat 2005). In the era of globalization, India has been experiencing a fast economic growth together with rapidly escalating urbanization; in such situation cities are working as centres for attracting investments.

The metropolitan cities are going through many socio-economic transformations in the era of globalisation which can be reflected in the demographic and spatial

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patterns of the city (Sita and Bhagat 2007). For a demographer and geographer, it has always been important to understand the process of concentration and spatial dispersion of the population in the city. This process is tried to track in previous studies and several theories of concentration and dispersion of the group has been propounded. Such theories manifested the spatial concentration and dispersion of the people within the city as a part of their life cycle, which is closely associated to the socio-economic transformation manifested at the space (Brush 1962). Thus, cities are visualised not only as a physical entity but as social phenomena (Mumford 1961).

In the era of globalization, the importance of metropolitan cities is growing worldwide, especially in the developing country. Because metropolitan cities are working as centres where global capital comes and interplays with the local economy, every city wants to project itself as a favourite destination for investment and aspires to become a global city. The contribution or share of cities in the GDP of the country is growing rapidly in every coming year. Inflow of capital and the emergence of new economic activities are enunciating many changes in the internal structure of cities of developing countries. With increasing economic activity and prosperity within the city, land became a more scarce resource in the core area of the metropolitan city; this has affected land use pattern and concomitant features of population structure and characteristics. Several studies have shown the slow-down of growth in the central city and increase in the growth in the satellite towns. Within the city also, the heart and older area of the city is getting depopulated, and while the population is growing in the newer or peripheral zones (Mahadevia 2008; Shaw 2007; UN-Habitat 2001).

In India about 377 million that is 31.16 % of the total population of the country are living in the urban area according to 2011 Census compared to 28.6 % in 2001 Census. The number of metropolitan cities and its contribution to the total urban population are also on the rapid increase. In 1991, census the total number of million plus cities was 26. Which increased to 35 in 2001, and now as per 2011 Census there are 53 million plus cities. Also, the eight metropolitan cities have crossed the mark of five million to qualify as mega cities. Out of eight mega cities, Calcutta is the only one which is situated in the eastern part of India, left behind in the pace development.

Kolkata is the oldest among all metropolitan/mega cities which achieved the mark of one million in 1901. The Kolkata urban agglomeration is spread over an area of 1,033 $km^2$. The urban agglomeration is formally administered by several local governments including 3 municipal corporations, 37 local municipalities, and 1 cantonment Board area. The Kolkata UA also consists of 75 census towns and 6 outgrowths according to Census 2011. Altogether there are a total 122 cities and towns in Kolkata UA. Kolkata lagged behind in the story of development after independence, but still not lost its importance as culturally, economically and strategically this is the nucleus of eastern and north-east India. The unique feature of Kolkata's regional location is that; there is no other major urban centre within a 100 km from Kolkata in the eastern India unlike other regions of the country. Thus, growth Kolkata UA assumes special significance for the development of eastern and north-east India. This study makes an attempt to study the demographic and spatial dynamics of the population in Kolkata UA.

## 9.2 Historical Background

Calcutta is the capital of the state of West Bengal, and the primate city of Eastern India, with a hinterland of over 270 million, mostly poor rural population (comprising the states of Bihar, Orissa, Assam, etc.). Calcutta urban agglomeration in 2011 is seven times larger than that of Patna, which is the second largest urban agglomeration in eastern India. This is far the highest primacy ratio of any Indian region. In 1690, an English merchant named Job Charnock arranged to lease three villages (named Kolkata, Gobindapur and Sutanuti) along river Hooghly in order to set up a trading post, and in 1698, Fort William was found (Chakravorty 2000; Raza and Habeeb 1976). Thus, Kolkata as the city began and its development enunciated as the British territory expanded in India by a decisive battle in 1757 at Plassey (about 120 km, north of Calcutta) (Chakravorty 2000). Modern industrialization of the city began in 1835 with the establishment of Jute mill in Rishra, a suburb. Jute, used for making bags, carpets, and low cost clothing became the mainstay of the region's economy till the middle of the twentieth century. Other jute mills were also established (usually) along the west bank of the river, towards the north of the city.

By the end of the nineteenth century, Calcutta was a powerful metropolitan centre, and the British capital in India (often called the second city of the British Empire)—a city of palaces and hovels (Chaudhari 1990a). Independence in 1947 was especially traumatic for Calcutta. With partition, a significant portion of Calcutta's hinterland (mainly the jute growing region) now became part of another country. Despite these problems the city was in an enviable position by Indian standards: until the mid-1950s West Bengal was the leading industrial state in the country with established economic infrastructure and manufacturing industry (automobiles, chemicals, consumer non-durables, etc.), and the highest per capita income levels in the country (Chakravorty 2000; see also Fig. 9.1). However, in Calcutta, unlike the other major cities in India, the hinterland remained not industrialized (with the states of Bihar and Orissa at the bottom of every development index), and very little new business moved into the agglomeration around the city. This situation was exacerbated by political turmoil from the early 1960s when centrist, leftist, and radical forces fought for control of the State. From 1977, the leftists have been in power; they have concentrated their efforts on rural development, particularly in quite successful land redistribution policies (Chaudhari 1990b).

The city and metropolis have seen capital flight to the west and north, the degradation of ageing infrastructure, a scramble for upper-middle class housing construction, and increasing corruption and inefficiency at all levels of municipal authority (Dutta 2003). On one hand, political importance of Kolkata was replaced by Delhi, when it becomes the capital of India in 1912; the economic significance of the city was replaced by Mumbai which emerged as economic capital of Independent India. With the enunciation of economic reforms in July 1991, all leading states with large cities become the first beneficiary of it; West Bengal is far behind-with less than 5 % of the total real investment it is nowhere near the leading states in early years of reforms. It shows the continuation of ill fate of Kolkata in the period following reforms (Chakravorty 2000).

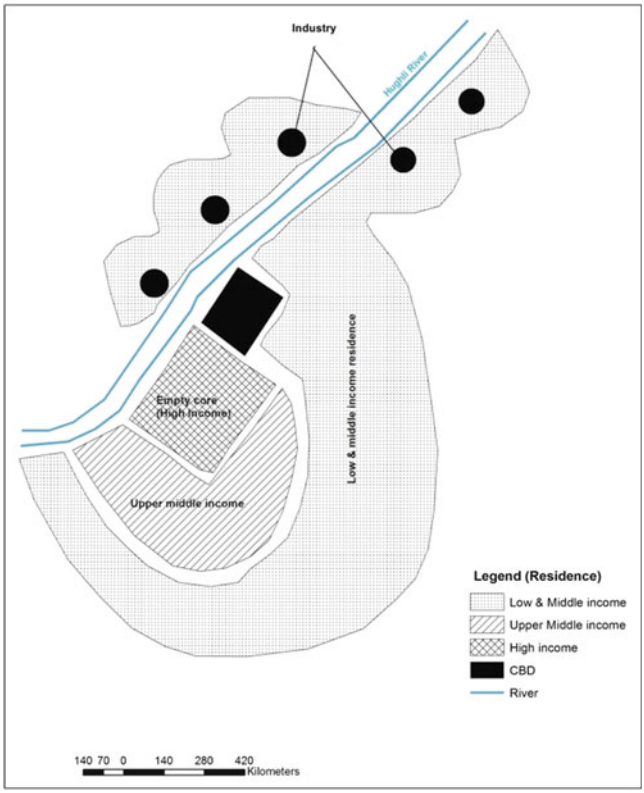


**Fig. 9.1** Spatial structure of post colonial Calcutta. *Source*: Adapted from Chakravorty (2000), p. 68

## 9.3 Review of Literatures

Urban sprawl has been studied in many researches which has listed the different stages of growth of cities. These studies explain how people from the core area spreads to periphery as cities grow. Gavin Jones (2008) in his study classified three zones namely, Core, inner zones, outer zones and analyzed the dynamics of change in population growth, migration, and employment between zones in Mega-urban region. It also shows that migration plays a very important role in population growth in cities and zones, where population growth was faster. People moving out from the core and other parts of the country mostly they migrate to the inner zone.

Mokherjee and Gayer (2010) tried to understand it in terms of different stages of life-cycle of a city. They suggest the differential urbanization tendencies or trend of urbanization, polarization, and eventual counter-urbanization as part of life cycle of a city. By studying the trend of NCR Delhi, the found that in the early stage of urbanization concentration take place in large cities which grow faster. As the city

gets mature, a process of counter urbanization starts and reversal of growth to adjoining peripheral area can be identified clearly.

Bhagat (2004) also shows that how cities grow initially benefiting from the increasing agglomeration economy, but after a certain stage due to congestion and crowding diseconomies set in resulting in the urban sprawl into adjoining area. And the monocentric urban structure become multi-centered and dominates the rest of the urban system.

Mills and Becker (1986) argue that it is quite natural that as the city grows it expands the economic base and activities of the city leading to increased advantage to the trade and commerce as well as to industries from the agglomeration economy. It cannot be sustained very long. The decline in growth rate will certainly set in with an increase in the size of the city in the long run. Hence, effort to restrict city size is not always necessary, and it could even be detrimental to the economic growth at the early stages of economic development in a country.

Tabuchi (1997) paid special attention to the impact of urban concentration and dispersion on transportation cost. Main result is that dispersion necessarily takes place when the transportation cost is sufficiently low. It depicts a structural transition from dispersion to agglomeration, and then re-dispersion when the transportation costs decrease monotonically over time.

In the given context of metropolitization in India, the recent study of Sita and Bhagat (2007) shows that in the present context, metropolitan cities are increasingly becoming focal points of urban concentration in India. The spread effects around these cities have resulted in satellite towns and towns on peripheral experiencing high growth rates. It gives rise to extended metropolitan region with the ones centered on Mumbai, Delhi and Kolkata being the most conspicuous.

Dupont (2005) in her work focuses mainly on metropolitan area, tries to analyse its recent developments in urban forms and processes with a view of accessing the adequacy of local definition and categorization of human settlements. The dynamics of metropolitan is examined through two interrelated perspectives. One is the evolving urban form, with emphasis on the processes of 'periurbanization' and 'rurbanisation' including expansion of suburb, formation of new residential quarters in surrounding rural areas and creation of satellite towns. The other is population redistribution within the metropolitan area.

## 9.4 Need for the Study

As it is evident from the literature that metropolis and their surrounding areas are growing rapidly all over the developing countries. Cities grow not only in terms of number but also the growth and features of a metropolitan city spill over to the surrounding areas. City Starts to radiate its geographical and socio-economic advantages to the surrounding areas and after achieving a particular stage of growth, results into the growth of adjacent area with satellite towns also more than the core area of the city. Studies also show that how the leading city of India

like Mumbai and Delhi are experiencing this phenomenon. This phenomenon is needed to be tracked in case of Kolkata which has been the oldest and still the third largest metropolitan city of the country, but showing the sign of the sharp decline in the growth rate. Since the change in the internal structure of the metropolitan region and socio-economic development is interconnected, such study can help to explain the changes in the land use, availability of price of land or residential property, employment opportunity and urban services. This study attempts to unravel the changing pattern of population growth and distribution in Kolkata UA and some associated factors.

## 9.5 Objectives

(1) To understand how the sluggish growth of Kolkata urban agglomeration is reflected in the demographic composition of the city compared to the other urban agglomerations of India.
(2) To map the temporal and spatial variation of population growth in the different parts Kolkata Urban Agglomeration.
(3) To explore the factors behind the differential growth of urban centres in Kolkata Urban Agglomeration.

## 9.6 Data and Methodology

This study is based on census data on urban agglomeration of Kolkata since 1981–2011. The 2011 Census has not published data on all towns. However, data pertaining to cities with population one lakh and more are made available in 2011 Census. The available data is helpful in studying the stated objectives of this paper.

As noted earlier, this paper has designed to understand the temporal and spatial pattern of population growth in Kolkata UA. The indicators like size, growth rate, density and sex-ratio have been examined and compared with the other largest metropolitan cities such as Mumbai, Delhi and Chennai, for the census periods from 1951 to 2011. Again to understand the temporal and spatial pattern of growth within Kolkata, the census data of Kolkata UA has been taken of different census periods from 1981 to 2011. There are 122 cities and towns within Kolkata UA. Cities and town level variations within Kolkata UA is also studied. At first the towns/cities have been classified according to their size, to understand the effect of size on growth rate and density. Three categories of towns and cities have been created according to size, first is Big towns (population more than 0.5 million), second is intermediate towns (population more than 0.1–0.5 million) and third is small towns (population less than 0.1 million). The distance of the cities and town from the main city Kolkata (M. Corp) is determined and the cities and towns/cities of Kolkata UA have been classified in two different

distance band categories. Based on distance, the cities and towns have been classified as falling in the core (Kolkata and Howrah) and periphery (Rest all other towns and cities). The population dynamics is also studied by their location in different districts; Kolkata, Howrah, North 24 pargana, Hooghly, South 24 pargana and Nadia.

There are two approaches to estimate the growth rate by size class of towns and cities namely (i) instantaneous approach and (ii) continuous approach. The instantaneous approach simply considers the population change within the size class category at two points of time. During the period between two points of time, however, several new towns come up and some of the old towns get declassified. The instantaneous approach does not make adjustment for this. Thus, many times the results of urban growth by size class of towns derived from instantaneous approach are misleading. The continuous approach on the other hand computes urban growth based on population change of only those towns and cities, which are common to two points of time. It is therefore an adjusted rate for new towns and also for declassified towns during the decade under study. While showing the growth-rate and density by distance and location continuous approach has been used in the study and the towns and cities which come in the class of big, intermediate towns in census 2011 has been considered in the same class in the back census also. The small towns have not been followed due to constraint of data, since the population of towns less than 0.1 million has not been released by census 2011. Correlation matrix has been shown to understand the relationship between different attributes of towns such as density, distance, and size with growth rate. The following formula has been used to calculate growth-rate, density and sex ratio, whenever it comes.

$$\textbf{Annual Growth rate} = \left\{ \mathrm{Ln}\left(\frac{Pt}{Po}\right)/\mathrm{T} \right\} * 100$$

Where,

$P_t$ is the Population of current year
$P_0$ is the Population of base year
T is the Time period
$L_n$ is the Natural log

$$\textbf{Density of population} = \frac{Total\,population}{Total\,Area}$$

$$\textbf{Sex ratio} = \frac{Total\,Number\,of\,Females}{Total\,Number\,of\,Males} * 1000$$

Definition and concepts:

(1) *Urban area*: There are three criteria to define an urban area;

(i) *Statutory criteria*: Any area having a stationary/civic body like Municipality, Municipal Corporation Board, Nagar Panchayat, Notified Area Committee, or any type of local self government.

(ii) *Demographic criteria*:

- a minimum population of 5,000;
- at least 75 % of male working population engaged in non agricultural pursuits;
- a density of population of at least 400 persons/km$^2$

(iii) *Discretionary criteria*: Respective state government and census authority may declare any area as urban e.g. pilgrim places, port area, coal mine area, project towns, campus area etc. The statutory criteria is considered first, while defining any settlement as town, the demographic criteria are used by census for settlements which does not comes in the category of town by statutory criteria. The town defined by demographic criteria by census is known as non-municipal or census towns.

(2) *Urban Agglomeration*: In 1971 census defined the term "Town Group" and new termed coined which is Urban Agglomeration (UA) and it refers to a continuous urban spread constituting a town and its adjoining urban outgrowths (OGs), or two or more physical contiguous towns together and any adjoining urban outgrowths of such towns. Examples of outgrowths are railway colonies, university campuses, port area, military camps etc. that may have come up near a statutory town or city but within the revenue limits of a village or villages contiguous to the town or city. For Census of India 2001, it was decided that the core town or at least one of the constituent towns of an urban agglomeration should necessarily be a statutory town and the total population of all the constituents should not be less than 20,000 (as per 1991 Census). With these two basic criteria having been met, the following are the possible different situations in which urban agglomerations could be constituted.

(i) A city or town with one or more contiguous outgrowths;
(ii) Two or more adjoining towns with or without their outgrowths.
(iii) A city and one or more adjoining towns with their outgrowths all of which form a continuous spread.

(3) *Out Growths (OG)*: An Out Growth (OG) is a viable unit such as a village or a hamlet or an enumeration block made up of such village or hamlet and clearly identifiable in terms of its boundaries and location. Some of the examples are railway colony, university campus, port area, military camps, etc., which have come up near a statutory town outside its statutory limits but within the revenue limits of a village or villages contiguous to the town. While determining the

outgrowth of a town, it has been ensured that it possesses the urban features in terms of infrastructure and amenities.

(4) *Usual activity status considering principal and subsidiary status taken together*: The usual status, determined on the basis of the usual principal activity(refers to activity status of a person during reference period of 365 days preceding the date of survey, the activity status on which a person spent relatively longer time during 365 days preceding the date of survey) and usual subsidiary economic activity (refers to a person whose usual principal status was determined on the basis of the major time criterion could have pursued some economic activity for a shorter time throughout the reference year of 365 days preceding the date of survey or for minor period which is not less than 30 days, during reference year) are taken together, and considered as the usual activity status of the person and is written as usual status (ps+ss). According to the usual status (ps+ss), workers are those who perform some work activity either in the principal status or in the subsidiary status. Thus, a person who is not a worker in the usual principal status is considered as worker according to the usual status (ps+ss), if the person pursues some subsidiary economic activity for 30 days or more during 365 days preceding the date of survey.

## 9.7 Results and Discussion

Table 9.1 shows the population of four largest urban agglomeration of India that is of Greater Mumbai, Kolkata, Delhi, and Chennai since 1951–2011. It shows that since 1951 Kolkata was the only city having high population of 4.67 million, but after 1981, it starts declining gradually. In 1991 Greater Mumbai holds the first place among UA having 12.6 million populations pushing Kolkata at 11 million populations (Refer to Table 9.1). Chennai is the third most populated UA having 8.6 million populations. Another drastic change occurred when Delhi crossed Kolkata and occupied the second place in 2011 for the fact of attracting huge influx of migrants from other part of the country. Kolkata registered the growth of only one

**Table 9.1** Population of four largest urban agglomerations of India, 1951–2011

| | Population in millions | | | | | | |
|---|---|---|---|---|---|---|---|
| Urban agglomeration | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
| Greater Mumbai | 3.22 | 4.52 | 6.59 | 9.42 | 12.60 | 16.43 | 18.41 |
| Kolkata | 4.67 | 5.98 | 7.42 | 9.19 | 11.02 | 13.21 | 14.11 |
| Delhi | 1.44 | 2.36 | 3.65 | 5.03 | 8.42 | 12.88 | 16.31 |
| Chennai | 1.54 | 1.94 | 3.17 | 4.29 | 5.42 | 6.56 | 8.70 |

*Source*: (i) Census of India 2001, series I, India, part II Table-A4, Towns and urban agglomeration with their population, Registrar General and Census Commissioner, India, New Delhi. (ii) Census of India 2011, (http://www.censusindia.net)

**Table 9.2** Annual exponential growth rate of four largest UA of India, 1951–2011

| | Annual exponential growth rate (%)[a] | | | | | |
|---|---|---|---|---|---|---|
| | 1951–1961 | 1961–1971 | 1971–1981 | 1981–1991 | 1991–2001 | 2001–2011 |
| Greater Mumbai | 3.4 | 3.8 | 3.6 | 2.9 | 2.7 | 1.1 |
| Kolkata | 2.5 | 2.2 | 2.1 | 1.8 | 1.8 | 0.7 |
| Delhi | 5 | 4.4 | 4.6 | 3.8 | 4.2 | 2.4 |
| Chennai | 2.3 | 4.8 | 3 | 2.3 | 2.1 | 2.8 |

*Source*: (i) Census of India 2001, series I, India, part II Table-A4, Towns and urban agglomeration with their population, Registrar General and Census Commissioner, India, New Delhi. (ii) Census of India 2011, (http://www.censusindia.net)
[a]It also includes new towns and outgrowths

**Table 9.3** Density (per $km^2$) of four largest UA of India, 1981–2011

| | Total area in per $km^2$ | | | Density per $km^2$ | | | |
|---|---|---|---|---|---|---|---|
| Urban agglomeration | 1981 | 1991 | 2001 | 1981 | 1991 | 2001 | 2011 |
| Greater Mumbai | 589 | 1,041 | 1,135 | 16,010 | 12,101 | 14,478 | 16,222 |
| Kolkata | 857 | 901 | 1,034 | 10,732 | 12,255 | 12,776 | 13,653 |
| Delhi | 581 | 658 | 889 | 9,916 | 12,862 | 14,490 | 18,357 |
| Chennai | 174 | 174 | 174 | 24,362 | 30,698 | 37,703 | 49,977 |

*Source*: (i) Census of India 2001, series I, India, part II Table-A4, Towns and urban agglomeration with their population, Registrar General and Census Commissioner, India, New Delhi. (ii) Census of India 2011, (http://www.censusindia.net)
*Note*: As data on total area of 2011 for different UA are not available so for that total area of 2001 is only used

million during the intercensal period 2001–2011 which is very less compared to previous periods and other largest UAs.

Table 9.2 reflects the growth pattern of four largest UA which shows that Delhi's growth rate oscillated between 4 and 5 % until 2001. During 2001–2011, the growth rate decreased considerably to about 2 % per annum because of the spread of the population in the peripheral towns such as Tigri, Badli Rohini, and Mayur Vihar, Trilokpuri. In case of Kolkata, its growth rate is declining continuously and reached almost to the situation of below the natural growth of the state which was 1.59 % in 2005–2006. However, the position of Chennai is somewhat unstable as in earlier census first it develops, then declines and again now in recent census it shows a sign of increasing growth rate.

Table 9.3 shows the density of the population in four largest UAs. Note that the density of Chennai is highest among four largest UAs. As per the total area under Chennai UA is very less, that is only 174 $km^2$, on the other hand, its population is also less, but the fact is that its area did not change since 1981, and with its increasing population size, Chennai acquired to become an UA with one of the highest density of population. In case of Greater Mumbai, density of population decreased from 16,010 persons/$km^2$ in 1981 to 12,101 person in 1991. Expansion of

**Table 9.4** Number of towns in Kolkata UA by size class of towns, 1981–2011

| Population | Number of towns | | | |
|---|---|---|---|---|
| | 1981 | 1991 | 2001 | 2011 |
| >0.5 million | 2 | 2 | 2 | 2 |
| 0.1–0.5 million | 12 | 22 | 31 | 33 |
| <0.1 million | 115 | 104 | 66 | 87 |
| Total | 129 | 128 | 99 | 122 |

*Note*: Calculated by the author

the total area in Greater Mumbai UA from 589 $km^2$ in 1981 to 1,041 $km^2$ in year 1991 was the reason for this decline in density of the population in Mumbai UA. In case of Kolkata, its density was more or less stable between 1991 to 2001, but in 2011, density increased at a slow rate as area also increased from 901 $km^2$ in 1991 to 1,034 $km^2$ in year 2001 (see Table 9.3).

Table 9.4 shows the number of towns in Kolkata UA by their size class. Towns have been classified in three categories (>0.5 million, 0.1–0.5 million, <0.1 million). The number of towns/cities remained almost same in 1981 (129 towns), 1991(128 towns) and census 2011 (122 towns). Only in census 2001 the number of towns declined to 99. Actually number did not decrease in real term, but in 2001, the outgrowths of the city are clubbed together in the Municipal Corporation or with the Municipality which cause the main reason for the decline. Twelve new towns also emerged during 2001–2011 such as Banupur, Domjur, Kamranga, Khantora, Noapara etc. It shows that Kolkata is not spreading in terms of increase in the number of towns, and the phenomenon of emerging of new towns at the space of Kolkata is not so evident. The towns which have population more than 0.5 million that is big towns are Kolkata and Howrah which comes in first category of big size of town, in every census period. The number of intermediate size of town is on a sharp increase, in 1981, their number was 12, in 1991, it went up to 22, in 2001, it was 31, and in 2011, its number was 33. The number of small size towns was on decrease simultaneously; in the census 1981, its number was 115, and in census 2011, its number declined to 87. It shows that with the process of urban growth in Kolkata UA, new towns are not emerging at the space, but the urban growth is getting concentrated mostly in the existing towns. Thus with this process, the town belonging to the lowest category is shifting into the intermediate category.

Table 9.5 reveals the size of towns and its share over time in Kolkata UA. It clearly shows that the town having a population greater than 0.5 million, in which two largest cities of Kolkata UA (Kolkata and Howrah) is being included; their contribution in total population of the UA is decreasing sharply. In 1981, both of them contributed around 53 % of the total population, in 1991, it came down to 49 %, in year 2001, it was 42 %, and in 2011, it was nearly 40 %. In contrast to this, the intermediate towns having population 0.1–0.5 million is gaining the share of the population in every census. In 1981, its population was 21 %, in 1991 its share reached 30.9 %, in 2001, it was around 48 % and the year 2011, it crossed the mark of 50 % (see also Fig. 9.2). The population share of small towns on the other hand,

**Table 9.5** Distribution of population in Kolkata UA by size class, 1981–2011

| | Population size categories | | | |
|---|---|---|---|---|
| | Population >0.5 million | Population 0.1–0.5 million | Population <0.1 million | Total |
| *1981* | | | | |
| Population size | 4.87 | 1.95 | 2.37 | 9.19 |
| Percentage | 53.01 | 21.19 | 25.8 | 100 |
| *1991* | | | | |
| Population size | 5.35 | 3.36 | 2.18 | 10.88 |
| Percentage | 49.17 | 30.84 | 19.99 | 100 |
| *2001* | | | | |
| Population size | 5.56 | 6.32 | 1.3 | 13.18 |
| Percentage | 42 | 47.98 | 9.84 | 100 |
| *2011* | | | | |
| Population size | 5.56 | 7.09 | 1.46 | 14.11 |
| Percentage | 39.39 | 50.25 | 10.36 | 100 |

*Note*: Only commons towns/cities are taken for all the census year from 1981 to 2011

is on the sharp decline; the small towns bearing population less than 0.1 million is contributing around 26 % in 1981, but it came down to 10 % of the total population of the Kolkata UA in 2011. It seems that the population share of intermediate towns in Kolkata UA has increased mainly due to increase in number of intermediate towns, instead of high growth rate of towns in this category.

Table 9.6 states about the workers who perform some work activity either in principle status or subsidiary status. Thus, persons who are not a worker in usual principle status is considered as workers according to usual status if the persons pursues some subsidiary economic activity for 30 days or more during 365 days preceding the date of survey (NSS 2004–2005). So it clearly reflects that numbers of usually employed males in Howrah are increasing by 1.9 % during year 1999–2000 to 2004–2005. In the female side also the number has stridently increased by 9.1 % during the same year as earlier. In contrast Kolkata usually employed males had decreased by 2.3 % during the year 1993–1994 to 1999–2000 and 2.9 % during 1999–2000 to 2004–2005 (see Table 9.6). In case of female in Kolkata city, it is growing at a sluggish pace. So while studying employment situation in core cities of Kolkata and Howrah, it can easily be conceptualized the condition of unemployment scenario in the main core cities. The cities are not generating the employment opportunity. On the other side, female participation is increasing in both the cities which show a good sign of development. It describes cities employment scenario in a different kind of development in which male employment is decreasing, and female participation in work is increasing.

Table 9.7 shows the annual growth rate of towns and cities in Kolkata urban agglomeration. The towns and cities have been divided into core and periphery in which core area includes only two cities that are Kolkata and Howrah (see Fig. 9.3 also). On the other hand, peripheral areas include all others towns having

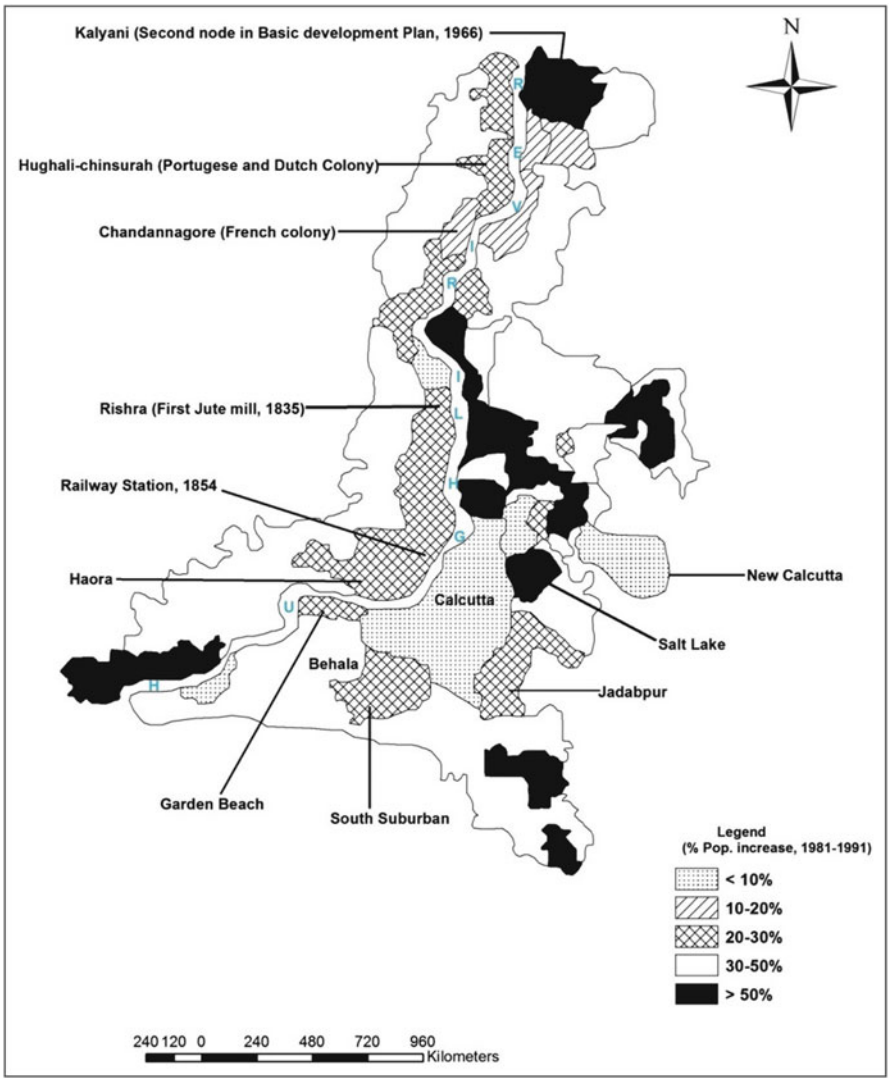


**Fig. 9.2** Percentage change in population in 1981–1991 with some important historical places in Kolkata UA. *Source*: Adapted from Chakravorty (2000), p. 68

**Table 9.6** Number of usually employed person per 1,000 person aged 15 years and above according to principal and subsidiary status of Kolkata and Howrah city, 1993–1994 to 2004–2005

| | Male | | | Female | | |
|---|---|---|---|---|---|---|
| City | 1993–1994 | 1999–2000 | 2004–2005 | 1993–1994 | 1999–2000 | 2004–2005 |
| Howrah | N.A | 760 | 779 | N.A | 67 | 158 |
| Kolkata | 803 | 780 | 751 | 183 | 187 | 190 |

*Source*: NSS Report No. 520; Employment and unemployment situation in cities and towns in India, 2004–2005

*Note*: N.A denotes that the city was not a class- I city

**Table 9.7** Annual growth rates of core and periphery region of Kolkata UA (in %)

| Distribution of regions | 1981–1991 | 1991–2001 | 2001–2011 |
|---|---|---|---|
| Core (Kolkata and Howrah) | 0.94 | 10.03 | −9.64 |
| Periphery (All others towns) | 2.69 | 2.74 | −0.65 |

*Note*: Only common towns are taken, drastic increase in the growth rate in the year 1991–2001 in core areas is because of increase in the area size of core region

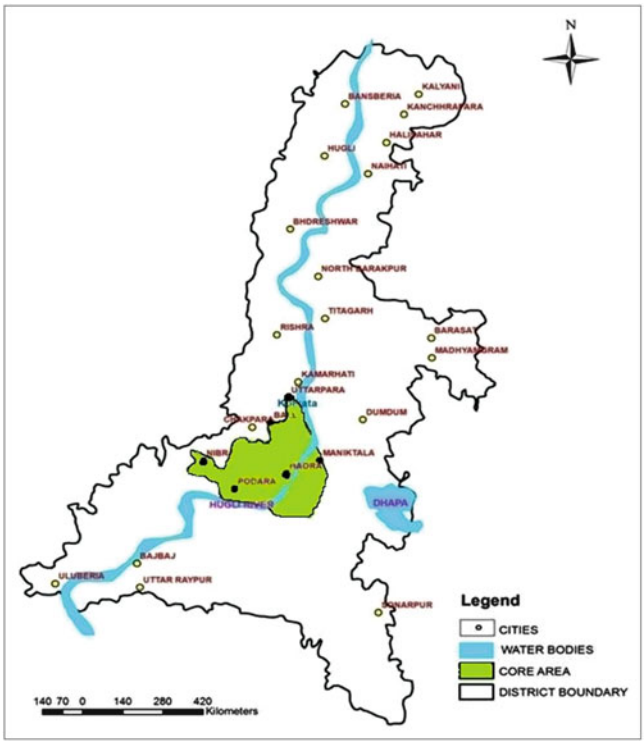


**Fig. 9.3** Kolkata UA: its core and periphery

population more than 0.1 million which are common in all census year. In 1981–1991, the growth rate of the core area was 0.94 % per annum which increased to 10.03 % per annum in year 1991–2001 because of increase in area from 203 to 219 km$^2$, but drastically decreased to −9.64 % per annum might be for the reason for using same area of 2001. On the other hand in case of peripheral areas the growth rate was 2.69 % per annum during year 1981–1991, it further increased slightly to 2.74 % per annum in the year 1991–2001 and further down to negative that is −0.65 % per annum. Thus, overall analysis shows a decrement in the growth rate of both core and peripheral areas of Kolkata UA only common towns.

Table 9.8 explains about the density of core and periphery which explains a very slow increment in the density of the core and peripheral areas despite an increase of

**Table 9.8** Density of core and periphery region

| Areas | 1981 | | 1991 | | 2001 | | 2011 | |
|---|---|---|---|---|---|---|---|---|
| | Area | Density | Area | Density | Area | Density | Area | Density |
| Core | 202.87 | 20,506 | 205.34 | 21,914 | 219 | 25,540 | 219 | 25,441 |
| Periphery | 498 | 8,684 | 517 | 10,947 | 593 | 12,539 | 593 | 11,758 |

*Note*: Only Kolkata and Howrah are taken in core area while all other common towns from 1981 to 2011 having population more than 0.1 million are taken in peripheral areas. (Area is in $km^2$ and density is denoted by per $km^2$)

**Table 9.9** Correlation matrix of attributes of cities and towns of Kolkata UA, 2011

| | Growth rate 2001–2011 | Log population in 2001 | Density 2001 | Distance |
|---|---|---|---|---|
| Growth rate 2001–2011 | 1 | −0.07 | −0.72** | −0.42* |
| Log population in 2001 | −0.07 | 1 | 0.19 | −0.17 |
| Density 2001 | −0.72** | 0.19 | 1 | 0.26 |
| Distance | −0.42* | −0.17 | 0.26 | 1 |

*Source*: * Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)
*Note*: Here distance refers to the core and peripheral regions

area size. It clearly indicates that population concentration is not so high in core and periphery of Kolkata UA, as a comparison to other urban agglomeration in India (e.g. Mumbai and Delhi) as due to the very fact of low growth rate in this city as well as owing to the fact of low attraction towards this city.

Table 9.9 illustrates the correlation between growth rate of cities and towns with different attributes of the cities and towns such as area, population and distance in Kolkata UA in 2001–2011. It shows that growth rate of cities and towns has a strong negative relationship (−0.7) with its density (see Table 9.9); it means that dense urban centres has grown with slowest pace. Again growth rate has a negative relationship with distance, but the relationship is not very strong (−0.4). It means that as the distance of town from the core increases then growth rate starts declining. This raises an important issue of spatial organization of population dynamics, employment opportunity and real estate growth in Kolkata UA compared to other big UAs of India.

## 9.8 Key Findings and Conclusion

In the context to urbanization it has been observed that for much of this century, the Indian urban system was dominated by four metropolitan cities namely Mumbai (Bombay), Delhi, Kolkata (Calcutta) and Chennai (Madras). Delhi as national capital and others served as a regional capital and acted as a central place for a

vast rural hinterland. Since the 1960s, these four cities have grown both in population and size of their metropolitan areas. While their regional importance continues unabated, they have now to contend with the emergence of other centres of urban growth at smaller metropolitan cities such as Bangalore, Hyderabad and Pune. The opening up of the Indian economy since 1991 has stimulated the development of such cities and led to the creation of new hubs of urban growth centered on the manufacturing computer software, electronics and related sunrise industries. It has also had a differential impact on the four dominant cities of the past. While Delhi remains important nationally as the seat of administrative power, Mumbai, the country's financial centre, has experienced rapid growth and is aspiring to become a global city.

The processes of centralization of finance and related services in Mumbai are discernible, and they are leading to a restructuring of land uses and jobs in its business district. Calcutta and Chennai continue to remain cities of the first rank in their regional contexts, but nationally the importance of the former as a centre of business and industry is falling. The four metropolitan cities saw differential rates of growth during the 40 years prior to economic liberalization in 1991, but the opening up process since then have clearly heightened the pace of differentiation. Liberalization has affected cities directly through the reduced involvement of the central government in the economic management of the states. Calcutta in fact has experienced a continued industrial decline since the 1960s and the movement an outward of major private sector companies continues. Each of the four largest Indian cities located in a different region of the country. It has been observed that the metropolitan cities located in less developed states/regions have inevitably grown slower than those in more dynamic regions. Calcutta's location in the eastern region, the less developed part of the country, can explain in part its lack of attractiveness to new business and investment.

The present study reveals that the growth rate of Kolkata UA is on the decline in every successive census period and now reached below the natural growth rate of the state. The main Kolkata city and many other towns are experiencing even negative growth rate. In this situation, new towns are not emerging at the space and only existing towns are contributing in the growth of the urban agglomeration. As it is commonly observed that as urbanization expands outward from core, cities and towns of intermediate and small towns grow with the fastest pace but, the 2011 census shows that most of the intermediate and small towns have experienced either negative or very slow growth rate in Kolkata UA. From the previous research and theories about life-cycle of the city, it is understood that as size of the city increases, its functional linkages to the adjoining towns and cities also get strengthened and urbanization spreads over space. The findings from the present research show a decline of the population in the core and periphery of Kolkata UA. In the context of deindustrialization of Kolkata, it is expected that the functional linkage may also getting weakened.

The findings depict a dismaying picture of decline in Kolkata city and indicate that to develop Kolkata as a 'Global city' and to regain the glory of its past needs lots of effort to revive it.

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# Chapter 10
# Local Action Planning for Pro-Poor Urban Governance in the Southern Megacity of Chennai, India

**T. Vasantha Kumaran and Divya Rajeswari Swaminathan**

**Abstract** This paper is about the poor of Chennai and in fact slums and how they may be governed by themselves. The paper recognizes that the poor are not only the majority on the planet; they are everywhere and the smallest event speaks of them. And the urge on our part to speak about them—about what they can do and how they may excel in their own governance—is because of the urge they show up to live like the others and, interrupted by moments of illumination in their life of constant grief, *to hold hands with other people*. This paper retells the story of how a slum community rose to the occasion of self-organizing for its own development through efforts of its own members in the last few years. It is indeed a serious time period in which the pro-poor policies are emerging. And '*there is a ceaseless spatial negotiation which is considerate or cruel, conciliating or dominating, unthinking or calculated*', to borrow the words of John Berger. Inside the homes of the poor, there is the kindly exchange, accommodation, *even physical, and psychological* sharing. But, outside of their homes, the space of choices is limited. And in slums of Chennai, every choice is starker. We live in a time of considerable change, which has placed new demands on local governments and raised a number of questions about the ability of these institutions along with other levels of government to address and resolve the problems that arise within contemporary communities. Traditional local governments are being questioned about the ability of their existing expert-driven and fragmented planning processes to resolve the problems that arise within contemporary communities. This has triggered the emergence of local government planning processes aimed at supporting more integrative and inclusive forms of planning that engage public, community and private sector players. This paper provides insights into the emerging local action planning processes from a case study of a Chennai slum which in fact enabled a

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broader range of players to participate in determining how the slum community self-organized to show the slum people's capabilities in working together for their own betterment and governance of *little that does matter for the community*. Drawing on the case study of a slum, the paper provides insights into the problems and possibilities that the slum communities face in their attempts to make the city an *inclusive city* that supports the development of more integrative and inclusive forms of planning within contemporary Indian urban milieu.

**Keywords** Chennai • Life on margins • Local action planning • Pro-poor policies • Sense of place • Urban governance

## 10.1 Introduction

This paper is about the poor of Chennai and in slums and how they may be governed, by self-governance. The paper recognizes that the poor are not only the majority on the planet; they are everywhere and the smallest event speaks of them (Berger 2008). And the urge on my part to speak about them—about *what they can do and how they may excel in their own governance*—is because of the urge they show up to live like the others and, interrupted by moments of illumination in their life of constant grief, *to hold hands with other people*. This paper retells the story of how a slum community rose to the occasion of self-organizing for its own development and governance through efforts of its own members in the last few years.

This paper also provides insights into the *emerging local action planning processes* from a case study of Chennai slums which enabled a broader range of players to participate in determining how the slum community self-organized to show their capabilities in working together for their own betterment and governance of *little that does matter for the community*. The paper provides insights into the problems and possibilities that the slum communities face in their attempts to make the city an *inclusive city* that supports the development of more integrative and inclusive forms of planning within contemporary Indian urban milieu.

## 10.2 The Scenario: Life on the Margins

Put yourself in a situation where the place you live in is, administratively, '*objectionable*', according to the dictates of the local government. It is objectionable that the city government, the Corporation, would deny you access to basic services such as cleaning the streets of garbage and street lighting. It (the city government) would keep threatening you, your family, and also your community, saying it would sooner destroy your hut and *raze* the place down so that you will be without a

home or residence. It would keep telling you that it would *devastate* you and your people and your place anytime and keep you guessing as to when it would relocate you, somewhere, and indeed anywhere, because you can't have peaceful life there, can't make your living there, because you would have lost your very livelihoods, because it would be far away from the place and milieu you are familiar with and people you are comfortable to live and work with because of the social networks you would have developed.

In short, in your own place you are already an *objectionable person* yourself, and you have any number of things happening around you, making it impossible for you to forget the fact '*you have indeed no place to go except here and that this place is not somehow yours, and the local government or some officials of that government machinery would be constantly nagging you and the community you live in to 'get set and move on' for this is not your permanent home*.'

And besides, you are poor and marginalized too. You have a family, with many children but no regular and proper job. But you make money all right, in good measure, but lose it on vices: *gambling, alcohol and what have you*. And you *live* for today, for you don't know what tomorrow has in store for you and you are not even sure where you will be tomorrow—here or someplace else which is not your own and not your choice. But yet, you have always lived in here since your birth, and some of your people have lived in as long as 60 or 70 years. In the years of your living here, the place has become bigger (too many people for your own liking), more congested and crowded (at the washrooms, water tap, ration shops and almost everywhere), accommodating people who came from your own rural and urban *roots*—the places you still go to because you have friends and relatives there.

But some of you have lost your roots—you know you have people there, but you don't have contacts with them, lost them and they have lost you, as well. Your roots have already become a '*thing of the past*' of which you remember so little and your memory is failing so much that you have just a '*blur*' of an idea about your roots. Your problem is that you have stopped going there so long ago that you don't feel you *belong* there anymore. Your roots are here now, but you can't hold it as your very own. It *is* your place and here is your milieu but you're definitely *not* the holder. Someone from the government keeps telling you that *you don't belong here* and *you must someday vacate*.

## 10.3 The "Margins"

A fully functioning community provides the *experience of beauty* for its people, say, in Chennai. But what kind of experience, and what kind of beauty, do we experience in Chennai slums? And what indeed are the experiences of men, women and children of the slums? We are sure that they are all happy sometimes in their lives, with full of smiles when there are *deep, open wounds* in their hearts. It is often

a situation that they can't openly speak of their *aches or laugh out loud* for their tendency is to hide troubles from others.

The "margins", the slums for us, are a *dilemma of differences*, in their cultural, social and spatial manifestations and offer a challenge to our ways of thinking. But the 'marginality' is not so much a *site of deprivation* but more *a site of radical possibility*, a space of resistance and '*giving voice*'. We do see *our* people on the edge, occupying the realistic margins and we firmly anchor them in their *sense of place* (*place essentialism*) and engage them as communities flourishing '*in place*', for only in place can they encounter the *possibility of past and future, of nearness and distance, of temporality and spatiality*: only in their complex unity of place, community engagement and culture become possible. It is here learning from the "*margins*" becomes salutary (see Breman 2007 for contrasting account of life on the margins).

Marginalized people are those on the 'edge of the world'. *And they are sometimes the elemental values of life: that is, it is from them we fully understand our space and freedom, sun and clean air, the cold majesty of the mountains and the loneliness of the plains, the gaiety of folk dance, and the easy friendliness of the people. These are the "margins" around the (sometimes) fretful business of earning a living.*

## 10.4 Sense of Place

'*Sense of place*' is a trendy phrase. The sense of place leaps readily to mind, becoming a *thought substitute*. The phrase "*sense of place*" has caught on because we live in an age when *authentic regional cultures that link people and places in a robust web of art and memory* have been neglected. We also live in a time that we feel we are losing contact with nature, with each other, and maybe with reality itself. *We can't feel we really exist if we can't find a real place.*

'*Sense of place*' is a hungering for a *reality that satisfies*. Older folks, and their generations, had a good sense of place, though they would not have thought about it as we do today, not having experienced the sense of *placelessness,* a curse of modernity. For us, sense of place matters, very profoundly, for their sense of *placelessness* is real. For they are there; and of course they are *not* there: that is the '*objectionable*' part of their existence. Amid the laments about their current troubles, however, it is helpful to remember that Chennai has remade its cultures repeatedly.

Today, sense of place is changing dramatically. Chennai is in an awakening to possibilities that didn't exist a decade ago. Are the slum people in the midst of some awakening? The slum people are awake to realities, possibilities and changes. But the changes they are looking for are both happening and are *not* happening. As possibilities change, so too must their *culture*.

Humans by nature are *culture-creators* and many of the psychic afflictions we feel are caused by delegating too much of the creative work. We hanker to participate in creating the *culture* we inhabit (see Massey 1994); and have we then created the culture of slums, deliberately?

## 10.5 Community Engagement

To become active participants in culture, we need to do creative work, learning through discussions and critiques to *self-organize, self-monitor and self-evaluate*. We derive our creativity from life. Mainstream views of creativity are set in certain norms. If you write, act, make films, sing and do a hundred different things which others feel difficult to do, you are creative. But life is creative. Life in the slums is creative too. *You need creativity to jump onto a running bus, to hang onto a local train in Chennai, to cook curry. All protest is creative* (K.P. Sasi, as told to Sengupta 2007). To make an impact, you have to protest in a creative manner.

So, what do we do, as a people and a community, and what do we see in such venues? We need an *education* that prepares us to create a culture that provides the *goods we most want*. We want such a culture in place for the slums (Fig. 10.1).

If you are to shape your own destiny, you indeed need an "*engagement*" that would take you beyond all those *pre-formulated* experiences, shaped for you by others. You need to observe and take notes, making the first drafts of culture.


**Fig. 10.1** Anjukudisai on Cooum, Chennai

You need direct encounters with nature, with historic sites, and with people who do and have done real work. In other words, you need to encourage "*community engagement*", an engagement that takes your sense of place seriously. And it is true that you have not yet found the best way to live in Chennai. But your culture is still young and the future beckons, as vast and deep as you—we—dare to see.

Different people act at different levels. There are hundreds of ways that people can help. We believe that people respond to stimulus. A discussion is a process. You need several processes like that. Community engagement is a way to consistently creating the space for such discussions. Community infuses resistance to inequities—unfairness, injustice, discrimination, inequalities, biases, disproportions and imbalances, yes, every negativity—with creativity and does justice to the people (Harvey 1973, 1992).

## 10.6 A Little that does Matter and a Lot that Doesn't

Inside the homes of the poor, there is the kindly exchange, accommodation, *even psychological* and *physical* sharing. But, outside of their homes, the space of choices is limited. In the slums of Chennai, every choice is starker. The choices for women and girls are even more starker than those for men and boys: men and boys are relatively better off (after all, a slum is a patriarchal society) and absolutely worse off (because of the vices they are part of, and are given to, and the violence they inflict on women and girls and, sometimes, on other men and boys too).

The little we know of the people of the slums lays bare the hypocrisy of men and the larger society: women and girls, and older people, face the darker side of life. They survive through silence, their mental strength supporting them throughout. In adversity, they do nurse their aspirations—women aspire for a better life for their children—and children dream of a better life for their mothers and grandparents—and survive the longing of their childhood friends, upholding warmth in behaviours towards men and, despite everything, they care for their husbands, sons, fathers: their priority is their lives not their own pleasures (see Gopalakrishnan 2007, p. 5).

## 10.7 Reinventing Local Action Planning for Pro-Poor Governance

We live in a time of considerable change, which has placed new demands on local governments and raised a number of questions about the ability of these institutions along with other levels of government to address and resolve the problems that arise within contemporary communities. Traditional local governments are being

questioned about the ability of their existing expert-driven and fragmented planning processes to resolve the problems that arise within contemporary communities. This has triggered the emergence of local government planning processes aimed at supporting more integrative and inclusive forms of planning that engage public, community and private sector players.

Disadvantage is concentrated in city slums and it has become a widespread characteristic of most modern cities as well, across the world (see Prior 2007b). In the face of this emerging disadvantage, we have sought to understand the multidimensional nature of the problems facing the slum people in the disadvantaged urban localities. Our concern for the disadvantaged has been growing not only for understanding the factors that cause these disadvantaged areas, but also the extent to which policies and initiatives could help to combat the problem. We are particularly concerned with the seething anger amidst the people and their well-known dislike for personnel of the local city government, the City Corporation.

Without doubt, cities have undergone significant social, economic and demographic changes over the past few decades. We understand that the socio-economic advantages and disadvantages the city people experience today are associated with the processes of globalisation, economic and technological restructuring across cities. They are not evenly distributed, either. The *social and spatial polarization* of the Indian cities, as well as the growth of areas of significant disadvantages, has occurred at the level of neighbourhood as a result of the restructuring processes. Slums are characterised by high levels of disadvantage. Chennai city itself manifests such areas of disadvantage throughout the city, with more than 2,000 notified slums and several hundred '*objectionable*' slums. When compared to other Indian cities, the disadvantages in Chennai are less intense, but the fact is that socio-economic differences are highly localized, and even street by street in some inner city and suburban neighbourhoods.

The *National Urban Renewal Programme* of India is probably a group of policy responses, developed to address localized disadvantages. Renewal as a concept has taken on currency almost everywhere in the world, including India (Randolph 2004; Katz 2004). '*The 'renewal program' policy response continuum over the years has seen a shift from wholesale or substantial asset disposal including demolition and redevelopment predominately within areas of high public housing concentrations; asset or physical improvement strategies; government approaches involving 'place management' with a focus on integrated service delivery by agencies, community; social and economic development strategies aimed at building community cohesion, social capital, employment and skills opportunities, and early intervention strategies*' (see Prior 2007b). In Australia, for example, renewal has turned out to be both 'urban' and 'community' renewal, the former referring to activities such as the physical upgrading of properties and neighbourhoods and the latter denoting social and economic community development activities (Prior 2007b; Randolph 2004).

A *traditional approach of planners* has been that physical upgrading promotes '*a nice living environment that fosters nice people*,' based on a belief in environmental determinism. Physical renewal has thus emerged as a planning activity in the decades since the 1950s through the mass renewal of public housing based on

modernist inspired, formalist physical solutions to urban decay. Recent renewal has embraced *new urbanism*, an orientation resembling much of the earlier planning approach aiming at using spatial relations to create a close-knit social community that allows diverse elements to interact: a variety of building types, mixed uses, intermingling of housing for different income groups, and a strong privileging of the "public realm".

We have doubts as to how the urban renewal programme may resolve the problems of urban disadvantages, unless the people participate in them on a large scale, throughout the country, and with investments on renewal of their own housing and other structures. It is possible that the renewal programmes may address some of the symptoms of disadvantage, but certainly will not address the underlying causes, such as socio-economic marginalization of the people in the disadvantaged areas such as slums and lower and upper middle-income localities. The programmes may improve the place but only at a cost to the community. True initiatives aimed at improving social and employment aspects of disadvantaged localities will become prominent within the renewal programme. This will certainly usher in concepts such as social capital, social exclusion and inclusion, as indeed these terms are already popular in respect of globalization and business process outsourcing experiences in various cities, including Chennai.

However disadvantaged, an individual in a slum needs access to economic capital to provide sustenance and self-esteem. He or she also needs cultural, or informational, capital for appropriating valued cultural products. Cultural capital is also related to having '*roots*': the feeling of belonging to 'the place you call home'. Social capital consists of totality of resources an individual or group has access to by virtue of being networked in the urban spaces through membership in a group or community. Of course, all different forms of capital are integrated with each other. And the concept of *capital* in disadvantaged communities has attracted much interest in India.

Awareness of capital has already led to some interesting policy developments aimed at increasing community self-help and capacity building through social networking. Self Help Groups of men and women in rural and urban areas of India are a testimony for building economic, cultural and social capitals. Rural and urban development policy makers have now adopted the term 'exclusion' to mean the multidimensional nature of the problems facing the people of disadvantaged areas. According to Power and Wilson (2000, p. 1):

> Social exclusion is about the inability of our society to keep all groups and individuals within reach of what we expect as a society.

*Social exclusion* also encompasses economic and cultural exclusion. The concept is in effect related to poverty, but makes sense only in the broader perspective of citizenship and integration into the social context. *Economic exclusion* traditionally means such things as poverty, underclass and lack of economic resources secured through employment while *cultural exclusion* is indeed a marginalization from shared symbols such as ritual and discourse. The final aspect of exclusion is *political exclusion*, which relates to the lack of stake in power or decision-making.

Exclusion is indeed a framework for policy action, for it focuses on the interconnectedness of the problems of unemployment, poor skills, low incomes, poverty, poor housing, cultural fragmentation, limited access to participatory mechanisms and bad health.

In the light of the above, there is need for an alternative mechanism for redressing the problems of the disadvantaged urban spaces and local action planning can be a tool by which the problems of urban development and governance could be resolved. It can be recommended as an alternative means of development only if it has been proved to be a real alternative in some contexts.

We are discussing such a context in respect of a Chennai city slum where we have made efforts first to examine the possibility of applying an ecosystem approach to human health (2004–2005), then to help a slum community self-organise for resolving its own problems (2005–2006) and then to map the outcomes of the community self-organizing for resolving problems on its own (2007–2008). We have taken a *participatory pathway*, and *public-private partnership*, as promising pathways in development and governance in the city slums.

There are new demands on local governments and there are also a number of questions about the ability of the local institutions and other levels of government to address and resolve problems within contemporary urban, and slum and disadvantaged communities (Prior 2007a). Looking at the way planning and development has gone on in this country, there are critiques who question the way the governments, that is, rural and urban local governments, plan their communities. It is because the established planning processes are not something we could be proud of, from the way they produce outcomes 'on the ground' (see Prior 2007b). Master planning for Chennai, for example, has not so far resulted in any improvements 'on the ground', say, in traffic conditions in the city or in the solid waste management or in green building concepts (Swahilya 2007: 1).

## 10.8 Reinventing Local Action Planning: Why?

We are pained to think that there is absolutely no *urban governance* in the slums and also in most parts of the city. *If it was there, and that it could only achieve the conditions manifest in the slums today, then should we not seriously think of doing away with it and find an alternative that works?*

Why would we keep something, which hasn't proved useful, or somebody who has never been useful: that is, what they did or, in fact, didn't? We are indeed talking about our master planners, who have made master plans and implemented them at high costs (we haven't heard of any cost-benefit analysis of our master plans until now). If what we see in the objectionable slums are a pointer to *what they should've done but haven't so far*, then it is good *NOT* to depend on them for anything, for it amounts to wasting huge amount of resources that could be more usefully spent with some other people who could make not only good plans but also be cost-effective in their implementation.

We believe that there is a good reason why we must *reinvent local action planning*. Kini (2008) in a brief debate of his speaks of it. It goes like this: Indian cities do boast of wonderful urban spaces, evolved for people out of their own needs—what we may call *people-centric urban spaces*. However, the process of urbanization in the country has proved to be detrimental to the existence of people as social beings. The skewed development that Chennai represents is indicative of the fact that the planners have lost sight of the traditional understanding of urban spaces. As urban sprawl, infilling and sub-urbanization go on simultaneously, with little planning and no strict regulations, traditional open spaces along the riverbanks, open-to-sky courtyards, market places and festival grounds are eaten up quickly. Combination of privatisation of space and the threat of social fragmentation pose serious threats to democratic society and ways of life.

Urban social space is a must for existence of a just society. Growth and economic development of Chennai and the growth of slums have totally ignored the need for urban social spaces, in good quantity and adequate quality, within the urban fabric.

The inevitable question therefore is: *Why are we—the people and planners of the city—so rude to cityscapes?* Quality urban spaces and *people-friendly urban areas* (we are not sure whether slums are as people-friendly as we want them to be) are the primary requirements of any society. The right to space—built and open, good environment, quality air, safety and security are the fundamental provisions for the people, even slum people—why would we call them 'objectionable', when the slums hold people like us, people deprived of social justice, women and girls pushed to the walls by the violent and aggressive men and boys?

We believe that piecemeal urban development and speculative approaches of the urban planners to the habitat design (for a debate, consider: *why would a city development authority—the CMDA—allow private developers build violating regulations and then allow them to pay a fee for regularizing the violations?* Chennai has now become a model for cities in Orissa) have resulted in fragmented pockets of development, leaving a large part of the city develop a slum-like landscape—the general social qualities of spaces and volumes are forgotten. There is a total neglect of public realm in Chennai that healthy social groupings and development are not promoted: Chennai slums are indeed a manifestation of such neglect, by the planners, policy makers and the local government people (Jeyan 2008).

Suffice it to say that there is a total negation of social spaces within Chennai and the planners and implementers have proved *not worthy of the trust* we, and the government, have put in them: there is therefore every reason to go to local people and trust they would be able to do what the planners and implementers have failed hitherto to do: *reasonable planning and good governance*. There is thus need to reinventing local action planning, for making city life bearable for the poor and the marginalized, by their own efforts and perseverance.

## 10.9 Chennai Slum Case Study[1]

Let us quickly summarise what happened in the 4 years of 2004–2007 in the Chennai slums (Fig. 10.2) we are writing about. Name[2] is not important, but what is happening there right now is important (read Notes below and get back here to better understand the material discussed). Believe us when we say that it wasn't

[1] We are unable to fully report on the myriad activities that went on in the last four years nor are we able to give the readers a very comprehensive account of events, flows and disruptions that occurred during the entire project of three phases (ecosystem approach, self-organizational and outcome mapping phases). Suffice it to say that the project was very intensively carried out, in all its phases, with shortcomings and upheavals bothering us along the way with more or less in a continuous manner. We are trying to put *you* in/on *our feet* and make you walk the length and breadth of the Chennai field sites and take a *peek* into the minds of our people to feel the *pain and suffering* and be part of the *space for compassion* within which we have operated with so many people with all kinds of *comings and goings*. We also want you to take pride in what we have achieved, which is still in a way very small indeed.

[2] We are talking about *Anjukudisai*, which is a small slum located on the banks of the most polluted waterway, Cooum at Chintadripet, Chennai. It is an objectionable slum by the categorization of the Corporation. Its inhabitants are daily wage workers who work at the fish market. Women are mostly maid servants in the local middle class households. It has 250 mortar houses and 100 thatched huts. Hygiene levels are very low and the homes (they cannot be considered residences) are used for all purposes from cooking, washing, eating and to sleeping. With minimum of vents, it is haven for all germs. Garbage is dumped right next to the Cooum, which clog the drainages. There is always an unpleasant odour in the air and is also a natural habitat for worms and insects. Mosquitoes are a menace. In the beginning of the project, people were reluctant, indifferent and arrogant. Outsiders were, and are still to an extent, unwelcome.

There is a visible and gradual transformation now in the mindset of the people. They are indeed nice people, given to altruism of the highest order, and friendly and they do welcome the outsiders as long as they don't exploit them for their own good. After four years of our work, in their midst, with as many as 100 people as partners in various capacities, the children of the slum are clean enough and the youth have forgotten their old ways and are employed, in the city, and are making 'men and women of themselves' with respect for work and honesty. They are into their sports, with a cricket team now competing with the best of the city teams and winning laurels, under the aegis of the David Morley Cricket Club (named after one of our senior, Canadian researchers).

There is enormous potential hidden in the children and youth of Anjukudisai, waiting in the wings to be tapped and harnessed. In order to channelize their talents and potentials, various programs have been launched with self-organized groups of women, youth and children that the local action planning for community development has become a reality. Some of the activities that have been implemented involving children, youth and women in Anjukudisai are: summer training program for children, formation of CBOs, awareness camps (health, small savings, HIV/AIDS), health camps (diagnosis and prescriptions), tree planting, street plays, psychological counselling, skills and livelihoods training, youth sports and cultural activities and evening tuition classes, to name a few.

In fact, in the beginning, there were two slums, the other being Pallavan Nagar along the beach. It was also a small slum, a fishing community, right on the beach and land belonging to the Public Works Department. It was washed off by the December 2004 tsunami. Twelve people died. The survivors were moved to Kargil Vetri Nagar first and then to Tsunami Nagar and the project team continued to visit them and are still in contact with them although, they are now rehabilitated in VOC Nagar and Tilagar Nagar of North Chennai. The CBOs organised by them are still operative and they are also active in community development activities of their own.


**Fig. 10.2** Spatial distribution of slums in Chennai, with study sites

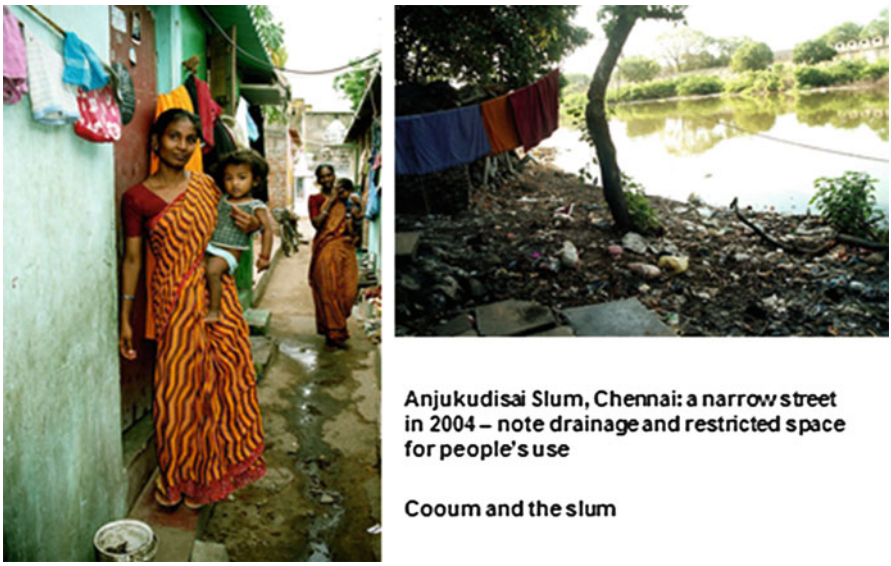


**Fig. 10.3** Slums in Cooum

easy to get to them and to get accepted, in the first place. Everyone was suspicious, and when you went with a white man, they thought that you were making money at their expense and out of them and that the white man paid us for bringing him to them and talking to them about their life and misery. For them, we were a *seller of miseries*, poverty and squalor. There was therefore an expectation in all of them when speaking to us. *They openly asked for that non-existent part of the money we made from the white man*.

When you first went, no men really came to ask you for what you were there for. Only women came to you, with a questioning look on their faces and the wrinkles on their foreheads making curious patterns, and children came but were hiding behind women's colourful clothes and wore shy smiles on their faces. When asked you said your piece and told them you were there to talk to them about their health and how the polluted waters of the Cooum caused problems for them and their children. But they were not interested and pestered you with more questions. More women and too many questions, you stayed for a while and left (Figs. 10.3 and 10.4).

You went again and this time with your (project) team members, quite a few of them and some women and still some white people, two men and a woman. They were even more curious. But they listened to you this time and some were even helpful with some answers. No man was in sight, except a few older people, minding their own businesses. You asked several questions and got good answers. You told them that you wanted to see their men and you were told that they would not meet with you. You insisted you wanted to see men and so they took you to some men and they were not interested.

Young married girls of Anjukudisai, with children

A family in Anjukudisai dependent on an informal eating enterprise

**Fig. 10.4** People on the 'Margins'

It was getting close to 5.0 p.m. and men were going away for their drinks. Some got back while you were still there. You made a mental note of never going there after 6.0 p.m.

You kept that promise for yourself and men were thankful for it. But they would not easily come to talk to you. They left women and children to talk to you. There was always a pattern to your visits and people you spoke to, in every one of your visits. It dawned on the team that the only better way to self-organize slum people was to approach women and youth and children, for they could be motivated, stimulated and made to listen to reason—a reason that is entirely ours.

You went then a few days later, looking for youth and adolescents. You found some huddled together, smoking and playing cards. Some distance away, a few were playing marbles and they were betting. They were gambling for money and foul-mouthing abusive language all the time while playing. You believed that *Tamil* is a rough language and ruffians'. One of the team—a youth himself—talking to them found that they had love for sports—cricket and caroms—and English. After several meetings, and cajoling, they showed real yearnings to leave vices alone and return to normal life. It took a real lot of cajoling and advice from their mothers, sisters and friends to wean them away from the vices. You had to work within the available and accessible *space for compassion*, and the resulting youth behaviour was indeed *affable* and *affordable*.

You did have moments of anxiety, not knowing which way they would turn: the hostile or the friendly, or the in-between, abusive but friendly. Women and children were a different matter. They became friendly, finding your ideas and compassion for their well-being good to listen to. They did listen to you, only after a long while, tossed in the meantime by the words afloat about what you could do and how you might destroy their social fabric. You were cautious, too, about getting too close and initiate everything yourself. You realized early on that you had limited space for manoeuvre and even more of a limited space for compassion. You wanted the manoeuvre and compassion to flow out of the people you were working with.

But you found more and more '*outsiders*'—NGO activists (EXNORA International was part of the team, primary stakeholders with you), strategic partners, college students, social workers, personnel of the Corporate Hospitals, even individuals with an avid interest in social work, churches and denominations getting involved in your work and contributing their time and energy for the people of the slums.

With collective effort, cooperation and sincerity, you were able to get the slum people to learn how to organize (self-organize) themselves and to think positively amidst the negativity (lack of enthusiasm, unconstructiveness, unhelpfulness, pessimism and disapprovals) of spaces, places and people. Working with them, with a commitment, involvement, compassion and genuineness, you found yourself in the midst of an emerging alternative: *you have reinvented local action planning to endure pain and to end the pain of your own people*. The lesson learned is that urban governance is better left to the local people. If they could do this—and travel thus far—you must let them go the remaining miles. And, wealth is only a veneer. There should be compassion in your mind to share your fellow humans' sorrows and sufferings. The people you work for have shown enough grit and tenacity to weave their own world with it.

## 10.10 Local Action and Urban Governance

In the 4 years of community engagement, we were able to show that the organizational efforts were distinctive in commitment to the direct involvement of slum people in the development processes. Various activities held in the slum identified few youths and women to voice their challenges, agonies, commitments and successes. CBO formation, awareness programmes, health camps, youth sports, children's club and skill training—all have introduced opportunities for community's self-organizing. In fact, the activities supported by the community were impressive throughout the 4 years. It was however a slow process that some of them were only sustained beyond the introductory stages. The emergence of active leaders amongst the youth and women were commendable.

Local actions became acceptable to the community with the summer camp for children in May 2006. We took them out and some of their moms. We showed them what outside world looks like. We showed them a thing or two in table manners, in public etiquette, in toilet behaviour. We took them to the planetarium and showed them how the stars looked like from inside of the giant, moveable dome. The children were wonderstruck. They were given a glimpse of what the outside life looks like. We walked with them across the road to the Children's Park and showed them lovely animals in the Park. We took *ugly* children and brought back *lovely* ones—all thirty of them.

Children became friendly and realized the value of cleanliness. Not only were they clean since then, but they also created awareness about the need for cleanliness in their homes and amidst men and women, and boys and girls. The people were now prepared to involve themselves in community development and

income generation activities. The youth organized floodlight cricket tournaments, successfully, becoming runner-up in one of the sincerely fought competitions with the local cricket clubs of Chennai. Women on the other had training in embroidery and were able to generate an impressive impact on the lifestyle of women of the slum. The community acquired an increased belief and confidence in its capacity to influence a future with a growing trust in each other.

Cricket tournament and embroidery training were the two best examples with which youth and women could share their experiences on sustainable self-management. Children were not left behind, either. We carried them along with us, all through. We showed them that we cared and they caught on with why they should care for others as well. We helped begin a tuition centre, and the money for it came from abroad. The NGO organised teachers and paid their salaries. Children began to learn the ways of the world. Mothers saw a faint light in the tunnel for their children. They walked with the children to the tuition centre and some stayed on at the door until the classes were ended. They brought the children home, listening to their constant chat. In their bosoms, they bore a light for their future.

Several moons and months passed. The community had clearly shown an *interruption of illumination*. We were able to show that each life had its own propensity for illumination and no two were the same. Illumination arrived by way of tenderness and eagerness for self and community development. For us, this illumination became a consolation of being recognized and needed and embraced for being what one suddenly was. Other moments were illuminated by intuition, despite everything, that the individuals of the community—youth and women and children and even some men—served for something.

Some drunken men did make trouble for us, because we had a street play showing alcoholism as bad. They came drunk and shouted at women and children and at us. But we brought more of the same and brought music to the streets and movies to the hearts. Street-smart kids became book-smart kids. Men, who never acknowledged our presence, began looking straight into our eyes. We saw for the first time that they had gleaming eyes. Things were beginning to grow easy on our conscience and theirs as well. Some had broad smiles, when we came into the narrow streets, and shook hands with us. Children joined in.

## 10.11 Health and Sanitation

In the last year, health and awareness really worked very well. The slum community warmly accepted the incorporation of the action theatre and other activities that provided non-traditional teaching. We worked so well that several things happened at once. A washroom became possible by the munificent grant from an individual. Although in the beginning there were problems of '*who would use the washroom*' and '*who would maintain it*', the problem was solved by women. Also there were demands for two more washrooms and the women were looking for private funds for building them. All women of the slums got together one fine morning, after breakfast, and decided on the locations for them. They had also decided about cleaning and building

a roof over the bathroom on the road. The local Councillor, for her part, got the Corporation people to clean the bathroom and the toilets for women and children.

Women were trained to repair the hand pumps if they failed. Women took turns to hold the responsibility of safeguarding the handle from being burgled or sold by insolent men for alcohol. Women took the handle away to their homes for safe keeping once the community collected the water for the day. They took turn also in repairing the hand pumps when required. Women took to cleaning the streets and maintaining order of a sort for the whole community. We took upon ourselves to take the youth group as well as active community participants from the slum to another slum where cleanliness had made a difference to the lives of the people there. This way the people could visually appreciate that there was a possibility of change for the better. We showed them that there were few areas in Chennai, which could be called '*clean slums*', and those places could be models for the people here.

The community changed drastically in their behaviour. We helped them grow with ideas for cleaning. We saw that the garbage used to be thrown in the Coum was dumped in the bins given out and we also taught them how to separate them and not throw by the river to have better hygiene and so the slum is now cleaner. But there is always more to do and we are always at hand for giving people help and advice. It was our effort (July 2007) that brought on the consensus that the community had taken the responsibility to the bathrooms and the toilets and men and women promised to take turn to clean it. A crucial decision was also taken by them to contribute ten rupees from a family of users for the upkeep of the bathrooms and toilets.

## 10.12 Education

The tuition centre was not the most suitable for a learning environment, rather due to long standing issues with other possible locations such as the church and the park. The Soroptimist International paid the teachers of the tuition centre. On the inauguration day of the tuition classes, 43 children enrolled. In a week's time, 24 children were attending the tuition classes regularly. Many children, who were then sitting at homes, getting wage labour, babysitting for their mothers, house-keeping, loading fish onto carts, began going to school. When difficulty arose with the tuition centre, a woman offered her house for the tuitions but it was too small and could accommodate only 15–20 children. The information board in the slum became training site for the children at tuitions classes.

## 10.13 Community Development

We made sure that the best thing to happen to the people was to meet once in a while and discuss the problems to arrive at solutions. We made sure people came to the meeting as well. Of course, there were women, who helped, immensely, by going round and calling people just before the meeting. Some would not come to

the meeting at all and would give excuses but this woman would go looking for them and bring them to the table. We put up then an information board, in a prominent place for people to write important information for others to see and abide. We helped them do it. It was actually at an inconvenient location and the youth were not passing through that location. So, we had it moved to an accessible location so that most youth and the community members would use it. And they did: everybody did, in time.

There was a time the two segments of the slum would not walk into each other's living areas. There was an unseen line of division. The east would not cross to the west and the west to the east. That has now changed with children and youth walking to each other and often singing and playing together. One day, we walked over to the invisible line and called out to a child to sing. He sang for us and for all men. Women came along and children too. They all began to sing, together and then each in turn. Someone in the gathering crowd began to laugh, to himself first and then to others. It caught on. And many laughs later, we went away only to return to the song they sang that day.

Then on another day, the YWCA people came, in the evening. They gathered 30 children around them and asked the children to come forward and sing songs of their choice. Children did come forward and sang songs. Older people joined in and these people made everyone happy. There was a puppet show, with moppets, on child education and labour. There was a street play on issues of alcoholism. At the end of it all, they discussed about training for women and young girls, for self reliance and economic independence. The volunteers from a city college promised to chip in with the YWCA to help the community.

There was a man who heard the song and came to help. He set up a small community centre with funds from a Christian organization so that we could all go to this new centre. We could use it as a crèche and double it as a tuition centre. The elders of the slum could go to as well to mingle and pray during the day. There are indeed good Samaritans in all of us. There is street lamp just outside the new community centre. It is the end of the lane where Karpagam lives. She is a good soul, dreams for her community and works to translate that dream for others. The slum's got nine lamps, an impending issue brought to a close. The motive was an upcoming election, somebody from the slum running for office again.

The good news was six youths were employed on a permanent basis (February 2007) for construction work at the airport. The community was happy about the employment.

There are college boys and girls, volunteers in the mission possible. They work on '*Live Labs*'—learning to initiate and visualize liaison action to benefit society is what they call it. They have organized rallies, seminars and street plays to sensitize the slum people on social causes. They have come up with a 10-day plan of action for the slum: *Livelab action plan*, with areas of intervention such as child marriage, school dropout, alcoholism, gambling, prostitution and lack of cleanliness through street plays, sports, essay competition for the kids, drawing competition and also one-to-one intervention. The *outsiders* are keeping the momentum going and their initiatives are sustainable as the *shift of responsibility* to the people keeps succeeding.

## 10.14 Conclusion

In sum, and in our understanding of the narrative, we[3] have in keeping with the understanding of the perceptions of the community about their most pressing needs, not to forget their own meaningful contribution to their own development and governance through capacity building and using external resources in the best way they could, moved towards sustainable and adaptive management of our community. From what we gather, we have achieved a qualitative, quantitative and participatory process of community development which has subjective meanings for us and the slum community: men, women and children. The people have decentralized local development and poverty reduction efforts, reinvented local action planning for good slum governance using participatory planning and management tools, beginning to provide impetus for participatory management from their neighbourhood to the city and facilitating pro-poor urban governance. Of course, as Jawaharlal Nehru would say, '*you have miles to go*' before fully develop, enjoy and cherish the fruits of community development. They have a dream and they want it nourished with the work of their own people with support from the outsiders who would always remain outsiders but catalyze and stimulate, motivate and achieve for you what you want for yourself and your community.

We do know by now that good urban governance can be enhanced through consultation mechanisms, and a wide range of complementary tools and instruments you could lay hands on from the people we are already in contact and consultation with. Of course, the relation between local communities, NGOs and local leaders is not always smooth. There are often overlaps in tasks. Conflicts and tensions are common and there is a problem of representation of some groups. But social representation is vital for democratisation. The representation issue is much more complex nowadays as they are more diversified and the social fabric is even more complex and dense, which make it more difficult to focus. People have realized that access to information was important for governance, but they lacked in opportunities for information. Our slum profiling (focusing on environmental, safety and poverty) provided an occasion to bring actors together to validate our information. Our people are sometimes afraid of participating with institutions that they do not know. There is need to sit together, to encourage mutual knowledge and to build confidence. After all, the process of participation is for a common vision, reinforcing our social fabric.

[3] Throughout the paper we have used 'you' to narrate events and outcomes in the slum community. This was intentional because we wanted the narrator to be various people from the research team, community, including you, the reader of this paper. We do believe we haven't caused chaos but deliberately made the narrative interesting enough. If we have succeeded in conveying the inner spaces, especially the spaces of compassion in each of the community members and in each of us, we would say that is our success of retelling the story of a simple and brave people, braving this very minute the life in their lived, social worlds, enduring *the face of walls,* the unconcerned, the politicians, the bureaucrats and the not-so-benevolent amongst us.

**Acknowledgements** The authors acknowledge assistance rendered by numerous people in the work relating to the case study reported here. We are thankful to the Madras-York Universities Project team and the people of the slums. Our thanks are due to the NGOs, teams of doctors and paramedics, college students and the Chennai Corporation officials who helped with shaping our ideas.

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# Chapter 11
# Housing in Hyderabad: Perception of Inclusivity

**Kalpana Markandey and B. Srinagesh**

**Abstract** Inclusivity—or being a part of the mainstream—as perceived by the residents has been viewed against the backdrop of income, occupation, education, religious group and community group.

People at the upper or lower levels of the income strata feel included in society, the middle class by implication seems left out. A study of the right to inheritance and ownership of land by women points to a general east–west divide in the city where the eastern part with traditional ethos is less accommodative of change on these counts This is not so with the western part of the city. Some residents laid emphasis on the material attainments of the locality for attaining a sense of inclusivity. In fact, the largest proportion of respondents interviewed said that drainage and water facilities in their localities need to be improved to make their life more liveable. Other facilities, like commercial, infrastructural, recreational, health and educational are also seen as vehicles of change leading to an inclusive city. Education as a means of change is not to be missed as people consider it as a major conduit for being included in the societal ambience. The need for education, including women's education has been felt across a wide cross section of people, spanning all strata of society and all localities in the city. Emphasis has also been placed on mutual help, helping the poor, helping students, the needy and poor. The educated and especially those in the core of Hyderabad have felt the need for Governmental intervention in improving the lot of the people. Other factors cited to bring about inclusivity in society are human resource and character building, unity, broad mindedness, change in human values, politeness, equality, security, patriotism as a unifying factor, absence of caste and religious feelings, formation of good associations for societal benefit, social interaction, duty consciousness, lower prices of commodities, rooting out of corruption besides others. Lack of mixed localities in the city has also been found to be a reason for lack of inclusivity.

**Keyword** Belongingness • Core- Periphery variations • Economic divide • Gated communities • Mixed localities • Multi- stage stratified sampling frame • Women's education

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## 11.1 Introduction

The place of residence of the people determines their well being to a marked extent. Their sense of belongingness depends to a large extent on the quality of the neighbourhood, common public spaces where people interact and adequacy of social infrastructure. While the slums signify one end of the spectrum within urban areas, the other is signified by the exclusive enclaves of the ultra rich sometimes manifesting themselves in the form of 'Gated Communities' which are physically and emotionally isolated from mainstream society. Hyderabad has witnessed a proliferation of both the slums as well as the gated communities in the recent past making for a wider gap between the haves and the have—not's and by implication a greater felt need for middle income housing. It is in this context that perceptions of the residents with regard to inclusivity are viewed where the marginalized groups can to be brought into the mainstream of cities.

## 11.2 Perception of Inclusivity as Related to Socio Economic Factors

Inclusivity—or being a part of the mainstream—as perceived by the residents has been viewed against the backdrop of income, occupation, education, religious group and community group.

A multi- stage stratified sampling frame is adopted for collecting primary data for this study, which is part of a larger study. Primary data has been collected for a total of 1,463 household in Hyderabad. A multi- stage stratified sampling frame is adopted for collecting data by means of a structured questionnaire where 10 % of localities in every ward are chosen and 1 % households in sample localities are chosen. A structured questionnaire is administered to each one of the sample households to measure and consequently analyze their views. Information was educed from the residents about a variety of issues besides the housing and neighbourhood conditions in the city and lacunae if any. This has helped in arriving at the perceptions of the people with regard to desirable locations, requirements of amenities, and economic capabilities. It is hoped that this exercise will enlighten all those who are involved in the housing scenario which include among others, the state, the civic authorities, private providers and the consumers—who span all categories of users, in making diligent decisions on their respective fronts.

A glance at Fig. 11.1 reveals that when it comes to levels of satisfaction so far as the inclusivity in the urban landscape of Hyderabad is concerned, it is either those at the upper echelons of the income strata or those at the extreme opposite end at the lower level who seem to be satisfied and feel included. While the former are a cut above the rest, the latter have very low thresholds for being considered as 'taken in'. It is also evident from this figure that most of the people emphasize on the social dimension for inclusivity to be made operational. Also the highest income group is

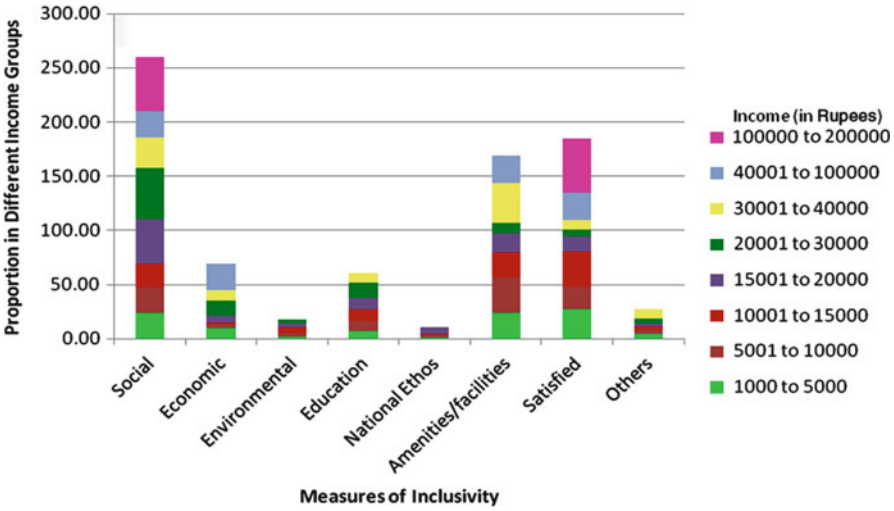


**Fig. 11.1** Perception of inclusivity by residents, 2008 (Hyderabad: perception of inclusivity by residents: 2008). *Source*: Field Survey (2008)

only included in this category, meaning thereby that they do not have any issues with environment, amenities/facilities, economic factors and educational factors besides others. For them inclusivity has only a social connotation. Specificities within this category for different income groups include a wide gamut of factors like social empathy, obliteration of caste and religious feelings in some instances and at times assigning pride of place to religious feelings, unity, equality, broadmindedness, politeness, strengthening of the moral fabric of society, development of human values, social awareness, social interaction and preservation of tradition and culture among others. Amenities and facilities follow as a close second as issues which have to be remedied for inclusivity to become operational, but interestingly the uppermost income group does not figure among those distressed on this front. The focus of this factor centres on the resolution of problems pertaining to drainage and water supply apart from traffic, lighting and ventilation etc. An assortment of economic and educational factors is also referred to in order to induce inclusivity in the city population. While people citing the lack of some of the amenities and facilities, and hence a greater need for them, figure high in the peripheral parts of the city, those vouching for educational inclusivity or extension of educational facilities to all, especially the women, cut across all localities of the city. Interestingly, they are not present in the top two income categories in the city. Thus, better and more disseminative education is viewed as a stepping stone for inclusivity by people with a monthly income of less than Rs. 40,000. Economic factors being considered a measure of inclusivity is all but too natural. People from all income groups barring the topmost category consider better earning capacity, standard of living, betterment of financial situation, lowering of land values etc. as parameters to bridge the economic divide.

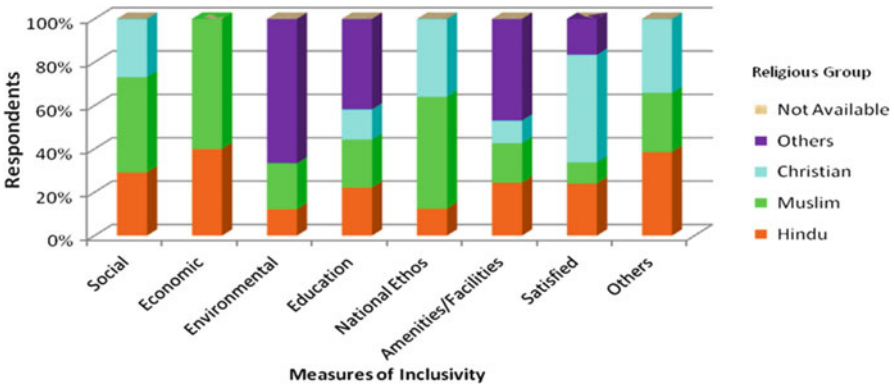


**Fig. 11.2** Perception of inclusivity by Religious groups, 2008 (Hyderabad: perception of inclusivity by religious groups: 2008). *Source*: Field Survey (2008)

Figure 11.2 pertains to the perception of inclusivity among people from different religious background. It is clear from this figure that of all the religious groups, the Christians are the most satisfied in terms or being included in mainstream society, they are followed by Hindus, Others (including Parsis, Sikhs and Jains) and Muslims in that order. The three main religious groups in the city—the Hindus, Muslims and Christians are almost equally concerned about social inclusivity, though the Muslims rate it a tad bit higher. Muslims also view inclusivity from the economic and the national ethos angle to a large extent. However, it is 'other' religious groups that are concerned about environmental issues. Most expressions on environmental inclusivity concern maintaining a clean environment, preservation of trees, greenery, natural resources, besides elimination of pollution and an environmental awareness.

The 'other religious' groups also feel the need for education and provision of better amenities and facilities in bringing about inclusivity in society.

Figure 11.3 pertaining to the caste and community of people conveys that while the Scheduled Tribe people in the city seem be the most satisfied on various counts of inclusivity, the minorities seem to be the least bit so. Among the prominent requirements cited by people from different communities are the need for social inclusivity among the forward class and minorities, of economic inclusivity among the scheduled caste and scheduled tribe, of environmental inclusion among the minorities, forward class and scheduled caste in that order. Among other things that emerge are the need for education among the backward castes, minorities and forward class in that order. The expression of national ethos as a measure of inclusivity is highest among the scheduled tribes followed by scheduled caste and minorities. The need for better amenities and facilities is felt to a large extent by the scheduled castes followed by the backward castes and minorities. Thus different groups exhibit varying levels of consciousness with regard to inclusivity, depending on their specific experiences and aspects of deprivation that they are confronted with.

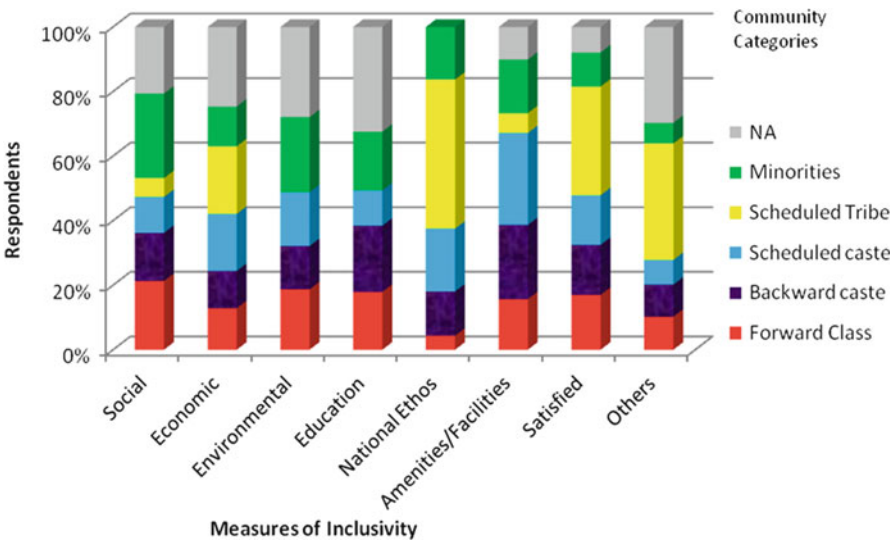


**Fig. 11.3** Perception of inclusivity by caste, 2008 (Hyderabad: perception of inclusivity by caste, 2008). *Source*: Field Survey (2008)

A glimpse of Fig. 11.4 reveals very clearly that all educational categories barring Ph.D. figure on the 'satisfied' category, most groups amongst them except those with Professional and Post Graduate degrees have an equal representation. Those with Professional and Post Graduate degrees figure low meaning that they believe there is a lot to be desired if inclusivity is to be achieved. Most of them express the need for education for all in order to achieve inclusivity. Those with Ph.D. Degree feel that inclusivity can be achieved by social inclusion as well as by the provision of amenities and facilities. Similar views are also held by M.Phil degree holders. Professional Degree holders, on the other hand, feel that better environmental conditions will induce inclusivity. National ethos as an element of inclusivity is highlighted by people cutting across all types of educational qualifications—whether high or low. Economic connotations of inclusivity strike a chord more with the professional degree holders.

A quick look at Fig. 11.5 indicates that all categories of occupations, except doctors and lawyers, are to some extent satisfied so far as the situation with regard to inclusivity is concerned. Nearly all occupational categories of people feel that the social and the amenities-facilities dimension require consideration in order to have a sense of inclusivity. The self employed and bank employees feel that the economic factors and national ethos bring about inclusivity, while for the doctors it is inordinately a better environment. Lawyers and teachers cite education as a means of inclusivity. Here again one finds that the specific level of understanding of each group and aspects of scarcity or plenty that they are confronted with guide their perceptions and rightly so about inclusivity.

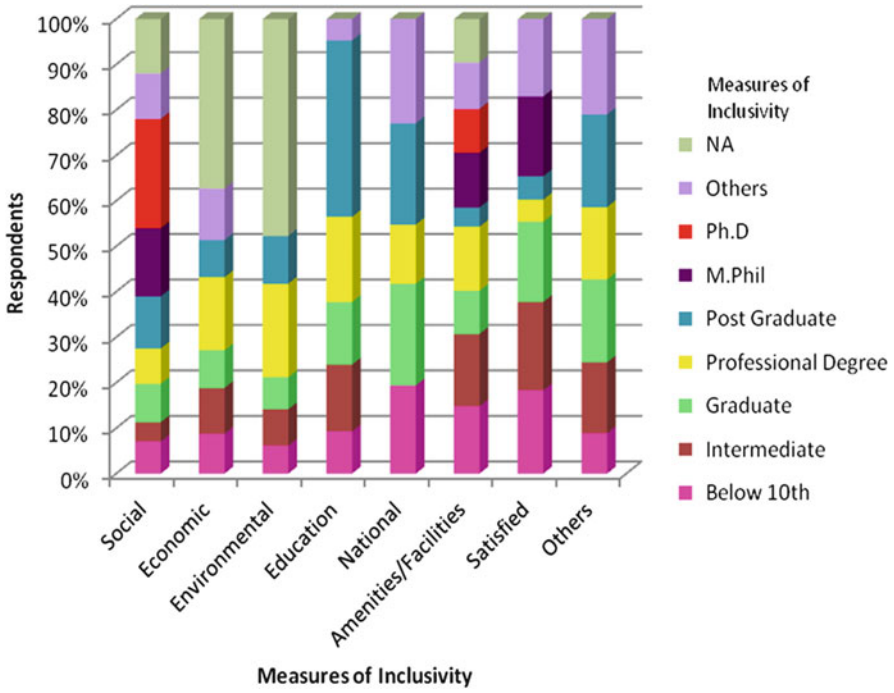


**Fig. 11.4** Perception of inclusivity by educational qualification, 2008 (Hyderabad: perception of inclusivity by educational qualification, 2008). *Source*: Field Survey (2008)

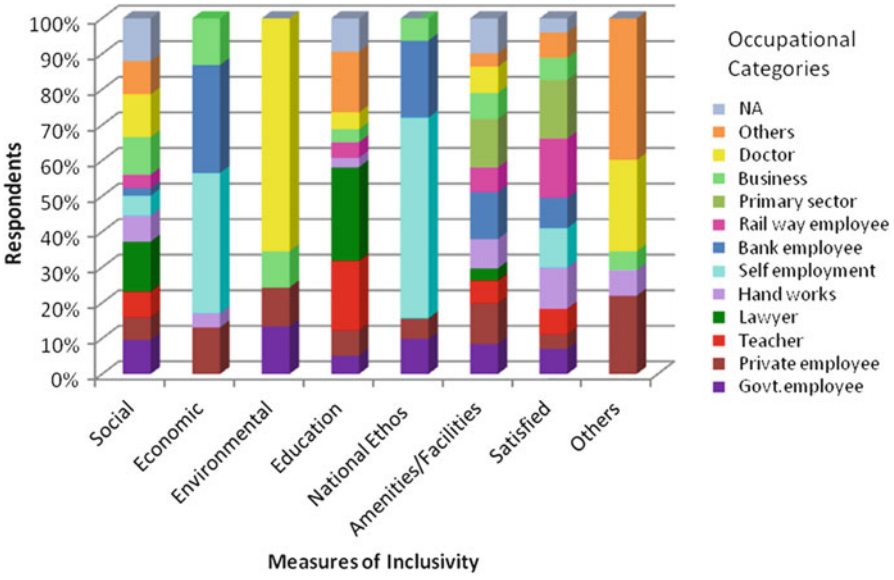


**Fig. 11.5** Perception of inclusivity by occupational category, 2008 (Hyderabad: perception of inclusivity by occupational category, 2008). *Source*: Field Survey (2008)

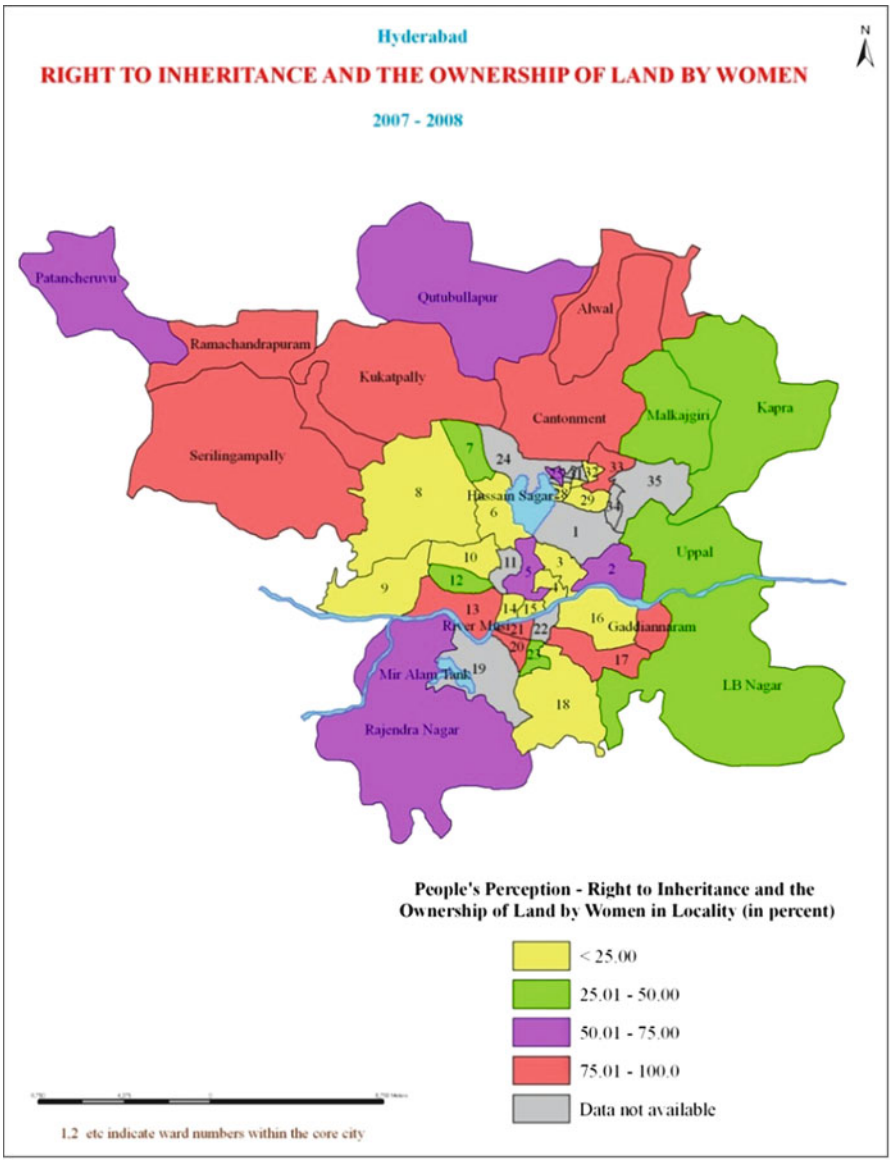


**Fig. 11.6** Right of inheritance and the ownership of land by women

A study of inclusivity within the framework of the rights and empowerment of women will not be out of place. An attempt has been made to examine the right to inheritance and ownership of land by women, Fig. 11.6 reveals that the spatial pattern with regard to the right to inheritance and ownership of land by women in Hyderabad is such that most locations in the core city display a low. Generally the core city has traditional population groups while peripheral areas have more of migrants.

The lowest of low are found in the central part comprising the twin CBDs of Hyderabad and Secunderabad and substantial portions in South Hyderabad. The peripheral municipalities in the eastern part are relatively moderately placed so far as the right to inheritance and ownership of land by the women is concerned. These also are the areas that figure on the middle income category. The peripheral municipalities in the Northern and Western part rank high so far as the right to inheritance and ownership of land by women are concerned. While some of these areas have people from the IT sector others are industrial enclaves and one of them is the Military Cantonment area. Some of these areas are quite high on the socio-economic scale. So is also the case with the adjacent Banjara-Jubilee hills area in the western part of the city but which lies in the core of the city. It can thus be inferred that there are core—periphery variations so far as the right to inheritance and ownership of land by the women is concerned, while the central part displays more of lows on this count the peripheral part displays a distinct high. An east–west divide is also evidenced, where the eastern parts have relative lows and moderately placed values, those in the western part are relatively high on this count. While this has a lot to do with the standards of living which are relatively high in the western pockets, compared to the preponderance of middle class residences in the eastern part, it also has to do with the mores of the people which may be more traditional in the eastern pockets compared to the western.

An analysis of the socio economic factors that are related with the perception of inclusivity among the people conveys the following broad facts:

- It is either those at the upper echelons of the income strata or those at the extreme opposite end at the lower level who seem to be satisfied and feel included in society
- Most of the people emphasize on the social dimension for inclusivity and this category cuts across income and occupational groups.
- Factors like social compassion, annihilation of caste and religious feelings, unity, equality, broadmindedness, politeness, strengthening of the moral fabric of society, development of human values, social awareness, social interaction and preservation of tradition and culture are cited as motivations for a better and more inclusive life in the city.
- The felt need for educational inclusivity or extension of educational facilities to all, especially the women, cuts across all localities of the city.
- Christians are the most satisfied in terms or being included in mainstream society.
- Muslims cite the need for economic and social inclusivity while people from other religions (Parsis, Sikhs and Jains) feel the need for a better environment, education and commitment to national ethos as the guiding factors for bringing about inclusivity.
- Scheduled Tribe people in the city seem be the most satisfied among the different social categories.
- The need for social inclusivity is felt more among the forward class and minorities; that for economic inclusivity among the scheduled caste and scheduled tribe and for environmental inclusion among the minorities, forward class and scheduled caste population.

- National ethos as an element of inclusivity is highlighted by people cutting across all types of educational qualifications—whether high or low.
- All educational categories barring Ph.D. figure on the 'satisfied' category, highlighting the sensitivity and lack of adaptability of the highly educated to any and every situation.
- Similarly among the occupational categories all except doctors and lawyers, are to some extent satisfied so far as the perceived prevalence of inclusivity is concerned.
- All occupational categories of people feel that better amenities and facilities would bring in a better sense of inclusivity.

Thus the perception of people with regard to inclusivity has been viewed against a backdrop of income, occupation, education, religious group and community group. It is felt that people either at the upper or lower levels of the income strata feel included in society, the middle class by implication seems left out. Certain groups of people like Christians, Scheduled Tribes feel an innate sense of inclusivity in the city. The highly educated and well placed people feel a lack of inclusivity as they have high expectations and if these are not met, they feel a sense of inadequacy. A study of the right to inheritance and ownership of land by women points to a general east–west divide in the city where the eastern part with traditional ethos is less accommodative of change on these counts This is not so with the western part of the city. Some residents laid emphasis on the material attainments of the locality. In fact, the largest proportion of respondents interviewed said that drainage and water facilities in their localities need to be improved to make their life more liveable. Other facilities, like commercial, infrastructural, recreational, health and educational are also seen as vehicles of change leading to an inclusive city. Education as a means of change is not to be missed as people consider it as a major conduit for being included in the societal ambience. The need for education, including women's education has been felt across a wide cross section of people, spanning all strata of society and all localities in the city. Emphasis has also been placed on mutual help, helping the poor, helping students, the needy and poor. The educated and especially those in the core of Hyderabad have felt the need for Governmental intervention in improving the lot of the people. Other factor cited to bring about inclusivity in society are human resource and character building, unity, broad mindedness, change in human values, politeness, equality, security, patriotism as a unifying factor, absence of caste and religious feelings, formation of good associations for societal benefit, social interaction, duty consciousness, lower prices of commodities, rooting out of corruption besides others.

The core–periphery variations where the core area is more traditional and the periphery more modern in outlook is also witnessed. Lack of mixed localities in the city has also been found to be a reason for lack of inclusivity.

# Chapter 12
# Street Food Vendors and the Dynamics of Public Space in the Emerging Mega City of Hyderabad

**Helene Grenzebach**

**Abstract** In this paper I discuss how and why socio-economic transformation affects urban public spaces, using the example of street food vendors in Hyderabad. The underlying question is whether the general socio-economic transformation is reflected in the segment of street food vending. In this context transformation is to be understood as a transition from an established system to a different system with altered basic structures: living conditions and values change in a fundamental and dynamic manner. During transformation traditional and new structures often contradict each other, factors formerly regulating systems lose impact and have to be replaced. In this way transformation is set apart from pervasive societal change. To create a sound foundation for my argument I will first touch on the conception of public space, introduce street food vending and illustrate the process of transformation in Hyderabad. In the first part of the paper I will introduce links between transformation and public space in general to then narrow in on the transforming discourses on street food vendors in Hyderabad. The second part of this paper shifts perspective, from overarching discourses to the daily practices of street vendors: I distinguish three strategies of space appropriation, and afterwards demonstrate how claims on using public space are negotiated, using four examples. Finally I will bring together the two parts and conclude with thoughts on how overarching discourses may affect the usage of public space.

**Keywords** Globalisation • Hyderabad • India • Public space • Societal transformation • Space appropriation • Street food

> 30 years ago there were no proper houses in Dilsukh Nagar; within five kilometres of this place you could not find any marketplace. There was a tiny bus stop here and so we established a few pushcarts to sell vegetables to the people who live in the surroundings. And look at this place now!

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So explains Bramiah, a vegetable-vendor in his late 1950s, while packing lady's fingers in a plastic bag for a waiting customer. Dilsukh Nagar—where his business is located—is about 10 km outside the city centre of Hyderabad. By now the tiny bus stop is a major bus terminal, the adjacent national highway 9 is heaving with traffic, and crowds of pedestrians rush by. The surrounding multi-storey buildings, mainly occupied by colleges and educational institutions, are covered in advertisements for mobile phones, shopping malls, movies, private hospitals and insurance companies.

Bramiah's statement draws attention to the tremendous transformation that Hyderabad's cityscape has undergone in recent decades. This growth and change of Hyderabad's appearance—as in many other cities—is accompanied by a transformation of the whole of society. Globalisation, with its far reaching structural changes, and Hyderabad's entry into global competition due to on-going market liberalisations, have led to a unique economic boom, accompanied by simultaneous urbanisation and modernisation. Along with these transformations new spatial relationships emerge that shape contemporary cultural forms and the experience of social relations in unprecedented ways (Donner and de Neve 2006). Especially in urban public spaces, these altering spatial relations can be observed in a condensed manner, as urban public space is the object of conflicts over appropriate use, governing and control. In urban public spaces, as a sphere where various stakeholders' interests overlap, changing power relations find expression. The present conception of urban public space can be regarded as one result of the restructuring of Indian society.

The conclusions drawn in this paper are based on 45 semi-structured interviews with street food vendors and security personnel at five research sites within Hyderabad (Ameerpet, Dilsukh Nagar, Koti, Punjagutta and Patny), three expert interviews with union leaders and concerned community members, mappings and observations. Data were collected in September and October 2011, the stay was funded by the "German Federal Ministry of Education and Research" within the framework of the "Sustainable Hyderabad Project".

## 12.1 The Concept of Public Space

Before analysing the dynamics of public space in urban India it is necessary to get a clear understanding of the concept of public space. A useful starting point is to examine the origin and meaning of the term. The notion "public" goes back to ideas of a particular configuration of commonness which emerged in the West in the course of the eighteenth century. It is associated with universal access and openness, which not necessarily exist in ideas of common space in general (Kaviraj 1997). One example is the assumed connection between "public space" and "public sphere" as an arena of political deliberation and participation, and therefore fundamental to democratic governance (Harvey 2006). Because of this, the transfer of concepts of public space to an Indian mega city leads to misinterpretations.

On a more general level, influential perspectives on the urban in anthropological and sociological writing on the West cannot simply be replicated, as early approaches have done (Donner and de Neve 2006); conceptualising urban public space in a South Asian context entails unique challenges.

Though Belina (2006) shows that universality of access is a mere ideology which was never achieved by any society, it remains the cornerstone of the Western concept of public space. But how does this differ from the Indian concept? From a governing perspective, Kaviraj (1997) helpfully illustrates the differences: contrasting the modern, Western idea of urban public spaces as designated and administrated, universally accessible areas with the empty, valueless negation of the private in colonial India, "places where general institutions through default and indifference or strange generosity lacked vigilance and control over its properties" (Kaviraj 1997, p. 88). He concludes that "public is a matter not of collective pride but of desperate uses that can range from free riding to vandalizing" (Kaviraj 1997, p. 105). Though the modern idea of the public sphere and governing conventions on public spaces were introduced into colonial India by the British administration and internalised by the modernist Indian elites, the conception is not widely shared (Kaviraj 1997).

In a survey of a Kolkata neighbourhood, Donner (2006) describes urban middle-class women's perception of the streets as places dominated by men where they themselves are objects of control; public space is regarded as the realm of the working class, and consequently perceived as filthy and morally problematic. It is not only aspects of purity and class differences that set Indian public spaces apart. The implicitness with which men urinate in public, for example, shows a negation of the "proper" distinction between private and public activities, but it also contradicts the normative ideal of activities open to all and universality of access. Public activities are instead ruled by a logic of appropriateness, segregation and a strict nonuniversalism (Kaviraj 1997).

These examples show that there are issues deeply rooted in culture and history which make public space in South Asian contexts unique and specific. Even though this inhibits the simple transfer of universal images and conceptions of publicity, there are general notions of the common which allow researching these unique contexts.

In this contribution urban public spaces shall be examined as a product of interrelations constituted through a process of interaction (Massey 1999). Various individuals and actor groups are involved in producing, establishing and using conceptions of urban public space, and all struggle for their realisation. Conflicting views of what public space is, and how it should be used, governed and controlled meet in everyday activities. Exploring everyday spatial practices and representations and locally specific patterns of spatial appropriation and control allows drawing conclusions about asymmetrical power relations, negotiation processes and social hierarchies.

Though the described processes are never static or complete, the present extensive restructuring of economic, political and social life increases the dynamic of producing space. The impact of globalisation and neo-liberalisation of India's

political economy, then, leads to a reconfiguration of urban public spaces (Donner and de Neve 2006). Doreen Massey suggests that phenomena such as globalisation can be understood as changing the spatial organisation of social relations. She further argues that these social relations always have a spatial form and spatial content (Massey 1994). By looking into the dynamics of urban public space, this article aims to illustrate how globalisation and neo-liberalisation of India's political economy permeate an existing system of spatial organisation. The mobile and semi-mobile street vending sector lends itself to examining these dynamics, since vendors depend on being in public places without having formal recognition. As Etzold (2010) has shown, street food vendors provide a revealing example of how concurrent processes of urbanisation, modernisation and socio-economic polarisation are reflected in local conflicts over the appropriation of space and the proper form of control in a transforming city.

## 12.2 The Street Food Vendors of Hyderabad

On Fridays Harish Chand stands in front of a small mosque in Punjagutta—a central district of Hyderabad. A colourful variety of roasted nuts, seeds, peas and chips is neatly arranged on the bright blue four-wheeled pushcart in front of him. While skilfully cutting fresh onions and tomatoes he chats with his customers. The mixture—picked by the customer, and spiced with chili powder and lemon juice—is wrapped in paper bags made of old newspapers and sold for ten rupees. Harish Chand stays in this calm residential area for several hours; sometimes he has to move his pushcart to let the occasional car pass by, and passengers may buy directly from car windows, but most of his customers are on foot.

Harish Chand is one of about 50 to 60,000 mobile street vendors in Hyderabad, of which an estimated 15,000 sell food items (Dittrich 2008); street vendors in general constitute approximately 2 % of the population of Indian cities (Bhowmik 2005). The number of food vendors is especially hard to determine since it rises and falls according to times of the year, week and day, and responds to patterns of customer demand and labour supply, cycles and fluctuations of the economy, and levels of traffic congestion and official control (Bromley 2000).

The average Hyderabad street food vendor is male, aged between 20 and 40 years (Rani and Dittrich 2010). Depending on the range of products and the location, daily incomes vary between 50 and 800 rupees (Dittrich 2008). The vendors do not belong to the poorest segment of Hyderabad's population, but households are nevertheless at high risks of poverty. Loss of income due to sickness, bad weather or theft can generally not be compensated. Therefore many street vendors are highly indebted to informal credit systems (Dittrich 2008). Harish Chand explains that in case of sickness nobody will take care of his business—this is the case for many other vendors, too.

While Harish Chand is in the small alley by the mosque, an occasional vegetable vendor passes by shouting his offers to attract the attention of housewives.

They move pushcarts like Harish Chand or carry baskets, sometimes attached to bicycles for ease of transport. Some customers on higher floors rope down baskets to collect their goods and send down payment in return. At the busy traffic junction Srinagar Crossroad, only a few 100 m away from Harish Chand, another scene can be observed: a variety of street food vendors offer their goods, including simple hot meals, snacks, ice cream and candy, hot and cold beverages, fresh fruits and vegetables, milk, and other products such as fresh fish. These categories cover the range of products found in Hyderabad's street vendor community.

Alongside this range of products, street vendors can be characterised by type of business. Vendors who sell unprocessed food items, like seasonal fruits and vegetables, do not need elaborate hardware: baskets or pushcarts and in some cases scales are sufficient. These vendors often acquire their goods on commission and pay the retailer in the evening. Offering a wider range of items requires sufficient financial means or strong relations to a wholesaler who will provide the desired variety. A narrow range of, for instance, one kind of fruit, in some cases indicates an elaborate supply chain from the farmer to the customer. Here the street food vendors will deploy relations to farmers and provide services to them which surpass selling: The vendors will also pick fruits on a farm in the peri-urban Hyderabad in the morning and transport them to the city centre to sell them during the day. If the fruit season is over, those vendors return to alternative daily labour activities. The relations between a fixed group of vendors and a farmer can last for many years.

In contrast to selling unprocessed food items, preparing Tiffin (light meal) like Pani-Poori (round, hollow fried crisp filled with a spicy sauce) requires knowledge and preparation as well as hardware. To operate businesses selling these it is necessary to have a variety of ready-made items like dough and fillings, a stove for cooking and frying, drinking water, plates and other implements. During busy hours the owners of top-selling mobile tiffin centres are supported by up to three employees at the same time.

Street vendors like Harish Chand are independent—he owns the pushcart, carries the risk and realises the profit. Other vendors are employed by a superior who provides them with skills and the necessary implements and commodities, tells them where to sell and takes care of conflicts. These vendors often earn a fixed amount of money on a daily or monthly basis. In this way one individual can own several pushcarts and merge preparations and the purchase of ingredients.

Vending offers direct and indirect employment, especially for the low-skilled population, as it has low barriers to entry and requires little financial means and no special qualifications (Anjaria 2006; Dittrich 2008). But contrary to common belief, street vending is not an occupation taken up predominantly by recently arrived migrants from rural areas (Anjaria 2006). Harish Chand was born in Hyderabad and was formerly employed at a snack shop. He recalls that he only earned 100 rupees per day. So 6 years ago he took up street vending, since he could not afford to rent his own shop. The profit—he reasons—is bigger on the streets.

To earn these profits, Harish Chand carefully selects his sale locations. He avoids busy streets where he feels threatened by the traffic police and places where local shop owners or other street vendors would attack or chase him away (he has to

balance the risk of facing problems with the chance of gaining more profit). "Every Friday I come to this mosque and sell snacks. All the Muslims come here. On some days I go to Krishnakanth Park; people are on leisure time there so I charge fifteen rupees instead of ten. I also go to Nehru Nagar or other places in Punjagutta."

Like him, all street food vendors can be categorised regarding their patterns of mobility. Etzold (2010) distinguishes four types of vendors: permanent, semi-permanent, semi-mobile and mobile. Experienced street food vendors follow a certain pattern of mobility: they sell on the very same spot every day without moving, or they roam limited areas—for example, the vicinity of a place that constantly attracts potential customers. Other vendors focus on a certain district and offer their services following a daily cycle. Vendors like Harish Chand walk the same route on a weekly basis to call at different sites. Very few occasional vendors will decide ad hoc on where they will be vending throughout the day. The sheer number of street vendors in Hyderabad makes them a usual aspect of urban public spaces. Be it the coconut vendors along busy transport axes and communication junctions, or the vegetable vendors in calmer streets and residential areas—vendors seem to be successful at appropriating space.

Street food vending in an urban environment is relevant for many reasons. Vendors offer convenience and easy access, as transactions happen directly on one's door step or while commuting. They also provide essential services to most of the population and substantially increase food security. Some scholars, including Anjaria (2006), argue that street vendors' vigilance over public spaces enhances the safety of all city residents. Especially in Hyderabad, the "food-centre" of India (Hofmann and Dittrich 2009: 1), street food vendors are an important part of the famous and distinctive food culture (Rani and Dittrich 2010)—some of its dishes are even exclusively prepared by street vendors. Particular vendors can attain cult status and attract crowds with their cuisine, customers consider themselves lucky when they hit the scarce opening hours and succeeded in purchasing snacks at these places which prepare dishes according to recipes that have been handed down for generations.

## 12.3 The Impact of Neo-Liberalisation on Public Space

Though street food vendors are a vital part of Hyderabad's food culture, they are not exclusive to this metropolis. Mobile street food vendors can be found in all African, Asian and Latin American countries (Bromley 2000). Still, Hyderabad's unprecedented urban transformation renders it a suitable site to examine the dynamics of urban public spaces. Starting with general information on Hyderabad, the following chapter will gradually narrow down the perspective from universal factors of transformation and globalisation in Hyderabad towards those affecting public space, and finally enlarge on new impacts and stakeholders shaping street food vending.

Since the early 1990s regional political elites in Andhra Pradesh sought to transform greater Hyderabad into a dynamic economic region oriented toward global growth sectors (Kennedy 2007). With more than six million inhabitants

the capital of Andhra Pradesh now ranks as India's sixth largest metropolis. Since the 1990s, the population has increased by 32 %, with even higher figures in the outer conurbation areas (Gotsch and Kohte 2007). Hyderabad is one of the emerging sites of the Indian computer industry. Through liberal economic and administrative reforms and massive privatisation, Andhra Pradesh was turned into an internationally known exemplar of development. Particularly in Hyderabad, innovation-oriented IT, pharmaceutical, biotechnology and nanotechnology companies were established through various incentives such as subsidies, tax credits, infrastructure aid, easing of building regulations and Public Private Partnerships. To increase Hyderabad's attraction for investors and the new affluent urban middle class, transport, utilities and communications infrastructure were improved (Gotsch and Kohte 2007; Dittrich 2008). In the 1990s these developments catapulted Hyderabad to its present status as a modern metropolis of national and international significance (Chacko 2007).

Hyderabad's success, the growth of the IT-sector and the changing cityscape is out of all proportion to an adequate supply of employment, housing or infrastructure; in many inner city areas, water and electricity are rationed to 2 h a day, less than 20 % of the population have a sewage connection, and two out of five inhabitants live in slums (Gotsch and Kohte 2007). While the number of affluent city dwellers in Hyderabad has grown immensely (Hofmann and Dittrich 2009), socio-economic polarisation progresses: the majority of Hyderabad's inhabitants still depend on informal businesses to secure their fragile livelihood and the gap between rich and poor is widening. Under these circumstances it is important to examine the effects of the described overarching transformation on less affluent city dwellers like street food vendors.

The business-oriented philosophy of urban development has had varied effects on public spaces in Hyderabad. Two examples shall be enlarged here to illustrate these effects: In order to accommodate the growing number of motorised vehicles and to facilitate the freer circulation of people and commodities, numerous flyovers have been built, and other roads have been widened, leaving ruins of houses literally cut in half by the constructions.

Economic development increased the number of transnational high-skill and well-paid residents (Chacko 2007), and some global retail chains have expanded their branch networks to cater to changing consumption patterns and lifestyles; Hyderabad is now considered an important centre of modern retail (Johnsdorf and Dittrich 2009). The sparkling shopping environments, equipped with security guards and parking space attendants to guarantee a sound shopping experience, create an illusion of a safe, clean public space for their selected range of customers. Though built on private property, they have an effect on the surrounding areas. Illuminated brand logos and shiny glass facades project an image onto public space that one can neither evade nor ignore. Parallel to this, countless advertisements appear alongside the main roads: they are fitted on bus stops, pedestrian bridges, buildings and billboards announcing the availability of credit cards, insurance and luxury goods.

Hyderabad's global economy-centered urban development policy is embodied in this new urban aesthetics. As Fernandes (2004) mentions, this aesthetics is mirrored

by the cultural practices of the so-called new urban middle class, characterised by the lifestyle and consumption available through India's liberalising economy. This new middle class is now a dominant social group shaping discursive processes; their status markers and lifestyle are closely connected to the restructuring of urban space. The emergence of shopping malls, upmarket restaurants, and ice-skating rinks illustrates this (Fernandes 2004). In public spaces this new urban aesthetics is reflected in endeavours to "beautify" and "clean" the city, or to improve the situation of pedestrians.

Comparing this image to the former notions of urban space mentioned earlier—valueless negations of the private, dirty and not worth the effort (Kaviraj 1997; Donner 2006)—reveals the severe changes in the conception of public space. But how does this affect the spatial practices of street food vendors in Hyderabad?

## 12.4 Discourses on Street Food Vending

After having shed light on the local specifics of transformation in Hyderabad, its impact on public space, and changes in the conceptions of urban public space, I will now enlarge on those aspects which lead to a dynamisation of public spaces for street food vendors in Hyderabad. The commercialised cityscape and the new urban aesthetics are closely related to this. In order to observe these changes more closely, I identify influential actors in the street vending arena and sketch their interests and opinions. These interests intertwine and relate to each other in a complex way that makes it difficult to distinguish groups and attitudes. Though the description of the groups appears foreshortened and simplified, their characterisations help to examine how overarching images and discourses are shaped.

Street vending is considered a major problem by urban authorities. Street vendors are perceived as locusts, coming in "plagues", "droves", and "deluges", as well as unsightly nuisances, and sources of disorder, congestion and crime; the city is depicted as being both invaded and asphyxiated (Bromley 2000). Urban authorities in particular describe street vending as a manifestation of both poverty and underdevelopment, so that its disappearance is viewed as progress (Bromley 2000). The aims of urban development and the municipal authorities of Hyderabad have been sketched above: in order to keep up with global competition and to attract investors, the municipal authorities of Hyderabad focus on implementing an ambitious renovation and modernisation program, achieved mainly at the cost of petty-trade vendors (Dittrich 2008). Earnest Leslie, a consultant of the Government of India's "Mission for Elimination of Poverty in Municipal Areas" (MEPMA) in Hyderabad describes the attitude of municipal authorities towards street vendors' interests as follows:

> The Municipal Department itself is overextended with mainstreaming street vendors' interests. In the new master plans of Hyderabad's city development 40 to 45 per cent of the roads have been earmarked for various interests. There is no will to consider street vendors, they are obstacles. Also the police department wants clean roads and free flowing

traffic. The city should be free of hassle to prevent accidents. They want smoothness of the city and in their view street vendors are a factor disrupting the balance of the city.

The current politics is biased towards multinational companies. This, Mir Inayath Ali Baqri, a representative of a local hawkers association explains, is reflected in the observation that municipal authorities manage to establish entire business districts for multinational companies and cater for their spatial needs while refusing to provide alternative vending areas for those vendors who get evicted from roads. The attitude of the new middle class towards street vendors is closely related to that of the municipal authorities. In her article about the "Politics of Forgetting", Fernandes (2004, p. 2416) tellingly delineates the "attempt to naturalize (...) processes of exclusion" and "forgetting about subordinate social groups such as street vendors" by producing a middle-class-based definition of citizenship. Thus a combination of political and private actors is shaping the construction of public spaces as it depicts an image of street vendors as a threat not only to traffic, sanitation and hygiene, but more globally as a "menace" increasing social disorder and threatening the civic culture of the middle class (Fernandes 2004).

In Mumbai especially, NGOs and neighbourhood-initiatives agitate contra street hawkers (Anjaria 2006). In Hyderabad agitation by private actors is not so obvious—the involvement of middle class organisations is not as fierce as that described by Bhowmik (2000) and Anjaria (2006), but is still present in for example minor conflict situations and encounters.

In addition to these merging spheres of actors, operators and managers of supermarkets and multinational retail companies can be considered competitors for street vendors' interests since the market liberalisation. They see street vending as a threat to larger-scale off-street commerce (Bromley 2000). Mir Inayath Ali Baqri describes them as a "barrier between the government and the vendors", in that they push the government to rid the city of street vendors and prevent the legalisation and relocation of street vendors to official street vending areas. Also, from the perspective of investors, the presence of street vendors or their relocation represents declining real estate prices for residential areas (Fernandes 2004).

These brief descriptions sketch three influential groups of stakeholders who recently started lobbying for their interests. In the course of increasing pressure on urban public spaces the parties involved in negotiating its conceptions, production and usage increased in number, resembling a complex field where a multitude of discourses are employed. The street food vendors themselves—though at the centre of the debate—do not have a dominant position at this level.

## 12.5 Governmental Endeavours to Control Street Vendors

The weak and oppressed position of street vendors in the negotiations for the right to use urban public spaces becomes more palpable when examining the actual strategies used to implement the dominant conceptions of citizenship, development

and appropriate use of urban public spaces. They are mostly enforced by municipal authorities, but there is also an evident "convergence between the exercise of state power and the production of a middle-class civic culture through the management of public space" (Fernandes 2004, p. 2422). This adoption of partial interests into official policy contributes to a discriminating reconfiguration of public space which aggravates the situation of those not included in the favoured middle class.

One omnipresent measure of modern space management is the persecution of street vendors by municipal authorities and the police. Evictions and raids occur regularly: pushcarts and scales are confiscated by the police and have to be redeemed following a complicated and expensive procedure. The fine is compounded by the loss of earnings during the break from work, and fresh goods will be spoilt during this process. The constant expectation of such raids is perceived by the majority of vendors: at the sound of a diaphone announcing the approach of police-pick-ups, the banana vendors in Dilsukh Nagar who, engaged in their business, roamed around the busy area of the bus stop, abruptly set their pushcarts into motion and rush away from the main road towards the smaller streets where they hide. Kiran, one of them, reports that approximately every 15 days the traffic police will come and charge up to 15 of the 50 mobile vendors in this location for blocking traffic.

In Koti, Kamalama sits next to her basket of sweet lemons which she sells to pedestrians. She remains in a 50 cm wide strip between the pavement and the main road demarcated by a white line of road marking: this area is dedicated to street vendors. Since Kamalama is reminded of these narrow confines by police officers on a daily basis and since she respects them, it is to be expected that she is not a victim of raids. But she recalls an event when a special police force came and evicted the roadside of all vendors. She was wounded and lost her belongings.

Not far away from Kamalama, in front of a bank building, an apple vendor has set up a small table to display his goods. Though he respects the white line, the security personnel of the bank urge him to leave—they argue that the pavement and the roadside are reserved for their employer's car. After a short argument the apple vendor has to leave and find another location. These brief examples illustrate the practical implementation of space management from municipal government authorities and private security personnel which happen on a daily basis.

A more advanced measure to execute the re-evaluation of urban public space and to control street vendors is the launching of a registration system for vendors in Hyderabad. In existence since 2004, it requires vendors to acquire personal photo identification in order to be licensed as street vendors. This is combined with the regulations for the use of public space in the form of demarcated special street vending zones and zones where vending is generally prohibited (Dittrich 2008). Both resemble a formalisation of the street food sector, which could provide formal recognition and enable monitoring of the numbers of vendors in urban areas. Many factors, however, render this system a repression of street food vendors.

As in many South Asian cities with provisions for issuing licenses to street vendors (Bhowmik 2000), the municipal authorities of Hyderabad were disinclined

to issue vendors cards. Furthermore, the requirements to obtain a license in the first place were so high that it was almost impossible for most vendors to meet them; as a result, many were pushed into illegality. By now Hyderabad has stopped issuing new licenses completely. In addition, the zoning for street vending does not refer to natural markets – on the contrary, it excludes vendors from high-volume sales areas and relocates them to areas far away from pedestrians which are unfit for their business (Dittrich 2008). This is further evidence of the exclusionary nature of Hyderabad's urban policy.

Many influences interact, be it the middle class or the municipal government which tries to attract multinational companies by obediently creating a business-friendly environment. The dynamics become even clearer when looking at the situation of street vendors from a historical perspective. Using the disparity of the reassuring fixity of shops on the streets versus the chaos of vendors on the pavement, Kaviraj (1997) describes the reinforcement of the conceptual distinction between the legal and the illegal as a significant task of policing and governing that protected the precarious order of modern life in colonial times. This underlying endeavour, it seems, was not affected by transformation and liberalisation, and has not changed till this day. Etzold (2010), for instance, characterises the denial of legalised street vending, and the resulting violence against street vendors on the part of civil authorities in Dhaka, as a demonstration of power and a tool to establish law and order, both in general and in public spaces. Furthermore, he shows how these violent actions against vendors are legitimised by emphasising modern ideologies of clean spaces and an aesthetically designed city free of interference (Etzold 2010). Parts of this disciplinary action, under the smoke screen of biased urban development policies, are reflected in Fernandes (2004) assumption of the "Politics of Forgetting" and the attempt to naturalise "spatial purification", segregation and processes of excluding subordinate social groups such as street vendors by redefining the concept of citizenship.

Against this background of overarching discourses and governing mechanisms, the situation of street vendors appears hopeless. It becomes apparent that street vendors have not been favoured by authorities and city development for a long time. But due to global transformation new sources of pressure and competition appear which alter long-established modes of negotiating public space. Globalisation, modernisation and global competition require adaptation and by this increased pressure on the city, they challenge its current mode. Adapting to a new mode entails victims, and the street food vendors of Hyderabad seem to be among them. While others thrive due to new opportunities, they cannot partake and their situation worsens.

Regarding the actions against them mentioned above, and the increasing obstacles put in their way, it is astonishing to note that the street food vending sector is apparently a booming market with considerable growth rates. To explain this phenomenon it is necessary to take a closer look at the local level to find out how street food vendors cope with the dynamics of public space.

## 12.6 Strategies of Spatial Appropriation

Some of the drivers altering street food vending and the measures taken to implement their conceptions of citizenship and urban public space have been described above. But for diverse reasons they do not have the desired effect of evicting street food vendors permanently. On examining the ground reality of street food vendors, one finds that the overarching discourses affect their everyday life in a distorted manner. This shall be demonstrated by firstly describing vendors' response strategies to the municipal authority's control measures, and secondly by analysing street food vendors' immersion in local trade with claims on public space. Against this background it becomes clear that municipal stakeholders concerned with establishing a modern aesthetics and conception of public space do not permeate this tightly bound system. It also shows that it is not only formal authorities, middle class interests and multinational companies that shape local street food vending, but rather a complex and unique network of exchange relationships.

The way street vendors respond to the mentioned legal measures against them reveals their successful spatial appropriation and sheds light on the importance of informality in this sector. Regarding the raids, evictions and controls by the police, three common strategies to minimise their impact exist.

The first strategy is represented by Harish Chand, the snack-vendor in Punjagutta. He stays away from busy roads and by this spatial practice avoids encounters with policemen. Choosing this behaviour affects his profits negatively: it is the main roads and busy traffic junctions where commuters—potential customers—accumulate, which attract street vendors and, more importantly, the attention of municipal authorities. For Harish Chand this increases the chance of getting in trouble with the police and having to pay fines. Avoidance equals not being discovered; the risk is low, but the profits are low, too.

The second strategy is pursued by the Banana vendors in Dilsukh Nagar. They do business in centres of public activities, benefit from high numbers of pedestrians and take the risk of being evicted by local authorities. Permanently anticipating their actions, the vendors are constantly prepared to escape. This strictly limits their business behaviour: the amount of products on offer and their display must be suitable for rapid evacuation, which prohibits any form of permanence. Relations with "escape helpers" are highly beneficial to fleeing vendors; for example, some established vendors offer hideouts and support the mobile vendors. Also, in some areas, vendors who are active in the same community warn each other using mobile phones. This strategy leads to distinguished spatial behaviour within the community: in Patny, one of the quarters of Hyderabad, a group of vendors offer guava to travellers passing by in cars. Their baskets are located along a wall; in case of an eviction two gaps in the wall provide the only escape routes. Proximity to these gaps is highly appreciated by all vendors and becomes a contested good; the alignment of vendors allows drawing conclusions about internal hierarchies.

The third strategy is deployed by those vendors whose business prevents successful escape. Vendors who use elaborate pushcarts like stoves or heavy

machinery (e.g. juice extractors) or those who offer a wide variety of goods enjoy a higher sales volume, but are tied to their location. For them it is necessary to establish relations with responsible police officers as well as shop owners—mainly by regular bribes. By this they cannot prevent evictions completely, but paying a certain amount of money to the authorities drastically reduces their insecurity.

These three strategies resemble ascending success in the appropriation of urban public space. Individual vendors usually deploy more than one strategy, but the vast majority of the vendors in Hyderabad deploy either the second or the third. The strategies shed light on the importance of informal dealings in the street food vending sector. Bribery is an omnipresent feature which will even be used by those vendors deploying the second strategy, since if they get caught it is possible to bargain with the police officers to avoid paying the full charge.

## 12.7 Micro Level Public Space Appropriation

So far this contribution has focused on official governing authorities and actors dominant in the overarching discussion. This group is represented by the national state government which passes laws and legislations, but also municipal authorities, officials and politicians who obtain the formal power to politically shape the environment of street food vendors. On the local level their policies and bills will ideally be executed by police officers.

At the micro level, however, other actors gain influence in the street food vending arena, and as became apparent in the strategies of space appropriation, informality is an important characteristic here. Though the actors are not dominant in the overarching discourses about street food vendors, they are still able to enforce their claims on urban public space and avail themselves of trading these claims. The following examples will illustrate how this is accomplished.

A striking example of the trade of claims on urban public space is the situation of 21 year-old Sunil. Originally from a village close to Zaheerabad, he sells sugar cane juice in Dilsukh Nagar. A "notable man" of his native village made this job available for him; he is also the owner of the juice extractor and undertook all the practical preparations for him. Sunil expects great profits for the summer season and will then pay his patron. He was taught how to operate the machine by a friend. Another friend of his, the driver of a cinema owner, suggested he start vending in front of the cinema, and so Sunil approached the owner of the cinema to ask for permission. The other shop keepers behind his pushcart object to him selling there sometimes, but since he has the blessing of the cinema owner, their complaints have no effect. He does not know the vendors next to him very well, but seemingly they have connections to the municipality which protects them from harassment by the shop-owners close by.

Some months ago the location of his juice extractor was rededicated as parking space under the supervision of Greater Hyderabad Municipal Corporation. This act could have been fatal for Sunil's business, but it turned out that he could informally rent the spot for 30 rupees per day. After that the juice extractor was destroyed by

the police during an eviction drive. In this context he was asked to pay a fine but negotiated and got away with a reduced fine. The patron from his native village looked after the incident and since then he has not been harassed.

Sunil's situation illustrates how his need to appropriate public space is utilised by different individuals. He demonstrates very elegantly how street food vendors have to balance a multitude of relations to succeed in appropriating public space for their business. In their everyday lives these relations are of vital importance: from the perspective of Sunil public space is simultaneously turned into private spaces by several actors whose power is based on informality. Sunil has to pay two parties for the right to use public space, and secures it by pitting the weak stakeholders (shop owner) against the strong (cinema owner). Since these local actors are able to restrict and grant access to space, vendors and their success in appropriating space are directly dependent on their goodwill. Sunil's case also shows that there is no final security to be obtained: despite paying money to the responsible patrons the police harassed him.

If the municipality's endeavour of dedicating parking spaces is interpreted as an aspect of the new urban aesthetics, its failure to do so indicates the resistance of the tightly bound system and the existing conception of urban public space.

The situation of 18 year-old Jeewan demonstrates how far-reaching and elaborate patron-client systems can become: Jeewan inherited his business from a cousin. He confidently boasts about the great benefits from its location: at the very centre of Punjagutta he operates a coconut pushcart which is clearly a traffic obstacle. He states that the common public rarely complains about this because people are too busy. Proudly he explains that the policemen are also his friends. They do not harass him since his family has good relations with a "well-known man in the police department". Based on this advantage his family established a network of coconut-vendors with dynastic dimensions. Their branches spread from Punjagutta to Banjara Hills and competition will—as Jeewan puts it—"not survive among us, they simply are not allowed". From his point of view risk only resides in influential people who can complain with one phone call: in case he attracted the attention of a person like that, his pushcart—he is sure—would be taken away within a short time. But in effect, he says, "we can handle that, no problem. We pay the fine and get the pushcart back".

Comparing Sunil's situation to Jeewan's points out the benefits of having one influential patron on a high level instead of the multitude of Sunil's relations. The far-reaching impacts also severely alter the internal competition within the vendors' community. Jeewan's situation also shows how lasting and stable these connections can be and how well the respective correspondences work across many levels of hierarchy: the patron does not even have to be acquainted with his protégés. Most importantly, the example again demonstrates how a street food vendor protected by a long term relations withstands impacts of urban development and the tremendously increased volume of traffic.

The following report of Raju demonstrates that street food vendors are not simply reacting to impacts, but actively participate in shaping the dynamic of urban public spaces. It also offers insight into internal competition within the vendors' society: It was a street vendor friend of his who called Raju's attention

to a colleague who was not able to keep up his pushcart due to drinking problems. Raju established his own Pani-Poori pushcart once the former one closed, and swiftly filled the gap. His pushcart is located in front of a building site in a busy quarter of Ameerpet. Asked about the risk of being evicted once the shopping mall behind him opens, he proudly replies that he and the owner of the building site coincidentally keep meeting in the morning since they start their businesses at the same time. So the owner already knows about Raju's presence and is happy about it. Raju is sure that the owner of the prospective shop will protect him against competition and that the shop will attract lots of potential customers and increase his profit. Time will tell whether Raju's hopes for a successful combination of Pani-Poori pushcart and shopping mall will be fulfilled. An encouraging example of modern shopping environments coexisting with "traditional" street food vendors is demonstrated in the last example.

In Ameerpet a group of vendors offers a variety of freshly prepared meals, juice and snacks. Some of the vendors gathered there have been selling in this same spot for more than 20 years. Regular bribes to the police and the municipal sweepers secured their position and allowed them to improve their offering and equipment. Four years ago a multi-storey shopping mall with a supermarket in the basement was built, which opened 3 years ago. Since that time they have had to pay an informal rent to the mall, and lower ranks of the private security personnel get paid in kind.

To cater to the needs of their customers and offer a wider, larger variety, the mall established a set of small outdoor booths directly at the egress of the supermarket. Here contract vendors offer the same goods as the adjacent street vendors, but in a manner that is considered more hygienic and modern. Obviously the mall contractors are competing directly with the "old-fashioned" street vendors, and their profit decreased. Still, for 3 years now the latter managed to assert themselves; moreover, compared to the mall contractors the vendors are seemingly frequented more often and their number even increased. The street food vendors proudly explain that the mall staff usually eat at their pushcarts because the catering by the mall is too expensive.

It can be assumed that due to the presence of the street food vendors the mall does not make the maximum profit: the contractors would be better off if the street food vendors were evicted. In fact the vendors experience some pressure from the mall's security personnel and there are small quarrels. But quarrels usually just concern the smooth flow of traffic towards the parking spaces of the supermarket or the dumping of garbage. The consistency of the street food vendors in the vicinity of the supermarket in Ameerpet was never severely compromised. Prasad, who sells orange juice, accurately outlines their situation: "If I get 500 rupees in the end of the day, I lose 250 rupees by bribing all the different people. But as long as there is money, they will accept my business."

Ramakrishna, the coconut vendor next to Prasad, directs the attention to a remarkable change that happened recently: a few metres apart from all the other vendors and clearly on the compound of the mall—protected from the grasp of the municipal police—a second coconut vendor established himself. Having two vendors offering the same product within such a close range is uncommon. It is said

that a supervisor of the mall regarded the original vendor's success with envy and thought of participating in this by offering or "renting" a competing coconut vendor a place clearly within his area of influence. The described situation is characterised by sufficient public space: the street food vendors occupy a niche which is not needed to provide ample parking spaces or to establish other features which attract customers.

Interpreted against the background of changing claims on public space, the coexistence of street vendors and the supermarket in Ameerpet illustrate how flexible and resistant the informal patronage system really is. For the mall it would have been no problem to evict the street food vendors once it opened; instead, both parties seem to profit from each other's presence. The implicitness of the contract vendors selling street food from booths instead of pushcarts to the customers of the mall illustrated that eating snacks outside is considered a profitable part of Hyderabad's food culture. The appearance and styling of the modern booths, colourful bold advertisements, and service personnel behind clean stainless steel working surfaces, wearing corporate-designed aprons and hairnets, is a reminder of the endeavours to modernise, to give the new urban middle class a place to distinguish themselves from the working class while still enjoying the taste of street food. This ambiguity is crowned by the lack of customers visiting the modern stalls.

## 12.8 Patron-Client System Structuring Public Space

Formally speaking, the street food vendors' system of appropriating public space can be characterised as follows: On the local level and from the perspective of street vendors a few distinct actors control urban public spaces and access to them. They do so on account of their power and influence: either they are able to directly enforce their claim on a certain public space or they indirectly enforce it by manipulating a person who owns a claim. A very powerful individual will be able to gain exclusive, ultimate and unrivalled claims which will last for a long time. In most cases the claims are informal and based on custom and practice. In every space influential actors negotiate their claims among themselves by determining who is the most powerful. These individuals can then sell specific entitlements to the safe use of public spaces to street vendors; these entitlements correspond to the claims they enforced earlier. The examples illustrated that multiple individuals can sell different entitlements on the same piece of land to the same vendor. The street vendors have to skilfully invest in the available entitlements, judge the provider's ability to protect their claim against others, and balance the risks and chances.

The result of this highly specific process of space appropriation will be a tightly bound, unique network involving the vendors and their diverse patrons. It determines how street food vendors access and use urban public space.

The street vendors involved in this system are not necessarily exploited victims of a cruel system. In effect they can acquire entitlements to safe usage of public space and can run their businesses. It is possible to live comfortably off the profits

of street vending. Evidently patrons are interested in keeping risks at a manageable level and to facilitate profits for their protégés and continue surplus appropriation.

Still, ultimate security will never be obtained. This is because the whole system rests on threat: the credible demonstration that public spaces are not open to all, but instead contested and permanently threatened is the driving force. The source of the threat can be external as well as internal, or even emanate from the potential patron. If a street vendor is convinced, he will logically desire to acquire protection. The amount of money a vendor is willing to spend is related to factors like the profit he expects at this spot, the severity of the threat and his risk behaviour.

Street vendors associations and unions exist, but most of the vendors do not know about them or are sceptical about their use. When asked why, the vast majority of street food vendors explained that they did not need external support since they were able to manage independently. This accords with the firm organisation rendered by the described informal system and explains the low level of labour union organisation within the street food vendors' community. It is unlikely that this situation will change.

The described system of spatial organisation is very efficient, profit-oriented, highly commercialised, individualised and resistant. The internal complexity of the patron-client system and its various, specific implementations—especially the many beneficiaries—contribute to a high resistance. Individual actors are exchangeable and niches will be filled, but the overall patterns of mutual dependency stay the same. However there are ways of considering it as dynamic: overarching changes in patronage might possibly alter the system. If for example the change in consumption patterns currently experienced in Hyderabad's emerging middle class extends to a bigger part of society, this may lead to a loss of customers. Ideally the patrons will react to this by decreasing their demands; otherwise street food vending would just stop yielding profits. Obviously as there are many stakeholders profiting by this system and as it is locally highly specific, changing it becomes very hard. This is also tellingly demonstrated by the failed attempt to implement a street food vendors' bill, which would have rendered legal certainty, as well as the failed execution of the vending zones.

## 12.9 Transformation of Urban Public Space?

In recent decades Hyderabad has undergone a tremendous transformation aimed at modernising the city to make it attractive for international investors. The changes include the conception of the appropriate use of urban public spaces. Because mobile street food vendors are perceived as manifestations of poverty and underdevelopment, their claim at using public space does not match the new urban aesthetics. Their disappearance would be judged as progress by a variety of stakeholders, firstly the municipal authorities. Irrespective of the pressure executed by the neo-liberalisation of India's political economy, the street food vending sector is booming. Overarching discourses opposing street food vendors seem to lose their

impact on the micro level. I showed that the influence of overarching discourses is reduced due to the complexity of the current system of space appropriation. The initial question whether the general socio-economic transformation is reflected in the segment of street food vending has to be negated. The elemental structures of the system of street food vending are currently not altered by overarching neo-liberalisation, the segment of street food vending is not transforming.

As reason for this I described an informal system of patronage based on threat and protection money which characterises the system of street food vending. Due to its locally specific nature and extraordinary complexity it resists measures of modernisation and liberalisation, and protects the vendors' community from external (access by municipal authorities) and internal (competition) threats. Those who are—by law—responsible for implementing concepts of urban public space profit from informal activities and do not follow their legal duties—in this case police officers do not execute municipal policies against street vendors on the micro level.

So what does that reveal about the dynamics of urban public spaces in the context of globalisation? Since the informal system of patronage is based on threats, and the effects of overarching transformation and liberalisation can well be interpreted as threats, globalisation may even strengthen the system of patronage for some time and keep up this network of trading with entitlements to safe usage of urban public spaces. Surely impacts of modern discourses on urban aesthetics are an important element of change in Hyderabad's urban public spaces. But instead of transforming into entirely new structures and basic conditions, the complexity of the existing system increases and external impacts interweave with traditional elements to form a unique interpretation of change.

On a more general level, the dynamics of transformation and liberalisation certainly have a detectable impact on conceptions of public space. But overarching discourses are not easily executed on the micro level. The influence of those shaping this discourse on a high level is especially decreased if their conceptions have to penetrate a complex, multi-beneficiary patronage system. Surely, the new urban aesthetics is affecting how public space is governed and negotiated, but the rapid transformation experienced by other segments of society is for the street vendors converted into gradual change, enabling adaptation. That is why a street food vendor selling Pani-Poori next to a modern supermarket is not a rare contradiction, but a common simultaneity – and this will most probably not change in the near future.

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# Part II
# Chinese Experiences

# Chapter 13
# Evolution of Population Structure and Spatial Distribution in Shanghai Since 2000

**Dan He and Yuemin Ning**

**Abstract** Since 2000, the social-economy conditions of Shanghai has been developing rapidly, which results from the transformation of city function, the adjustment of industrial structure, the transition of the old city, and the city renewal. Correspondingly, the population structure and spatial distribution in Shanghai has made a big change. Based on data from the Fifth and Sixth National Census of Shanghai, this paper analyzed the characteristics of population changes and spatial distribution since 2000. The research findings reveal that the trend of multi-center population pattern is strengthening, and the floating population dominating the growth in suburbs becomes the population growth center of Shanghai. However, Shanghai also faces with several problems, such as population aging, shortage of professional and technical personnel, floating population pouring, high population density in the inner city, and lacking driving force of the population decentralization. The current population decentralization is mainly led by industrial suburbanization and residential suburbanization. Nevertheless, the high-quality public service and infrastructure concentrated in the inner city, lacking Mass Rapid Transit to the suburbs and slow construction of new city hindered the population decentralization. To conclude, the sustainable development of population in Shanghai still faces great challenges in the future.

**Keywords** New city • Population structure • Shanghai • Spatial distribution

## 13.1 Introduction

Since Pudong New Area started to open up in 1990s, great changes have taken place in urban Shanghai, especially in the urban spatial structure and population distribution. Coming into the twenty-first century, with the construction of

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international metropolis and the "Four Centers",[1] the implementation of the "1966 Town System"[2] and the "Twelfth Five-year Plan", the population structure and spatial distribution of Shanghai are changing further.

In the early 1990s, the transformation of the spatial structure and spatial distribution of population in Shanghai were strongly concerned by domestic scholars. Afterwards, the evolution of spatial structure and adjustment of industrial structure of Shanghai became the main topic (Ning and Yan 1995; Ning and Deng 1996; Chen 1996). Meanwhile, with the acceleration of suburbanization, the population suburbanization, traffic evacuation and industrial restructure also became the focus of the study (Peng and Ning 1998; Zhang and Du 2001; Zeng 2002; Liu et al. 2004; Xie 2004; Tan 2005). Since floating population increases, the distribution of floating population and its mechanism therefore were concerned widely (Roberts and Wei 1999; Gao and Wu 2005; Xu and Ning 2005; Wang and Dai 2005; Luo and Wang 2008). In recent years, with the expansion of the population in Shanghai, population carrying capacity, environmental problems as well as the population dispersing have become a new trend of researches (Wang et al. 2008, 2013; Zhang et al. 2013; Shi et al. 2013).

With rapid development of social-economy conditions in Shanghai, the city function region has changed and so has spatial pattern of population. Questions are raised that as follows: from 2000 to 2010, what are the characteristics of the population change and population distribution; whether the trend of population suburbanization and multi-center population pattern is strengthened or not; whether the population of inner city is effectively evacuated while these new cities absorbed these population or not. In order to understand dramatic change of population in Shanghai, this paper summarizes characteristics of population changes and spatial distribution based on the data from the Fifth and Sixth National Census of Shanghai. Furthermore, the paper also discusses dispersal mechanism of population and urban problems that Shanghai has to face, on the expectation to provide some policy suggestion.

[1] Four Centers refers to International Economic Center, International Financial Center, International Trade Center, and International Shipping Center. It, as the development target of Shanghai, was put forward firstly on Ninth Congress of the Communist Party of Shanghai in May of 2007. Xi Jinping make a report to the Congress on behalf of the eighth session of Shanghai Municipality Council. The development target of Shanghai, in the next five years, is to form the basic framework of international economic, financial, trade, shipping center. Shanghai local government plans to complete basically the construction of "Four Centers" and the modernized international metropolis till 2020.

[2] 1966 Town System refers to a town system plan of Shanghai, in which Shanghai local government aims to construct many new cities or towns to promote population decentralization from the inner city, as well as to attract migrant workers into the new cities or towns. Shanghai local government improves rural urbanization and intensive farming by merging nature villages into central villages. In order to reach the goal, Shanghai local government plans to build 1 central city (the region of about 600 $km^2$ within the outer ring road of Shanghai), 9 new cities (Baoshan, Jiading, Qingpu, Songjiang, Minhang, Nanqiao of Fengxian, Jinshan, Lingang, Chengqiao of Chongming), about 60 new towns, and about 600 central villages.

## 13.2 General Characteristics of Population Changes in Shanghai

### *13.2.1 Advancing Resident Population with Booming Floating Population*

Along with the process of reform and opening, a large number of floating population (*wai lai ren kou*) have poured into urban Shanghai since 1980s, which contributes to the resident population's (*chang zhu ren kou*) sustainable growth in Shanghai. From 1982 to 2010, the resident population of Shanghai increased from 11.86 million to 23.02 million, which is a net increase of 11.16 million equivalent to a newly rebuilt urban Shanghai. Particularly, the period from 2000 to 2010 is the peak of population growth in Shanghai, during which the resident population increased by 6.61 million.

Despite of the rapid growth of resident population, the growth of registered population (*hu ji ren kou*) is relatively slow. From 1982 to 2010, the registered population increased slowly from 11.78 million to 14.04 million and the net increase is 2.26 million. The proportion of the registered population to the resident population gradually decreased to 61 % in 2010.

However, the floating population has been experiencing a strong, steady growth since 1980s, especially after the Development and Opening of the Pudong New Area in 1990. The number of population doubled every 5 years. From 2000 to 2010, the floating population of Shanghai increased rapidly from 3.46 million to 8.98 million, with an increase of 159 %. The number of floating population doubled every 5 years nearly and the proportion of the resident population has substantially climbed to 39 % in 2010. As a result, the floating population plays an important role in Shanghai (Fig. 13.1).

### *13.2.2 Aging Registered Population with Younger Floating Population*

The continuing growth of resident population is contributed to the huge labor market created by the sustainable development of social economy in Shanghai since the Reform and Opening-up (Yu et al. 2012). However, the limitation of Residence Registration System (*hu kou*) and the low birth rate of the registered population in long term have resulted in the low growth and the accelerating aging trend of the registered population. Consequently, it provides an opportunity for a large number of young migrant labors to have access to Shanghai, which gives rise to greater differences in the age structures between registered population and floating population.

The Sixth National Census of Shanghai reveals that the registered population focuses on the age group ranging from 45 to 64, which indicates the obvious aging

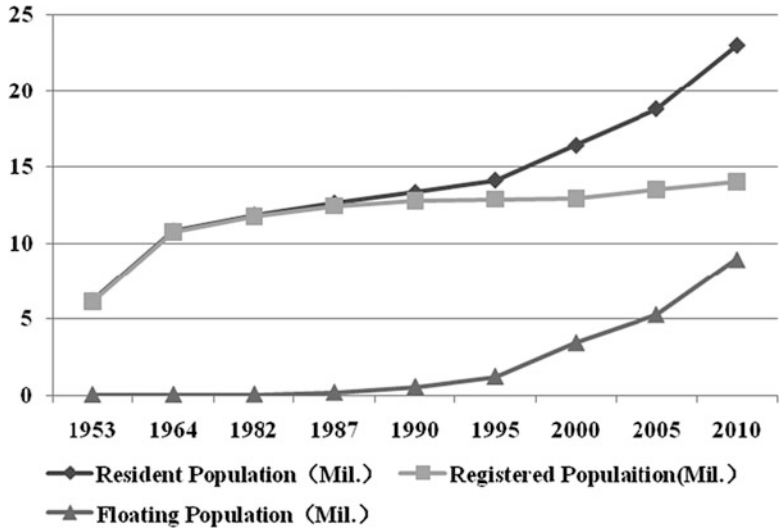


**Fig. 13.1** The evolution history of population in Shanghai (1953–2010). *Sources*: Shanghai Bureau of Statistics (2009), Shanghai Bureau of Statistics (2012)

trend of registered population. By contrast, the floating population mainly centers on the age group ranging from 20 to 44, which is 1.5 times more than that of the registered population in the same age group. Furthermore, the amount of floating population is more than that of registered population in age group from 15 to 44. Although the rapid increasing of young immigrant meets the needs of the demand of labor market, Shanghai local government has to face the tremendous pressure caused by the aging problems in registered population. To a certain extent, such a great discrepancy in the age structures can relieve the pressure from the social security system and the public finances in the short term. However, in the long run, the situation will be worse, with the demographic dividend of young migrants cashed out in the near future (Fig. 13.2).

### *13.2.3 Diversified Floating Population Sources due to Economic Factors*

In shanghai, the sources of floating population are diverse. The eastern China, e.g. Anhui, Jiangsu and Zhejiang, are the main sources of immigrants in Shanghai (Table 13.1). However, the comparison finds that the proportion of floating population from eastern China declines slightly and the proportion of Henan, Sichuan and Jiangxi increases gradually. The immigrants from central China and western China gradually become the important sources of floating population, though immigrants from eastern China still place the strong position.

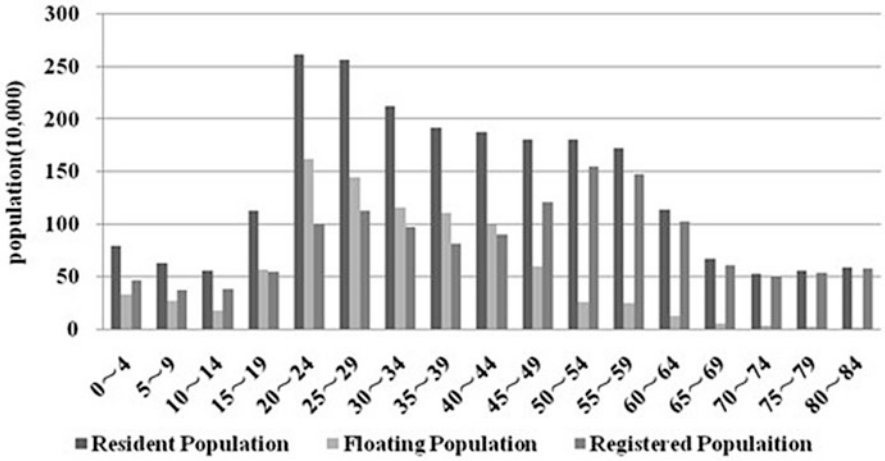


**Fig. 13.2** The age structure of population in Shanghai in 2010. *Sources*: The Sixth National Census of Shanghai

**Table 13.1** The source distribution and ranking of floating population in 2000 and 2010

| Province | The proportion in 2010 (%) | Ranking | The proportion in 2000 (%) | Ranking |
|---|---|---|---|---|
| Total | 100 | | 100 | |
| Anhui | 29.0 | 1 | 32.2 | 1 |
| Jiangsu | 16.8 | 2 | 24.0 | 2 |
| Henan | 8.7 | 3 | 4.1 | 6 |
| Sichuan | 7.0 | 4 | 7.3 | 4 |
| Jiangxi | 5.4 | 5 | 6.0 | 5 |
| Zhejiang | 5.0 | 6 | 9.9 | 3 |
| Hubei | 4.5 | 7 | 2.7 | 8 |
| Shandong | 4.2 | 8 | 2.1 | 9 |
| Fujian | 2.9 | 9 | 2.8 | 7 |
| Hunan | 2.5 | 10 | 1.4 | 10 |
| Other province | 14.0 | | 7.5 | |

*Sources*: The Fifth and Sixth National Census of Shanghai

For most immigrants to Shanghai, economic factors are the main reasons. Compared the Fifth and Sixth National Census data, it can be revealed that working and business are still the main reasons for migration. What's more, it is on an upward trend. In 2010, more than 78 % people moved to Shanghai because of working or business, and equally the proportion are near 70 % in 2000. Meanwhile, accompanying movement with family members should not be ignored, which ranks second. From these findings, it can be safely concluded that the most distinct characteristics of migration is not single but "with" the family member (Table 13.2).

**Table 13.2** The reason for migration of floating population in Shanghai in 2000 and 2010

| | The proportion in 2010 (%) | The proportion in 2000 (%) |
|---|---|---|
| Total | 100 | 100 |
| Working or business | 78.3 | 69.9 |
| Migrant with family member | 8.5 | 13.5 |
| Stay with relatives and friends | 4.7 | 5.5 |
| Learning and training | 2.1 | 2 |
| Marriage | 2.1 | 2.5 |
| Job transfer | 1.7 | 1.2 |
| Removing | 1.1 | 1.7 |
| Others | 1.5 | 3.7 |

*Sources*: The Fifth and Sixth National Census of Shanghai

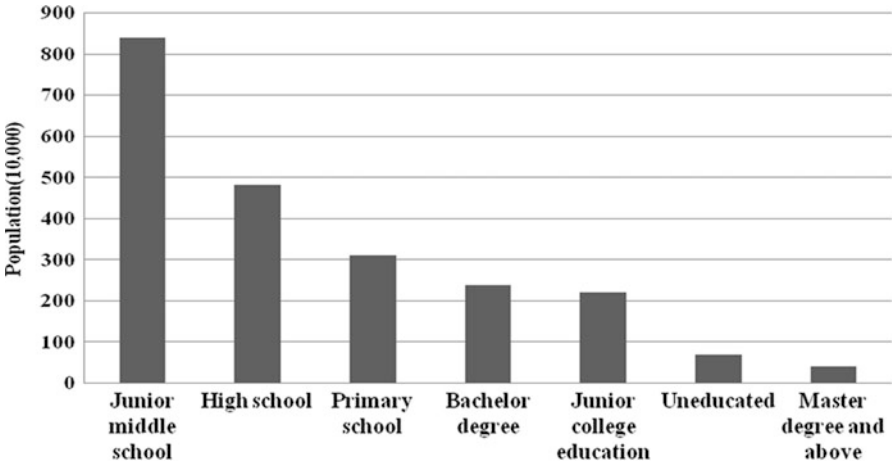


**Fig. 13.3** The education level of population in Shanghai in 2010. *Sources*: The Sixth National Census of Shanghai

### *13.2.4 Considerably Increasing Highly Educated Talents while Still Lack of Professional and Technical Experts*

The number of high educated people has increased rapidly since 2000, according to statistics in Shanghai, There are 21,892 people who have bachelor's degree, 20,953 people who gain the high school education degree, 36,519 who reach junior middle school education level and 13,561 with primary school education level in 2010 (Fig. 13.3). The number of people with a bachelor's degree doubles that of 2000. The amount of people who have Master Degree or above increased from 76,200 in 2000 to 421,800 in 2010.

Despite the rapid growth of highly educated talents in Shanghai, the professionals are still lacking in Shanghai, which is a bottleneck for Shanghai to develop advanced manufacturing industry and modern producer services. In 2008, there

**Table 13.3** The professional technical talents in Shanghai in 2004 and 2008

| Items | Total in 2004 (10,000 persons) | Proportion in 2004 (%) | Total in 2008 (10,000 persons) | Proportion in 2008 (%) |
|---|---|---|---|---|
| The total technical title personnel | 138 | 15.15 | 142.8 | 13.71 |
| Junior technical titles | 66.9 | 7.34 | 69.4 | 6.66 |
| Intermediate technical titles | 54.8 | 6.02 | 55.9 | 5.37 |
| Senior technical titles | 16.3 | 1.79 | 17.5 | 1.68 |
| The total technician and worker | 57.4 | 6.3 | 58.5 | 5.62 |
| Senior technician | 1.5 | 0.16 | 2.2 | 0.21 |
| Technician | 4.7 | 0.52 | 6.3 | 0.6 |
| Senior worker | 12.1 | 1.33 | 14.4 | 1.38 |
| Intermediate worker | 39.1 | 4.29 | 35.6 | 3.42 |

*Sources*: National Economic Census of Shanghai in 2004, 2008

were 1.43 million people with technical titles, accounting for 13.17 % of the total number of employees. However, there were only about 180,000 people who have senior technical titles. In addition, there were only 22,000 senior technicians in the 585,000 people, which refer to the total technician and worker (Table 13.3). Compared with the data in 2004, although the absolute number of the professionals increased, the proportion of the total employees declines.

According to the experience (Wang 2009), the proportion of financial professionals in the total population should be more than 10 % if a city wants to become an international financial center. For example, the number of insurance employees in Hong Kong reached more than 350,000 people in 2007, accounting for about 10 % of the total employed population. In 2008, the number of financial professionals was 231,900 in Shanghai, only 2.2 % of total employees, which did not even reach 1/4 of financial professionals in London. Taken population of 7.5 million in London into consideration, the proportion of financial professionals in Shanghai is much smaller than London (Sassen 2001).

According to the forecast,[3] the human resource demand of Shanghai's goal to the international shipping center is about 300,000, of which the core professionals will be nearly 100,000. The proportion of modern shipping service professionals to shipping employee now is only 3.9 %, far behind that of London (60 %). It is also an obvious gap with Hong Kong and Singapore. According to the professional classification, the urgent demand of talents in Shanghai international shipping center includes international shipping management, international freight and customs clearance, shipping finance and insurance, ship driving, channel design, construction, etc. The talent gap is about 156,000.

[3] Xinhua News Agency in Shanghai reported. 2009. Xinhua News Agency. http://www.sh.xinhuanet.com/2009-04/13/content_16238372.htm. Accessed on 13 Apr 2009.

## 13.3 Spatial Distribution of Population

At present there are 16 districts, namely Pudong New Area, Xuhui, Changning, Putuo, Zhabei, Hongkou, Yangpu, Huangpu, Jingan, Baoshan, Minhang, Jiading, Jinshan, Songjiang, Qingpu, Fengxian, and one county, Chongming under Shanghai's jurisdiction. The administrative jurisdiction of Nanhui and Luwan were separately changed in 2010 and in 2011. In order to ensure the consistency of data, this research uses the administrative jurisdiction before adjustment. To be more specific, there are 18 districts and 1 county in Shanghai in this paper. On the basis of the previous study (Li and Ning 2007), the districts are divided into four layers: the core zone of inner city including Huangpu, Jingan and Luwan; the fringe zone of inner city including Hongkou, Xuhui, Changning, Putuo, Zhabei and Yangpu; the near suburban area including Pudong New Area, Minhang, Baoshan, Jiading; the far suburban area including Jinshan, Songjiang, Qingpu, Nanhui, Fengxian and Chongming County (Fig. 13.4).

### *13.3.1 Emerging Trend of Multi-Center Population Pattern with Population Declined from the Inner City to the Suburb*

The population has been converging on the center of Shanghai and the single center pattern is significant. The population distribution has a significant characteristic of regional layer structure, gradually declined from the center to suburb (Fig. 13.5). The population density of the three districts in core zone of inner city was 30,000 people/km$^2$, while the density was 40,000 people/km$^2$ in 2000. The population density of the fringe zone of inner city like Hongkou, Yangpu, Zhabei, Putuo, Xuhui and Changning kept at 18,000 people/km$^2$ above. The population density of near suburban area like Pudong New Area, Minhang, Baoshan and Jiading was over 3,000 people/km$^2$, while it was 1,600 people/km$^2$ in 2000. The population density of far suburban area like Jinshan, Qingpu, Nanhui, Fengxian, Chongming was less than 1,000 people/km$^2$, except Songjiang of 2,600 people/km$^2$. Based on the standard of the Fifth National Census of Shanghai, the area whose population density is more than 1,500 people/km$^2$ is namely urban area. The urban area of Shanghai has significantly increased in decade, which reflects evident trend of sprawl outward.

The data shows that the peak of the population density mainly distributed in the center of the city, but it is noteworthy that there are multiple peaks. For example, there is a sub-highest peak in the south of Hongkou District. Meanwhile, two small population peaks emerges in Jiading Districts and Songjiang New City, which shows approaching multi-center distribution tendency of population with the new city construction (Li et al. 2010). So is the situation in Jinshan and Qingpu, whereas the population density still remains lower.

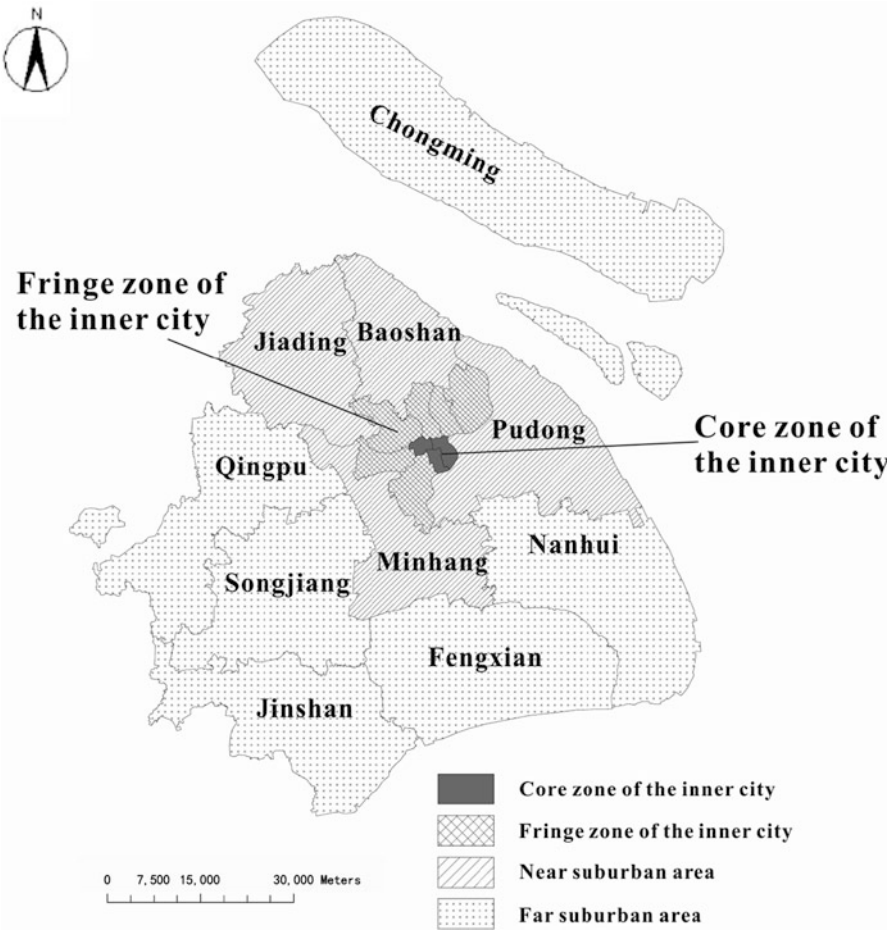


**Fig. 13.4** The map of four layers in Shanghai. *Sources*: Li and Ning 2007

### *13.3.2 Core Growth of Population in Suburbs and Narrowing Density Gap Between Inner City and Suburbs*

Faced with the traffic and environmental pressure, Shanghai local government puts forward urban policies to decentralize the population density of inner city in order to promote the population redistribution rationally, which has gained certain effects. As it can be seen from Table 13.4, the population of the whole city maintained a substantial growth, nevertheless the population of inner city increased only 56,000 in the 10 years. While the population in the core zone declined sharply by 23.43 %, the population in the fringe zone climbed gradually by 5.93 %. In the fringe zone, the population of Hongkou and Changning decreased slightly, and the other four districts increased slightly. The population of suburbs grew dramatically

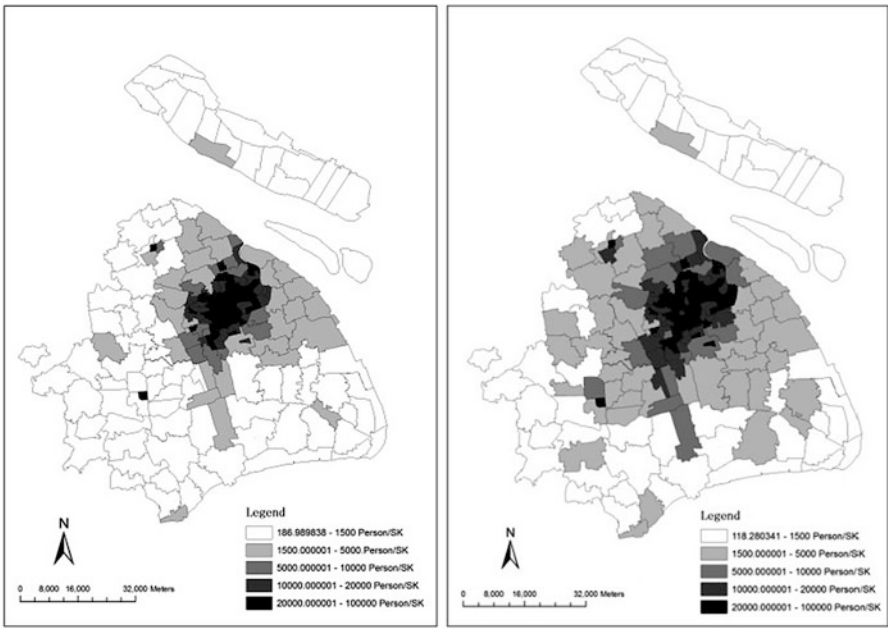


**Fig. 13.5** The density distribution map of the resident population in Shanghai in 2000 and 2010. *Sources*: The Fifth and Sixth National Census of Shanghai

in comparison with that of the inner city. It is apparent that the population of the suburb area grew 6.59 million from 2000 to 2010, accounting for 99.61 % of the entire increasing population of Shanghai in this period, which indicates that the population growth of Shanghai mainly concentrates on the suburbs.

It can be seen in Fig. 13.6 that the population in most areas of Shanghai keeps growing in the past 10 years, in addition to the center area and Chongming County. The reason why the population of these two areas declined is not quite the same. The population decrease of Chongming is justifiable on grounds of her aim to construct the Ecological Island, so large numbers of people are shifted to suburban areas or inner city to seek for new jobs, which is also an obvious urbanization. Meanwhile, the negative growth of the inner city population is mainly caused by the demolition and resettlement in downtown rebuilding and jobs spreading to the suburbs, which result in suburbanization (Wu 2010).

Owing to population diffusion from inner city to suburbs, the population density of Huangpu, Luwan and Jingan dropped sharply. More significantly, the population density of Huangpu decreased from 46,300 people/km$^2$ in 2000 to 34,640 people/km$^2$ in 2010. However, at the same time, the population densities of far suburban area like Jiading, Qingpu, Songjiang, Jinshan and Fengxian all rised. The population density gap is narrowing down among districts. The gap between "peak" (the max.) and "valley" (the min.) reduced from 74.2 times in 2000 to 61.1 times in 2010. To conclude, there is still great room for suburbanization for Shanghai in the future.

**Table 13.4** The change of resident population in Shanghai in 2000 and 2010

| Regions | Resident population in 2000 (10,000 persons) | Resident population in 2010 (10,000 persons) | The change of population in 2000–2010 (10,000 Persons) | The change rate of population in 2000–2010 (%) |
|---|---|---|---|---|
| Total | 1,640.78 | 2,301.91 | 661.13 | 40.29 |
| Inner city | 693.03 | 698.62 | 5.59 | 0.81 |
| Core Zone | 120.88 | 92.55 | −28.32 | −23.43 |
| Huangpu | 57.45 | 42.99 | −14.46 | −25.17 |
| Luwan | 32.89 | 24.88 | −8.01 | −24.54 |
| Jingan | 30.53 | 24.68 | −5.85 | −19.17 |
| Fringe Zone | 572.16 | 606.08 | 33.92 | 5.93 |
| Xuhui | 106.46 | 108.51 | 2.05 | 1.93 |
| Changning | 70.22 | 69.06 | −1.16 | −1.66 |
| Putuo | 105.17 | 128.89 | 23.72 | 22.55 |
| Zhabei | 79.86 | 83.05 | 3.19 | 3.99 |
| Yangpu | 124.38 | 131.32 | 6.94 | 5.58 |
| Hongkou | 86.07 | 85.25 | −0.82 | −0.96 |
| Suburban Area | 944.71 | 1,603.29 | 658.58 | 69.71 |
| Near suburban area | 558.07 | 959.88 | 401.94 | 72.02 |
| Minhang | 121.73 | 242.94 | 121.21 | 99.57 |
| Baoshan | 120.8 | 190.49 | 67.12 | 55.69 |
| Jaiding | 75.31 | 147.12 | 71.82 | 95.38 |
| Pudong new area | 240.23 | 379.33 | 139.11 | 53.9 |
| Far suburban area | 387.67 | 643.28 | 255.61 | 65.93 |
| Jinshan | 58.04 | 73.24 | 15.2 | 26.19 |
| Songjiang | 64.12 | 158.24 | 94.12 | 146.79 |
| Qingpu | 59.59 | 108.1 | 48.51 | 81.42 |
| Nanhui[1] | 78.51 | 124.98 | 46.47 | 65.03 |
| Fengxian | 62.43 | 108.35 | 45.92 | 73.55 |
| Chongming* | 64.98 | 70.37 | 5.39 | 8.3 |

*Sources*: The Fifth and Sixth National Census of Shanghai

**Note*: In 2005, the two townships Changxing and Hengsha of Baoshan district are zoned into Chongming district, so in the Sixth National Census of Shanghai Chongming district included the two town population. In order to keep the data comparability and consistency, the data of Baoshan population subtracted the two townships population in the Fifth National Census in 2000, and so the population of Chongming district included the two town population

[1]Nanhui district is zoned in Pudong district in 2009, in order to keep the data comparability and consistency, the table uses the unchanged zoned method

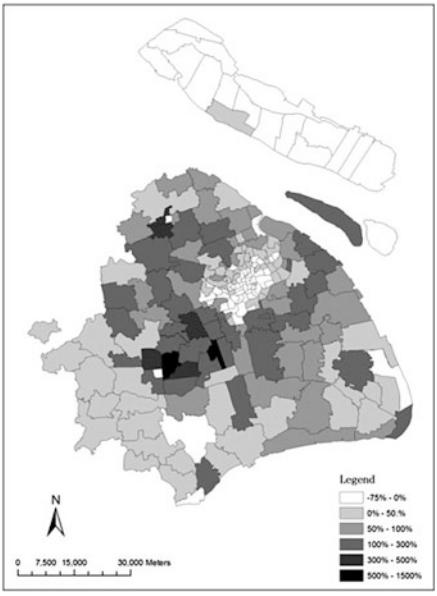


**Fig. 13.6** The growth rate of population in Shanghai in 2000–2010. *Sources*: The Sixth National Census of Shanghai

### *13.3.3 Floating Population Dominating Population Growth in the Suburbs with Disperse Population Peaks*

In 2000, 1/3 of the population was in the inner city, and 2/3 distributed in the suburbs. The floating population in the suburbs was 1.2 million more than that in the inner city in 2000, and the gap had become 5.5 million by 2010. There is only 19 % of the floating population distributing in the central city in 2010.

The floating population dominates the population growth in the suburbs. In the whole suburb it increased by 4.68 million, accounting for 91.56 % of the total increased population in the city in the past 10 years (2000–2010). The floating population in the near suburban area and the far suburban area grew respectively by 2.53 million and 2.14 million, accounting for 49.61 % and 41.96 % of the total increased population. It should be also noted that the population growth in the inner city is concentrated on the fringe zone of inner city. In recent 10 years, the floating population of the inner city grew only 432,400. However, the floating population of the core zone of inner city climbed by only 54,500, while the remaining 377,800 people mainly grew in the fringe zone of inner city (Table 13.5).

In fact, the floating population is not only the main force of population growth in the suburbs, but also approaches or exceeds the local population. By 2010, the total floating population had accounted for 45 % of the total population in the suburbs. The ratio of floating population in the near suburban area and the far suburban area respectively reached 45.58 and 44.60 %, which is far higher than that of the inner city (24.81 %). The ratio of floating population in Songjiang, Qingpu and Jiading has

**Table 13.5** The change of the floating population in Shanghai in 2000–2010

| Regions | Floating population in 2000 (10,000 persons) | Floating population in 2010 (10,000 persons) | The change of population in 2000–2010 (10,000 persons) | The change rate of population in 2000–2010 (%) |
|---|---|---|---|---|
| Total | 387.11 | 897.7 | 510.59 | 131.89 |
| Inner City | 130.07 | 173.3 | 43.24 | 33.24 |
| Core Zone | 18.92 | 24.37 | 5.45 | 28.83 |
| Huangpu | 9.43 | 13.25 | 3.82 | 40.48 |
| Luwan | 4.85 | 5.4 | 0.55 | 11.31 |
| Jingan | 4.64 | 5.72 | 1.08 | 23.38 |
| Fringe Zone | 111.15 | 148.93 | 37.78 | 33.99 |
| Xuhui | 23.31 | 27.95 | 4.64 | 19.93 |
| Changning | 16.27 | 17.54 | 1.27 | 7.83 |
| Putuo | 23.11 | 36.3 | 13.19 | 57.07 |
| Zhabei | 14.4 | 20 | 5.6 | 38.86 |
| Yangpu | 19.68 | 27.53 | 7.85 | 39.89 |
| Hongkou | 14.38 | 19.61 | 5.23 | 36.35 |
| Suburban Area | 256.88 | 724.4 | 467.52 | 182 |
| Near Suburban Area | 184.21 | 437.51 | 253.3 | 137.5 |
| Minhang | 48.1 | 120.37 | 72.27 | 150.27 |
| Baoshan | 25.4 | 82.82 | 57.42 | 226.12 |
| Jaiding | 37.44 | 76.61 | 39.17 | 104.61 |
| Pudong New Area | 73.28 | 157.71 | 84.43 | 115.22 |
| Far suburban area | 72.67 | 286.89 | 214.22 | 294.8 |
| Jinshan | 6.08 | 20.11 | 14.03 | 230.82 |
| Songjiang | 19.05 | 93.74 | 74.7 | 392.18 |
| Qingpu | 16.82 | 60.5 | 43.68 | 259.62 |
| Nanhui[1] | 12.26 | 44.72 | 32.46 | 264.79 |
| Fengxian | 13.06 | 52.72 | 39.66 | 303.77 |
| Chongming* | 5.4 | 15.1 | 9.7 | 179.49 |

*Sources*: The Fifth and Sixth National Census of Shanghai
**Note*: ditto
[1]Nanhui district is zoned in Pudong district in 2009, in order to keep the data comparability and consistency, the table uses the unchanged zoned method

outstripped by 50 %. In particular, the floating population proportion of Chedun Town in Songjiang Industrial Park has exceeded 90 %. It has become not only an important driving force of economy growth, but also the main force of urbanization (Fig. 13.7).

In Fig. 13.8, the floating population density demonstrates the characteristics of diminishing in circle layer from the inner city to the suburbs. The resident population centers on the core zone of inner city and has formed a continuous development zone. In contrast, the floating population shapes several population peaks in near and far suburban area.

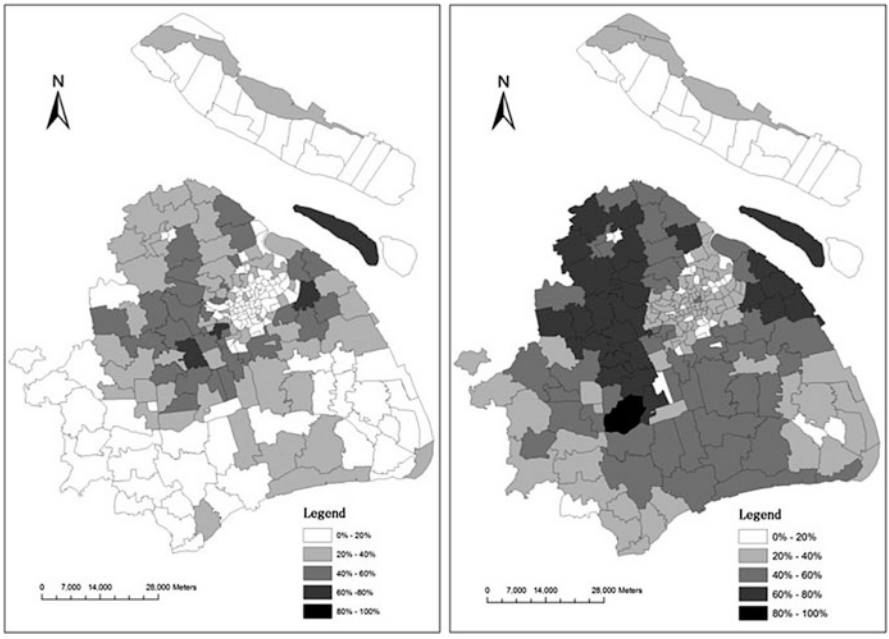


**Fig. 13.7** The proportion of floating population to resident population in 2000 and 2010. *Sources*: The Fifth and Sixth National Census of Shanghai

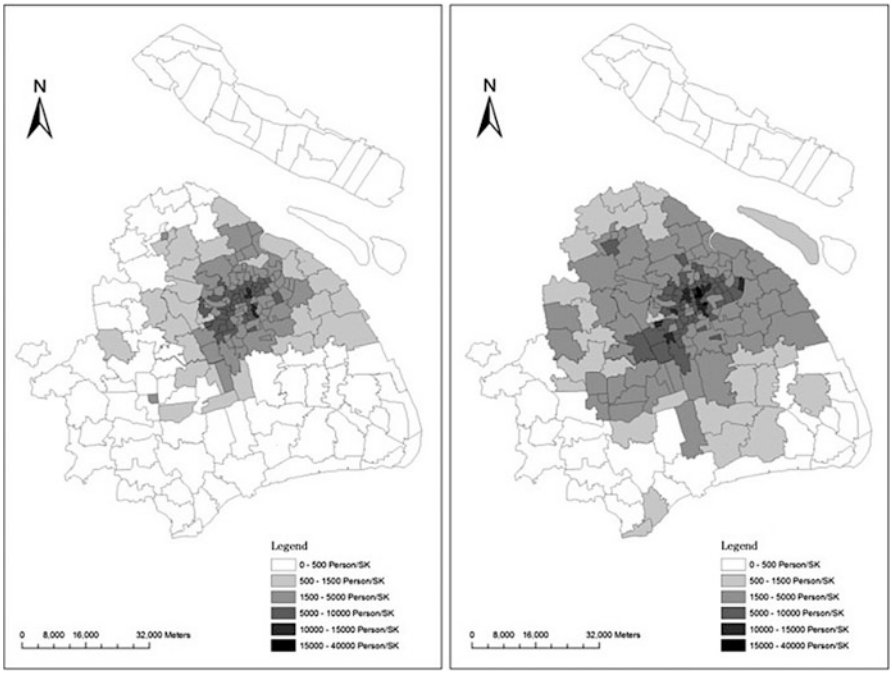


**Fig. 13.8** The distribution of floating population in Shanghai in 2000 and 2010. *Sources*: The Fifth and Sixth National Census of Shanghai

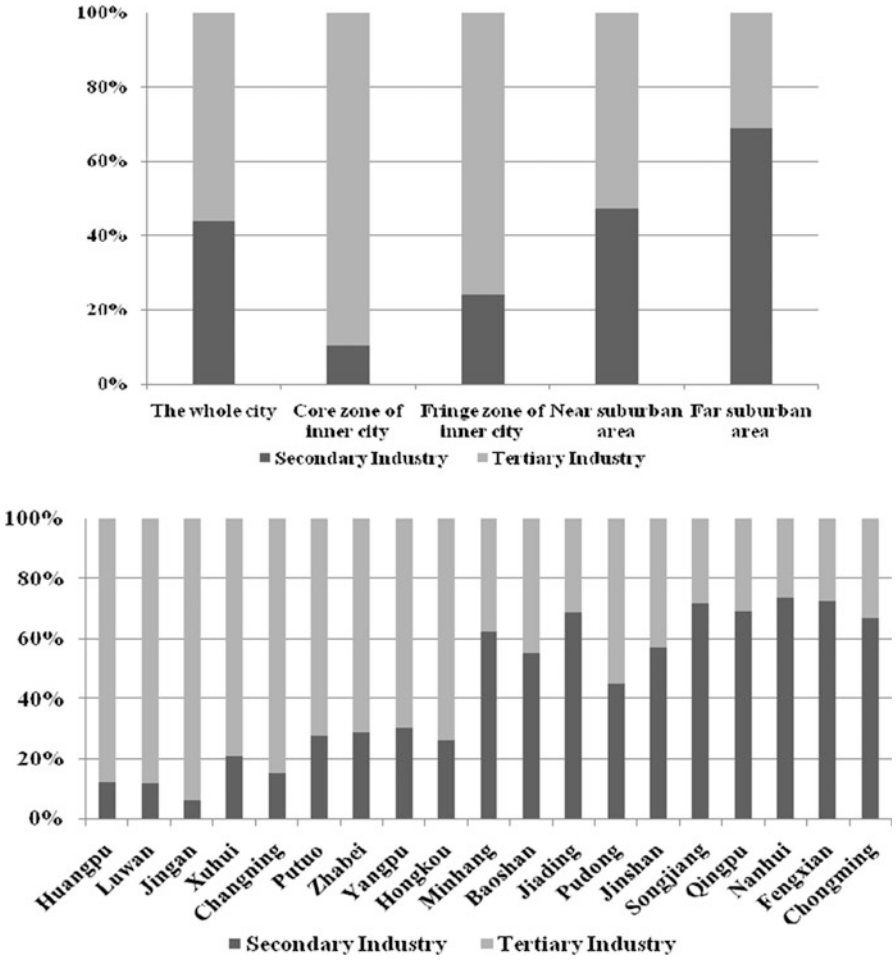


**Fig. 13.9** The employment structure in different districts. *Sources*: The Sixth National Census of Shanghai

### *13.3.4 Highly Developed Industrial Suburbanization with Slow Suburbanization of the Retail and Office*

The employment structure changes along with the migration of population. The number of employees in primary and secondary industries in Shanghai is 10.41 million in 2010. And the proportion of the two industries is almost equal. The proportion of primary industry is 47.24 %, while the secondary industry is 52.76 %. The employment structure of downtown and suburbs considered, 80 % of the employment population in the inner city concentrated in the service industry, and about 60% of employee in suburbs is mainly in the manufacturing industry (Fig. 13.9).

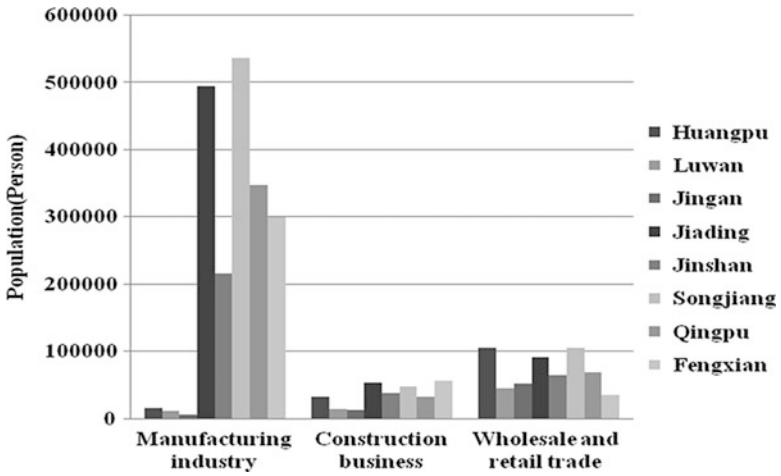


**Fig. 13.10** The employment in different industry of Shanghai in 2010. *Sources*: The Sixth National Census of Shanghai

The employment situation in various districts of inner city or suburbs still remains different. The proportion of employment in service industry in core zone of inner city is around 90 %, of which Jingan District, reaching 94 %, is the highest. At the same time, the proportion of employment in service industry in suburbs is 70–80 %. The secondary industry employment population in the suburb is generally higher than the average, expect Pudong New Area. The proportion of employment in secondary industry in the near suburban areas in 60 %, and the proportion in the far suburban area is about 70 %. The employment population of secondary industry rises while the employment population of tertiary industry steps down from the core zone of inner city to the far suburban area, which reflects the characteristics of "industrial suburbanization" in Shanghai (Zhou and Ma 2000).

Compared with the prosperous industrial suburbanization, the retail and office suburbanization develops relatively slowly. The employment population proportion of wholesale and retail industry in the tertiary industry is largest both in the five districts in the far suburban area and the core zone of inner city (Fig. 13.10). But the leasing and business services, accommodation and catering industry, the real estate industry and the financial industry vary greatly between them. There are very few employees in the financial industry in the five suburban districts, and employment population of accommodation and catering industry and the real estate industry is 2 % below, which shows that there is great gap between the core zone of inner city and suburban area in finance, leasing and business services, real estate and other modern service industry, and the development of accommodation and catering industry, transportation, storage and postal industry and other traditional service industry in the suburban area is relatively backward as well. And only the development gap of the wholesale and retail industry is smaller. The

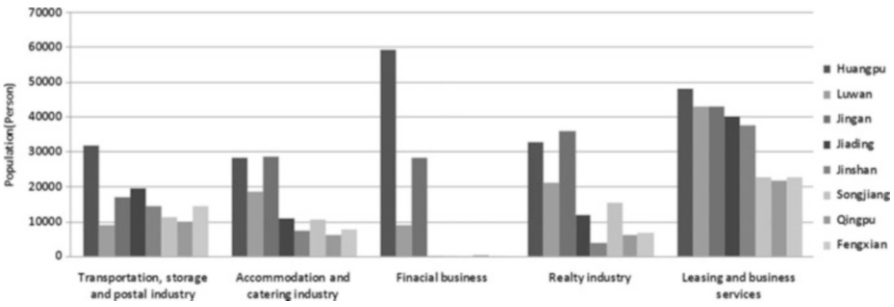


**Fig. 13.11** The employment in different sectors of tertiary industry of Shanghai in 2010. *Sources*: The Sixth National Census of Shanghai

five suburban districts absorb massive employees in manufacturing industry and at the same time the service industry does not develop equally. The traditional service industry like traditional accommodation, catering and other personal and family services remains for further improvement in the future. Furthermore, the development of service industry in the five suburban districts still has a long way to go.

### *13.3.5 Lack of MRT in Suburbs Resulting in Tardy New City Construction and Population Decentralization*

Mass Rapid Transit (MRT) has the advantages of large capacity, long distance and high attainability, which makes it one of the most important means of transportation during the commuting time in mega cities. The main MRT lines which connect inner city and suburban areas are the urban land expanding axis (Meng and Xu 2007). The pattern of Transit Oriented Development (TOD) has become an important way for industrial layout, population distribution and land use, especially in some international city, such as New York, Tokyo, Hong Kong (Loo et al. 2010). The connection between the inner city and suburbs is established by large quantities of MRT, which would promote the population decentralization to solve the problem of high population density of inner city (Qi and Zhao 2007).

By the end of 2013, Shanghai has built 13 Metro (including the Maglev), with three lines under construction. The Shanghai Metro network is preliminary formed. Figure 13.11 reveals that population density has a close relation with Metro distribution. The population density in the inner city where Metro spreads all over is very high, meanwhile, the suburban area, where Metro can arrive like Minhang, Songjiang, Jiading, had much higher population density than the other suburban areas. As for the growth rate, where the population grows rapidly mainly concentrated in Minhang, Jiading New City and Songjiang New City where Metro can arrive directly. The population of other suburban areas, where no Metro

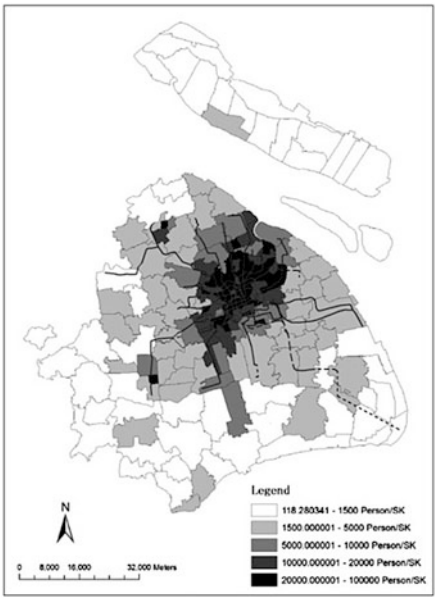


**Fig. 13.12** Population density and MRT in Shanghai in 2010. *Sources*: The Sixth National Census of Shanghai

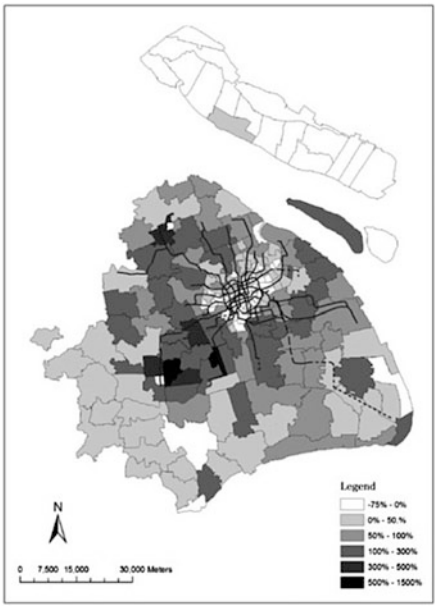


**Fig. 13.13** Population growth rate and MRT in Shanghai in 2000–2010. *Sources*: The Fifth and Sixth National Census of Shanghai

reached, grows relatively slowly (Fig. 13.12). Therefore, the convenient MRT connected inner city to suburban areas, to a certain extent, can greatly promote the population flowing from the inner city to suburban areas, and accelerate the population growth and agglomeration in suburban areas (Fig. 13.13).

"1966 Town System" is in no doubt the highlights of the Eleventh Five-year Plan in Shanghai. It plans to construct a number of new cities (*xin cheng*) to promote population decentralization and enhance the level of urbanization. The data show that Minhang, Jiading New City and Songjiang New City attained rapid population growth among the nine planning new cities. The three new cities have solid industrial foundation, long urban histories and good infrastructure, which is a strong attraction to population. The pro-growth urban policy (He and Ning 2008) and Metro construction further promoted these areas become the most attractive regions for the population in inner city with the background of industrial and residential suburbanization. However, the other new cities have the weaker development foundation and lack Metro, which results in a weak attraction to population. To some extent, the potential employment opportunities and convenient traffic condition are the main reasons for population agglomeration in suburban areas (Chen et al. 2009).

## 13.4 Discussion and Conclusion

The rapid economic growth not only reshapes the skyline but also the population structure and spatial distribution in urban Shanghai. This paper analyzes the characteristics and spatial distribution changes of the population in Shanghai based on the Fifth and Sixth National Census of Shanghai. The research findings reveal that population of Shanghai shows new features, mainly for sustained growth of resident population and explosive growth of floating population. The registered population is aging, while the chief component of floating population is youngster, who contributed to the booming of labor market in Shanghai. To be more specific, the source of floating population is countrywide, but mainly from the central and eastern China. And the main reason of their moving to Shanghai is working or business, as well as the reason, moving with family number, cannot be ignored. Meanwhile, highly educated personnel have been increasing significantly, but technical personnel are still in desperate need. With the influence of industrial and residential suburbanization, population spatial distribution in Shanghai has transformed correspondingly. The trend of multi-center pattern has emerged and suburban areas have become the hotspot of population growth, which results from the dispersed population concentrated in several new cities where the potential employment opportunities and traffic conditions are better than other regions. The industrial suburbanization develops rapidly, but the retail and office suburbanization develops relatively slowly. Therefore, the floating population, who seek for the job opportunities, has dominated the population growth in suburban areas, particularly near the industrial park. As a result, the population density gap between inner city and suburban areas is narrowing down.

Although population growth of the inner city is slowing down, the pressure of population decentralization is still tremendous. As mentioned above, the general

trend of population growth has shifted to the suburban areas. On the one hand, along with rising income, some middle-class residences begin to see suburban estates as alternative places to improve their housing conditions. On the other hand, many residences are relocated into the suburbs through urban redevelopment, which the old neighborhoods are demolished to make space for office and commercial buildings and high-end apartment. However, the population density of inner city is too high compared with other international metropolis (Walcott and Pannell 2006). The flourishing urban economy, diversified employment demand and perfect public service, especially good education facilities and hospitals make most people willing to live in the inner city of Shanghai.

The suburban area become the hotspot of population growth, nevertheless the driving forces of decentralization in different area are distinctly different. Those relocated residences from inner city, owing to the relatively low housing costs and accessed to the public service of inner city, are more inclined to live in the near suburban areas which similar to the commuter zone in the metropolis of developed countries (Hanlon et al. 2009; Jun et al. 2012). If there were no rational urban policies to control the random property-oriented development, the near suburban areas perhaps become a hard-hit area of urban sprawl. In this case, it is quite hard to realize the expectations of population decentralization, rather, it will bring many problems, e.g. environmental impact, increased in traffic and traffic-related fatalities, delays in emergency medical services response and fire department response times and increased infrastructure costs and personal transportation costs (Brueckner 2000; Habibi and Asadi 2011), to urban development in Shanghai. Moreover, the new cities or towns near the industrial park in near suburban area become the attractive resident area for the people who want to find the jobs in industrial park, particularly, Minhang, Jiading New City which have long history of industrial development and good infrastructure facilities. Therefore, both the residential decentralization and industrial suburbanization are main driving forces of the development in near suburban area.

In far suburban area, the phenomenon that the industrial suburbanization promotes population concentrations is rather significant. The potential employment opportunities attract more people, particularly the migration workers, to settle in new cities or towns near the industrial park. The industrial park, on the other hand, provides the affordable housing or dormitory to migration workers. The migration workers trend to the work-oriented settlement with a low-cost living condition. In addition to the above, those attractive new cities in far suburban area, e.g. Songjian New City, as same as Minhang, Jiading New City in near suburban area not only have strong industrial foundation and good infrastructure facilities but also have the convenient Metro connect to the inner city.

Therefore, the significant population center scattered in the specific new cities, in which the good living environment, employment opportunities, cheap housing prices and rapid access to inner city are their common characteristics. In comparison, the other planned new cities in “1966 Town System” are less developed.

In other words, these specific new cities have formed the local industrial and commercial centers before the policy of "1966". The attempts, which merely rely on urban development policies to promote the population agglomeration, are impossible. From the analysis above, it can be concluded that the planning guidance and market promotion should be combined according to the economic laws. The government should support and encourage the development of spontaneous market cities, and avoid vanity projects and political game that are divorced from reality. The spatial distribution of population should be compatible with the city function regions and the development direction of Shanghai (Li and Ning 2007).

Finally, some suggestions are proposed as follow. Population decentralization in Shanghai needs to accelerate the development of MRT network, which not only connect the suburbs to inner city but also links among the new cities (Mu and Jong 2012). The whole transport network can be the "vessels" that can decentralizes population to the suburban areas gradually and rationally move among the new cities, and ultimately the multi-center population pattern will be formed. On the other hand, the function of inner city should transfer to the suburban areas gradually. Along with industrial and residential suburbanization, the public service function, such as hospitals, schools, company office buildings and government sectors, should transfer to the suburban areas properly as well. The new public service zones combine with local market, and the function of new cities will become more and more consummate. It is more important to build up the new cities containing living, working, services, entertainment, rather than the industrial function zones (Gaubatz 1999), and make the suburbs become the sub-urban areas like a "growth machine" (Shen and Wu 2013). In this case, the people who come to the suburban areas for work or study temporarily are willing to settle in the new cities, and the people who face high housing price or employment pressure will choose to move to the new cities for a better self-development (Ma and Wu 2013). The local government should put forward to the certain preferential policies to encourage the people, especially the floating population, to live in the new cities, as well as reduce the stress of floating population pouring into the inner city.

The international metropolises are faced with the problem of population decentralization in the period of rapid urbanization and economic growth generally. The population decentralization in Shanghai should not only draw lessons from other developed countries' experience, but also base on its actual development. It is inevitable for Shanghai to put forward a rational planning guidance or urban policies according to the economic laws to optimize population spatial structure and achieve the sustainable population development.

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# Chapter 14
# Characteristics of Urban Expansion in the Yangtze River Delta in a High Economics Growth Period: A Comparison Between Wuxi and Kunshan in Metropolitan Fringe of Shanghai

**Zengmin Ji and Shan Yang**

**Abstract** In this thesis, the comparison of Wuxi and Kunshan is studied for horizontal relation and commonality and heterogeneity of urban expansion patterns. To be more specific, regional and interannual characteristics of the entire Wuxi and Kunshan area are classified through a cross functional comparison and each characteristic of the new city and development zone types are further emphasized. First, it is quantitatively analyzed by dividing it into four time periods and four quadrants to see how development focusing on housing and industry are reflected into land. Next, suburban areas are extracted from the entire city area, its expansion process is revealed, and then the land use change is quantitatively elucidated based on the composition ratio of water area, agricultural and forest sites, and land for urban use. The background producing heterogeneity is analyzed with statistical data and the peculiarities of both cities are also sought. Furthermore, common characteristics between both cities and the background of common social systems and economic development are extracted.

**Keywords** Industrial estate • Kunshan • Land use change • New city • Urban–rural coupling regions • Wuxi

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## 14.1 Introduction

### *14.1.1 Study Background*

It has been well known that the Chinese government has strongly promoted population concentration, agglomeration of industrial plants, and agricultural intensification for full time farmers, which are the so called "measures concentrating on three issues" in order to promote urbanization and efficiency of land utilization focusing on the Eastern coastal regions. New cities, Development Zones, and large-scale agricultural fields are the areas where these measures can be realized. Construction of new cities and preparation of development zones have been implemented mainly in the suburbs of cities in a planned manner. As the development of a mass transit system progressed, industrial parks were built in the suburbs and rows of condominium buildings were constructed. As a result of the policy strongly backed by the government and a huge amount of fund infusion, the rate of urbanization of the population reached 46.6 % (620 million people) at the end of 2009; it was 20.6 % in 1982. It has increased by 1 % on average every year in the past 27 years.[1]

The spatial extent of suburban areas is from the administrative border at the urban side of the township, which is adjacent to the city center to the administrative border at the rural side. In other words, the inner edge of the suburban area is linked to the city center and the outer edge to the rural area. Until the 1980s, city areas had been administratively categorized into three areas; urban, suburban, and hinterland (rural areas) on the basis of the planned economy and a different family registration system, land ownership and land use, and the social welfare and insurance system were applied to these three areas respectively. Existing outlying areas have been incorporated into a development zone or a new city and have encroached the hinterland of rural villages as suburban areas by the development of urbanization since the 1990s. Suburban areas rapidly expanded to the hinterland due to the strongly increasing impetus of urban development from the early twenty-first century.

During the planned economy period, before implementing reform and opening-up and a low economic growth period, suburban areas played the role of a buffer zone intervening between urban areas and rural villages. However, with the market economy period after the 1990s in particular, and the beginning of the period of rapid economic growth they have been rapidly transformed into the "front of urbanization" zone. Therefore, suburban areas in this thesis can be comprehended the same as the "front of urbanization".

In suburban areas each system (e.g. land ownership and family registration), economy, and society of urban areas and rural villages are mixed and under the unavoidable relation of interdependence land uses compete against each other. Under the policy of urbanization priority, the conversion of farmland has been promoted in order to secure land for industrial plants, residential areas, and commercial and public facilities. At the same time of progress there is the disappearance

of agriculture and farm households, and the heterogeneity of non local citizens (new comers) who do not share life customs with local citizens has been newly added.

It is considered that the border which divides the three areas; the urban area, the suburban area and the hinterland will be almost lost and integrated regional development including urban areas and rural villages will be promoted in the cities of the Yangtze River Delta around 2030, according to the regional development policy made by the government. Original hinterland will rapidly become suburban areas and the coexisting of urban and rural residents and the mixing of urban and rural land use and landscape will progress[2]. As mentioned above, the extension of suburban areas and the reflection on the ground is the barometer which apparently shows the trajectory and progress of urbanization in the Yangtze River Delta.

Large scale development has drastically changed the land use and landscape, social structure, and life style in suburban areas. Suburban areas have possessed a property of boundary areas which are neither rural villages nor urban areas. The present writer calls this boundary area the "third space". As non local workers and permanent residents increased, various issues that China faces have intensively been exposed in suburban areas: gaps between urban areas and rural villages and coastal areas and inland areas, the "three agricultural problems", and issues on land and family registration. The change in suburban areas indicates accomplishment of urbanization and future vision and is a mirror to the light and the shadow of China's modernization. It is necessary to examine suburban areas where progress and the result of change are intensively mirrored comprehensively from the confirmation of facts and clarification of the actual conditions to the presentation of future development policy from the standpoint of regional reorganization.

The writer decided on the Yangtze River Delta as the main region of investigation, focused on suburban areas where urbanization is remarkable, followed the flow chart as shown in Fig. 14.1, and extracted Wuxi and Kunshan as representatives of a new city and a development zone. The writer has advanced research on the development of new cities and expansion of urban areas in core towns since the end of the 1990s that included Wuxi (Zengmin 2004) and has done collaborative research with Professor Yang Shan of Nanjin Normal University since 2007.

On the other hand, the writer positioned Kunshan as a representative emerging industrial city, which has rapidly grown by preparing large scale development zones, clarified the actual conditions of regional reorganization in suburban areas through the shifting from a pure agricultural prefecture to an emerging industrial city, and examined its mechanism. The achievement was classified and publicized in the literary work, "Regional Reorganization of a Suburban Rural Village in China" (Zengmin 2010).

In the first stage of the study by the authors mentioned above, a detailed examination of the two representative types, a new city and a development zone, was conducted and regional characteristics of each type and its background were revealed. As research results of the first stage, examination of topographical results on case regions was focused on, and the process and mechanism were thoroughly studied by being correlated with characteristics of the region. For instance, Kunshan is studied positioning certain regional units in its upper regional unit: from the

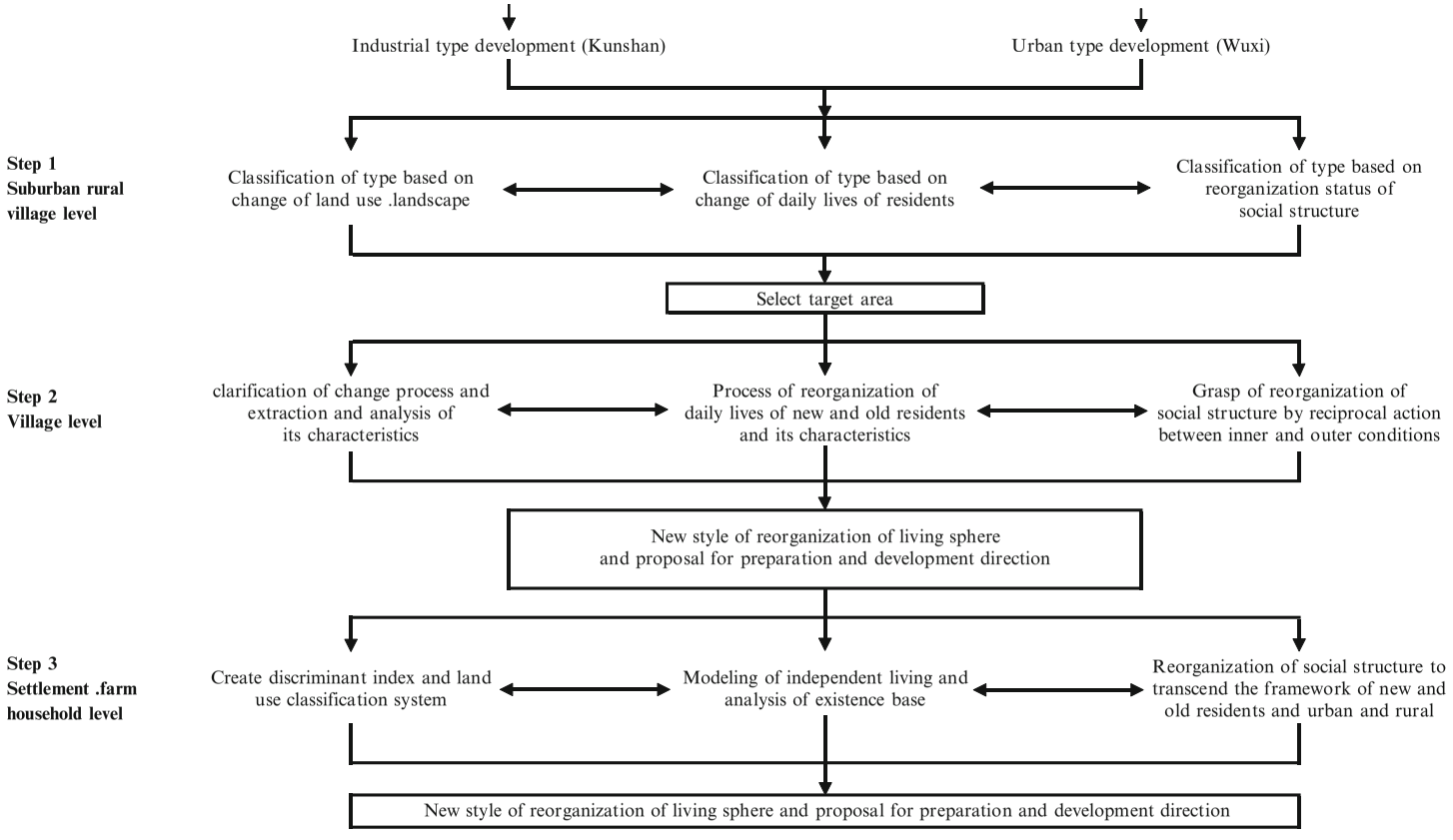


**Fig. 14.1** Research unit and correlation in mesoscale (wide block and metropolitan sphere) Analysis on regional transformation of suburban area in Yangtze Delta as an example

entire city, development zone, adjacent areas, developed area and area under development which cover multiple towns or roads, communities or neighborhoods, settlements, to groups. A vertical study has been hierarchically conducted along each administrative district. It is a matter of course that the difference of transformation with the ripple effect of development has also been studied along a time line, based on the actual conditions where the urban area was stretched from the west to the east.

### *14.1.2 Study Objective of the Study*

In the first stage of the study, there remains an issue that the extraction of characteristics by a multifaceted comparison study and its process and background were not clarified for these two representative types in the broad range, the Yangtze River Delta. At the second stage of the study, it is necessary to extend the study range from the analysis of an individual case to the Yangtze River Delta based on the actual condition which was revealed in the first stage and to find out the characteristics of the pattern of urban expansion by a new city and the development zone types and its generality. Moreover, while the urbanization ratio in developed countries is over 75 %, but in China still remains low and therefore, it is expected that urbanization of the flying geese pattern will rapidly spill over from the Eastern coastal area to the inland area.[3] It is significant to sort out the new city construction type and development zone preparation type in terms of time and space, and to classify and systematize its development process and mechanism in order to have a view of and predict the least developed urbanization in inland areas.

In this thesis, the comparison of Wuxi and Kunshan is studied for horizontal relation and commonality and heterogeneity of urban expansion patterns are clarified. To be more specific, regional and interannual characteristics of the entire Wuxi and Kunshan area are classified through a cross functional comparison and each characteristic of the new city and development zone types are further emphasized. First, it is quantitatively analyzed by dividing it into four time periods and four quadrants to see how developments focusing on housing and industry are reflected into land. Next, suburban areas are extracted from the entire city area, its expansion process is revealed, and then the land use change is quantitatively elucidated based on the composition ratio of water area, agricultural and forest sites, and land for urban use. The background producing heterogeneity is analyzed with statistical data and the peculiarities to both cities are also sought. Furthermore, common characteristics between both cities and the background of common social systems and economic development are extracted.

While analysis by satellite image is focused on in order to get over the shortage of statistical data and problems of credibility and implement an objective comparison based on the same criteria, the results of statistical data and hearing investigation are also referred to.

Since there is limited space, the study focuses on comparison from multi views on the change of suburban areas in Wuxi and Kunshan. In “Mechanism of Land Use

Change in Suburban Areas"[4] as the related thesis of this paper, extensive expansion of the central urban area and binary structure of expansion of the urban area in towns and its background were concretely studied, in "Enhancement of Village Growing Strength and Reorganization of Rural Villages on the Fringe of Urban Area"[5] "Fumin Kyouson" measure (measures to promote social and economic growth) which Kunshan has enforced were raised and its enforcement and issues were studied, and in "Growth from Core Town of Rural Village to Small city"[6], self sustaining growth and planned urban development of Luoshe town in Wuxi were examined.

These discussions cannot be separated and therefore, they must be referred to by this study.

## 14.2 The Study Region

### *14.2.1 Overview*

Figure 14.2 indicates the location of both cities. Both cities are the ones which have been voluntarily developing themselves under the ripple effect of the large international city, Shanghai.

Wuxi is located in the Southeastern part of Jiangsu and is 128 km away from the center of Shanghai. It is a prefectural level city which is administratively composed of Wuxi city district, and two county level cities, Jiangyin and Yixing. The Wuxi city district is focused on in this study and its area is 1,622 km$^2$ and 1,249 km$^2$ by

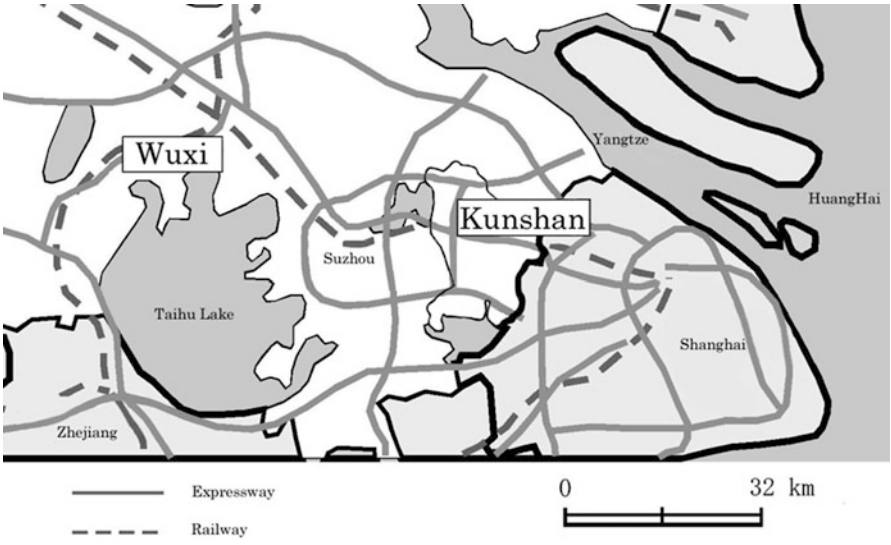


**Fig. 14.2** Location of Kunshan in Shanghai Metropolitan Area

excluding the water area of Taihu Lake. The population is 3.8 million of which the registered population is 2.38 million. The planned population by 2020 is estimated as 4.8 million.

Kunshan is located between Shanghai and Suzhou and is approximately 55 km away from the center of Shanghai. It is a county level city belonging to Shuzhou city, Jiangsu Province and is composed of a total of eleven autonomous bodies, ten towns and one development zone. The area is 927 $km^2$; 33 km from the east to the west and 48 km from the south to the north. As of 2008, the registered population is 690,400 and the number of registered new comers is 954,200 and the total of the permanent population is 1,644,600. Of the permanent population, 17,000 are foreign or Taiwanese registered.

### *14.2.2 Appropriateness as a Case Region*

The major characteristics of the urbanization in both cities are the accumulation of urban functions into the central urban area and external expansion from the 1980s to the end of the twentieth century. In addition, there is a common aspect that large scale industrial parks and housing parks have been developed playing a driving force to expand the urban area into suburban areas. There are more similar points that the preparation of new cities, which are independent in outer suburbs, far from the existing central urban area, has been promoted by the government since the beginning of the twenty-first century.

(1) 1,622 $km^2$ of the city range has been targeted in the urban space of Wuxi since 2005 and a systematic new urban creation has been proactively processed driven by the transportation network. Wuxi is a representative city growing through the development of new cities whose purpose is to improve residential functions and enhance service sectors which are the most frequently seen in the Sunan.

Moreover, according to the urban planning of 2009, the central urban area is and will be positioned as a high-level residential area with functions including commerce, service industries, and culture until 2020. The planned area is 173 $km^2$ and the planned population is 2,200,000. "Taihu New Town" located in the Southeast is planned as the CBD and the planned area is 150 $km^2$ and the planned population is one million. "Huishan New Town" located in the northern part is positioned as a sub center of the north and a manufacturing and logistics base. The planned area is 77 $km^2$ and the planned population is 400,000. "Xidong New Town" of which the core is Wuxi station where a high speed railway is positioned as a sub center of the eastern part and in the center of high tech industries. The planned area is 125 $km^2$ and the planned population is 500,000. The "Science and Technology New District" located in the southeast has been planned as the center of high-tech industries centering on the Sunan International Airport and is a model human friendly residential area. The planned area is 220 $km^2$ and the planned population is 800,000.

(2) In Kunshan the development zone was developed in 1985 and industrialization has been rapidly promoted by proactively inviting foreign companies. As of the end of 2007, there were 5,200 companies from 50 countries and regions and the investment amount reached 30 billion dollars based on contracts and 14 billion dollars based on performance. In particular, Taiwanese companies account for two thirds of the total of the foreign companies. The total exports and imports reached 53.4 billion dollars and the imports are 30.5 billion dollars. Although the area of Kunshan accounts for 1/10,000 and the population accounts for 5/10,000, the investment amount of foreign capital accounts for 22/1,000 of the total in China and the total exports and imports account for 22/1,000. Foreign capital has accounted for over 90 % of the total investment in fixed assets since the end of the 1990s and has played a role as the main driving force of economic growth in the city. As of 2007, industrial output, the total exports and imports, and the amount of tax payment account for 89.6, 98.4, and 57.6 % of those of the city respectively.

In most of the economic indicators such as GDP, government financial income, utilization of foreign capital, and imports and exports per capita, Kunshan ranked the first in Jiangsu province. It is said that, "Kunshan cannot exist without the development zone". In 1983, Kunshan was an agricultural prefecture which was the most behind in economic growth of all the eight prefectures belonging to Suzhou. However, it made a jump to the top of the same level cities (prefectural) on total economic capability in 2005. The total GDP, GDP per capita, and financial income surprisingly rose at an annual rate of 23.7, 22.6, and 24.5 %. Economic capability and financial income increased 475 times and 588 times respectively.

(3) As mentioned above, both Wuxi and Kunshan have followed the process of urbanization which was common in the Yangtze River Delta since the 1980s and the distance between the cities became closer, 45 km. Their development patterns and mechanisms of urbanization are also similar. However, they appeared to be different on the land surface as a new city type and a development zone type respectively. In addition, both cities are known as the representatives of the new city type and the development zone type not only within Jiangsu but also in the whole of China.

Furthermore, according to the study by Xiao et al. (2009), the expansion pattern of the new urban area in the Yangtze River Delta is large and can be categorized into three patterns: (1) Concentric expansion pattern making the old urban area as a core, (2) Mutually integrated pattern of urban areas as a result of expansion of new and old urban areas individually, and (3) Separate pattern where new and old urban areas expand separately. Wuxi has followed a concentric expansion pattern and Kunshan has been developed by integration as a result of expansion of old urban areas and a development zone respectively. Both cities are representative cases and appropriate target regions for objectives of this study.

## 14.3 Characteristics of Expansion of Suburban Areas in Wuxi and Kunshan

The left column of Fig. 14.3 indicates expansion of the central urban area and the suburban area in Wuxi in the following 4 years; 1991, 1998, 2005, and 2008. Table 14.1 shows the change of dimension and ratio of the central urban area and the suburban area as part of the city area over 5 years by adding the data of 1984 to the data of the above mentioned 4 years.

According to these, from 1984 to 1998 the central urban area in Wuxi increased only slightly. However, it has rapidly expanded since 1998 and accounted for 38 % of the total city area in 2008.

As responding to the movement of the central urban area, it was seen that suburban areas rapidly expanded from 1998 to 2008 and although they accounted for 14 % of the city area in 1984, this increased to 58 % in 2008. The years 1998 and 2002 are turning points where the central urban area was expanded from a slow pace to a rapid pace. The range of suburban areas reached almost the entire city area and the hinterland decreased to only 4 %.

The suburban area of Kunshan could not be extracted due to satellite image degradation in 1984. The right column of Fig. 14.3 indicates the expansion of the central urban area and the suburban area in Kunshan in the 4 years; 1991, 1998, 2005, and 2008. Table 14.2 shows the area of central urban areas and suburban areas and the ratio of them as part of the entire city area in the above mentioned 4 years.

According to these, the central urban area in Kunshan expanded from 6.6 to 24.6 $km^2$ from 1991 to 1998 and moreover, the central urban area increased 2.1 times from 2005 to 2008 and accounted for 15 % of the total city area.

Responding to the movement of the central urban area, suburban areas have rapidly expanded since 1998. They accounted for 21 % in 1998: however, they more than doubled to 48 % in 2008.

The percentage of which the central urban area accounts for of the entire city area in Kunshan is less than half of that in Wuxi. The ratio of suburban areas as part of the entire city area in Kunshan is approximately 10 % less than that in Wuxi.

## 14.4 Differences Seen in Expansion of the Suburbs in Wuxi and Kunshan

### *14.4.1 Expansion of Urban Areas in Wuxi and Kunshan from the Viewpoint of Different Periods*

(1) The expanded area of the urban areas in Wuxi and Kunshan in the four time periods (1984–1991, 1991–1998, 1998–2005, and 2005–2008) was acquired

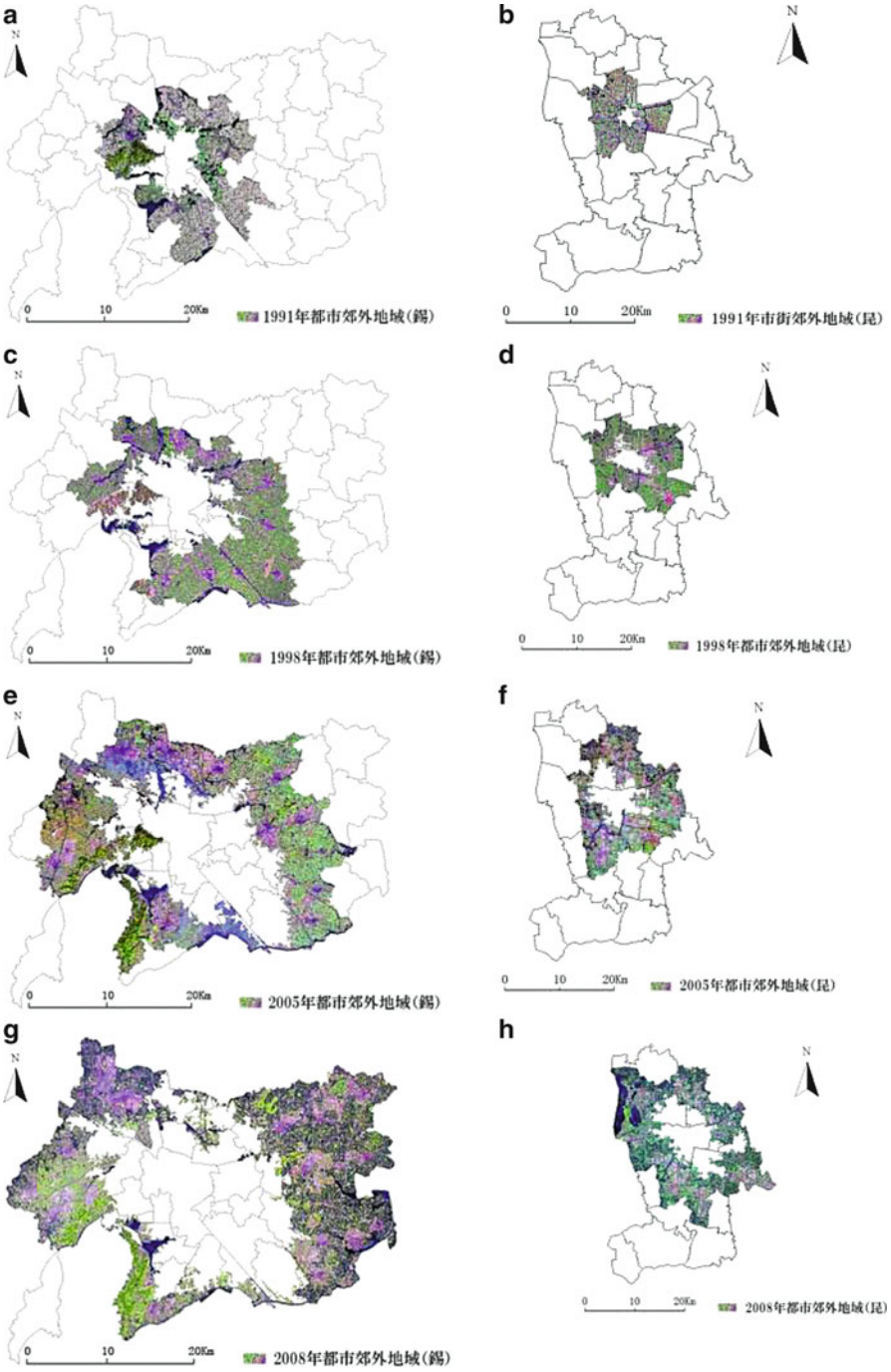


**Fig. 14.3** Transformation of suburban area in Wuxi (*left*) and Kunshan (*right*) 1991–2008). (**a**) Suburban area in 1991 (Wuxi). (**b**) Suburban area in 1991 (Kunshan). (**c**) Suburban area in 1998 (Wuxi). (**d**) Suburban area in 1998 (Kunshan). (**e**) Suburban area in 2005 (Wuxi). (**f**) Suburban area in 2005 (Kunshan). (**g**) Suburban area in 2008 (Wuxi). (**h**) Suburban area in 2008 (Kunshan)

**Table 14.1** Transition of area and ratio of suburban area and central urban area in Wuxi

| Item | 1984 | 1991 | 1998 | 2005 | 2008 |
|---|---|---|---|---|---|
| Suburban area (ha) | 18,326 | 25,462 | 38,435 | 62,220 | 74,443 |
| Central urban area (ha) | 4,382 | 5,945 | 13,688 | 33,359 | 48,031 |
| Ratio of central urban area as part of city area (%) | 3 | 5 | 11 | 26 | 38 |
| Ratio of suburban area as part of city area (%) | 14 | 20 | 30 | 49 | 58 |

*Source*: Based on analysis of satellite images from each year

**Table 14.2** Transition of area and ratio of suburban area and central urban area in Kunshan

| Item | 1991 | 1998 | 2005 | 2008 |
|---|---|---|---|---|
| Suburban area (ha) | 11,100 | 19,725 | 29,861 | 44,726 |
| Central urban area (ha) | 662 | 2,467 | 6,776 | 14,205 |
| Ratio of central urban area as part of city area (%) | 1 | 3 | 7 | 15 |
| Ratio of suburban area as part of city area (%) | 12 | 21 | 32 | 48 |

*Source*: Based on analysis of satellite images from each year

**Table 14.3** Expansion of urban areas in Wuxi and Kunshan over different time periods

| City | | 1984–1991 | 1991–1998 | 1998–2005 | 2005–2008 |
|---|---|---|---|---|---|
| Wuxi | Expanding area (ha) | 1,446.54 | 7,859.46 | 19,671.10 | 14,672.09 |
| Kunshan | Expanding area (ha) | 216.05 | 1,802.82 | 4,311.62 | 7,429.01 |

*Source*: Based on analysis of satellite images from each year

through the analysis of satellite images (Table 14.3). Based on the result, the expanding status of the urban area has been decided to be studied as an index such as the expansion index of urban area.

Expansion index of urban area is calculated as follows: $Ti = (Ni/Mi) \times 100\%$

Ti is defined as expansion index, Ni increased urban area in a city area, and Mi total land area of a city here.

Hereinafter, urban expansion in Wuxi and Kunshan will be analyzed based on a different Mi.

Case of Mi=city area: since the area of Wuxi is 127,295.36 ha (excluding the area of Taihu Lake from the city area) and the area of Kunshan is 92,709.6 ha, calculation result of Fig. 14.4 was acquired.

Case of Mi=urban area as of the end of 1984: Since Wuxi is 43.8 $km^2$ and Kunshan is 4.4 $km^2$, the calculation result of Fig. 14.5 was acquired.

Case of Mi=urban area at year end of the following four period: 1984–1991, 1991–1998, 1998–2005, and 2005–2008, the calculation result of Fig. 14.6 was acquired.

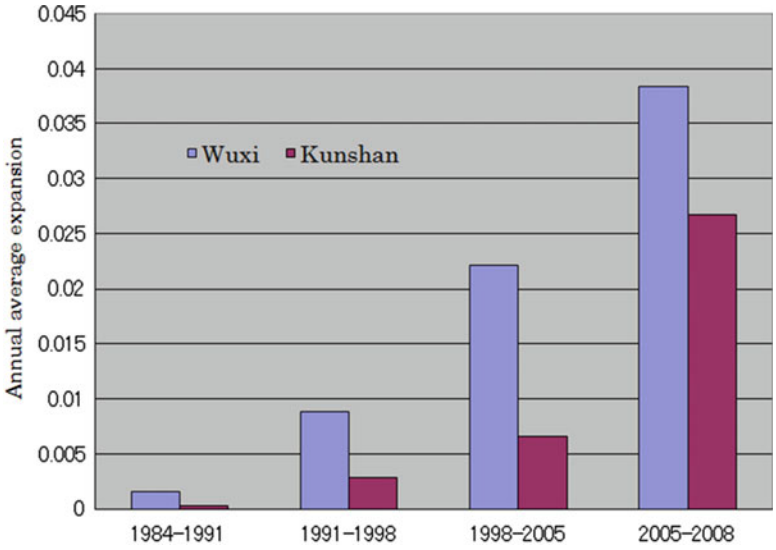


**Fig. 14.4** Comparison of annual average expansion index of suburban areas in Wuxi and Kunshan. Mi = case of area of urban region

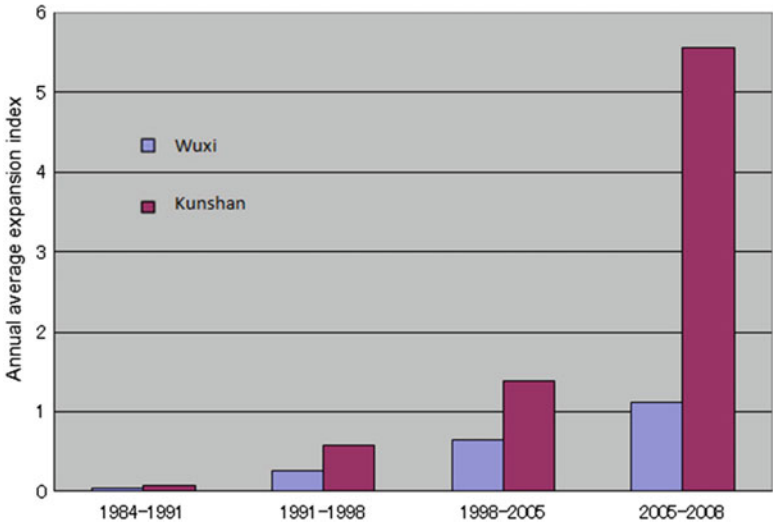


**Fig. 14.5** Annual average expansion index of urban areas in Wuxi and Kunshan. Mi = case of urban area at the end of 1984

The following was revealed from the above calculation results. At first, according to Fig. 14.4, the expanded urban area of Wuxi is more than that of Kunshan in all four periods. That is, the percentage of the urban area, which occupies the city area in Wuxi, is more than that is Kunshan. However, the difference decreased during the period from 2005 to 2008.

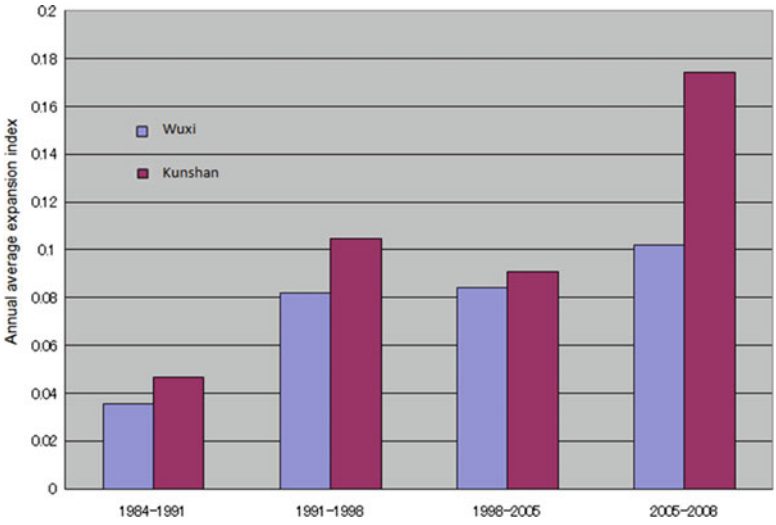


**Fig. 14.6** Expansion index for urban areas at the end of each period in Wuxi and Kunshan. Mi = case of urban area as of the end of each period

Meanwhile, according to Figs. 14.5 and 14.6, the expansion speed of the urban area in Kunshan at the end of 1984 and at the end of each period is faster than that in Wuxi. In Fig. 14.5, expansion of the Kunshan urban area at the end of 1984 was remarkably more than that of Kunshan. The gap between Kunshan and Wuxi has gradually increased and in the period from 2005 to 2008 while the expansion index of Wuxi was 1.1162, Kunshan reached 5.5546. It is equivalent to a little less than five times that of Wuxi. In Fig. 14.6, the gap between Wuxi and Kunshan against the urban area as of the end of each period is less than that of Fig. 14.5.

The next trend can be pointed out based on the result from Figs. 14.4, 14.5, and 14.6. Although the urban area in both Wuxi and Kunshan has significantly expanded since 1984, as the existing urban area in Kunshan in 1984 was only 4.4 $km^2$, the expansion scale and speed of Kunshan since 1984 has exceeded that of Wuxi at a relative ratio. According to Figs. 14.5 and 14.6, the difference between Kunshan and Wuxi was caused by not only the scale from the starting point but also by the difference of rise in velocity.

(2) Urban expansion in Wuxi and Kunshan by direction: Integrated urban area (so called central urban area) in Wuxi and Kunshan will be divided into 4 quadrants and each quadrant will be studied here.

a. Tables 14.4, 14.5, and 14.6 show result of analysis of Wuxi and Tables 14.7, 14.8, and 14.9 of Kunshan. Since each quadrant represents the ratio of the urban expansion area as part of the entire city, the transition of the total urban area was specified at the bottom of each table.

**Table 14.4** Expanding area of central urban area in Wuxi by period and by quadrant

| | 1984 (ha) | 1991 (ha) | 1998 (ha) | 2005 (ha) | 2008 (ha) |
|---|---|---|---|---|---|
| First quadrant area | 904.05 | 1,205.14 | 2,526.40 | 6,755.53 | 11,740.97 |
| Second quadrant area | 1,018.67 | 1,211.00 | 2,752.60 | 6,459.02 | 10,554.93 |
| Third quadrant area | 1,055.52 | 1,567.34 | 3,560.50 | 3,610.49 | 6,524.94 |
| Fourth quadrant area | 1,403.50 | 1,961.29 | 4,848.24 | 16,537.36 | 19,210.08 |
| Total urban area | 4,381.74 | 5,944.77 | 13,687.74 | 33,362.40 | 48,030.92 |

*Source*: Based on analysis of satellite images from each year

**Table 14.5** Expanding area of the central urban area in Wuxi by period and by quadrant

| | Expanding area of 1984–1991 (ha) | Expanding area of 1991–1998 (ha) | Expanding area of 1998–2005 (ha) | Expanding area of 2005–2008 (ha) |
|---|---|---|---|---|
| First quadrant area | 301.09 | 1,321.27 | 4,229.12 | 4,985.44 |
| Second quadrant area | 192.33 | 1,541.59 | 3,706.42 | 4,095.91 |
| Third quadrant area | 511.82 | 1,993.16 | 49.99 | 2,914.46 |
| Fourth quadrant area | 557.79 | 2,886.95 | 11,689.12 | 2,672.72 |
| Entire urban area | 1,563.03 | 7,742.97 | 19,674.65 | 14,668.54 |

*Source*: Based on analysis of satellite images from each year

**Table 14.6** Expansion index of the central urban area in Wuxi by period and by quadrant

| | Expansion index of 1984–1991 | Expansion index of 1991–1998 | Expansion index of 1998–2005 | Expansion index of 2005–2008 |
|---|---|---|---|---|
| First quadrant area | 0.0338 | 0.1483 | 0.4746 | 1.3055 |
| Second quadrant area | 0.0216 | 0.173 | 0.416 | 1.0725 |
| Third quadrant area | 0.0574 | 0.2237 | 0.0056 | 0.7632 |
| Fourth quadrant area | 0.0626 | 0.324 | 1.3118 | 0.6999 |
| Entire urban area | 0.1754 | 0.869 | 2.208 | 3.8411 |

*Source*: Based on analysis of satellite images from each year

**Table 14.7** Expanding area of central urban area in Kunshan by period and by quadrant

| | 1984 (ha) | 1991 (ha) | 1998 (ha) | 2005 (ha) | 2008 (ha) |
|---|---|---|---|---|---|
| First quadrant area | 113.56 | 166.00 | 661.27 | 2,111.13 | 3,191.36 |
| Second quadrant area | 112.68 | 160.03 | 545.26 | 1,969.67 | 3,403.79 |
| Third quadrant area | 93.38 | 142.35 | 251.10 | 451.26 | 736.54 |
| Fourth quadrant area | 126.20 | 193.47 | 1,009.22 | 2,244.24 | 6,873.59 |
| Total urban area | 445.82 | 661.85 | 2,466.85 | 6,776.30 | 14,205.28 |

*Source*: Based on analysis of satellite images from each year

**Table 14.8** Expanding area of central urban area in Kunshan by period and by quadrant

| | Expanding area of 1984–1991 (ha) | Expanding area of 1991–1998 (ha) | Expanding area of 1998–2005 (ha) | Expanding area of 2005–2008 (ha) |
|---|---|---|---|---|
| First quadrant area | 52.44 | 495.27 | 1,449.86 | 1,080.23 |
| Second quadrant area | 47.35 | 385.23 | 1,424.41 | 1,434.12 |
| Third quadrant area | 48.96 | 108.75 | 200.16 | 285.28 |
| Fourth quadrant area | 67.26 | 815.75 | 1,235.02 | 4,629.35 |
| Total urban area | 216.02 | 1,805.00 | 4,309.45 | 7,428.98 |

*Source*: Based on analysis of satellite images from each year

**Table 14.9** Strength to expand in central urban area of Kunshan by period and by quadrant

| | Expansion index of 1984–1991 | Expansion index of 1991–1998 | Expansion index of 1998–2005 | Expansion index of 2005–2008 |
|---|---|---|---|---|
| First quadrant | 0.0081 | 0.0763 | 0.2234 | 0.1665 |
| Second quadrant | 0.0073 | 0.0594 | 0.2195 | 0.221 |
| Third quadrant | 0.0075 | 0.0168 | 0.0308 | 0.044 |
| Fourth quadrant | 0.0104 | 0.1257 | 0.1903 | 0.7133 |
| Total urban area | 0.0333 | 0.2781 | 0.664 | 1.1447 |

*Source*: Based on analysis of satellite images from each year

According to Table 14.4, in all the time periods the urban area in Wuxi expanded to the 4th quadrant, that is in the direction of the Southeast, most remarkably and the 4th quadrant has ranked as the first in all. According to Table 14.5, the period from 1998 to 2005, the contrast of the expansion of the urban area between the 2nd and 3rd quadrants is significant. While the 2nd quadrant largely expanded to 3,706 ha, the 3rd quadrant remained only 50 ha and it ranked down from the second position in the two periods from 1984 to 1991 and from 1991 to 1998 to the last. Table 14.6 shows that after the 4th quadrant rapidly expanded in the period from 1998 to 2005, its expansion index was sharply decreased to 0.7 and it ranked down to the last position.

Meanwhile, it is understood that the 4th quadrant remained at the first position regarding the urban area of Kunshan in all the periods, the same as Wuxi according to Table 14.7. The area of the 4th quadrant reached 6,873 ha in 2008 and accounted for 48 % of the total urban area of 14,205 ha in the same year. In contrast to the 4th quadrant, significant expansion cannot be seen in the 3rd quadrant and through all the periods, it was in the last position. According to Table 14.8, the expansion of the 4th quadrant remained only 1,253 ha in the period from 1998 to 2005 and lost its velocity. By direction, it fell to the third position following the 1st and 2nd quadrants. However, the 4th quadrant expanded 4,629 ha from 2005 to 2008 and it accounts for 62 % of the total expanded area in the same period.

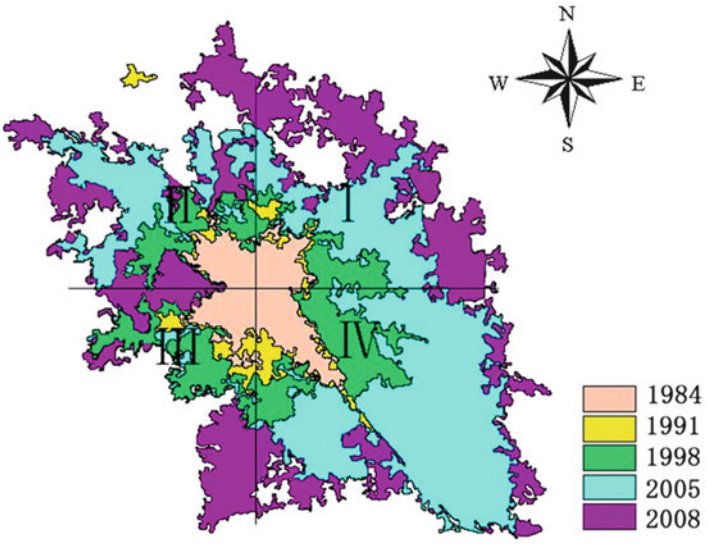


**Fig. 14.7** Expansion of urban area by period and by quadrant in Wuxi

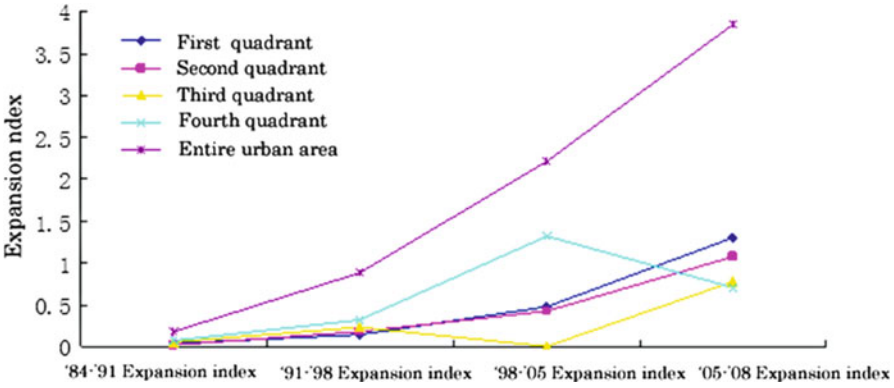


**Fig. 14.8** Transition of expansion index of urban area by period and by quadrant in Wuxi

b. Figure 14.7 is the expansion status by quadrant in Wuxi in the four periods: 1984–1991, 1991–1998, 1998–2005, and 2005–2008. Figure 14.8 is a graph of the annual average of expansion index by quadrant. The annual average of expansion index of each quadrant is calculated based on the formula: (the area of applicable quadrant at the end of each year−the area of applicable quadrant at the beginning of each year)/the area of applicable quadrant at the beginning of each year * time). Figures 14.9 and 14.10 show the case of Kunshan.

According to Fig. 14.7, until 1998 the urban area of Wuxi concentrically continued extensive expansion. In the period from 1998 to 2005, the urban

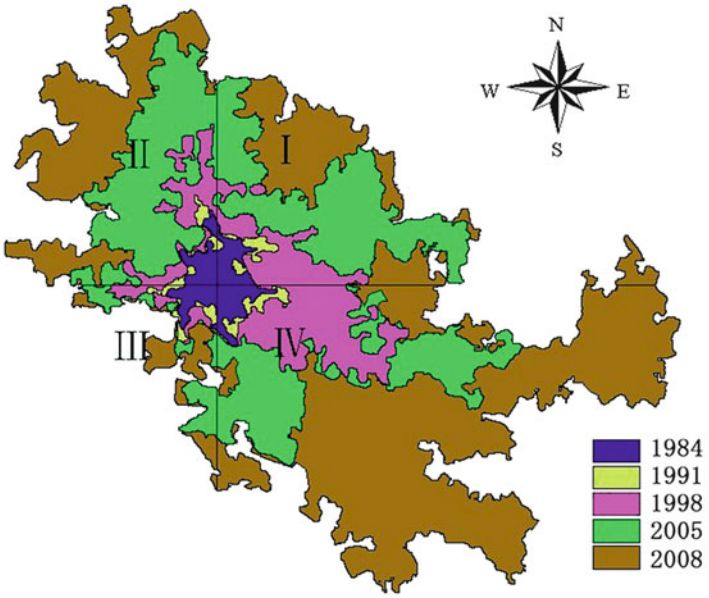


**Fig. 14.9** Expansion of urban area by period and by quadrant in Kunshan

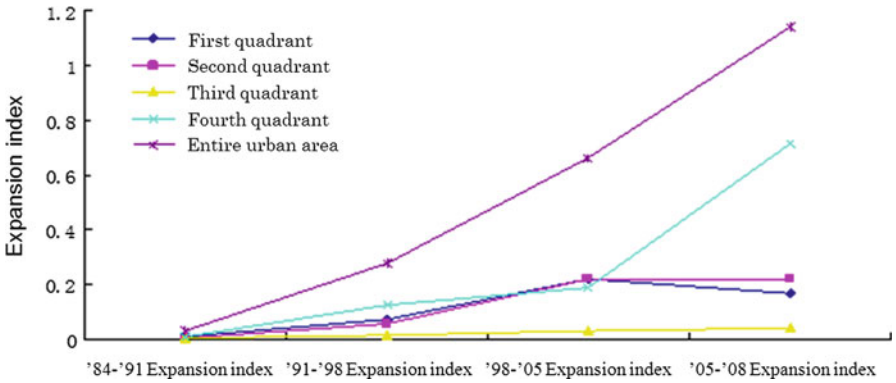


**Fig. 14.10** Transition of expansion index of urban area by period and by quadrant in Kunshan

area most significantly expanded toward the south eastern direction and from 2005 to 2008 it largely expanded to the northern and the southern part. On the other hand, Kunshan has shown the unbalanced stretching pattern, which mostly expanded in a south eastern direction since 1991. In the period from 1998 to 2005, the urban area significantly expanded in the northern part. In the period from 2005 to 2008, the urban area largely expanded in a southeastern direction again.

**Table 14.10** Breakdown of expanding urban land in Wuxi by period

| Years | Industrial site (ha) | Ratio (%) for the total urban land | Residential and Public land (ha) | Ratio (%) for the total urban land |
|---|---|---|---|---|
| 1950s–1960s | 28.2 | 58.3 | 207.2 | 28 |
| 1960s–1970s | 45.1 | 58.4 | 136.5 | 28 |
| 1970s–1980s | 37.4 | 34.4 | 386.3 | 42 |
| 1980s–1990s | 82.5 | 23.8 | 1,561 | 39 |

*Source*: "Spatio-temporal features of expansion of urban area in Wuxi and analysis of its trend" by XUE dong-qian, et al.

From the viewpoint of a relative comparison between Wuxi and Kunshan, the space of Wuxi is balanced and the urban area of Wuxi has expanded in the four directions evenly. Expansion to the southeast from 1998 to 2005 was primarily promoted by development of the economic development zone and the expansion in the other periods was overlapped with the period of constructing new cities. On the other hand, in Kunshan expansion of the urban area promoted by the development zone is remarkable and the stretching pattern is an unbalanced expansion mostly towards the southeast mostly. The following are considered to be the causes of the unbalanced expansion in a southeastern direction: the driving force of the Kunshan Economic and Technological Development Zone and Huaqiao Economic Development Zone and closer access to Shanghai by the construction of an intercity rapid transportation system as typified by light rail transit.

### *14.4.2 Comparison of Land Category*

(1) Table 14.10 shows the change of major land usage in Wuxi from the 1950s to the 1990s. According to this, industrial sites rapidly increased from the 1950s to the 1970s and it accounted for 58 % of the urban area. On the other hand, housing and public facility sites remained at a moderate increase and they accounted for a low percentage, only 28 % of the total urban area. However, the portion of the industrial sites occupying the total urban area decreased in relative ratio year by year from the 1970s to the 1990s. In the 1990s, it decreased to less than one quarter, 23.8 %. Housing and public facility sites rapidly expanded and the area and the portion occupying the total urban area were more than those of industrial sites.

(2) As shown in Table 14.11, in 2002 industrial sites reached 6,330 ha and it accounted for 38 % of the area for urban land use, 16,660 ha. The portion of 38 % is over the criteria for medium and small-sized cities decided by the government as 30 %. In 2007 industrial related sites such as industrial parks reached 132.6 $km^2$ and account for 14.3 % of the total city, 927 $km^2$.

**Table 14.11** Land use change in Kunshan from 1994 to 2002

| Category | Type of land use | 1994 A (ha) | 2002 B (ha) | B−A (ha) | Increase–decrease rate (%) |
|---|---|---|---|---|---|
| Farm land | Cultivated land | 48,828 | 40,998 | −7,830 | −16 |
| | Park | 758 | 340 | −418 | −55 |
| | Forest | 342 | 547 | 205 | 60 |
| Urban land | Residential and Industrial site | 11,349 | 16,660 | 5,311 | 47 |
| | Of which Urban development | 927 | 2,512 | 1,585 | 171 |
| | Development of rural villages | 1,437 | 1,925 | 488 | 75 |
| | Industrial development | 2,886 | 6,330 | 3,444 | 119 |
| | Transportation | 2,819 | 3,212 | 393 | 14 |
| Other | Water area | 28,658 | 30,975 | 2,317 | 8 |
| | Unused land | 37 | 32 | −5 | −11 |

*Source*: Based on hearing investigation in Kunshan

**Table 14.12** Composition of urban land use in urban areas of Wuxi and Kunshan (2008)

| | Wuxi | | Kunshan | |
|---|---|---|---|---|
| Composition by land use | Area (ha) | Ratio which accounts for of the total (%) | Area (ha) | Ratio which accounts for of the total (%) |
| Residential site | 5,840 | 32.81 | 45 | 24.62 |
| Public facility site | 2,360 | 13.26 | 7 | 3.83 |
| Commercial facility site | 0 | 0.00 | 6 | 3.28 |
| Industrial site | 5,860 | 32.92 | 87 | 47.59 |
| Site for logistics and warehouse | 380 | 2.13 | 2 | 1.09 |
| Road | 810 | 4.55 | 23 | 12.58 |
| Urban facility related site | 520 | 2.92 | 1 | 0.44 |
| Green area and open space | 2,030 | 11.40 | 12 | 6.56 |
| Total | 17,800 | 100.00 | 183 | 100.00 |

*Source*: Made by "Statistical yearbook of Wuxi in 2009" Based on page 93 of Urban master plan of Kunshan (2009–2030)

Table 14.12 indicates the composition of urban land use by land item in the urban area of Wuxi and Kunshan in 2008. According to it, industrial sites account for 48 % (87 $km^2$) of the urban area of Kunshan (183 $km^2$). Those of Wuxi remained at only 32.8 %. On the other hand, residential and public sites account for 46 % of the entire city in Wuxi, which is high and those account for 31.8 % in Kunshan (including commercial facility sites). The percentage residential and public sites of Wuxi is 14 points higher.

### *14.4.3 Change of Suburban Areas*

Characteristics of expansion of the suburban areas in Wuxi and Kunshan will be compared based on the above mentioned; Fig. 14.3, Tables 14.1 and 14.2.

(1) In Wuxi there was a suburban area surrounding the central urban area in a circle in 1984 and there were series of vegetable fields providing products to citizens. There was almost no change of the range of the suburban area from 1984 to 1991. From 1991 to 1998 it moderately expanded. Since 1998 suburban areas have rapidly expanded around the central urban area under the effect of extensive expansion of the central urban area and large scale reclamation of the "Wuxi new area". Development of rural industry and the change from full time to part time farmers promoted assimilation of suburban area into the entire city area and entire rural village areas were transformed into suburban areas in 2008.

    From 1984 to 2008, traces of simultaneous expansion of both areas can be confirmed from the central urban area in Wuxi and the expansion figure of the urban area in towns. Central urban areas of towns such as Qianqiao town, Huaxiang town, and Dongting town have been connected and integrated since 1998. Area scale expansion of the central urban area has rapidly accelerated as responding to the expansion of urban the area in towns along arterial traffic roads since 2005. In 2008 excluding Taihu Lake located in the south, integration of central urban areas and urban areas of towns along arterial traffic roads advanced in the east and the west and in the northern part and the urban area stretched to the outer border of the city.

(2) Based on the result of analysis of satellite images, there was no apparent suburban area existing around the central urban area in Kunshan until 1991 and the city was divided into two: the central urban area and the rural village region. Vegetable fields were scattered in the northern and southern parts of the central urban area. However, they were separated and therefore, they were not integrated.

    Since the beginning of 1998, suburban areas have been able to be confirmed between the central urban area and rural village region. As responding to the movement of the central urban area, the suburban area is smaller than that of Wuxi and even if compared to 2005 and 2008, there are few covering towns. In addition, the effect by the preparation of a development zone and improvement of arterial traffic is significant and large expansion of the suburban area is unbalanced, stretching mostly eastward. As of 2005, it reached the eastern border of Shanghai. On the other side, in 2008 it reached the western side adjacent to Suzhou. Furthermore, in 2008 there remained rural village regions which were not included into suburban areas such as Bacheng town in the north and Zhouzhuang town in the south. Suburban areas expanded the entire city area excluding the central urban area, which contrasts with Wuxi where rural village areas don't exist.

The stretch of suburban areas has influenced the long and thin shape of Kunshan of which the north to south length is 48 km and improvement of arterial traffic in the east and west direction such as a high speed railway, an intercity elevated railway, local lines, high ways, and national routes.

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## Notes

1. According to a report by China, the central ratio in April 20, 2010, urbanization ratio in china in 2009 reached 47 %. However, it includes many rural migrant workers. The urbanization ratio excluding rural migrant workers is estimated to be approximately 33 %. The contribution ratio of the second industry as part of GDP is 46.8 %. Based on JF Daily in April 20, 2010, Dr. Zuo Xuejin, Executive Vice-President of Shanghai Academy of Social Sciences describes that the characteristic of urbanization in China is the low level of urbanization.
2. Refer to my book "Regional Reorganization of Rural Villages on the Fringe of Urban Zone in China—the Case of Adjacent Area to Development Zone in Kunshan, Jiangsu" for suburban zone in urban city.
3. According to "The Urban Blue Book: The China Urban Development Report No.3" publicized by the Institute of Urban Development and Environment, Chinese Academy of Social Sciences and Social Science Academic Press in Beijing in July 29, 2010, China will enter a new transition stage where urbanization and urban development will be overlapped during the period of "125 (the 12th 5 year plan: 2011–2015)" in China and it is estimated that the urbanization ratio will increase by the annual average of 0.8–1.0 point, and reach around 52 % by 2015 and 65 % by 2030. The change which has the meaning of milestones in urban economic growth is defined as the situation where the urbanization ratio increases and reaches 50 % and the urban population exceeds the rural population. The urban economy will further reinforce its subjective position in the national economy after each population ratio of urban area and rural village is reversed.
4. Are currently in progress.
5. Are currently in progress.
6. Are currently in progress.

# Chapter 15
# Urban Restructuring of Beijing City Through Residential Development After the Reform and Open Policy

**Haruhiro Doi and Yanwei Chai**

**Abstract** Beijing City that is the capital of China has grown up to the megacity through a tremendous population increase and economic growth as a result of the mechanism of the market principle being introduced into the socialism socioeconomic system after the reform and open policy is introduced. And, the maintenance of the traffic system in addition to the maintenance of the sophisticated industry and the business centers advanced, and the residential house to meet housing needs of various citizens was developed in the process. Large-scale residential quarter development is done in a surrounding area and the suburban area besides an older urban area and the corporate ownership ground are renewed, and subsidized housing and a high-level commercial house are developed. In these developments, there is a case where related companies of a local government and a powerful enterprise are related. Moreover, in the vicinity of the boundary with the adjacent city, the high-level villa house prohibited in Beijing City is developed by the nationwide real estate enterprise.

**Keywords** China • Reform policy • Residence • Suburb • Urbanization

## 15.1 Introduction

The reform and open policy started in 1978, and 30 years have already passed. China achieved remarkable economic growth in gross domestic product and it is climbing up to the second position in the world in 2010. Industrial developments and business activities have been actively settled down on a lot of cities based on the socioeconomic system. Beijing City has grown up as an economic central city of the capital in Chinese history. The amount of gross domestic product of Beijing

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accounts for 3.5 % of the entire China, and exists at the position that follows Shanghai City (3.9 %) in 2012.

The reform and open policy has introduced the economic system for capitalism into a socialistic social-economic system till then. Land price has not been set up substantially in an economic activity and land use of the city, and broad acres of land were given to *Danwei* (working unit) such as state-owned enterprises and several public facilities. *Danwei* has been a social unit in the city region not only an economic entity, so it had to offer family life's facilities such as residential houses, schools and shops for their employees. Citizens could afford to reside in the residential house by a very cheap rent constructed by *Danwei* or local government though citizens' incomes were not high. Therefore, because not only the production facility but also the residential house was constructed on the site, the environment to which the office and the residential house were adjacent was maintained.

The housing policy has changed drastically after introducing the reform and open policy in 1978. The developmental stage of the real estate industry in Beijing after the reform and open policy is introduced is as follows. Beijing was a city where the real estate industry developed in the early stage in China, and after the housing reform in 1998 had advanced, the real estate industry of Beijing accomplished rapid development.

In this research, the authors intend to consider the time series and regional features of the housing development in Beijing in recent years, and also intend to introduce some cases that are behind such features in order to show how residential houses have been developed for growing its population and in correspondence with various income groups in Beijing City. And the authors also intend to consider how real estate companies rapidly increased the number after introducing the reform and open policy manage a project of housing development in the city. The transformation of an existing urban regional structure according to the housing development of Beijing City that keeps growing up as a megacity is clarified through these considerations. In the research, the authors advanced an existing publication, especially the analysis of the statistical material, and executed the hearing survey by the real estate companies and Beijing government agency relating housing development.

## 15.2 Change of Regional Structure of Beijing

### *15.2.1 Socioeconomic Transformations of Beijing City*

The population increase of Beijing in recent years remarkably reached 20.18 million people in 2012 (Fig. 15.1). The population of Beijing has become four times from 4.2 million people in 60 years since 1949 which the new China founded[1]. The family registry that distinguishes the city resident and the rural

[1] It depends on '50 years in Beijing'. The administrative area of Beijing in 1949 was narrower than that of the present, and the total populations were 2.09 million people.

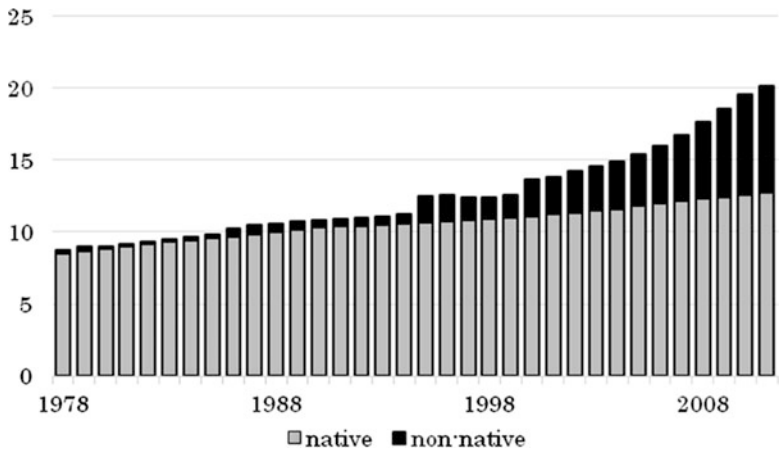


**Fig. 15.1** Population trend of Beijing City. *Source*: Beijing Municipal Bureau of Statistics and NBS Survey Office in Beijing (2012)

resident has had a big influence on a Chinese society. The native population is 12.76 million people among the living population of 16.95 million people in 2012, and 7.42 million people who equivalent to 36.8 % are non-native population. Figure 15.1 shows that much increased population is occupied by not the register population but by the non-native population in recent years. The increase of the non-native population is reflected that the intensification of the urban economy of Beijing has been remarkable by the accumulation of manufacturing, commerce and monetary function in addition to the capital function.

After the 1990s, the industrial structure in Beijing City was greatly changed. As for the employed population by industry that was almost the same number before the reform and open policy, the first industrial population decreased, and the second and the third industrial population have increased after the policy is introduced (Fig. 15.2). In addition, the third industry increased rapidly after the 1990s while the second industry had decreased gradually. The third industrial employed' ratios came to account for 74 % in 2011. Afterwards, the number of employed population of the state-owned enterprise decreased after the peak in the first half of the 1990s. The number of other enterprises including the private company increased rapidly on the other hand. The industrial infrastructure of Beijing City has been drastically converted to the third industry that enlarges the scale, and centers in the private sector including the service industry.

According to material concerning the address of the headquarters of the company group whose property is 500 million yuan or more, the headquarters of 191 groups of 10.6 % is in Beijing City among the company groups were 1,808 exists in the whole country in 2004. The number of employees of these groups accounts for 31.3 % of the whole country. Moreover, it accounts for 41.4 % in the operating income and it accounts for 48.7 % of property total. In a word, the

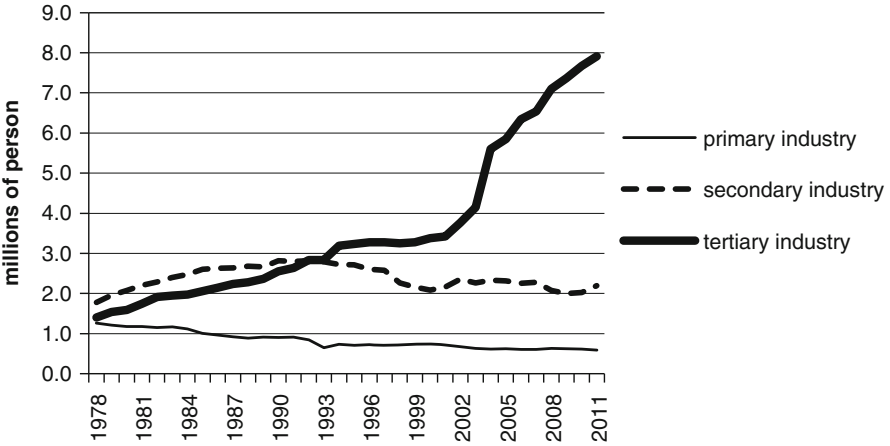


**Fig. 15.2** Time-series trends of employee by industry. *Source*: Beijing Municipal Bureau of Statistics and NBS Survey Office in Beijing (2012)

company group that locates the headquarters in Beijing City is abundant powerful enterprises of petrochemistry, construction industry, and information industry, etc. Beijing City is not only a political center of China but is also an economical, academic central city including a lot of the research laboratories of Chinese Academy of Science and national government in Beijing.

Beijing is the second place in China in the population scale and GDP after Shanghai. Various projects were executed to promote the urban function and economic growth in recent years in Beijing. The Olympics Game held in 2008 has promoted the maintenance of the transportation system, namely the subway system and the expressway. Those transportation infrastructures played a major role to connect the suburban areas and the downtown and introduced to change the rural areas to suburban residential areas for the citizens. Moreover, the opening of the rapid-transit railway between Tianjin (2008) and the new terminal building of the capital airport (2008) strengthened the connection with every country in the world as well as enlarging the metropolitan area of Beijing.

In the downtown of Beijing City, a quadrangle outer road was constructed (Fig. 15.3). The Second Ring Road was maintained by demolishing the old rampart and the Third and the Fourth Ring Road was maintained in the 1990s. Construction of the Fifth Ring Road completed in 2003, and it has promoted making the built-up area of suburbs. The frontier of a present urbanization reaches outside of the Fifth Ring Road. The Sixth Ring Road was maintained after 2000, and completed in 2009. The subway maintenance did not advance for a while since the Subway Lines No.1 and No.2 in 1969. However, a lot of subway lines connecting the downtown area and the suburban area have been constructed since the opening of the Subway Line No.13 in 2002. The private car spreads rapidly in the Beijing city, therefore traffic congestion occurs here and there. The subway maintenance eases the traffic jam of the city a little, connects the downtown area and the suburban area directly, and has improved citizens' mobilities.

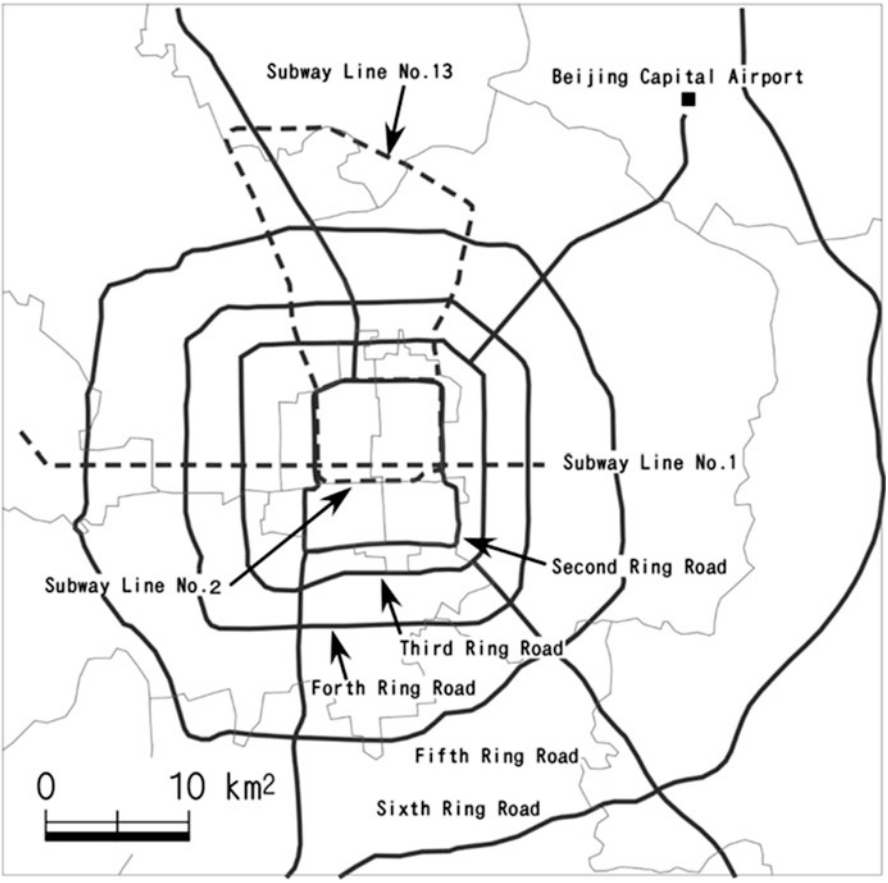


**Fig. 15.3** Outline of the older area of Beijing City

### *15.2.2 Demographic Changes of Beijing*

The characteristic of population increase and housing development of the several regions is different according to the location in the Beijing metropolitan area. The administrative area in Beijing is divided into 14 districts and 2 prefectures (Fig. 15.4). In order to analyze the feature of the population change, the division of four areas is adopted in "30 years of the reform and open policy in Beijing". The four areas are Core Areas of the Capital Function including the old historic downtown, Extension Areas of Urban Functions corresponds to the main built-up area, New Areas for Urban Development including much agricultural land and Development Areas for Ecological Conservation where the rural region including the mountainous area connecting the Inner Mongolia Autonomous Region and

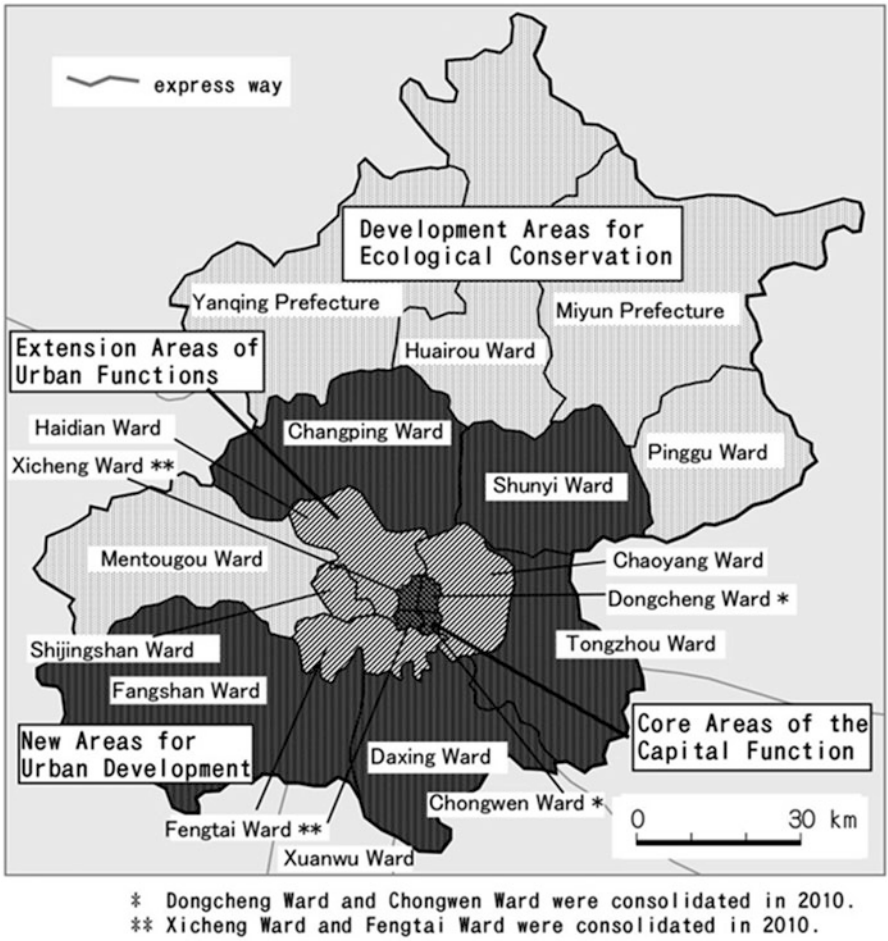


**Fig. 15.4** The administrative area in Beijing

Hubei Province[2]. It is reasonable to make the city center of Beijing the vicinity of Old Palace and Tiananmen Square, considering historical development though it is not possible to say with the center of an economical urban function. Core Areas of the Capital Function occupy the region within 10 km from the city center,

[2] In Core Areas of the Capital Function are *Dongcheng* Ward, *Xicheng* Ward, *Chongwen* Ward and *Xuanwu*, and Extension Areas of Urban Functions are *Chaoyang* Ward, *Fengtai* Ward, *Shijingshan* Ward and *Haidian* Ward, New Areas for Urban Development are *Fangshan* Ward, *Tongzhou* Ward, *Shunyi* Ward, *Changping* Ward and *Daxing* Ward and Development Areas for Ecological Conservation are composed of *Mentougou* Ward, *Huairou* Ward, *Pinggu* Ward, *Miyun* Prefecture, and *Yanqing* Prefecture. *Dongcheng* Ward, *Chongwen* Ward were consolidated as new *Dongcheng* Ward and *Xicheng* Ward and *Fengtai* Ward were consolidated as new *Xicheng* Ward in 2010.

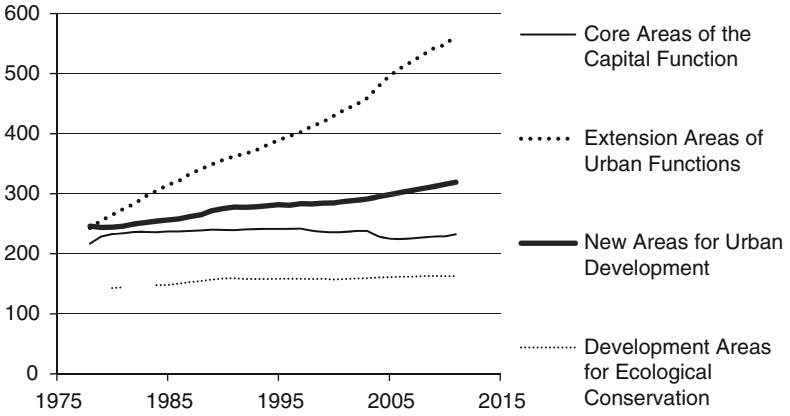


**Fig. 15.5** Population trends of four Areas. *Source*: Beijing Municipal Bureau of Statistics and NBS Survey Office in Beijing (2012)

Extension Areas of Urban Functions is equivalent the area within 30 km, New Areas for Urban Development is also equivalent to the area within 50 km and Development Areas for Ecological Conservation is a region with 50 km and more from the city center.

To understand the regional trend of the population increase in Beijing, the above-mentioned population of four areas was total[3] (Fig. 15.5). The population of the Core Areas of the Capital Function came to be decreasing after 2000 though it was stable during the 1990s according to the figure. On the other hand, the population of Extension Areas of Urban Functions increased rapidly, and 2.43 million of the 1978 increased to 5.6 million people and 2.3 times in 2011. The population of New Areas for Urban Development and Development Areas for Ecological Conservation increased 1.3 times and 1.1 times respectively for the same period. In the ratio that the in-migrant population occupies in the living population, Core Areas of the Capital Function is 24.8 %, Extension areas of Urban Functions is 40.6 %, New Areas for Urban Development is 40.9 %, and Development Areas for Ecological Conservation is 16.6 % in 2011. The population of Beijing increases rapidly in the region surrounding the downtown though the population of the downtown is stable as the regional characteristics of the population increase in Beijing. In addition, the population increases in the suburban district reflected by the inflow of the population though the increasing rate is rather low.

The ratio of the population of the in-migrant in the number of people who bought the residential house of Beijing is about 4 % in recent years according to the hearing survey with the real estate enterprise. The real estate development is advancing in

[3] The population of these ages of Development Areas for Ecological Conservation graphed as a missing value because the registrant population in 1983, 1982, 1979 had not been described in *Miyun* Prefecture.


**Fig. 15.6** Regional structure of Beijing City with two axes

the major city where there is a lot of the in-migrant population, such as Shanghai, Guangzhou and Shenzhen. In a word, it is possible that a large amount of the in-migrant population has exerted a big influence on the development of the real estate industry of a city concerned.

### *15.2.3 Regional Contrast in the Urban Area of Beijing City*

The feature of the regional structure of the present Beijing City is explained with two axes in the north–south and the east–west (Fig. 15.6). As for the east–west axis, the administrative function and the political function accumulated historically in the region on the north side on the boundary of *Changan* Avenue that was the main street where the south of the Old Palace (*Gugong*) was run through from east

to west. The market was located in the south of *Changan* Avenue, and people's towns including the minority were formed. *Feng Shui* and a geographical features characteristic is in the background where such a comparison arose. In a word, a historical urban area in Beijing is formed on a gradual alluvial fan, and the altitude in the north has risen. The place that relates to the mountainous district such as the Great Wall and the royalty in 13 mausoleums etc. of discernment in the north of Beijing City is located. The hall of Beijing Olympics Game in 2008 was maintained in the due north of the Old Palace. On the other hand, the southern part that includes *Qianmen* Gate etc. is a doorway to a vast North China Plain. Therefore, it had the condition that the minority and the market gather easily. The Beijing West Station and the Beijing South Station are opened in the southern part in recent years, and the Beijing Economic Technological Development District is also to the southeast direction. In addition, a new airport development project advancing by the boundary with the Hubei Province is located in the due south of the Old Palace.

The south and north central axis that makes the Old Palace a boundary divides a regional character for domestic-oriented and foreign-oriented. There is a region that is called *Zhongnanhai* which is the political arena of China in the west side of the Old Palace, and various organizations of national government are located in Zhongnanhai and the vicinity of the moon platform (*Yuetan*) that is the stage of the politics of China on the west side of the Old Palace. Moreover, the bank and the brokerage firm, etc. in the domestic capital in the south of *Changan* Avenue moved to the newly maintained Financial District by the urban renewal project 20 years ago. On the other hand, the enterprise and the financial institution of the foreign capital are chiefly located in *Guomao* Area, *Chaoyang* Ward, and *Dongcheng* Ward on the east side. A lot of foreign embassies are located in these regions, too. A regional habitat segregation in such east and west where the Old Palace was made a boundary was not to have started now. It continues before that after approving new China. The region in the west is domestic-oriented on the boundary of a center axis, and historical inertia for foreign countries has been succeeded as for the region in the east now.

### *15.2.4 Change in Living Environment of Beijing City*

The living environment of Beijing has changed greatly after the Reform and Open Policy introduction. For instance, the residential floor space a person is 4.9 $m^2$ in 1949, but it decreased even to 3.2 $m^2$ in 1960. Meanwhile, the total population increased from 4.2 million people to 7.4 million people, and a welfare housing policy of a city region at that time was not able to supply an enough residential house to such a increased population. Enough though the residential floor space a person increased to 6.7 $m^2$ as a result of housing conditions' being gradually maintained in 1980s, it has not come to fill the house needs of the citizens who

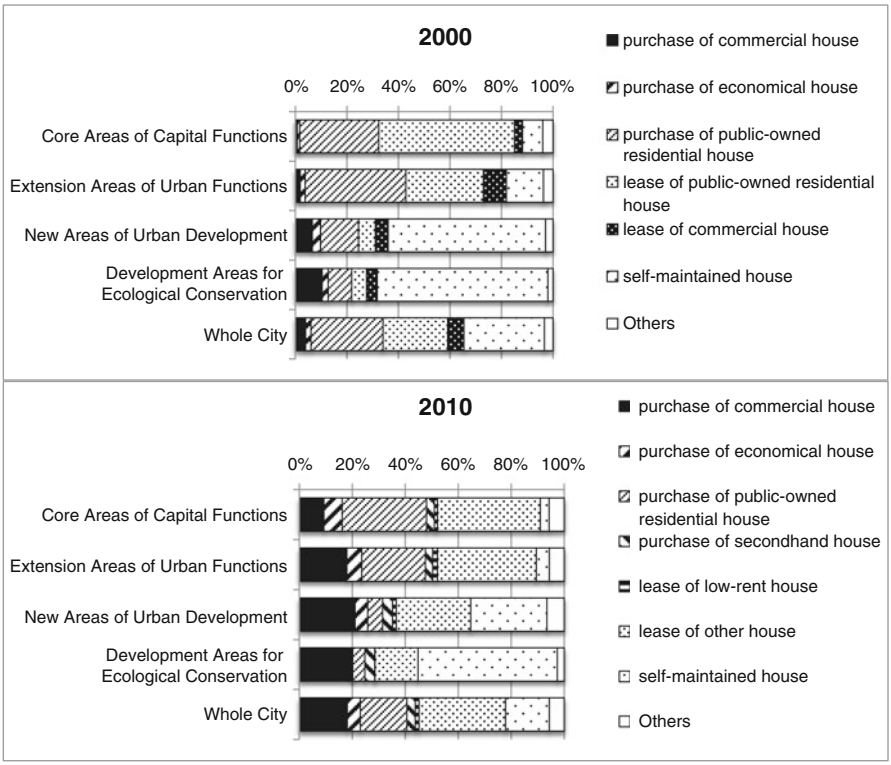


**Fig. 15.7** Change in the house ownership of the citizens. *Source*: Beijing Municipal Office of the Fifth Population Census and Beijing Municipal Bureau of Statistics (2002), Beijing Municipal Office of the Fifth Population Census, Beijing Municipal Bureau of Statistics (2012)

increase up to 9.4 million people (1980)[4]. Afterwards, the residential floor space a person rises rapidly, and became 21.6 $m^2$ in 2008. The number of Beijing citizens who buy commercial houses, in consequence the ratio is rapidly increasing since 2000. The change in such house ownership leads to the improvement of a qualitative level of the residential house. The residential house that had not been fully equipped with restroom and bathroom accounted for about 30 %, and the residential house with rest room and no accounted for about 50 % in around 2000. The ratio of the houses equipping of the rest room and the bathroom rose rapidly to 52.8 % in 2002 though it was 7.0 % in 1998.

Figure 15.7 shows the change in the house ownership of the citizens in the process where this living environment was rapidly improved according to the four

[4] There is a difference in data about the index that shows the passing age transition used in this chapter like the population etc. by the statistical book used. 'Beijing statistical yearbook 2009 and 2012' had been used after '50 years in Beijing' and 1978 about the residential floor space a person before 1978.

areas in 2000 and 2010. The public-owned house was the typical type of residential house which most urban resident lives distributed by *Danwei* (working unit) with a low rent as the welfare social policy before the Reform and Open Policy introduction. The introduction of the Reform and Open Policy played an important role in promoting economic development of China. The reform of the property right and use rights of land and the residential house was advanced at the same time as a base. The housing reform is advanced preceding and experimentally such as in Shanghai, and has spread the result to the whole country. The high ratio that public-owned house shown in purchase and lease of public-owned residential house in Fig. 15.7 occupies until 2000 shows that it takes so many years to accomplish the privatization of housing market for a large city.

The privatization has prevailed in the housing market in Beijing since the end of the 1990s. The ratio of the *Fanggai* house shown as purchase of public-owned residential house in the figure had been sold to the citizens is decreasing rapidly since 2000. About 50 % of the citizens are living in the *Fanggai* house combined with the lease of public-owned house in 2000, and the proportion of commercial houses sold by the real estate enterprise is still small. The early stage of the commercialization of residential house became into a full-scale corresponds to the developing process of the living environment in Beijing as mentioned above. According to the figure, the ratio of leases of a public-owned house was about 50 % in 2000, and it decreased to 40 % or less in 2010 in Core Areas of the Capital Function that corresponded to four districts in the center of a city.

As for the commercial houses, it is not a main residential type of the Beijing citizens, only about 5 % of the residents live in the commercial houses with the purchase and the lease in 2000. However, the value rose to 18 % in the entire city in 2010, and it exceeded 20 % from 18 % and District of New Areas for Urban Development and Development Areas for Ecological Conservation in Extension Areas of Urban Functions as for it. As a result, it can be said that the commercial house widely spread to the Beijing citizens. The house for resale purchase is 3 % moreover, and the residential real estate market for the resale and the lease including the sale of new homes understands from showing of the rented accommodation 1.5 % and it is understood to be formed. However, many of other rented accommodations shows the residence of the public housing by the lease, and the value's reaching 30 % shows that the public housing before the house reform has had a big meaning as citizens' houses before.

Figure 15.8 indicates an constructed year of the building where it resides in four areas. It decreased sharply to 5.3 % in 2010 though the building before 1980 before the house reform started in 2000 accounted for 25 % in the entire city. Seventy-five percent of 2000 year-end people resided in the house of the 1980s and the 1990s. The citizens who reside in the house after 1980 reach 90 %, and reside in the house where most citizens were constructed since the house reform in 2010. In this tendency, the ratio in which it resides remarkably in the house of construction

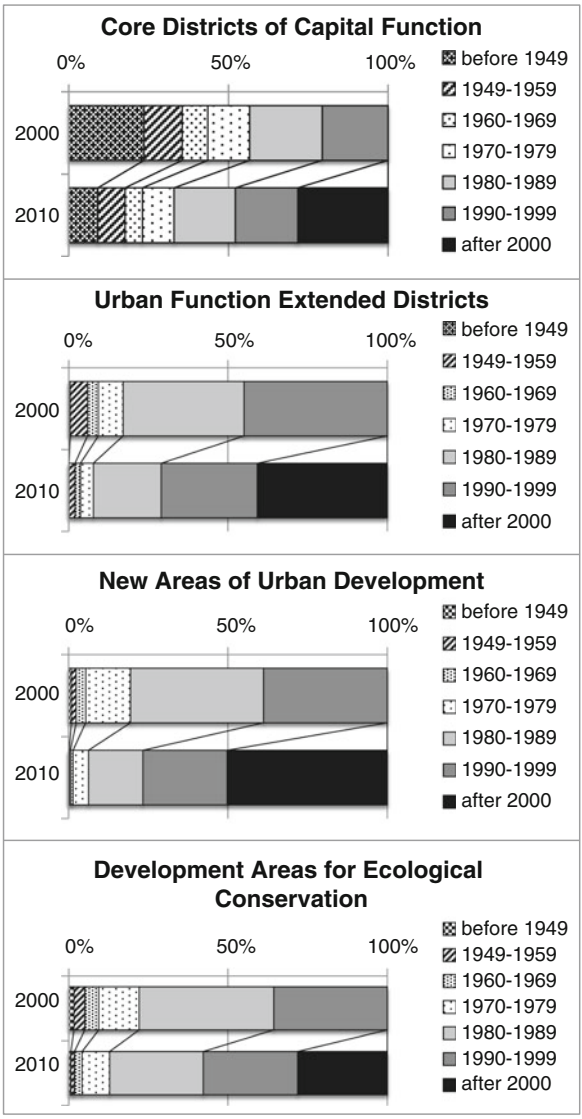


**Fig. 15.8** Constructed year of the building by four areas. *Source*: Beijing Municipal Office of the Fifth Population Census and Beijing Municipal Bureau of Statistics (2002), Beijing Municipal Office of the Fifth Population Census, Beijing Municipal Bureau of Statistics (2012)

with District of New Areas for Urban Development and Extension Areas of Urban Functions after 1990 is 71 and 77 % respectively. Many large-scale housing complexes have been developed in the suburban area surrounding the built-up area, and they are directly influencing the population increase in the suburbs after the 1990s. Urbanization is not advanced after the introduction of the Reform and Open Policy in these areas remarkably and living environment has been remarkably improved.

## 15.3 Regional Characteristics of Housing Development of Beijing

### *15.3.1 Time-Series Trend of Housing Development in China and Beijing*

The housing development of the real estate development enterprise of Beijing increased rapidly in the housing development trend of the whole country since the end of the 1990s, and the trend has strengthened year after year (Fig. 15.9). The housing development consists of three types in official statistics, namely luxurious condominium and villa, economical houses and other usual house consist of the ordinary commercial house. The other usual house has much ratio in the residential development in China, and its floor space has rapidly increased in recent years. The development area of luxury condominium and villa and economical houses is not big ratios on a nationwide scale. However, time series change of both is symmetrical, recently, the development area has increased rapidly to luxury condominium and villa as well as the other usual house. On the other hand, the development area of the economical houses has decreased since 2001. As a result, it became almost the same area in 2011 though the development area of the economical houses was considerably larger than that of the luxurious condominium and villa in 2001.

It provides for a large amount of other usual house in nationwide trends supplied for the urban residents where their income drastically rose by economic growth on a nationwide scale. On the other hand, the housing development for the upper-income group has increased more than the development of the house for the low-income group who has a welfare character shows that a more capitalistic element has progressed in the residential real estate market in China.

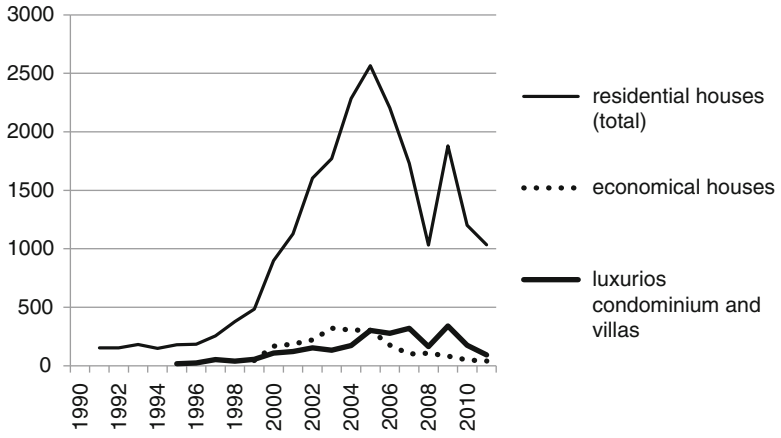


**Fig. 15.9** Completed areas of residential houses in Beijing City (unit: 10,000 $m^2$). *Source*: Beijing Municipal Bureau of Statistics and NBS Survey Office in Beijing (2012)

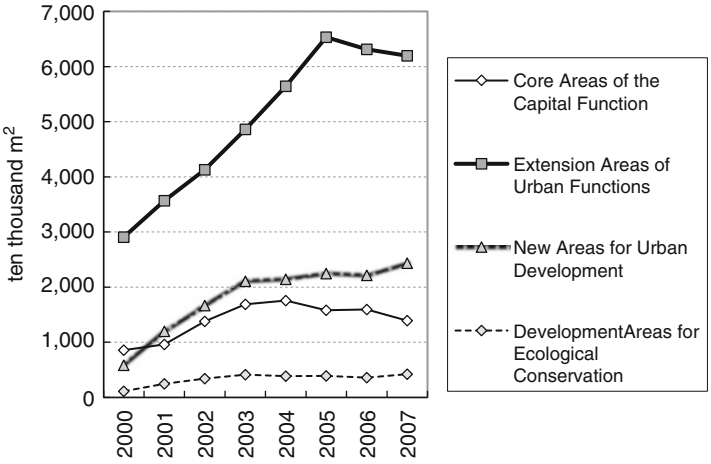


**Fig. 15.10** Development area of commercial houses of every four areas. *Source*: Beijing Municipal Bureau of Statistics (2008b)

The feature in the housing development of Beijing is that the total development area tends to stagnate, and it is greatly in the increasing tendency the above-mentioned compared with the national trend, reflecting its economic growth and population increase due to its the national capital situation. However, it is estimated that there are some political and planning control by the government lay behind the decreasing tendency of the other usual houses and economical houses for these several years.

### *15.3.2 Regional Characteristic of Housing Development in Beijing*

Figure 15.10 shows the transition after 2000 concerning the development area of commercial houses of every four areas. The Extension Areas of Urban Functions have a large amount of development area of the commercial houses, and it has much increased by 2005. It accounted for 60 % of the commercial house development area of the entire Beijing in 2005. The Extension Areas of Urban Functions dominate in the supply of the commercial houses in the city due to the ratio of 50 % or more after 2000. The New Areas for Urban Development are the second position in the supply of the commercial houses. As for the development area of this district, it increased rapidly until 2003 though it was 17.4 % in 2000 of the entire city. The ratio of the development area of this district keeps 25–30 % of the entire Beijing. As for the supply of commercial houses in Beijing, the range between the Third Ring Road with about 10 km from the city center and the Sixth Ring Road with 30 km is the main supplying area. The traffic condition has been rapidly improved by maintaining of the expressway and the subway system.

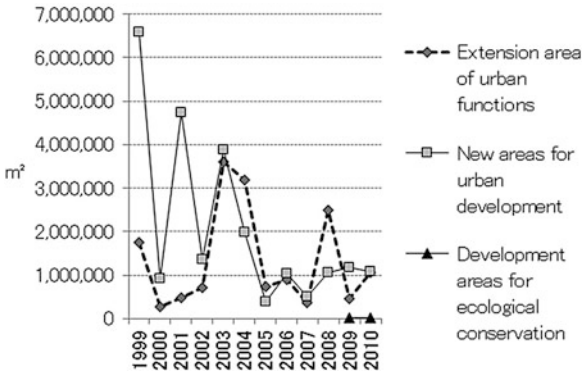


**Fig. 15.11** Sales area of economical houses by four districts. *Source*: Beijing Municipal Commission of Housing and Urban–rural Development

On the other hand, as for Development Areas for Ecological Conservation that the distance is quite long from the city center, the ratio of the development area of the commercial house with that of the entire city is about 5 % and remains unchanged since 2003 though it increased by 2003. Therefore, this district is not the main supply region of the commercial house in Beijing. However, because constant housing development is done even though the area is far left from the city center, it is thought that the high-quality house such as a villa is widely developed in this district.

The development area of the commercial house is in the decreasing tendency after 2003 though it increased to 2003 as in Core Areas of the Capital Function. The ratio of the development area drastically decreased to 6.9 % in 2007 though it accounted for 13.6 % of the entire Beijing in 2003. A lot of new housing developments are not done in this district except a part of high-priced housing for the reasons such as sudden rises of house price affected by the rise of the land price according to economic growth, and there is a limit in the proper land of the redevelopment in this area.

The sales area of economical houses intended for lower-income households was similarly totaled every four districts (Fig. 15.11). After 1999 when the economical house was supplied first in Beijing, the main supply area of economical houses is Extension Areas of Urban Functions and New Areas for Urban Development. However, there is a difference in the secular distortion of both districts. In a word, the main supply area of time when the supply of economical houses was begun with Beijing is New Areas for Urban Development. A lot of clearout residents moved away from the downtown according to the urban renewal projects, and settled into the large-scale housing complex development in the suburban area etc. where the subway system was not maintained in the Beijing northern part at this time. The quantity supplied of economical houses in Extension Areas of Urban Functions increased, and it became the same level as New Areas for Urban Development after 2003.

Economical house is not supplied in Core Areas of the Capital Function. The role as the resident function in the downtown has drastically decreased in Beijing

combined with the decrease of the supply of commercial houses in the area. On the other hand, the supply of economical houses started after 2009 in Development Areas for Ecological Conservation though its volume of sale was small. Because citizens' mobility has risen by maintaining transport network and diffusion of private car, the supply of the residential house for the middle and low-income household came to be possible to purchase in this region far left from the city center.

### *15.3.3 Change in Housing Development Policy of Beijing in Recent Years*

In urban areas in China such as Beijing, their citizens' economical situations are made two poles while the sudden rise of housing prices is remarkable in the background of the economic growth in recent years. As a result, there are a lot of citizens who do not obtain an enough living environment. Such a situation is reflected, and the national and local government comes to interfere with the living conditions of citizens, and they especially emphasize the enhancement of secured house at the last few years. This secured house policy has three types such as price restricted house, low-rental family housing and political low-rental housing. Price restricted house are floor spaces of 70–90 $m^2$, and prices are lower than economical houses, and the floor space is also smaller. There is a limitation of the person who can buy it by the situation of an income and present house, and only the person who has the register of Beijing can buy the price restricted house. As for the low-rental family housing, the lower income group living population where doesn't have their own residential house is able to lease a house for a family in low rent. The political low-rental housing is the original policy of Beijing, and its target is a person who is not so poor but cannot purchase his own house. This policy aims to generate the person such as a younger generation and the new employee to get the moderate living condition. An actual supply method of the political low-rental housing is in the course of discussion with the planning department of Beijing City.

The policy concerning such secured house applies to the citizens who are not able to apply the better residential condition in this growing real estate market in the Chinese cities. These policies are executed in Beijing according to the society and the hierarchy.

It is difficult to supply the secured houses such as low-rental family housing and economical houses at once by the budget of a city. To supply them as early as possible, the Beijing city government buys the room from the private development company of commercial houses in a constant ratio. Generally, the government buys some rooms from the developer by a price near a market price of commercial houses. The private development enterprise might talk with the developer by the government before executing a development when expected that there is a room that remains unsold, and the government decides the number of rooms to buy out. The number of purchase rooms is not necessarily constant because it is decided for 1 year depending on the budget of the government every year. Demand for

such secured house is relatively high in the central area of the city as citizens' standpoints, because an old resident who consists of the senior citizen remains in the downtown. On the other hand, an actual supply doesn't meet the demand. There is an unbalance concerning such spatial demand and the quantity supplied for secured house.

The development project of a new villa house is not permitted in Beijing City. However, the supply of a new villa house will continue for several years, though a new villa house that has already permitted will come onto the residential market in near future.

## 15.4 Five Cases of Housing Development of Beijing Metropolitan Area

### *15.4.1 Development of Economical House as Urban Renewal*

#### 15.4.1.1 Redevelopment of *Kaiyangli* District as Urban Renewal in Beijing City

After the reform and open policy introduced in the Beijing city, a lot of urban renewal projects have been accomplished to upgrade of the urban function and to improve citizens' living environments. An urban renewal project in Beijing City is roughly divided into two periods. The first period is up to 1994 from 1991, compensation is given to the resident on half of the redevelopment schedule ground in the renewal project and the residential house is secured outside the district for 1–2 years. After the resident moves out, the redevelopment is started. When the redevelopment of the region is completed, the resident who had moved out and the resident of the remainder is moved there. Afterwards, it begins the redevelopment of the schedule ground of the remainder. Thus, a project is accomplished while replacing the resident at this period. This method is called "Free residential house distribution", and the resident is distributed about the residential house free of charge to the ground redevelopment.

This redevelopment method was stopped in 1995 for a problem of the financial deficit. In a word, this method is based on the housing policy as the welfare policy, and the redevelopment plans without the annual revenue other than the government budget. There were a lot of problems in respects of amends and the negotiation, etc. to the removal resident, and the enterprise that executed the redevelopment was not able to secure the capital in which the problem was overcome enough. The Beijing City government converted the residential house maintenance policy from the renewal in old urban areas to the development of the large-scale housing complex in the suburbs in 1995. The *Wanjing* District development described later started in the same year symbolizes this policy conversion. The emphasis renewal districts executed in the first period were five districts including the *Kaiyangli* District in which a lot of economical houses have constructed. It is at 2000 to enter the second

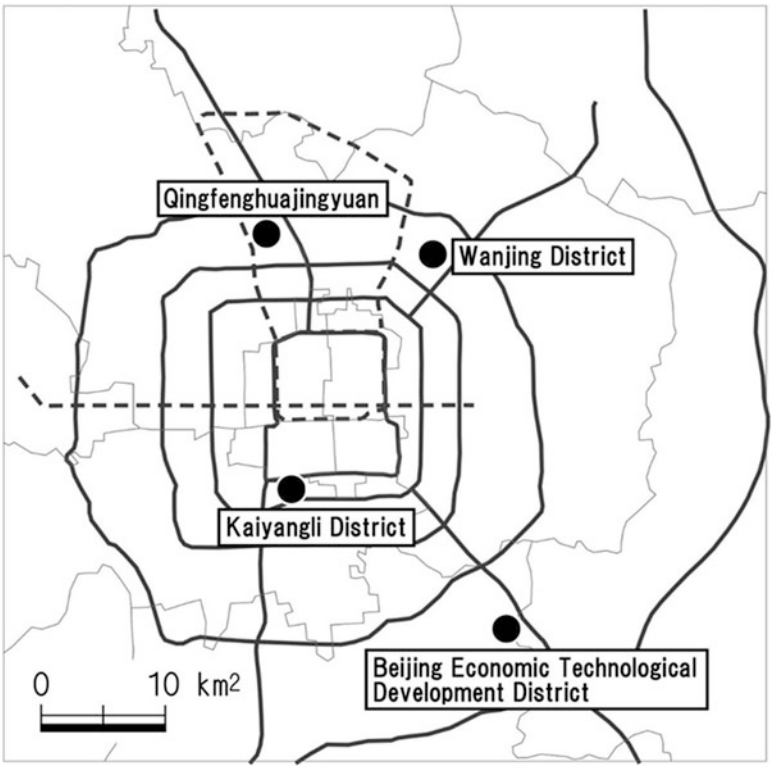


**Fig. 15.12** Locations of the four residential development districts

period of a new urban renewal. The residential house is not distributed to the resident free of charge in a new policy but the resident should purchase a dwelling by the own capital. This policy change according to the conversion of the national policy in 1999 aims securing of the development enterprise an original annual revenue by selling the commercial house during the redevelopment, and the smooth flow of funds of the whole project.

#### 15.4.1.2 Feature of Development Enterprise and Redevelopment of *Kaiyangli* District

The *Kaiyangli* District is located in the *Fengtai* Ward, and exists on just inside the Third Ring Road in the southwestern area of Beijing City (Fig. 15.12). Total planning area is 412,000 $m^2$, and the total floor space of the building are 582,000 $m^2$ in which the area of residential house is 466,000 $m^2$. This redevelopment project has supplied 152,000 $m^2$ of floor space for economical house, and the average area per household is 132 $m^2$.

The planning and the execution of this project were accomplished by the branch company of the Beijing Urban Development Group Company jointly with the government of *Fentai* Ward. This branch company has chiefly taken charge of redevelopment project of the entire built-up area in the dependent business in the Beijing Urban Development Group Company centering on the southern part of Beijing City. The redevelopment at the *Kaiyangli* District is progressed by the method of the second period in the urban renewal of Beijing City mentioned before. And the company has received land property of the redevelopment site from the city government free of charge in 1991. This company negotiates on enterprise, facilities and resident in the planning area for moving out.

The per person area of residential house was 12 $m^2$ before the project in the planning area. The local population composed the private owner of the house built by himself/herself, the farmer; about 20 % and the resident in the public residential house supplied by the local government; 80 %. It is said that a lot of residents in the area moved out when the Great Hall of the People is constructed on the *Tiananmen* Square.

As for this branch company, it had another redevelopment plan scheduled to execute between 2006 and 2010, and the company has received the land property from the local government free of charge as well as the *Kaiyangli* District in the 1990s. To improve flow of funds unlike the situation to date, this company sells the commercial house in the first class market beforehand.

It is said that the following problems are in the urban renewal project executing in Beijing City. It is not enough amount of compensation to the resident to achieve a good living environment because house prices have risen rapidly in the market. When the residential house is requested besides the planning area, the resident cannot buy the residential house from 100 to 150,000 yuan obtained as compensation in the region inside the Fifth Ring Road. Because present amends are based on the number of people, some households increase the residential population illegal to raise the amount of compensation even a little. On the other hand, because a luxurious commercial house is not constructed with the urban renewal project, it is difficult for the urban renewal project to obtain an enough profit for the real estate development enterprise that executes it. It is said by there are a lot of deficits in the enterprise that is related to the project. Because it is few that a private major company does this project, the enterprise that relates to the local government like this company actually often still does the project by the government initiation.

## *15.4.2 Commercial House Development in Built-up Area; A Case of Qingfenghuajingyuan Development*

### 15.4.2.1 Feature and the Main Business of Developing Enterprise

*Qingfenghuajingyuan* is the housing development area escorted by Beijing Huaqin Investment Company in 2002, and located in the northern part and the *Haidian* District in the Beijing City (Fig. 15.12). The project area is between the Fourth Ring Road and the Fifth Ring Road, and it exists in the adjoining location in the

expressway reaching the Grate Wall from the center of the city. *Qingfenghuajingyuan* is composed of the commercial house, and total floor space of the residential house is 135,000 $m^2$. In the sold house, it is 160 $m^2$ in floor space for a usual type, and a part of type is from 130 to 180 $m^2$.

This company is established in 2001 as related companies of Qinghua University, representing China, and is developing the residential house in a high-tech industrial estate etc. that relates to the University. Qinghua University does not take part directly in a daily business though the capital of the University has been invested in the establishment of this company. As for this company, it is managed after 2003 as a pure private company, intangible assets of social credit by related companies of Qinghua University are advantageous though the relation between Qinghua University and this company is weakening.

Several projects have progressed in this company simultaneously. *Qingfenghuajingyuan* is a first project for the company began in 2002. Another two projects are located in the Beijing Economic Technological Development District in the southeastern area of the city, and the company is constructing and supplying office building besides the construction of the commercial house in the District. Moreover, this company is also doing "Land arrangement". After conferring with the local government, making the land, and maintaining the infrastructure in the designated area, this company puts it out to the second class market of land property.

#### 15.4.2.2 Obtaining and Development Process in Land

It was changed to "Formal transfer" in 2003 though the acquisition of land was done by "Agreement transfer" until 2002 in Beijing City. The agreement transfer is to be transferred the right of using land from landowners to development enterprise based on the conference on both. A formal transfer is to be done the transfer of this by the tender. The company obtained the land of *Qingfenghuajingyuan* by the transfer agreement. It was transferred by the discussion with the affiliated company of Qinghai University though the company had used the land as a warehouse.

*Qingfenghuajingyuan* has a feature different from sales of other usual commercial houses in Beijing. In a word, some of the residences have been sold preliminary before sales to the citizen though the commercial house was sold to general citizens in the same residential quarter. In preliminary sales, sales were done only to persons involved of Qinghua University and any other university located in the vicinity by priority only for 3 days. The order poured at this time, because the sales price was discounted by 7 %, and reservation money was 20 % of the sales price. Afterwards, formally sold to the citizen, in a word, the transfer was done.

### *15.4.3 A Large Scale Development: A Case of Wanjing District Development*

#### 15.4.3.1 Outline of the *Wanjing* District

The *Wanjing* District is located on the northeastern area of Beijing City along the expressway connecting to the Beijing Capital Airport and the downtown (Fig. 15.12). The development of the *Wanjing* District is a huge project that started in 1995, the district area is 30 $km^2$, and the planned population is 350,000. In the district, neither a business nor an industrial function is provided though a commercial function is basically provided in the residential housing area. There are some economical houses constructed in the early stage of development, but most of the supplied house is a commercial house. About 60 % of the residents in the *Wanjing* District is a businessman and a student, and the South Korean also is moving in. Moreover, the Beijing Union University bought the commercial house developed for the citizens in the district, and sold it cheaply for the school personnel.

There are the following problems about the *Wanjing* District. First of all, the traffic of the car outside the district is large because the population is large, and the heavy traffic jam occurs. This problem is being improved by having increased the exit from the district to the outside to three places. Little job opportunity in the district is another problem. The job opportunity in this vicinity region decreases because a lot of factories in the northern part of Beijing City have disappeared one after another because of the redevelopment for the housing construction. The third problem is ratio of building volume to the lot is large. It is densely populated because the ratio of building volume became 300 % though it was 200 % in the initial plan. The fourth problem is that the infrastructure maintenance such as the school, the hospitals, and green spaces is late.

#### 15.4.3.2 The Feature of the Development Enterprise and Obtaining and Development Process in Land

The development of *Wanjing* District is executed by the Beijing Urban Development Group, and the company is one of the four large government-run housing development companies independent of the Beijing City government. The company has originally established as a public affairs construction office of Beijing City government in 1974, and has constructed the residential houses as a welfare policy. The company became independent in 1980, and continuously managed the same business. However, the development of the commercial house was started by a welfare housing policy's having been converted in 1999. This company in national context is classified into the first class enterprise in the state-owned enterprise.

The development of the *Wanjing* District started in 1995. First of all, the development plan is decided by the master plan of the local government, this company of the state-owned enterprise purchases the farmland, and the development plan is begun. The company maintained the infrastructure such as roads in the

whole area, developed residential houses on the half of land by itself, and was selling it to the citizen, and the remaining half was sold off to the real estate development enterprise of ten companies every 3,000–4,000 yuan/$m^2$ through the second class market in land.

Because this company was the first class enterprise, the acquisition of land was able to be done by the local government easily and the obtaining price was suppressed to low. The company still has a lot of land in the *Wanjing* District etc. though the agreement transfer of land has already ended. The company can put out these lands to the second class market in land. The advantage as the state-owned enterprise is now lost because the land came to be obtained by the tender.

### *15.4.4 Change in Location of Housing Development in Beijing Economic-Technological Development District*

The Beijing Economic-Technological Development District is the industrial estate developed across *Tongzhou* Ward and *Fengtai* Ward in southeast Beijing (Fig. 15.12). Economic-technological development area was introduced followed by the special-economic zone based on the Reform and Open Policy, the special economic zone where the coastal region had been mainly set up became the mainspring of the economic growth of China. The economic-technological development area is the national project set up aiming to attempt economic development in a certain city and region by attracting the frontier industry of the high-technology industry etc. It is essentially different from an industrial estate only for introducing the factory location of other countries. The economic-technological development district in China is an independent organization like an administration that has a lot of administrative power except justice etc.. The development area committee is an administrative organization that induces a concrete factory location, and is independent of the municipal administration in the housing construction for a related resident including the plant worker and the point of maintaining infrastructures such as a road and upper and lower water service in addition.

The developmental stage of the Beijing Economic-Technological Development District is as follows. First of all, the development area was set up with 3.8 $km^2$ by Beijing City government in 1992. Only the northern part in the present development district designated as the development district at that time. The development area is specified for the national development district in 1994 afterwards, and the development district has expanded to 15 $km^2$ (Fig. 15.13). An industrial site in the southern part (7 $km^2$) of the initial development district was recognized of the inside *Zhongguancun* Science and Technological Estate by the nation in 1999, and it came to be able to receive various preferential treatments. As a result, Beijing Economic-Technological Development Area is located under *Zhongguancun* Science and Technological Estate in the organization. However, the development area located on the opposite side of the city, the development area has actually operated

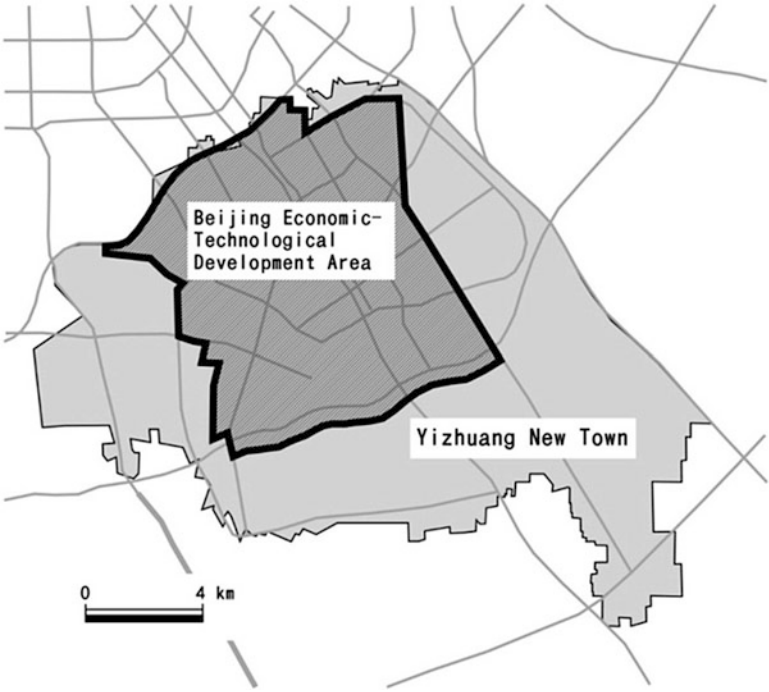


**Fig. 15.13** Designated area of Beijing Economic Technological Development Area and Yizhuang New Town

as an independent organization. Afterwards, the development area enlarged its area to 24 $km^2$ approved by the State Council.

The situation of industrial development of the development area is as follows. The number of enterprises located was about 2,000 in 2007, and it increased to about 3,000 companies in 2009. The located main manufacturing is a car assembly factory, related part industry, biotechnology and a medicine manufacture and so on. A lot of factories have moved from the existing urban area of Beijing beside the factories from another province and foreign countries. As for the Beijing Economic-Technological Development Area, it aims at the conversion of the industrial structure in the future, and the digital television manufacturing and the accumulation of industry of the relation broadcasting are scheduled in the eastern part of the development district in the background of the intention of the managing committee. Moreover, the enterprise related to clean energy that represents China is located, and a wind power generation and a solar power generation device are manufactured[5]. Moreover, it aims at attracting like the cultural creative industry,

[5] There is a wind power generation accumulation zone from Hubei Province in Xinjiang Autonomous Region called Wind Power Generation Belt. It tries to produce the countries of the wind power generation device that relies on the import in China before.

the airline industry, and the productivity service industry, etc. The managing committee is now aiming at strengthening Research and Development function.

The expressway where Beijing and Jinan are connected passes over the adjacent area for transport links in addition to the expressway where Beijing is connected with Tianjin in the development district. Moreover, the rapid-transit railway between Beijing and Tianjin having already opened passes in the district though there is no station in the district. A new station of the rapid-transit railway is scheduled to open in several years. And a light rail transit is maintained that connects the new station of the railway with each place in the development district.

Recently, the role of the development area has greatly changed, though it has developed as independent existence with an existing local municipal district up to now. In a word, the region including this economic-development district was specified for one of the new towns designated in the metropolitan area development plan that Beijing had planned (Fig. 15.13). The planning area in the new town named *Yizhuang* New Town has surrounded this development area (Fig. 15.14). Because this development area had been taken into the city planning of the Beijing metropolitan area, the role as the new town including citizens' residence functions was added to the basic role of the manufacturing. As a result, this new town became an important development area in the southern part of Beijing region.

The industrial attracting policy and the housing development policy in the development area are changing affected by the development area was included as the new town in the Beijing metropolitan area. A lot of blocks for the development in the future have been left in this development area. This development area extends over *Tongzhou* Ward and *Fengtai* Ward as mentioned before. As a rule, the development project in both wards is executed by judging each ward, but the joint development project in this development area and both districts is tried executing in recent years, and the development site is supplied to the first class of land market for residential development. As for both districts, industrial ground is originally developed, and there are of course a lot of people engaging the work in the development area who reside outside the development area, and there are a lot of people commuting the downtown who did not work in the area.

The economy-technological development area was, so to speak, a symbol of development under the socialist market economy system in China. It was established by an independent authority in a place away from the downtown, and an experimental role was played at first. Tianjin Economic-Technological Development District (TEDA) before is the classic example. However, the relation as the metropolitan area has strengthened as the development area develops, and the downtown comes to connect geographically with the development area. In addition, nowadays several levels of development area designated by province and city etc. in addition to that on a national level was specified. It became a situation in which the development area competed for preferential treatment, and as a result, the economic-technological development area was not become a special existential.

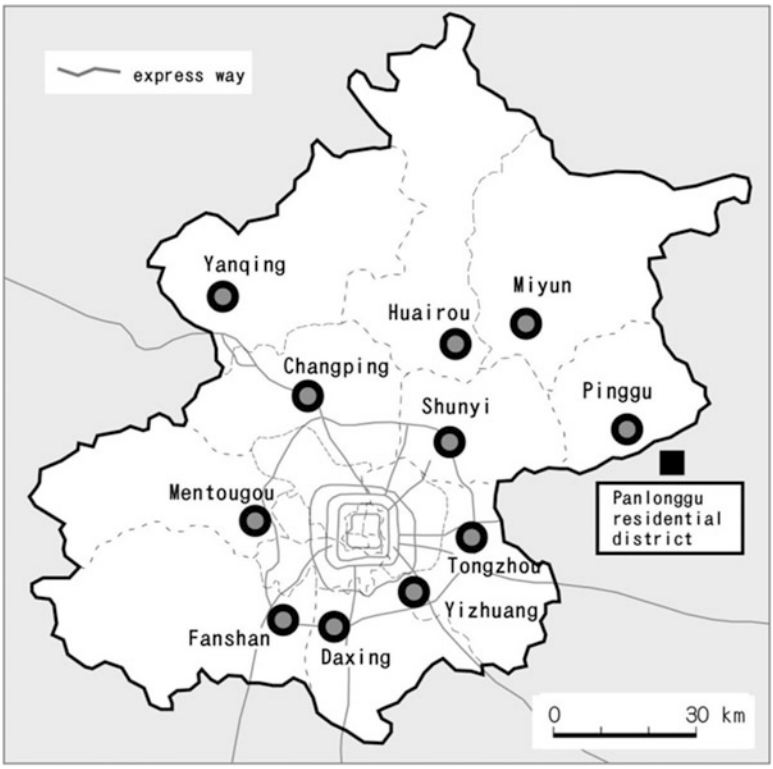


**Fig. 15.14** Location of new towns and Panlong development district

### *15.4.5 Case with Villa Development Outside Beijing City*

*Panlonggu* District is a resort residential quarter developed by a nationwide real estate development company in which the state-run enterprise was established as a mother's body (Fig. 15.14). This company has executed many projects in various parts of China, and was placed by the first place in the whole country in 2008. The development area of *Panlonggu* is 28 $km^2$, and this company is executing this project jointly with Tianjin City government. *Panlonggu* is located in a valley region within Tianjin City on the part of the edge outside the metropolitan area of Beijing, so it is estimated that Beijing citizens will purchase many plots in the project. As the plan, the residential population is 65,000 of people, and the employed worker is 45,000 of people in the planning district.

A regional composition in the development district is about as follows. A general road almost passed the center of the district, and the first stage sales consist of the villa house on the west side slope has been sold all about the district. The first stage sales houses are about 200 households, and the building is being almost completed, and the outdoor facilities such as relating road were under construction in 2009, and

residents who purchased is scheduled to reside in 2010. The floor space a household is 200–300 $m^2$, and the price is 5,000–6,000 yuan/$m^2$. There is the second stage sales house in the east side district on the road, and the floor space of the second stage sales house is 400 $m^2$ or more, and 5,000 yuan/$m^2$, so the total price a household is about two million yuan.

It schedules to be located several shops along the general road, and public facilities etc. are scheduled to be located in the southern part of the east side district. The hotel and the art club etc. as a public facility will be constructed in European design and style. An architectural style of the villa house is a European style especially is designed in the image of Tuscany in Italy. Underground water is used as a portable water basically in the development district.

*Panlonggu* is a project based on a concept different from a mere resort or the villa area, and it has a concept of culture creation and talent's promotion. The cultural creation district is installed in the district and a variety of cultural facilities are attracted. The human resources development is promoted concerning the art and the movie, etc. of the talent, and the villa house and the golf course are constructed to exclude this. The development company needs to appeal to the concept of culture and talent etc. on this project, but it is not mere a villa development because the national government submitted the policy of severely limiting the villa development project on a nationwide scale about 10 years ago.

The valley region that was adjacent to Beijing was chosen as a development ground for some reasons. The first reason is to be severely limited the villa development in Beijing. To respond to large demand of the Beijing citizens for high-quality residential house, the place geographically contact with Beijing City was chosen. Such the development example reflects on Hubei Province where it touches the north of Beijing. The second reason is a spectacular landscape in this place. Here are a lot of gradual valleys of which the famous mountain waits behind, and the mountain greenery is excellent spectacle places. Here is called the *Panshan* Mountain Scenery District, and specified for the sightseeing spot of three-star of China. The third reason is excellent in a traffic access of Beijing and Tianjin with the expressway. The interchange was established adjacent to this development site in June 2009. Some changes are scheduled outside of the *Panlonggu* development site. First of all, Theme Park is planned in the south of the district where Germany cooperated with Tianjin City. The concept of this Theme Park is to take the rampart in old Rome. And the restoration of the *Shaolin Si* Temple is planned though *Panshan* Mountain is a place with *Shaolin Si* Temple before. Facilities where such a tourist is induced are planned. The new farm village construction is done in a place away at 20 km in this region, and the farmer who resides within the development ground of *Panlonggu* is supposed also to move.

## 15.5 Conclusion

After the reform and open policy was introduced in 1978, a lot of residential houses have been constructed, and the citizens who increased acquired those houses in the economically growing Beijing City. The purpose of the residential development was not only corresponding to a population increase but also meeting the needs of the citizens in various income strata as well as for maintaining the living standard of the citizens. This paper considered what the influence of residential development had given the urban regional structure, and also consider the mechanism of residential development in Beijing City.

In the central area of Beijing City, a lot of urban renewal projects has been accomplished to create the base of economic development. It is necessary to achieve such an urban renewal project to move out of the citizens who have resided. Because high-income household was comparatively few in the region where the renewal project was necessary, the redevelopment of the *Kaiyangli* District achieved it by expropriating an old resident of the economical house. In the *Qingfenghuajingyuan* development, the real estate enterprise redeveloped the site that was the warehouse, and supplied the commercial house to the citizens. The part was sold by the person related to the university which was the holding company of the real estate enterprise by priority. Two cases with *Kaiyangli* and *Qingfenghuajingyuan* affected the reorganization of the urban regional structure. In a word, it contributed to the improvement of resident's housing standard when an old residential house was renewed, and a part of the resident was driven out of the suburban area. Moreover, it contributed to an efficient urban formation by effective use of the site that the unit had owned. The house development in the urban area contributed from two cases with *Kaiyangli* and *Qingfenghuajingyuan* to an efficient urban formation by contributing to the renewal of an old house, and the improvement of resident's housing standard, and using the site that the unit had owned effectively.

The development of the *Wanjing* District is a large-scale new town in a surrounding area. Such a large amount of a housing supply is difficult in the redevelopment in the built-up area though large-scale housing development is necessary to accommodate the increased population. A large amount of the citizens has secured their residential houses as a result of the majority of houses' being sold as a commercial house in the district. However, the job opportunity was not created in the district, and it was assumed that the maintenance of the traffic system that connected the district to the urban area was a problem because a large amount of resident had had to commute. A private real estate enterprise independent of the Beijing City government took charge of the development of the entire district though a half of the residential house has been developed and sold by other private real estate enterprises.

The Beijing Economic-Technological Development District is now located at one of the new towns in the suburban area though it was not considered to be a housing supply region at first. In a word, it is shown that the character of the district

of economic growth that centers on high-tech industry in Beijing City changed in quality. The *Panlonggu* District is development ground in the high-level villa house in Beijing suburbs. Because the upper-income group had increased in Beijing City, the development of the luxury home corresponding to the needs of the upper-income group became active. However, because this development trend had caused the sudden rise of the real estate value of the city, the development of the villa house in the Beijing city was not permitted. The case with the *Panlonggu* District shows that it influences the development trend of suburbs where the house development trend of the Beijing city is adjacent.

This paper showed that the transformation of the housing supply system after the reform and open policy made a market had a big influence on the urban regional structure composed of a built-up area, its surrounding area and the suburbs through the activity of the real estate enterprise in Beijing City of a population increase and economic growth.

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# Chapter 16
# Urban Growth in a Rapidly Urbanized Mega City: Wuhan

**Jianquan Cheng and Jie Zhou**

**Abstract** Wuhan, the largest mega city in central China, is not only a historic and cultural city but also a regional economic, transportation and educational centre. In the past six decades, Wuhan has witnessed massive changes in national and local policies of urbanization and urban development. Its spatial and temporal growth has shaped a representative urban morphology, which is interpretable from socio-economic and spatial processes in each corresponding period. Since 2000, Wuhan has entered a new era of economic boom and started the construction of metro system. However, such rapid urban development has addressed great challenges to local urban planning. After reviewing the process of its urban growth and evaluating the roles of urban planning, this paper aims to analyze the challenging issues in transport, population ageing, migration and environment and ecology. We argue the current local data infrastructure is insufficient to support comprehensive or integrated planning in Wuhan.

**Keywords** Planning • Transport • Urban growth • Urban morphology

## 16.1 Introduction

The urbanization level, measured as the proportion of urban over total population, has reached 50 % in 2010 in China according to the latest 6th population census. Rapid urbanization has significantly brought about the massive changes of space in city, horizontally and vertically. The process of urban development followed a very similar model as urbanization because both were largely determined by the national policies in the period.

Wuhan, first termed in 1927, is situated on the East side of Hubei province as its capital (Fig. 16.1). It lies between 113°41′ and 115°05′ East Longitude, and 29°58′

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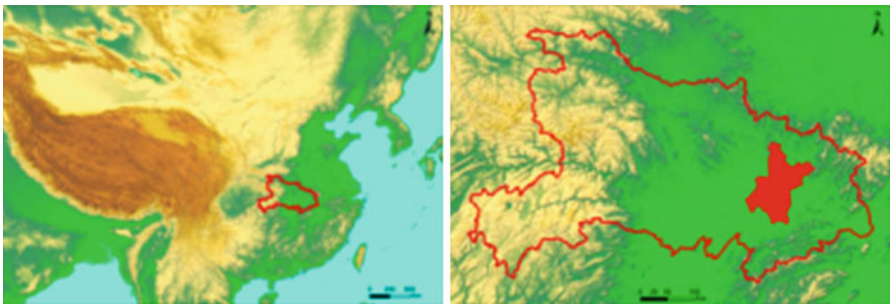

**Fig. 16.1** Location of Hubei in China (*left*) and Wuhan in Hubei (*right*)

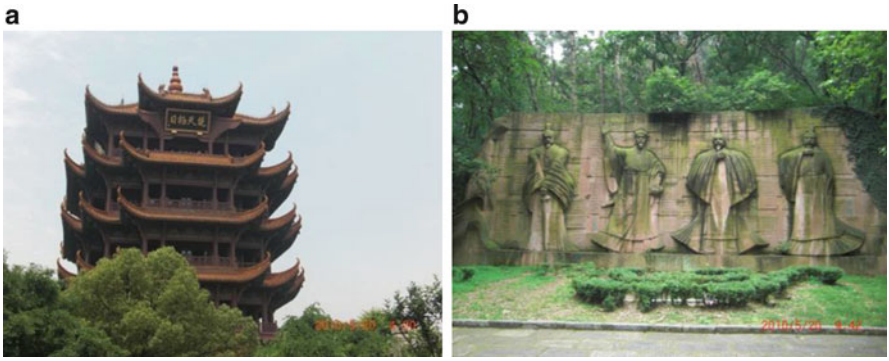


**Fig. 16.2** Historic and cultural landscapes in Wuhan ((**a**) Yellow Crane Tower; (**b**) traditional Cu-culture park)

to 312°2′ North Latitude. Its topography is dominated by relatively flat land between 22 and 27 m above sea level except the hilly areas sporadically distributed in suburban districts. This region is characterized by typical subtropical monsoon climate and well-marked seasons with cold and dry winter, abundant rainfall (e.g. annual average precipitation is 1,140–1,265 mm), and sunshine in summer.

Wuhan has a nickname 'Water City' (*Jiang Cheng*), which is shared with its sister city—Manchester in the UK, as water body takes a high percentage (>20 %) of its territory and because it is located at the middle reaches of Yangtze River which is the third longest river in the world. The whole city is divided into three parts by the Yangtze River and its longest branch—Han River.

Wuhan is also a well-known tourism city, including the largest urban lake—Donghu Lake, Guiyuan Temple, a historic building—Yellow Crane Tower (Fig. 16.2a) and traditional Cu Culture. On the top of the Yellow Crane Tower that was first built in 220 AD and fully reconstructed in 1981, the entire landscape of Wuhan city can be overviewed. Hubei is the origin of traditional Cu culture popular in Zhou Dynasty. The well-known bronze concert bell produced in around 450 BC is a typical example of Cu culture displayed in a provincial museum in Wuhan. The sculptures of Cu cultural stories (Fig. 16.2b) are displayed in the Moshan hill, a part


**Fig. 16.3** Wuhan municipality and districts (*Source*: Han and Wu 2004)

of Donghu Lake. Wuhanise—a local dialect is another cultural landscape of Wuhan. In the recent history of China, Wuhan was the origin of democratic revolution—turning the Qing Dynasty over in 1911. The historic street in which the revolution happened is located in Wuchang, near the Yellow Crane Tower.

The administrative division of a municipality defines how a variety of demographic, social and economic data are registered and reported. The administrative units in Chinese cities are stratified as municipality, urban district (or sub-urban district and county), sub-district (or town, township and farm) and community (or residential committee) (see examples in Cheng et al. 2006). Till the end of 2012, Wuhan municipality, or called Greater Wuhan, is composed of seven urban or central districts and six suburban districts (Fig. 16.3).

The total number of permanent inhabitants of Wuhan municipality is 10.02 million in 2011 and total area 8,494.41 $km^2$. The permanent inhabitant, contrasting with floating population, means those who have stayed for more than 6 months.

**Fig. 16.4** Wuhan Landscape (*Source*: www.baidu.com)

Therefore, the population density of Wuhan municipality is 1,180 people/km$^2$ in 2011, which is much higher than 882 people/km$^2$ in 2000. As a result, Wuhan is a typical mega city in central China (Fig. 16.4).

After this introduction, Sect. 16.2 aims to review the urban development in the three periods: pre-1949, post-1949 and post-2000. Section 16.3 is focused on several master plans implemented during the periods and their impacts on urban growth. Section 16.4 tends to address the main challenges to local urban planning. The chapter ends with a general conclusion.

## 16.2 Wuhan Urban Development

### *16.2.1 Pre-1949*

To be consistent with the division of Chinese development history, the pre-1949 period is called "recent times" and the post-1949 period "contemporary age". Historically, the three towns of Wuhan were constructed and configured in different dynasties. The first town—Wuchang named as 'Jiangxia' occurred some 1,600 years ago. The second town—Hanyang was founded around a castle that was built during the Han Dynasty (206 BC–222 AD). The third one—Hankou began during the period of the South–north Dynasties (420–589 AD) and the area was situated next to Hanyang before the Han River changed its course during the Ming Dynasty (1368–1644 AD), separating it from Hanyang. By the thirteenth century,

Wuchang and Hanyang had been developed into commercial and handicraft towns. Since 1700s, Hankou had been already a major inland river trading port.

Wuhan was only a city 'along the Han River' before 1840, but became a city 'along the Yangtze River' later. This transition was a result of the opening to the world after 1840, which converted the city into a centre of not only domestic but also international trade due to its convenient water and ground transportation systems with good connections to the surrounding areas. In 1905, Wuhan had "114 foreign firms, 8 local banks and 9 foreign bank branches" (Zeng and Cai 2002, p. 360). The three towns were functioned as the centers of commercial and trade, industry and transportation in order. The output values in trade and industry took the third~fifth and the second~fouth places respectively among all the large-sized Chinese cities in that period (Pi 1996). Particularly, Hankou town had become one of the four largest commercial towns across China since 1570s.

Since 1900, the three towns had been developed into functionally different centres, i.e. Hankou for commercial, financial, trade, transportation, service, entertainment, and information; Wuchang for institutional and educational activities; and Hanyang for steel and machinery industry. During the period 1840–1949, the population of the three towns had increased from 0.2 to 1.2 million and the city area including the suburban areas had expanded from 20 to 941 $km^2$. By the mid-1920s, the production capacity accounted for 13.67 % of the national total, ranking the second in China, next to Shanghai (Yuan and Yin 1997), and this ranking position also applies to population density (Pi 1996).

### *16.2.2 Post-1949*

Since the Chinese communist party came into power in 1949, there have been numerous political, socio-economic and cultural reforms, nationally and locally, in the past eight decades, which have had unprecedented impacts on the urban development of Wuhan city, as other mega-cities in China did. There are several models describing the urban morphology of Chinese cities during this period. For example, Zhang (2008) split the urbanization process of China into six stages: short but rapid expansion (1945–1957), fluctuation (1958–1966), stagnant (1967–1977), recovery (1978–1985), townization (1986–1995) and long expansion (1996-present). Wu's model (1998) represents a universal process of urban growth in China, despite its origin from the case of Guangzhou city. The Chinese city of the 1949–1976 era sprawled outwards rather than upwards. The construction of large numbers of high-rise buildings in the 1980s and 1990s, particularly in commercial sector, has come to symbolise the transformation of China's cities.

It was estimated that the urban built-up areas of Wuhan city grow tenfold between 1955 and 2000 (Cheng 2011). The spatial patterns of temporal urban growth from 1955 to 2000 shown in Fig. 16.5 have many indications. First of all, the urban growth of this period was characterized by spreading outward from the Yangtze River and from a discontinuous (sprawling) to a continuous (compact) pattern. Secondly, the urban growth 1955–1965 was dominated by leap forward

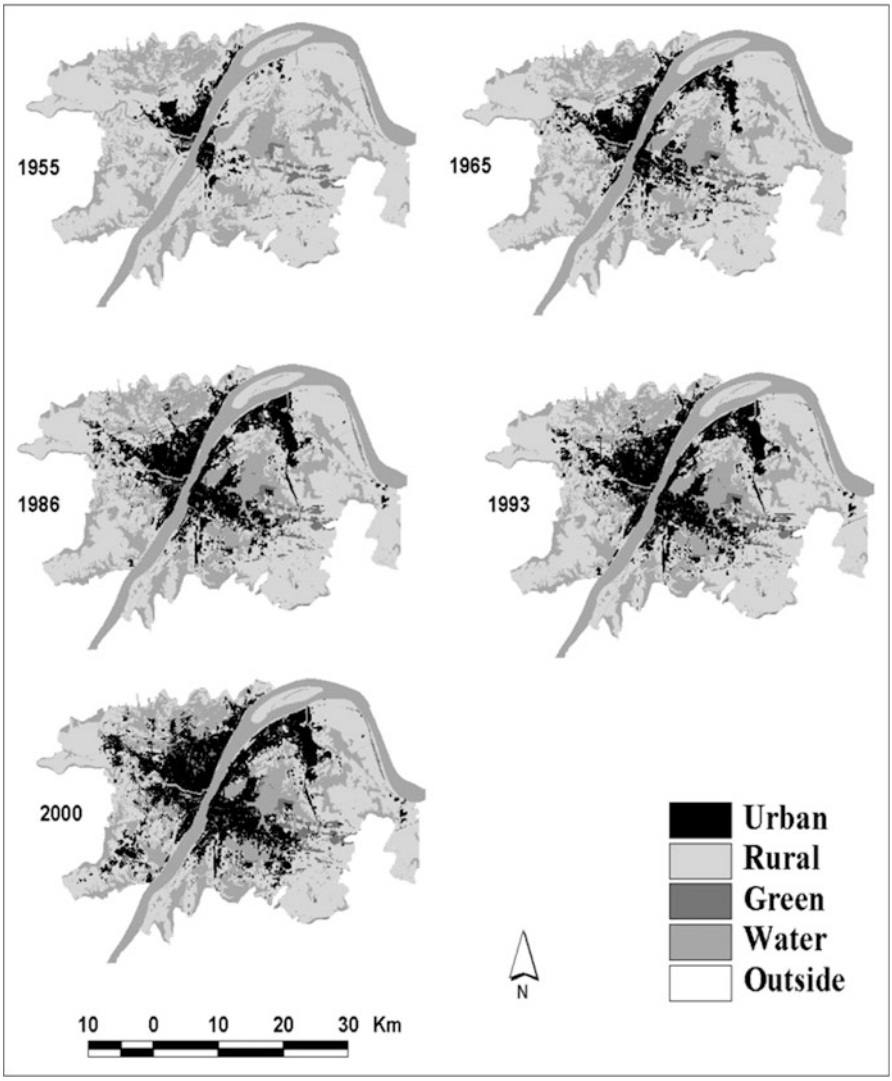


**Fig. 16.5** Temporal urban growth of Wuhan 1955–2000

development slightly along the rivers. Thirdly, the urban growth 1965–1993 was dominated by infill development mostly along main roads and slightly along rivers. Fourthly, the urban growth 1993–2000 was dominated by outward expansion from traditional industrial centres, mixing with continuous compact development. To understand better the spatial patterns of the temporal urban growth in Wuhan, it is necessary to explore the process of urban development and relevant national and local policies. The governmental policies in the period from 1949 to 2010 can be referred to the paper by Zhou et al. (2013).

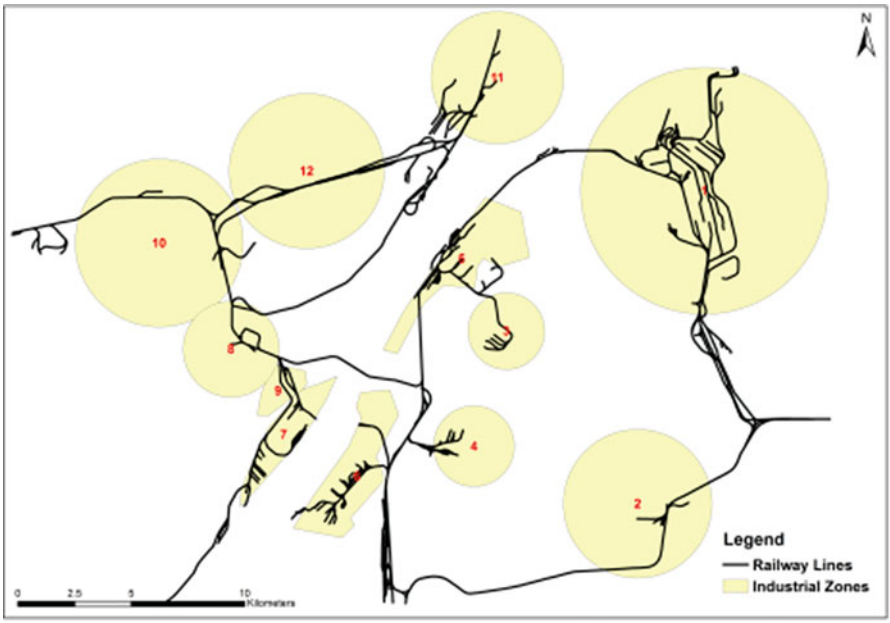


**Fig. 16.6** Industrial clusters and railway lines before 1978

The first wave of large-scale urban development projects was initiated in 1953 that was the starting year of the first 'five-year plan' (1953–1957). Due to its historic position in China, Wuhan was designated by the central government as one of few key heavy industrial cities which were able to receive considerable national investment. The key industry and infrastructure projects that were constructed fully or partially during the period includes the well-known Wuhan Iron and Steel Company, Wuhan Heavy Lathe Plant, Qingshan Thermoelectric Plant, Wuhan Boiler Plant and the (first) Road-Rail Bridge over the Yangtze River. More than ten new universities including the famous Huazhong (meaning Central China) University of Science and Technology were founded then. Consequently, Wuhan had become a heavy industrial city and a centre of education and scientific research since then. Meanwhile, a large-scale of clustered residential units were built up by diverse work units (e.g. university, government and factories) to serve their employees. In total, Wuhan received 136.92 million RMB Yuan in these 5 years, accounting for 28.6 % of the total investment across China (Han and Wu 2004).

During the period of second 'five-year' plan (1958–1962), China proposed the notorious industrial campaign called 'The Great Leap Forward'. Required by the political movement, Wuhan city made an ambitious industrial development scheme in which some 200 new projects were planned to be completed within 5 years. However, the shortage of construction capital had eventually reduced the scheme down to 12 industrial zones (Fig. 16.6) and each of which had occupied a large area because the land was freely allocated to state-owned factories in that period.

After 1965 the state shifted its industrial development from large inland cities to middle and small sized cities located in remote mountain areas (e.g. Sichuan, Guangxi and Yunnan) for the purpose of national military defence. As no investments were available from the central government, the process of Wuhan urban development slowed down. Further, disturbed by the 10-year "Cultural Revolution" (1966–1976), the construction was dominated by small-scale local industrial projects which were principally invested by the municipality and other lower level of administrative organizations. Land development was restricted in sporadic area ("Jian Feng Cha Zhen" in Chinese). Equally, as the development emphasis was put "first on production, second on living", the house construction had almost been stopped since 1958. Until 1975, the 12 industrial zones had been filled in completely and had created approximately 279,000 jobs. In 1981, Wuhan was China's fourth largest industrial centre, next to Shanghai, Beijing, and Tianjin (Liu 2000). These industrial zones were tightly connected by railway lines to warehouses, railway stations and harbours (Fig. 16.6).

After the economic reform, Wuhan was open to the World in 1980 and, again, one of the pioneering cities with economic system reform in 1984 through the "single planning city system" which made the city directly responsible to the central government. Stimulated by these policies, Wuhan proposed the plans of the Donghu New High-Technology Development Zone (also known as "China's Optics Valley now) in Wuhan" in 1984 and the (Zuankou) Wuhan Economic and Technology Development Zone in 1985, for the purpose of attracting foreign direct investment and promoting local economic and urban development. These plans were approved by the State Council in1990 and the construction of the two zones was started in 1993. However, in the 1980s, as the state investment was still shifted to and focused on coastal cities with more preferential policies, Wuhan urban development was much slower than open coastal cities or Special Economic Development Zone such as Shenzhen. This is because that China's economic reform is characterized by spatial or regional imbalance.

The land reform in 1987 was a propeller for the second wave of rapid growth of Chinese cities (the first one occurred in the period from 1953 to 1958). Wuhan implemented its land reform policy in 1992 after the historically significant Mr Deng's Tour to South China in the same year. Particularly, Deng Xiaoping's policy of the 'Three Alongs' (developing economic hubs along China's border, along the coast and along the Yangtze River), offered Wuhan new opportunities of economic take-off. Since then, Wuhan has entered a new era of urban development characterized by the construction of large-scale projects of new development zones, infrastructure and redevelopment in inner city. Except the two development zones (Donghu and Zuankou), the well-known projects include Tianhe international airport (use in 1995), Qingshan trading pier, and the second (use in 1995) and third bridge (2000) over the Yangtze River.

The spatial patterns of the temporal urban growth in the period 1955–2000 were jointly determined by many spatial (proximity to rivers, main roads and city centres), administration (e.g. sub-district or town), and planning control

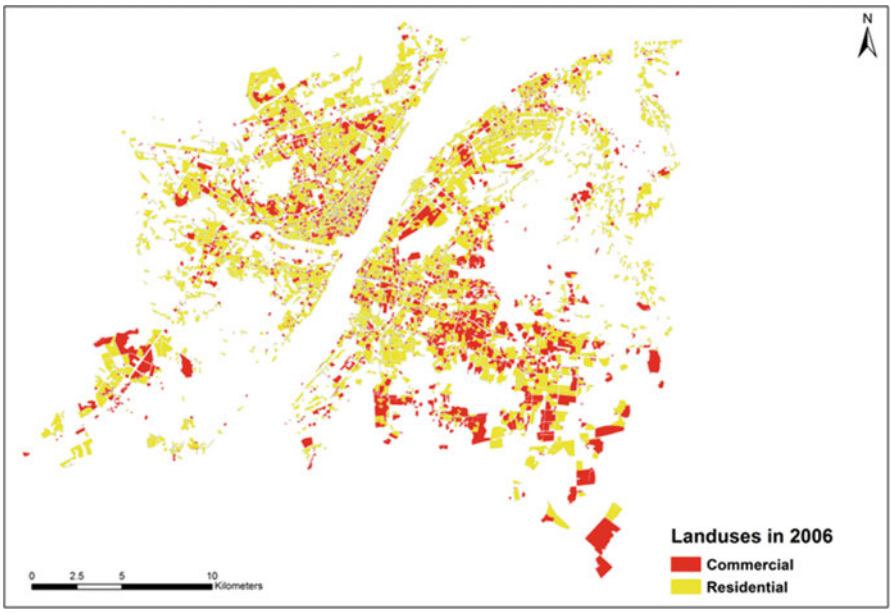


**Fig. 16.7** Residential and commercial land uses in 2006

factors (details can be referred to Cheng and Masser 2003; Cheng 2011). The urban expansion was simultaneously mixed with urban redevelopment occurring in the inner city as pushed by the real estate market.

### *16.2.3 Post-2000*

Generally, 2000 is a fourth turning point of China's urban development (Zhou et al. 2013) when urbanization was promoted as a national strategy. The spatial patterns of residential and commercial land uses shown in Fig. 16.7 imply there is no significant change of urban form from 2000 to 2006. This is because there have been more vertical instead of horizontal development.

In 2007, an urban network development strategy proposed by Wuhan municipality was approved by the State Council. The urban network is centred on Wuhan city with the inclusion of other nine cities that are all located with 100 km distance from Wuhan. The total population within the network is 31.1462 million in 2010 and its total area 5,780,000 $km^2$. It is an emerging urban cluster (or called urban circle in Chinese) in China following the Bohai Rim, the Yangtze River Delta, and Pearl River Delta. Wuhan municipality is also approved as a comprehensive reform pilot area of resource-saving and environment-friendly society in 2007. Thus, building a resource-efficient and environmentally- friendly eco-city has become a new aim for the spatial development strategy in Wuhan.

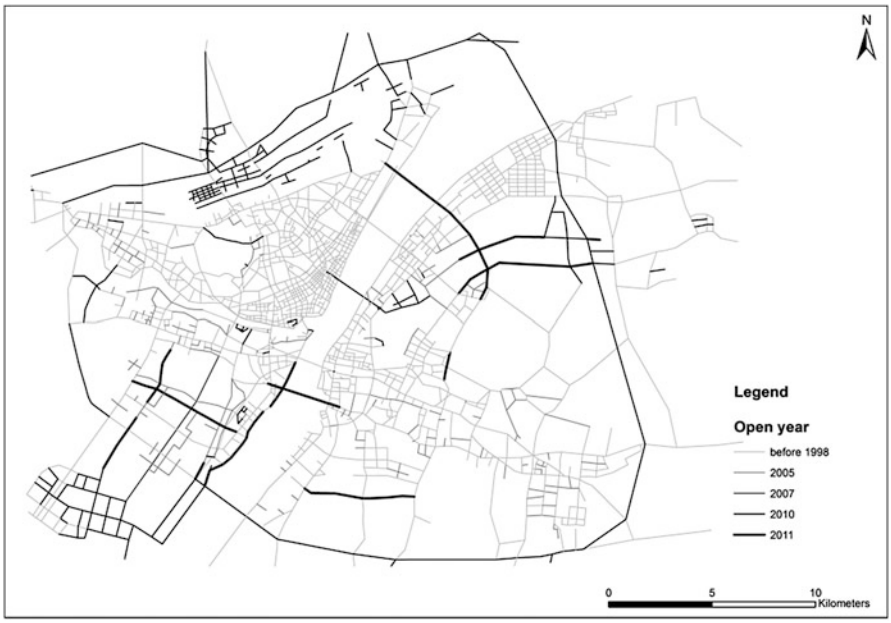


**Fig. 16.8** Transport infrastructure of Wuhan city in 2011

It is well-recognized that transport infrastructure has been taking important roles in stimulating economic development in China. Before 1987, the railway system was the dominant transport infrastructure connecting factories and warehouses with harbours and stations (Fig. 16.6). As a riverside city, the bridges over Yangtze and Han Rivers particularly have made great contributions to transport mobility and urban forms. There are five new road or rail or road-rail bridges (Junshan, Baishazhou, Erqi, Tianxingzhou and Yangluo) over Yangtze River, completed from 2000 to 2012. These, together with the first and second bridges in use before 1995, have facilitated the connection between city centres and suburban areas within the municipality by the functional inner, second and outer rings across the municipality (Fig. 16.8).

There are also seven bridges over Han River, connecting the three towns efficiently. As a mega-city with high density of population and employment, a metro system is very imperative for commuting and other urban services. Since 2004, Wuhan has entered an era of metro system development. Its first metro line (No:1) located in Hankou was put into use in late 2004, followed by the second and third lines (No:2 and 4) operated in 2013, which connect Hankou with Wuchang through a tunnel under the Yangtze River. To match with its long-term development strategy, Wuhan municipality has planned to construct ten lines of metro with a total length of 292 km by 2020. Undoubtedly, the provision of multi-hierarchical transport system would remarkably improve urban transport accessibility and reshape its urban form. Compared with other provincial capital cities,

**Fig. 16.9** Donghu high-tech new development zone (*Source*: www.baidu.com)

Wuhan is one of the three provincial capital cities with the rapidest decrease of compactness degree in the period from 1990 to 2010, dropping from 0.45 in 1990 to 0.12 in 2010 (Pan and Han 2013).

There are three state-level economic and technological development zones in Wuhan: Donghu, Zunkou and Wujiashan. The Donghu Hi-Tech Development Zone (Fig. 16.9) focus on optical and electronic communications, bioengineering, material research and laser technologies, while the Wuhan Economic and Technological Development Zone at Zunkou emphasizes on the production of automobiles and spare parts, food and beverages. Similarly, the Wujiashan Industry Development Park puts emphasis on food and beverages; in addition, it also focuses on agricultural products for further processing, and bioengineering. Together, these three Development Zones in Wuhan play a critical role in its economic development and urban growth.

Nominal GDP has increased by five times from 134.8 billion RMB Yuan in 2001 to 676.2 billion RMB Yuan in 2011. Wuhan's total investments in fixed assets have surged by 8.8 times from 49 billion RMB Yuan in 2001 to 426 billion RMB Yuan in 2011. The fastest growth occurred in 2008 with a rate of 26 % relative to the previous years. Figure 16.8 also has revealed that numerous major roads and bridges were constructed after 2007. The total real estate investment for residential housing is 73.73138 billion RMB Yuan in 2010, contrasting with 6.76933 billion RMB Yuan in 2001. The residential land uses in 1994 and 2006 shown in Fig. 16.10 indicate different spatial patterns. The total residential area is 131.60 $km^2$ in 2006 and 51.14 $km^2$ in 1994.

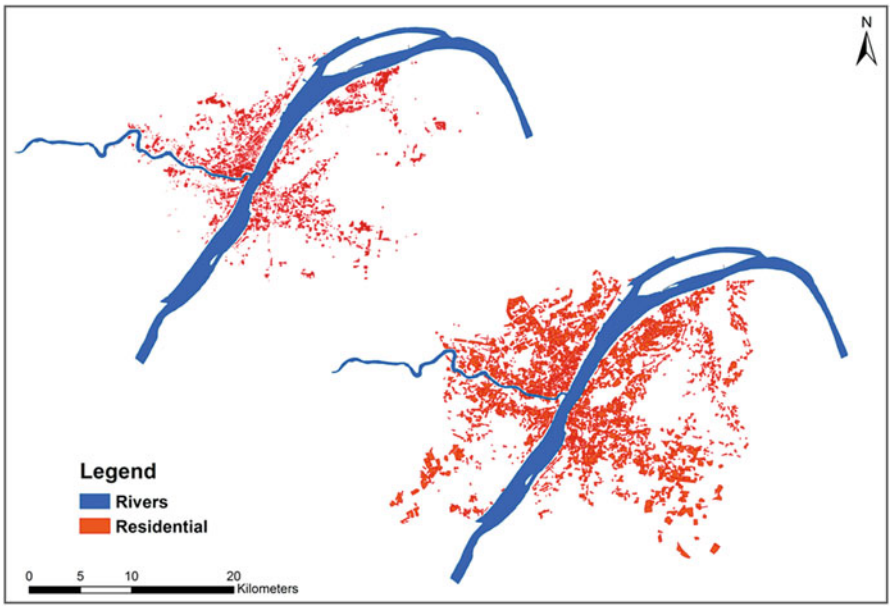


**Fig. 16.10** Residential land uses in 1994 and 2006

## 16.3 Urban Planning and Its Impacts

Since 1949, Wuhan city has designed and revised five master plans in total in 1954, 1982, 1988, 1996 and 2009 respectively (Fig. 16.11). The land use classifications in the master plans have been evolving in this period. From 1954 to 1982, the main urban land uses were industrial, warehouse, residential, universities/schools, and green areas. In 1988, the classes included industrial, warehouse, residential, commercial/trade, universities, and green areas. In 1996 the classification was updated with low-density residential, commercial and residential, commercial, banking and trade, offices, education and research, culture, hospital and recreation, green areas, industrial, warehouse, external transportation, railway, infrastructure, waters. Local land use classification used before 1992 was not uniformed nationally and underwent many modifications. The National Land Use Standard Classification (NLUSC) is promoted in China since 1992. It has 10 major classes, 46 groups and 73 subgroups. These modifications indicate a shift of urban development from industry-oriented to tertiary-oriented as more detailed sub-classes related to tertiary sector are added into the new classification.

Urban planning before 1989 was focused on the coordination of industrial projects (Yeh and Wu 1999) and the tasks of planning was to project the national and local urban development policies into free land. The Urban Planning Act enacted in 1989 is a major milestone in the history of urban planning system in China. The planners are authorized by law to investigate the spatial and temporal

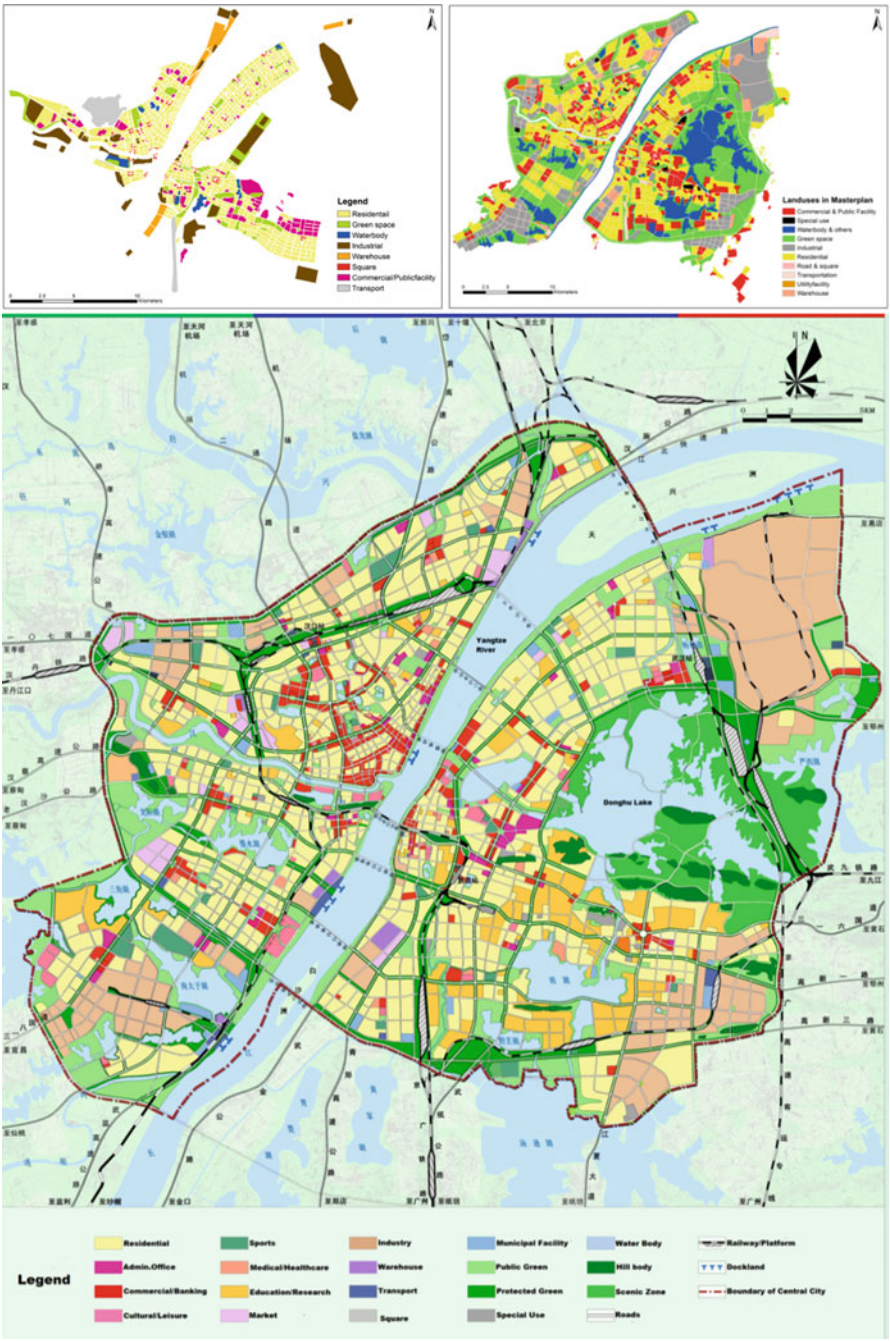


**Fig. 16.11** Master plans of Wuhan in 1954, 1996 and 2009

matches between constructions and plan schemes. New or re-development projects are required to go through a legal and formal process of applying certain planning permit and building permit. This makes the development control become possible on both scales: new-development in the fringe and re-development in inner city (Tian and Shen 2011).

In the new Law of the People's Republic of China on Urban and Rural Planning promulgated in January 2008, the words "strictly control the size of large cities" were replaced by "the coordinated development of large, medium and small-sized cities and small towns" (Zhou et al. 2013). This has stimulated the emergence of urban networks and particularly the Wuhan urban circle. Urban planning has been systematically integrated with regional planning. Cheng et al. (2006) have evaluated and compared the impacts of urban planning (master plan) on the temporal urban growth between the two periods 1955–1965 and 1986–2000. The plans were implemented in 1954 and 1988 respectively. Their analysis shows that the spatial match between urban growth and master plan is 17 % in the period 1986–2000 and 24 % in the period 1955–1965 (Fig. 16.12a, b). The different percentages suggest that master planning under a market economy (1988–2000) exerted less control over urban expansion. The spatial match between the residential land use in 2006 and the residential land use in the master plan of 2009 is 38 % (Fig. 16.12c). Many reasons have contributed to this consequence. Local government intervened with the land and housing markets, leading to the majority of land transactions being made under 'agreement' rather than according to the free market price. The co-existence of a free market price and an institutionally arranged price in the transaction of land is usually known as the dual land market. The dual land system leads to some confliction with urban planning (Yeh and Wu 1999). To attract foreign investors, local government of ten relax development control and simplify permit application procedures (Wu 1998). As a result, the planning authority is often in a rather passive position.

## 16.4 New Challenges

Wuhan, as the largest mega city in central China, has achieved rapid economic and urban development in the past decades. With the increasing complexity of the urban system, the current urban planning is facing many new theoretical, methodological and practical challenges, which are never addressed by the former planning systems under a command economy.

### *16.4.1 Transport*

Being the hubs of high-speed and other railway systems, the interactions between Wuhan and other mega cities in the Yangtze and Pearl Deltas, such as flows of

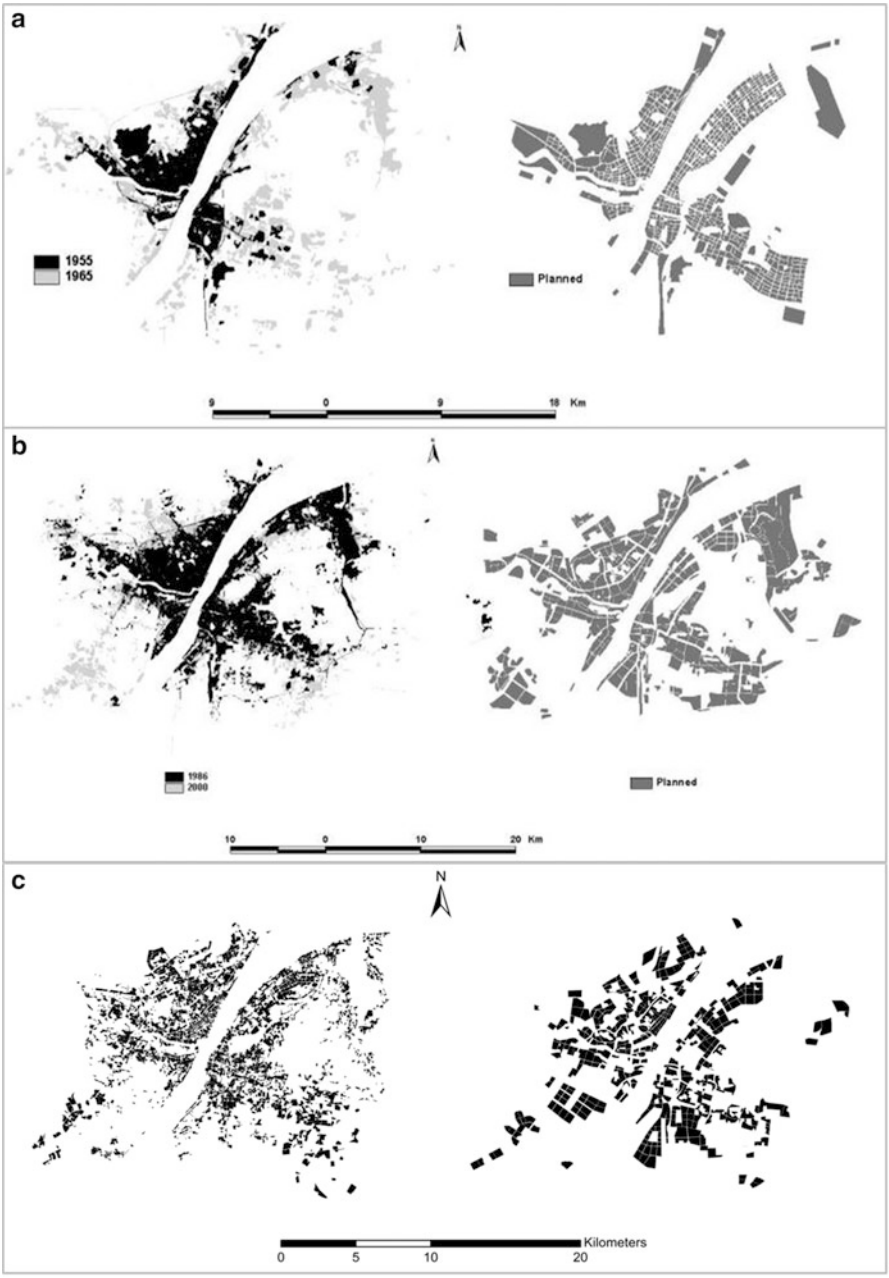


**Fig. 16.12** Assessing the impacts of master plan (**a**): growth 1955–1965 and plan in 1954; (**b**) Growth 1993–2000 and plan in 1988 and (**c**) residential land uses in 2006 and planed residential land use in 1996

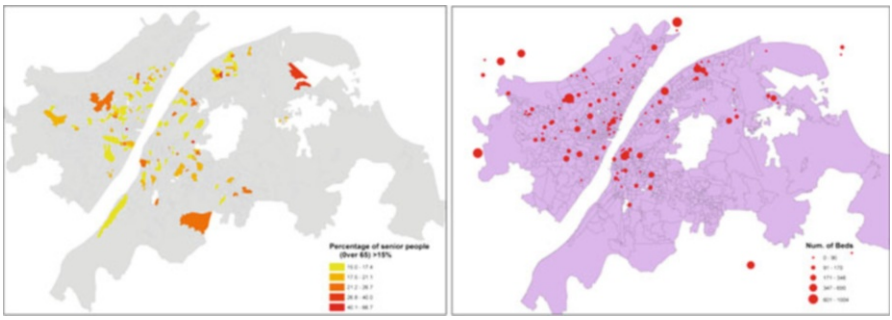

**Fig. 16.13** Spatial distributions of ageing population (*left*) and healthcare facilities (*right*)

goods and people, have been greatly enhanced. Within the municipality, the metro system, river bridges and tunnels, and ring roads have effectively improved the connectivity between the three towns. The improvement of various accessibility indicators (e.g. employment, services and facilities) across the city has efficiently increased the land and housing values and accordingly the real estate market has been stimulated considerably. Zhang and Wang (2013) have confirmed that investments in mass transit can have significant and positive impacts on land development through a case study of Beijing. The focus of traditional planning method should be shifted from on proximity analysis to on accessibility analysis and the latter is aimed to provide sustainable and equal access to a variety of opportunities among diverse groups. Cheng et al. (2013a) proposed an accessibility-based view of urban form or urban network, which outperforms the traditional node and density-based views, by taking a case study of Amsterdam. Commuting is the most frequent travel of urban working groups. Huang et al. (2013) estimated that the average travel distance of family head for working is 6.32 km in Wuhan, based on a sample of 1,194 surveys conducted in the end of 2010. Job accessibility, as the interface between transport, worker and job systems, can simulate the complex spatial and social interactions between the three systems and particularly the impacts of transport infrastructure on urban form (Cheng and Berterloni 2013). Consequently, accessibility planning needs to be integrated into process of urban planning particularly in a rapidly growing mega city.

### *16.4.2 Population Ageing*

It is estimated that China's aging population will increase at a rate of 5.96 million/year from 2001 to 2020 and then 6.2 million/year from 2021 to 2050, and is expected to exceed 400 million by 2050, accounting for 30 % of its total population. Same as other cities, such as Beijing, Shanghai and Guangzhou, Wuhan has also entered the era of population ageing. By the end of 2011, the proportion of the elderly (aged 60 and above) over the total population is 15.96 %, among which 10 % is over 80 years old (Gilroy 2012). Figure 16.13a shows the spatial

distribution of communities with greater than 15 % of ageing population (aged 65 or older) based on the 2010 population census data, covering all the urban districts. The communities with the highest percentages are mostly located away from city centre. Figure 16.13b exhibits the spatial distribution of healthcare facilities measured as number of beds available surveyed in 2012 (Xie 2012). Comparing the two maps, there is a mismatch between the ageing population and provision of healthcare facilities. Gilroy (2013) argued that the large-scale urban renewal in Wuhan has demolished many neighbourhoods and there is a need in planning practice to recognize the role of place and community as a locale for the well-being of older people. To build an age-friendly city and healthy community, space demand of elderly people and their interactions with others should be considered in the process of urban planning at varied levels.

### *16.4.3 Environment and Ecology*

Both the central and local governments have raised concerns about increasingly worsening environmental issues such as air pollution, water pollution, soil pollution and climate change. As a traditional and modern industrial city, Wuhan has been experiencing massive environmental and ecological changes. Firstly, air quality has been decreasing across China due to rapid industrialization and motorization. Recently the prevailing smog present in many cities is one of numerous strong evidences. Feng et al. (2011) analyzed the spatial and temporal variations of PM10 in the period from January 2006 to December 2008 based on the monitoring of sampled nine sites evenly distributed across Wuhan city. They concluded that air quality is not only very poor, reaching a certain alert level but also has a very regular temporal pattern: poorer in winter and spring than in summer. The main local pollution sources include industrial and residential coal burning, automobiles, road dust, and dust from city construction projects. Secondly, as a water city, Wuhan is proud of abundant water resources within city and drinking water was available for local residents from the largest Donghu Lake even in 1980s. However, all the water bodies within the central districts have been polluted heavily since 2000. Yang et al. (2011) analyzed a 100-year record of polycyclic aromatic hydrocarbons (PAH) collected from the Donghu Lake and found that the levels of PAHs, especially the high-molecular-weight carcinogenic PAHs, increased rapidly and reached the highest value in recent years due to rapid industrialization occurring in Wuhan. Thirdly, more and more pollutants in soil have been detected and measured in previously industrial sites. Cheng et al. (2013b) provide an up-to-date assessment of the trace metal contamination (As, Cd, Cr, Cu. Hg, Ni, Pb, Sb, Se, and Zn) in urban soils of 31 metropolises in China. They found Wuhan is categorized as a slight pollution level in terms of degree of contamination with trace metals and with a total area of contamination computed as 108 $km^2$.

Large-scale urban growth and real estate development have filled in numerous lakes and ponds. Du et al. (2010) revealed that rapid urban expansion in Wuhan has

significantly led to the size reduction, disappearance and pollution of surface water body. Xu et al. (2010) concluded that the natural wetland area—lake and marsh wetlands decreased by 18.71 and 50.3 % from 1987 to 2005, respectively and natural, societal, and economic, as well as human, activities are major factors for the structural changes in the Wuhan wetland landscape. Li et al. (2010) predicted the total urban ecological footprint of Wuhan city in the period from 2006 to 2015 and found that Wuhan's ecological footprint continuously exceeded its bio-capacity. They argued that the conflict between the people and the land will become highly tense and the city will be in a state of unsustainable development in the next 10 years.

As Yangtze and Han Rivers go through the city, Wuhan has encountered heavy flooding several times in its history, such as the recent large-scale flooding in 1931 and 1998. Particularly the flooding occurred in 1998 caused 1,183 factories to close, with a total loss of about 570 million RMB Yuan (Wu 2002). Wuhan has been one of several 'fire stoves' cities in China due to its very high temperature in summer. Undoubtedly, the future impacts of likely climate change should be considered in the process of urban planning. In some developed countries (e.g. UK), climate change has been embedded into local planning practice (e.g. Manchester) although adaptation appears at present to be a relatively low priority issue for city planners and governors (Carter 2011).

### *16.4.4 Migration*

Internal migration across China has been the largest flow of people in the history of human being (Cheng et al. 2014). The total number of internal migrants in China has reached 211 million in 2010. It has been well recognized that these migrants have made great contributions to China's and local economic boom particularly to manufacturing, construction and service industries but they also have created massive burden to local carrying capacity including housing, environment and facility. Same as developed country (e.g. UK and Germany), there is an un-answered popular question—how these migrants can be better spatially, socially and culturally integrated into local society? Wang and Fan (2012) conducted a pilot study on socio-economic and cultural integration of rural-to-urban migrants in Wuhan and concluded that Hukou is still a crucial institutional barrier to the integration. Most of these migrants live in urban villages because the rent price in urban villages is much lower than that in other places. Urban village is defined as communities that are situated in the areas governed by the master plan, but still with the collective ownership and under rural administration. Simply speaking, it is a village in a city. It is estimated that there are 147 urban villages and 15 agricultural units in Wuhan and among which 117 urban villages are located within the latest master plan boundary. It has been proven that urban village as a special landscape (Fig. 16.14) has numerous negative impacts: economic, social and environmental. Economically, it will lead to inefficient use of the urban land, reduced values of the


**Fig. 16.14** A urban village located in the central part of Wuchang

properties around, and passive use of urban space. Socially, it will cause problems of public security (home of low-income residents and sometimes criminals), insufficient guaranty in social security that may cause instability of surrounding urban communities. Environmentally, it produce ugly scenes in urban areas and pollutions from overcrowd population and insufficient utilities. It is reported that urban villages occupy 22,458.9 ha in 2006. There is a challenge for local planners: how to redevelop these areas and how to integrate these migrants?

### *16.4.5 Integrated Planning and Information Requirement*

From a systematic point of view, Chinese mega cities are not only growing larger and larger but also the interactions among urban political, social, economic, cultural and environmental components are becoming more and more complicated (Cheng 1999). The urban system is increasingly unpredictable due to numerous stochastic and chaotic processes resulting from these dynamic interactions and also the external environment such as globalization. As a result, traditional planning methods need to adapt to the fast changing environment. Planners in the master plan or blueprint era saw planning as mainly concerned with the production of plans, very physically oriented. The existing master plan has no phasing related to the implementation of its policies, and it is more like a physical design instead of a comprehensive plan (Tian and Shen 2011). The examination and approval of a city master plan sometimes take nearly a decade and this will lead to the failure of reflecting the changing environments: planning always lags behind development or construction. First, there is an increasing trend of comprehensive planning in China with more socio-economic and

environmental factors considered. However, the current comprehensive plan is a static output, lacking the consideration of dynamic interactions (e.g. transport and land use). One of many reasons might be insufficient information support for plan-making at various stages (Cheng et al. 2006). Though geospatial technology has been developing fast and extensively applied for Chinese mega cities, its data infrastructure particularly data integration, data sharing and data dissemination are still less developed. Without the availability of all the required information, it would be impossible to develop integrated planning support models for analyzing, modelling, simulating and evaluating the problems, patterns, processes, behaviours and policies across a variety of spatial, temporal and decision making scales (Cheng and Masser 2004). Second, among the four coexisting styles abstracted from American planning practices by Innes and Gruber (2005): technical/bureaucratic, political influence, social movement, and collaborative; or in other practical terms: planning with engineers, planning with/for politicians, planning for the public and planning with the public, Chinese urban planning is more dominated by the first two styles. Market economy has created multiple actors involved with urban development—such as investors, developers, engineers, planers and residents but the current political system and traditional culture have not created an appropriate atmosphere for effective public participation as the western countries are practicing such as a public participation GIS application for urban design in the UK (Cinderby 2010).

## 16.5 Conclusion

Wuhan, the largest mega city in Central China, has been experiencing massive urban growth since 1950 and its urban morphology has undertaken significant changes including leap-frog sprawl, infill development, and river/road–along expansion to transport infrastructure-induced development. As a historic and industrial city, transport infrastructure (rivers, main roads, bridges and metro system) have taken and will take crucial roles in shaping its urban forms in a variety of periods. However, rapid economic and industrial development without proper urban planning has addressed many challenges for urban planning including transport, environment and ecology, and population and migration. A comprehensive planning method based on information support and public participation is needed to reflect the fast changing environment, consider the dynamic interactions of the urban system and integrate opinions from multiple actors.

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# Chapter 17
# Kunming: A Regional International Mega City in Southwest China

**Qiyan Wu, Jianquan Cheng, Dan Liu, Li Han, and Yuhong Yang**

**Abstract** Kunming, the capital of Yunnan province in Southwest China, is located strategically in the northeastern part of the Greater Mekong Sub-region (GMS). During the 2nd Sino-Japanese War, Kunming had ever been the hub of transportation connecting China with the Western world due to its complex topography and advanced transport infrastructure and facilities including airports, highways and railways. Since the economic and land reforms and housing commercialization, Kunming has gradually developed into a regional mega city leading the Yunnan Central Urban Agglomeration, and become the bridgehead of Southeast Asia and sole metropolis in China participating in the Association of Southeast Asian Nations (ASEAN). This chapter outlines its historical evolution, morphological development, economic structure, urbanization, housing and ecological environment, followed by the main challenges that Kunming faces in future development.

**Keywords** Dianchi • Great Mekong sub-region cooperation • Urban morphology • Urbanisation level • Yunnan

## 17.1 Introduction

Yunnan is the most Southwestern province in China. The northern Yunnan forms part of the Yunnan–Guizhou Plateau. Situated in a mountainous area, this province has the richest natural resource and largest diversity of plant life in China. Yunnan province shares a border with Burma in the west, Laos in the south, and Vietnam in the southeast (Fig. 17.1).

As a provincial capital, Kunming is located in east-central Yunnan province (Fig. 17.1), between north latitude 24°23′ and 26°22′N, and east longitude 102°10′and 103°40′E. There is a largest lake in Yunnan, Dian Lake, titled as “the Pearl of the Plateau”, which is the sixth largest fresh water lake in China with an

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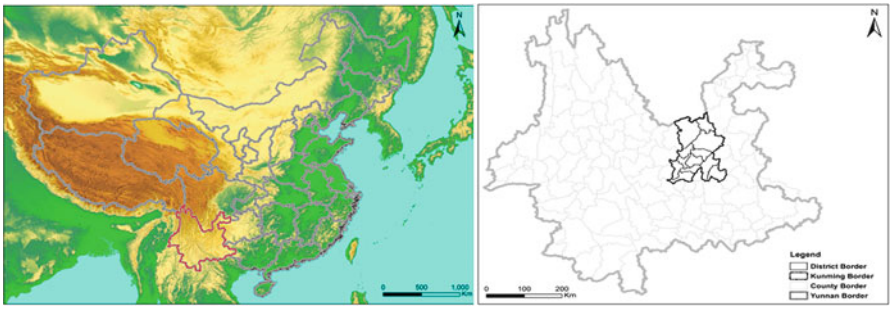


**Fig. 17.1** Location of Yunnan in China and Kunming in Yunnan

area of approximately 340 km$^2$. Kunming is situated on the Northern shore of the Dian Lake and surrounded by mountains to the North, West, and East.

With low latitude and high elevation (1,890 m), Kunming has one of the mildest climates in China and its annual mean temperature is 14.91 °C. As its perpetual spring-like weather provides the ideal climate for plants and flowers, Kunming is known as the "City of Eternal Spring" and world-famous for its flowers and flower-growing exports. More than 400 types of flowers commonly grow in the city all-year round.

As the third largest city in Southwest China (after Chengdu and Chongqing), Kunming currently administers 6 urban districts, 4 counties, 3 autonomous counties and 1 county-level city with a total area of 21,012 km$^2$ and a total number of permanent inhabitants of 6.486 million in 2011. The permanent inhabitant, contrasting with floating population, means those who have stayed for more than six months. Undoubtedly, Kunming is a typical mega city in Southwest China (Fig. 17.2).

Kunming is one of the historic and cultural cities earliest approved by the state. It has a nearly 2,400-year history. There are 52 ethnic minorities (e.g. Yi, Hui and Bai ethnic minority) living in the city, occupying 15.33 % of its total population in 2012, among which 26 are local ethnic minority. It is also a well-known tourism city such as the physical landscapes: Shilin World Geological Park, Dianchi Lake, Anning Spring Fountain, JiuXiang, YangZongHai, JiaoZiXueShan Mountain and also the human landscapes: World Horticultural Expo Garden and Yunnan Nationalities Village.

The Changshui Airport in Kunming is the fourth largest airport in China, which connects Kunming city with the primary cities in Asia including Beijing, Shanghai, Osaka, Seoul, Hong Kong, Kuala Lumpur, Bangkok, Yangon, New Delhi, and Singapore. The construction and services of the Trans-Asian Railway and Bangkok-Kunming railway, and oil-gas pipelines between Burma and Yunnan have made Kunming become the hubs of transportation and energy in the Southwestern region of China and a bridgehead linking China and South and particularly Southeast Asia. After this introduction section, Sect. 17.2 tends to describe the historical change of its urban morphology and particularly in the period from 1900

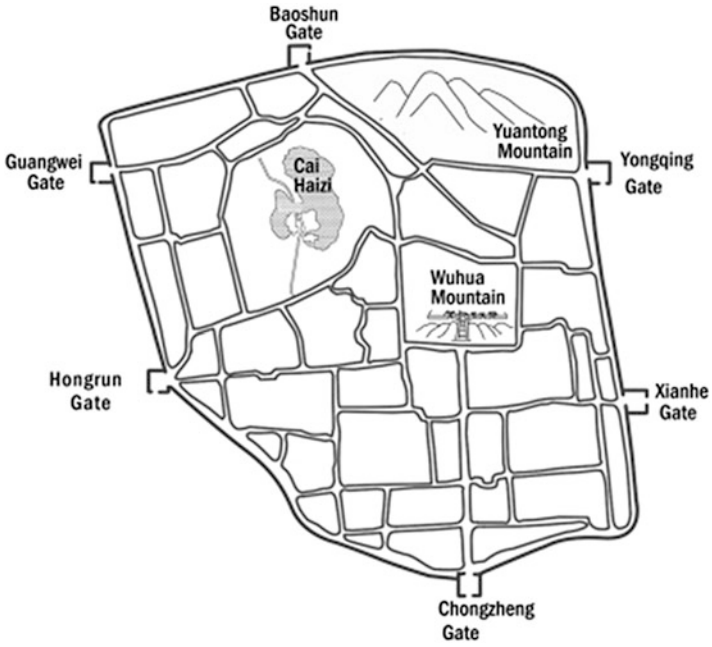


**Fig. 17.2** City wall and gate towers of Kunming in Ming and Qing Dynasties (Zhanhai Wang)

to 2010. Section 17.3 moves on to its economic development and industrial structural change. Section 17.4 is intended to compare its population growth and the process of its urbanization. Section 17.5 is focused on impacts of real estate market on housing. The final section ends with future development opportunities and its massive challenges particularly coming from worsening environment.

## 17.2 Urban Morphology

### *17.2.1 Ancient City*

Kunming's history can be dated back to 280 BC, with the earliest townships in the southern edge of Dianchi Lake. In 1276, Kunming became the capital of Yunnan province as a county. The city grew as a trading centre between the southwest and the rest of China. In 1284, the Venetian traveller Marco Polo appraised Kunming as 'Magnificent large-sized city' (Xie 2009). In 1382, Kunming was built up by brick and encircled by the city wall and moat on the West bank of Panlong River. In that period, the built-up area of Kunming was about 3 $km^2$, shaped like a tortoise (Fig. 17.2). In the subsequent five centuries, Kunming kept this urban morphology until the industrialization occurring in early nineteenth century (Liu 2002).

**Table 17.1** The evolution of administrative divisions of Kunming city 1910–2011

| Year | Administrative division | Municipal Area ($km^2$) | Municipal population (ten thousands) |
|---|---|---|---|
| 1910 | Six districts (internal and external) and three commercial ports | – | 9.69 |
| 1950 | Eight districts: | 17.96 | 33.72 |
| | KingSingJie, YuanTongJie,QingYunJie, HongRunJie, ShunChengJie, TangZiXiang, LuoShiWan, and XueJiaXiang | | |
| 1951 | Five urban districts and one county: | 1,878.23 | 60.12 |
| | ShengLiTang, YuanTongJie, XiaoJiPo, ChongRenJie, ShangYiJie, and Kunming County | | |
| 1956 | Two urban districts and five suburban districts: | 3,363.36 | 82.25 |
| | Panlong District, Wuhua District, Guandu District, Xishan District, Longquan District, Haikou District, and Anning District | | |
| 1965 | Four districts and four counties: | 6,465 | 138.25 |
| | Panlong District, Wuhua District, Guandu District, Xishan District, Anning County, Fumin County, Jinning County, and Chenggong County | | |
| 1983 | Four districts and eight counties: | 15,561 | 322.16 |
| | With the addition of four counties: Yiliang County, Songming County, Shilin Autonomous County, and Luquan Autonomous County | | |
| 1999 | Five districts, one city and eight counties: | 15,561 | 389.58 |
| | With the addition of the following three: Dongchuan District, Anning City, Xundian Autonomous County | | |
| 2011 | Six districts, one county-level city and seven counties: | 21,012 | 648.6 |
| | Setting Chenggong county as a district | | |

*Notes*: 1. the population data of 1910 from the book 'Yunnan Historic Record of Population in Recent Time' by Yunnan Provincial Archives; 2.the data of 1950–1983 from the book 'Forty-Year Enweave of Kunming' by Kunming Bureau of Statistics;and 3. data of 1999–2011 from 'China Urban Statistical Yearbook'

Though Kunming had been the political centre of Yunnan province, it was not set as a municipal city until 1928. Over the past one century 1900–2010, there have been many political, socio-economic historical events at national and local levels having massively affected its administrative division (Table 17.1) and development of Kunming's urban morphology (Fig. 17.3). For example, the suburban district outside the inner beltway of Kunming municipality was Kunming County from 1950 to 1956. After 1956, the Kunming County was merged into the Kunming municipality and it was further divided into two suburban districts, namely, Guandu and Xishan.

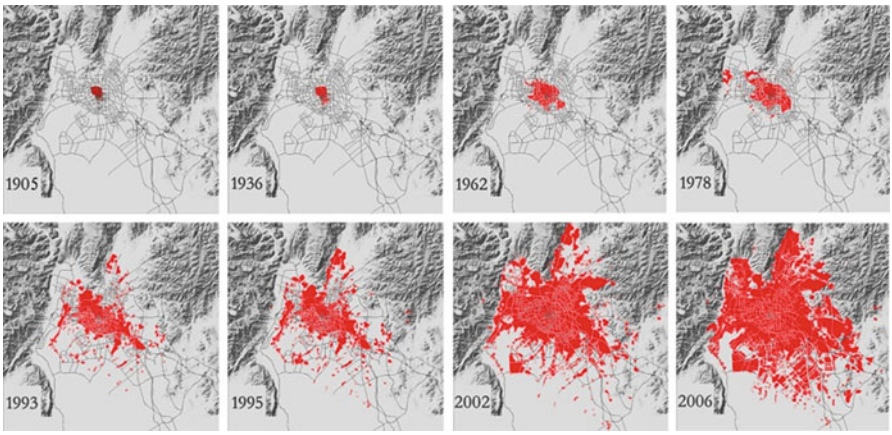


**Fig. 17.3** The evolution of urban morphology of Kunming (1905–2006) (Wu et al. 2012)

### *17.2.2 1900–1949*

In 1905, a commercial centre with a total area of 2 $km^2$ was built-up in the South-east outside the ancient city. In 1910, the first railway in Western China, was fully operated, with a total length of 854 km from Kunming to Haiphong in Vietnam. In 1922, the second airport in China—Wujiaba was constructed in South–east Kunming. YangJie military and Wujiaba joint military-civilian airports, the two airports had provided a channel of transporting goods received from international organizations to China during the Second Sino-Japanese War. As a result, the expansion of Kunming city to its Southeast was stimulated by the transport development.

During the war, numerous factories, government offices, and schools had been relocated from coastal and inland regions to Kunming due to its complex terrain and fast transport system in Kunming. This had led to the rapid growth of population, economy and urban built-up areas. Within the city, continuous outward expansion centred on ancient city indicates a clear central tendency. Outside, industries were located around towns in suburban areas, formed independent clusters on the North, West and South-west sides far away from the city centre. The urban spatial structure exhibits a leapfrog development in the form of clusters (Wu et al. 2012).

### *17.2.3 1949–1978*

In 1958, the central government shifted its development strategy from coastal and central to 'The Third Line' regions for the purpose of national military defense. 'Three lines' is a division of China's military geography: the 1st line is coastal regions, 2nd line central regions and 3rd line all the others. As a key region of the 3rd line category, the development of Kunming in this period gave the first priority

to the construction of Chengdu-Kunming and Guizhou-Kunming railways and focused on national defense industry, coordinated by the industries of metallurgy, mining, chemical engineering and building materials. Its urban development was dominated by two independent outward expansions. Internally, the central district is patterned as grid and expanded outward evenly. Externally, the surrounding industries were clustered and expanded outward along the main roads connecting to the city centre. Gradually, the road network was patterned as a mixture of grid, sector, radiating and ring roads.

### *17.2.4 1978–1999*

Till the mid-1980s, Kunming has radically formed a ring-radiating road network system, called 'two rings and nine exits', whose radiation effects on surrounding regions were reinforced. The development of inner city was dominated by urban renewal and infill development, exhibiting a concentric expansion. In the near suburban areas, eight industrial zones expanded inward along radiating roads and majority of them have been connected to the central city areas. By the end of 1980s, the urban spatial structure exhibits a star-model of radiating clusters, composed of 'one centre and eight clusters' (Liu and Wang 2012). Later on, in the master plan of 1996, the spatial pattern of central district of Kunming city was positioned as a model of single nuclei centre with a group of clusters along major axes, which is composed of 'major axes on North and South, two wings on East and West, one major and four subcentres'. However, the four subcentres on north, south, east and west were not constructed in the process of real urban development. These subcentres on North and South were not formed until the World Expo in 1999, and the city form was in the transition from a single nuclearate centre to dual-nuclei centres. The World Expo has attracted much attention of people all over China and the World, which has considerably promoted the tertiary led by tourism industry. The percentage of tertiary industry has increased from 38.9 % in 1995 to 44.7 % in 2000 and further to 49 % in 2010 (Fig. 17.4).

With the increasing proportion of tertiary industry, Kunming city has been in the transition from industrial production city to production, consumption and service city. To promote the strategic transition, three state-level development zones: Kunming New High-tech Industry Planning Zone, Kunming Dianchi Tourism Holiday Zone and Kunming Economic and Technological Development Zone have been constructed to North–west, South–west and South–east central district.

After the 20 years' development, the new high-tech zone, economic and technological zone and tourism holiday zone have achieved 57.6, 13.7 and 10.6 billion RMB in gross industrial output value in 2011 respectively, all of which occupied 32.63 % of its GDP. The panned built-up areas for the three zones have been expanded to 91.88 $km^2$, 156.6 $km^2$, 47.5 $km^2$ respectively. The three zones together have become the largest bases of new industry, leisure and tourism and holiday, and the growth pole-nuclear of foreign investment and openness in Yunnan province.

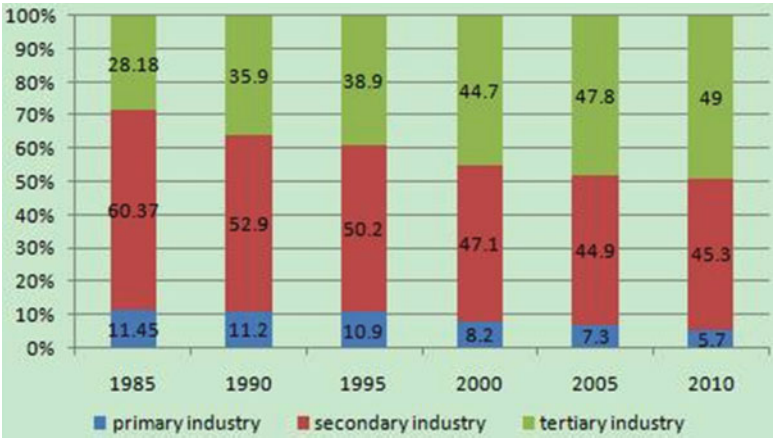


**Fig. 17.4** The first, second and third industry of Kunming from 1985 to 2010. (*Source*: National Bureau of Statistics of China 1986–2011)

### *17.2.5 1999–2010*

Entering the twenty-first century, Kunming practised an urban enterprise strategy of government-induced investment and construction for promoting local economic development, based on the successful experience learnt from the urban and economic development of coastal regions (Hall and Hubbard 1996; Harvey 1989). Local and municipal governments have framed a planning framework of 'Greater Kunming' to achieve a high-speed development. Within the municipal area, a urban development strategy was proposed which is composed of 'five districts and three axes, one major and three sub centres, sporadic development within the central district, expansion northward, limited development in the south, optimal development in the west, and expansion in the east'. However, the spatial development strategy mentioned above was replaced only by the urban renewal in the central city area due to limited availability of construction capital and long-term historic development lag (Fig. 17.5a). The construction lags in the urban–rural buffer area and the coordinated infrastructure have led to severe flooding within city in July 2013 (Fig. 17.5b).

Nanping Street is an old commercial street that was banking, commercial and entertainment centre and honoured as the 'Wall Street' of Kunming. To maintain its role as a central city area, it has been renewed several times and the urban renewal was not completed until 2013. Pedestrian and vehicles routes have been effectively separated. As a modern commercial centre, it still keeps the traditional landscape pattern and multiple cultural landscapes (Fig. 17.6a).

Since the World Expo in 1999, Kunming city has been rapidly expanded Northward. Several local real estate companies have joined the development and all these have motivated the progress of suburbanisation of residential housing. For


**Fig. 17.5** (**a**) Urban renewal in Shuncheng street (Hui minor nationality) in 2012 (taken by Qiyan Wu in 2012) and (**b**) urban flooding in Kunming (photo taken by Fei Li in 2013)

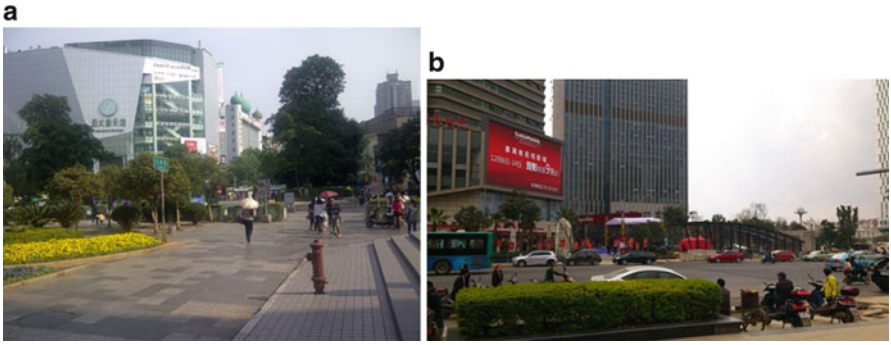


**Fig. 17.6** (**a**) Central city area—Nanping Street (photo taken by Qiyan Wu in 2013) and (**b**) Wealth Centre (photo taken by Guihua Chen in 2013)

example, in 1992, approximately 3,000 ha residential area had been built up, sufficiently accommodating 30,000 households. However, there have been no any commercial activities in this area due to infrastructure lag. That is why this area was called 'sleeping city' in many years afterwards. With the completion of many landmark buildings (e.g. Jiangdong Union International Mansion, Jiangdong HaoShiJie, Harmonious Century, and Fortune Centre) (Fig. 17.6b) and of the required facilities and infrastructure in 2006, the regional value increased and

**Fig. 17.7** North district area in Kunming (photo taken by Qiyan Wu in 2012)

more commercial activities were attracted there and formed a certain scale. Gradually this area has become a new nuclear centre (Fig. 17.7). Kunming starts to be transformed from a single centre to a dual-nuclear structure.

In the new twenty-first century, Kunming city has been attempting to transform from a regional central city to a regional international city through the regional economic development opportunities of GMS (Poncet 2006; Jacques and Willy 2001). To achieve this, the municipality proposed a spatial development planning framework of modern new Kunming multiple-centres, aimed to implement a multi-nucleate spatial development strategy, further promote the birth of Kunming-centred Dianzhong urban agglomeration (e.g. Yuxi, Qujing and Chuxiong), and eventually keep the core and bridgehead roles of Kunming in the GMS region (Great Mekong Subregion Cooperation) (Su 2012) (Fig. 17.8).

In the new planning framework, North District, with planned population of 2.2 million and land use of 220 $km^2$, will be a central district, a core city area and a centre of banking, commerce and trade, tourism and service, next to the four districts of Wuhua,Panlong,Guandu and Xishan.

East District, with planned total population of 950,000 and land use of 100 $km^2$, is a new city of Chenggong, composed of new industry, scientific, cultural and educational zones, an industrial basis of flowers-oriented biology, and a modern centre of urban logistics.

South District, with planned total population of 750,000 and land use of 80 $km^2$, is a mixture of JinCheng and Xingjie town,forming a new model of tourism and holiday town with clustering development.

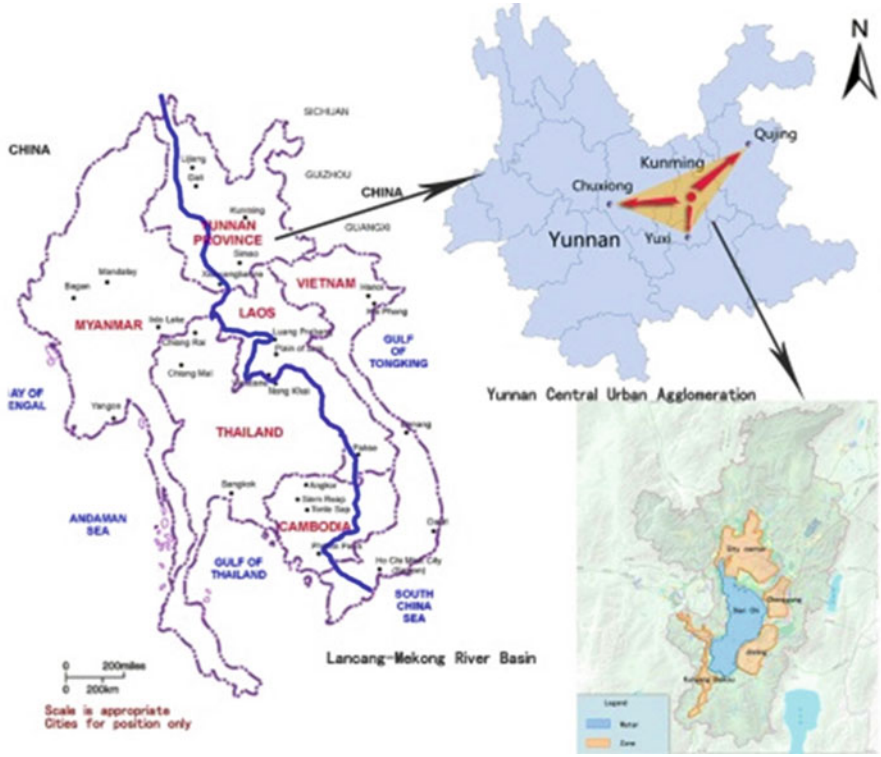


**Fig. 17.8** Regional development strategy

West District, with planned total population of 600,000 and land use of 60 $km^2$, is a mixture of Kunyang and Haikou new towns, becoming an industrial city of phosphorus chemical industry, mechanic manufacturing, electronic devices, and tourism and service.

To date, the pattern of 'One lake and Four sub-centres' has yet been formed because the central district is still expanding and only Chenggong of the four sub-centres is nearly built-up. Among the twelve clusters in the Chenggong sub-centre, Municipal administration centre has been built-up with a total area of 4.07 million $m^2$. Yunnan University, Yunnan Normal University, Kunming University of Science and Technology, Yunnan Nationalities University, Yunnan University of Chinese Medicine and Kunming Medical University have been relocated to here. Several larger-sized enterprises including Chinalco Yunnan Copper, Yunnan Aluminuim Co. Ltd, Kunming Mingchao Electric Cable Co. Ltd, Kunming Cigarette Factory, Yunnan Baiyao Group Co. Ltd have moved in. However, Kunming is notoriously named as a 'Ghost city' due to its unattractive living environment, low population density, and small city scale (Fig. 17.9).

**Fig. 17.9** Chenggong new town (new Kunming, Dianzhong and GMS) (photo taken by Shuang Wang in 2013)

## 17.3 Urban Economic Development

### *17.3.1 1900–1949*

In 1910, the Dian-Vietnam railway was put into use and such a transport infrastructure connecting Kunming and the Western developed countries had initiated the industrialization of Kunming. During the 2nd Sino-Japanese war (1937–1945), numerous factories and plants of mineral processing, mechanic manufacturing, chemical engineering, optical device, and electric power, emerged in Kunming urban area due to its unique location and efficient transportation system. Up to 1940, Kunming had risen up to a third place in gross industrial output value across Southwest China, only after Chongqing and Chuanzhong (a district of Chengdu), with a total number of 80 industrial enterprises including 11 mechanic manufacturing, 6 metallurgy, 25 chemical engineering, and 18 textile factories. However, all the factories, schools and employees relocated here during the war had returned back when the war was over. By the end of 1949, there were only about 10 factories with more than 100 employees remaining there, including Yunnan Steel Plant, Central Machine Plant, and No:63 Ordnance Factory; as a result, Kunming' economy collapsed afterwards (Xie 2009).

**Table 17.2** Urban gross industrial and agricultural output values and fixed asset investment in Kunming 1958–1962

| Year | Gross industrial output value | Agricultural output values | Fixed asset investment |
|---|---|---|---|
| 1958 | 88,726 | 19,432 | 22,870 |
| 1959 | 131,389 | 18,022 | 31,987 |
| 1960 | 158,200 | 17,280 | 33,104 |
| 1961 | 73,403 | 16,868 | 9,347 |
| 1962 | 60,822 | 18,378 | 2,699 |

*Source*: Kunming Statistics Bureau (1959–1963). Unit: in ten thousands RMB at constant price of 1980

### *17.3.2 1949–1978*

In December 1949, Chinese communist party came to power in Kunming. After the 3 years economic recovery and reform of private ownerships, the industries of mineral processing, chemical engineering, mechanical manufacturing had started to recover. The massive enterprise merging had produced scale efficiency. Together with the massive investment from governments, the industrial output value had reached 15.109 million RMB in 1957, which is 3.1 times than that around 1950. The proportions of the first, second and tertiary industries were 40.06: 40.40: 19.54 so the second industry has surpassed the first one.

However, the follow-up 'Great Leap Forward' (1958–1961) and 'Cultural Revolution' (1966–1976) movements had stopped the industrial development of Kunming. The urban socio-economic development slowed down in large scale with lagging development of the first industry, backward development of the second industry and ceasing development of the tertiary industry. As a result, the level of industrialization had fallen down to the level in 1958. As shown in Table 17.2, the industrial output value in 1962 had dropped down by 31.4 % from 1958, and agricultural output value by 5.4 % and fixed asset investment by 88.2 %.

### *17.3.3 1978–1999*

After the economic reform in 1978, the socio-economic development and particularly its industries had been progressing steadily. The industrial gross output value of Kunming reached 18.26 billion RMB in 1992, almost increased 6.3 and 1.37 times compared to that of 1978 and 1988 respectively. Its agricultural output value had also increased from 0.37858 billion RMB in 1978 to 1.89 billion RMB in 1992. The fixed asset investment had also increased from 0.24909 billion RMB in 1978 to 2.10315 billion RMB in 1988 and 2.15 billion RMB in 1992 (Kunming Statistics Bureau 1993).

Except the mineral processing, mechanic engineering and chemical engineering, the tobacco industry was developing very rapidly and had become the new pillar industry and been taking a lead in the China's tobacco industry. Benefiting from its unique climate weather and natural environment, Kunming had made 19.55 and 49 % contributions to the total cigarette yields and tax of China respectively in the period from 1986 to 1995.

After 1992, with further national reform and development of market economy, the industrial structure and economic output values had been developing steadily. In 1999, its GDP had reached 5.918911 billion RMB and the proportions of the first, second and tertiary industries were 8.4, 47.1 and 44.4 %. During the 8th five-year plan (1991–1995), Kunming had focused on the development of commercial, trade, and tourism industries. The gross output value of its tourism industry had been ranked among the best among all the provincial capitals and primary tourism cities across China. The annual growth rate of tourism gross output value during the period had reached 56.54 %.

### *17.3.4 1999–2010*

In the new twenty-first century, Kunming has formed several competitive industries: cured tobacco, flowers, vegetables and forest fruits. More specifically, the industry sector has the competitive industries of tobacco, mining and metallurgy, mechanics, medicine, and chemical engineering. The service sector has the key industries of commerce and trade, tourism and logistics. Among all of these, tobacco, mechanical manufacturing, bio-pharmaceutics, metallurgy, building materials and tourism have become the cornerstone industry of Kunming, whose gross output values occupied 50 % of the total and its tax occupied more than 60 % in 2010. Kunming has shown its steady development among the four provincial capitals of Southwest China (Figs. 17.10 and 17.11).

Yunnan is the 'Plant Kingdom' of China, with ample flower resources and rapidly growing flower industry. The total gross output value of flower industry in 2005, occupying 92,000 ha of flower plantation and horticulture, was 1.344 billion RMB, which had increased by 72.9 % compared to that in 2004 and occupied 21.1 % of agricultural gross output value. Kunming contributed more than 50 % of flowers in flower market across China and up to 70 % of flower market in Guangzhou, Shandong and Xinjiang (Fig. 17.12).

Bio-pharmaceutical industry is another unique feature of Kunming. It is estimated there might be more than 3,000 types of folk plant medicine in Yunnan, only after India over the world. There are more than 360 biological and bio-pharmaceutical enterprises including the well-known Yunnan Baiyao Group Co. Ltd, Kunming Dihong Pharmaceutical Co. Ltd, and Kunming Pharmaceutical Corporation, located in the State Biological Industry Basis—Kunming new high-tech zone. Its gross output value has reached 13.047 billion RMB in 2011.

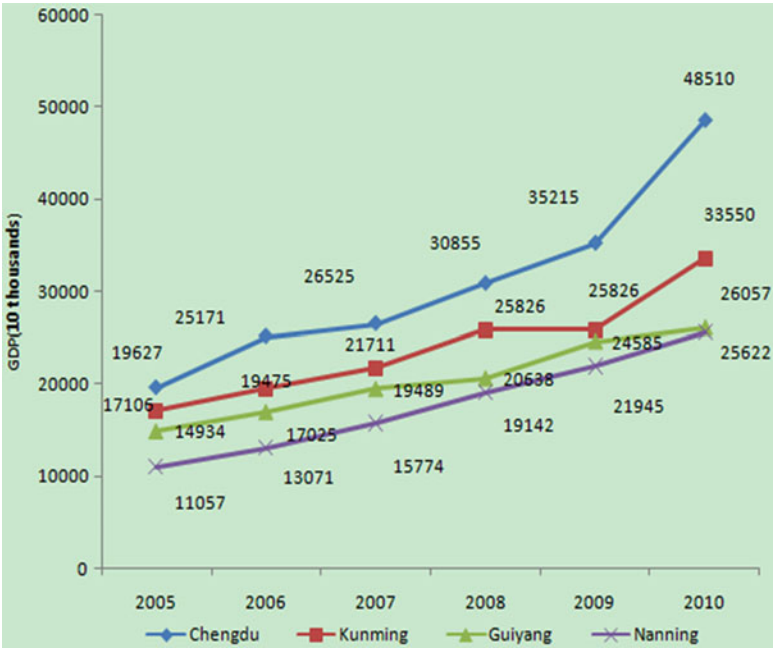


**Fig. 17.10** The trends of GDP per capita (ten thousands RMB) in 2005–2010 among the four provincial capital cities in Southwest China. *Source*: National Bureau of Statistics of China 2006–2011

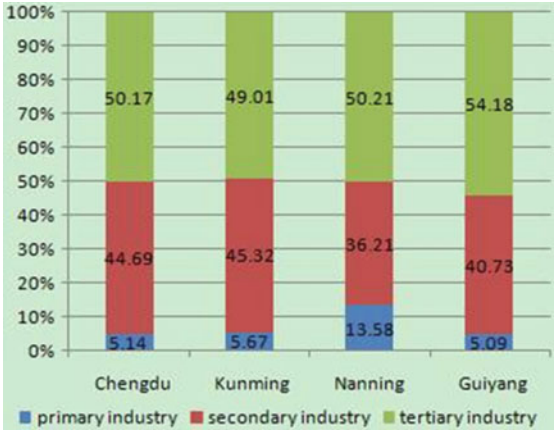


**Fig. 17.11** The comparisons in urban industrial structure in 2010 between the four provincial capital cities in Southwest China

**Fig. 17.12** International Flora Auction Trading Center (photo taken by Shuang Wang in 2013)

## 17.4 Population and Urbanization

### *17.4.1 1900–1949*

During the period from 1900 to 1949, Kunming was characterized by the initial industrialisation in recent times, weak economic development, and continuous wars. As a result, urbanization was progressing very slowly (Skinner 1977). Since the 2nd Sino-Japanese war, Kunming had thrived with rapid growth of population due to massive migration of factories and schools from coastal and central regions. It was estimated that total population of Kunming had increased from 91,800 in 1908 to 255,462 in 1941 and again to 308,818 in 1949.

### *17.4.2 1949–1978*

The period 1949–1965 covers the first (1953–1957) and second (1958–1962) five-year plans and three year adjustment (1963–1965). This period had witnessed the socio-economic recovery and improvement of people's living quality. As a result, Kunming had seen the first peak of birth, which resulted in steady population growth. Afterwards, the 'Great Leap Forward' in 1958 and the follow-up three-year natural disaster (1958–1961) had made the rate of population growth sharply decline. Consequently, the population growth of Kunming dropped down to the

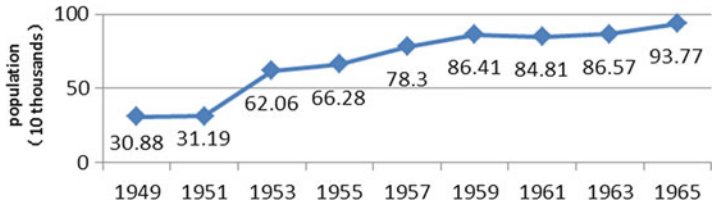


**Fig. 17.13** The population growth of Kunming city (1949–1965). *Sources of data*: Kunming Statistics Bureau (1950–1966)

**Table 17.3** Population, urbanization and gross output values of Kunming 1966–1976

| Year | Total population (10,000) | Non-agricultural population (10,000) | Urbanization level in urban districts (%) | Social gross value (billion RMB) | Non-agricultural output value (billion RMB) |
|---|---|---|---|---|---|
| 1966 | 96.74 | 66.71 | 68.96 | 1.733 | 1.5 |
| 1967 | 97.47 | 66.31 | 68.03 | 1.311 | 1.080 |
| 1968 | 100.43 | 67.93 | 67.64 | 0.645 | 0.419 |
| 1969 | 99.37 | 66.51 | 66.93 | 1.654 | 1.409 |
| 1970 | 96.39 | 62.43 | 64.77 | 2.089 | 1.812 |
| 1971 | 100.53 | 65.6 | 65.25 | 2.296 | 2.010 |
| 1972 | 104.36 | 69.53 | 66.63 | 2.471 | 2.150 |
| 1973 | 108.35 | 71.92 | 66.38 | 2.77 | 2.411 |
| 1974 | 111.27 | 73.94 | 66.45 | 2.561 | 2.280 |
| 1975 | 112.04 | 73.77 | 65.84 | 2.617 | 2.257 |
| 1976 | 113.86 | 74.49 | 65.42 | 1.812 | 1.482 |

*Source of data*: Kunming Statistics Bureau (1967–1977)

lowest. After 1962, there was a second peak of birth in Kunming due to some compensating demographic policies (Fig. 17.13).

In the 'Cultural Revolution' period (1966–1976), the ongoing rapid population growth was ensured by still a great number of fertile women and the fact that the family planning policy was yet released. The urbanization level in urban districts dropped from 68.96 % down to 65.42 %. In the meanwhile, urban construction and economic development almost ceased. During this period, the average annual rate of social gross output value was only 0.45 % and non-agricultural gross output value was even lower than that of 1966 (Table 17.3).

### *17.4.3 1978–1999*

After the economic reform in 1978, the urban built-up areas and population had grown rapidly with increases of total area from 22.6 $km^2$ in 1978 to 70 $km^2$ in 1992

**Table 17.4** Urbanization of four capital cities in Southwest China in 1998

| City | Urbanization level (%) | Built-up area ($km^2$) | Non-agricultural gross output value |
|---|---|---|---|
| Guiyang | 45.01 | 98 | 1,967,164 |
| Nanning | 40.15 | 91 | 2,146,158 |
| Kunming | 43.26 | 132 | 5,028,375 |
| Chengdu | 32.83 | 192 | 9,791,042 |

*Source of data*: National Bureau of Statistics of China 1999

and of total population from 1.1 million in 1978 to 1.8 million in 1992. The rural villages near the city were gradually encircled by urban areas and many 'urban villages' emerged from year to year. There were various factors constraining the process of urbanization. The rapid population growth was highly correlated with the economic growth in this period.

Compared with coastal regions, the implementation of reform relevant policies was suffering severe lag. The development strategy of catching up with eastern coastal regions was not implemented in Kunming until 1990s. The transition into market economy made the second and third industry form a certain scale and process of urbanization was speeded up. Rapid urban growth was driven by the development of tertiary industry, suburban development motivated by the radiation force from central districts and mixture of rural urbanization and industrialization and regional economic development. Kunming has achieved an urbanization level of 43.26 % in 1998 with the total built-up area of 132 $km^2$, total non-agricultural gross output value of 5.028375 billion RMB (Table 17.4), ranked only after Chengdu city (Li et al. 2012).

### *17.4.4 1999–2010*

In the period 1999–2010, urbanization of Kunming was speeded up because of two contributing factors. The first one is the World Horticultural Expo held in 1999. The urban infrastructure centred on water, road, tree and air projects had been considerably improved. Six billion RMB were invested in 18 key infrastructure projects and 5 billion RMB in 10 municipal facilities. The planning and construction of main road networks had been completed 10 years earlier and as a result, the service functions of urban infrastructure had been unprecedentedly improved (Fig. 17.14). The successful organizing of the World Horticultural Expo has improved the image of Kunming city and accordingly enabled the attraction of foreign investment, adjustment of industrial structure, and particularly the rapid development of tourism-centered tertiary industry. Kunming, as one of ten top tourism cities in China, has become a preferred tourism site and one of migration destinations.

The second one is the new strategic development framework proposed in 2003. This framework has facilitated the rapid development of urban infrastructure and increase of urbanization level. From 2003 to 2010, the urban built-up area has


**Fig. 17.14** The World Horticultural Expo Garden (photo taken by Guihua Chen in 2013)

**Table 17.5** Urbanization of Kunming in 1999–2010

| Year | Urbanization level (%) | Built-up area ($km^2$) | GDP (10,000 yuan) | Non-agricultural gross output value (10,000 yuan) |
|---|---|---|---|---|
| 1999 | 38.65 | 141 | 5,918,911 | 5,415,804 |
| 2003 | 41.00 | 185 | 8,120,121 | 7,525,728 |
| 2006 | 42.49 | 233 | 12,072,855 | 11,256,730 |
| 2010 | 63.60 | 275 | 21,203,700 | 20,001,450 |

*Sources of data*: National Bureau of Statistics of China 2000–2011

increased from 185 to 275 $km^2$ with an annual rate of growth 5.82 % and urbanization level from 41 to 63.60 % (Table 17.5).

## 17.5 Housing

After the housing reform in 1995, commercialization of housing had become increasingly significant, residential areas have been massively increasing annually. Since 2005, the state has paid increasing attention to indemnificatory apartment; however, local government has not done so. In most years, the amount of public housing was going down gradually and its market value was declining. The provision of these was not comparable with that of commercial housing. In the recent 10 years, the market of commercial housing has been increasing and provision of commercial housing has dominated the whole market of housing provision

**Table 17.6** The housing development of Kunming in 2000–2009

| Year | New public housing ($m^2$) | New commercial housing $m^2$) | Value of public housing (10,000 yuan) | Value of commercial housing (10,000 yuan) |
|---|---|---|---|---|
| 2000 | 375,909 | 1,257,894 | 74,116 | 231,185 |
| 2001 | 495,790 | 2,037,740 | 32,334 | 199,202 |
| 2002 | 145,815 | 1,542,757 | 65,077 | 221,851 |
| 2003 | 735,536 | 2,821,300 | 39,400 | 295,570 |
| 2004 | 109,015 | 4,305,128 | 49,561 | 426,310 |
| 2005 | 75,370 | 4,854,571 | 22,335 | 585,996 |
| 2006 | 84,046 | 2,842,132 | 48,334 | 782,571 |
| 2007 | – | – | 6,894 | 500,799 |
| 2008 | 219,842 | 4,991,091 | – | – |
| 2009 | 34,624 | 6,971,511 | 8,871 | 1,399,665 |

*Data source*: Kunming Statistics Bureau (2001–2010)

**Fig. 17.15** An example of low rental housing—XingFuYuan (Happy Family) (photo taken by Guihua Chen in 2013)

(Table 17.6). Urban socio-spatial space has changed accordingly (Zeng and Wu 2012; Zhang 2010).

Since 2004, Kunming has been implementing the policy of low-rental housing construction. Up to August 2010, the whole municipality has invested 2 billion RMB and constructed 18,907 units of low-rental housing with a total area of 0.94535 million $m^2$. Several zones of low-rental housing such as XingFuYuan, HuafuYuan, CuiFeng Garden, and Dongchuan Xianghe Jiayuan were built-up (Fig. 17.15). In total, 12,753 households were provided with allowance of rental

housing, 1,471 households paid reduced rental and 30,000 households with low income were helped with solving housing issues.

In 2009, Kunming municipality built up 22,318 units of affordable housing, financially shared by governments, commercial housing projects and enterprises. In 2010, the municipality has planned to build up 4,000 units of public rental housing for low-income households, rural migrants, new employees and talents introduced by governments. Over the period 2006–2008, totally 0.17 billion RMB has been invested to maintain 24,101 households and demolish and redevelop 13,780 households for the project of earthquake safety engineering in rural settlements. These figures were updated to 7,870 and 4,852 households respectively in 2009. The total municipal investment for indemnificatory apartment was up to 0.638 billion RMB in 2010.

## 17.6 Future Development and Challenges

### *17.6.1 Development Planning and Opportunities*

China has been promoting the cooperation with Southeast Asian countries. Kunming is a bridgehead fortress connecting West China with the GMS (Great Mekong Sub-region Cooperation) countries. In 1992, the six countries along the corridor of the Lantsang River—Mekong River: China, Burma, Laos, Thailand, Cambodia and Vietnam, have founded the GMS important region of Asian socio-economic development for the purpose of formatting an ASEAN (the association of southeast Asian nations) free trade zone. Yunnan is the principal province participating with specific cooperation projects. Undoubtedly, GMS cooperation lays a solid foundation for opening the bridgehead fortress to develop Southwest China.

From 1992 to 2010, the member nations of GMS had developed 227 cooperation projects in nine key areas: transport, energy, telecommunication, environment, agriculture, human resource development, tourism, trade and investment, with a total investment of 14 billion US$. Among these, 55 investment projects used for infrastructure construction cost 13.8 billion US$; 172 technical assistance projects employed for supporting for research and capability building in member nations involve the denotation fund of 200 million US$. At present, the GMS cooperation has moved into the third ten-year stage (2012–2022) (Medhi 2004).

Globalization has made Kunming play an increasingly important role in international communication network. Since the formation of GMS in 1992, the continuous efforts of member nations have remarkably improved the transport system in this sub-region. To date, the transport pattern of ‘four national exits and seven provincial exits’ centered on Kunming have been formed to connect China inland regions with South-eastern and Southern Asian countries. With the construction and completion of motorway and trans-Asian railways, Kunming is becoming a land bridgehead connecting the transport network in Southeast Asia with China inland transport network. In the meanwhile, based on the frame of ‘three vertical lines and

two horizontal lines' centred on Kunming-Bangkok highway, a regional economic corridor integrating industry, trade and infrastructure into a whole starts to be formed. Kunming will become a regional centre and a land hub connecting China inland regions and Southeast Asian countries.

Moreover, the Changshui International Airport in Kunming put in use in 2011 aims to open up regional international airlines to Southeast and South Asia. As the fourth largest international airport in China, after Beijing, Shanghai and Guangzhou, the Changshui Airport has managed 275 national airlines, 38 international airlines and 6 regional airlines in 2012, with 24.06 million passengers in total. In addition, since its operational use in 2000, the international water course over the Mekong River has laid a solid foundation for the water transportation of massive agricultural products. Accompanying with the improvement of water, land and air transportations and their network development, Kunming has been transformed from a former border city in Qing Dynasty into a central city in GMS region (Lu 2011; François 1950; Skinner 1977).

The biological, mineral and water electricity resources in the sub-region of GMS are very abundant but their capacities of development are very weak due to less diverse categories and low added value. Kunming has achieved successful lateral cooperation through technology in exchange for market. For example, in the aspect of energy, Kunming provides Thailand, Burma, Cambodia and Laos with technology of water electricity development and transports electric power to their border regions. In the advanced agricultural technology and development of biological resources, Kunming provides them with seeds, cultivation, processing techniques, and technical training and improves the production level of local farmers. In mechanical manufacturing, Kunming expands the output of mechanical machines, founds joint-venture enterprise within the five countries, conduct mutual benefit projects such as project contracting, based on its traditional advantageous industry (Yu 2002; Haefner 2013).

The Dianzhong urban agglomeration composed of Kunming, Qujing, Yuxi and Cuoxiong is one of three state-level urban agglomerations (Chengyu, Weizhong and Dianzhong) across West China. As the regional central city, Kunming enables to coordinate and organize the economic development and urbanization process between many middle and small sized cities in the Dianzhong region. The Dianzhong urban agglomeration region had been economically developing very rapidly and steadily in the period 2001–2010. Its total GDP had increased from 127.64 to 426.690 billion RMB, occupying 59.06 % over the total GDP of Yunnan province. Its GDP per capita increased from 9,220 to 30,973 RMB, slightly above the national average (29,748 RMB). In 2010, its population took 37.4 % of total population of Yunnan province with an urbanization level of 45 % greater than the provincial level 34.8 %. It is estimated that its total population and level of urbanization will reach 24 million and 75 % respectively by 2030. More importantly, this urban agglomeration is actively developing several competitive export-oriented advantageous industries (such as bio-medicines, metallurgy and processing of non-ferrous metals, new energy, tourism and cultural industry, and unique agricultural by-products processing), expanding the economic cooperation and exchange

with South and Southeast Asia, and playing crucial roles in connecting China with GMS, 10+1 and other international regional economic bodies.

For many years, tobacco industry as a pillar industry had been developing very successfully but had brought about a series of issues against sustainable development of Kunming. Kunming is speeding up the foundation and development of some unique advantageous industries represented by biomedicine and cultural industries. During the 12th 'Five-Year' plan (2011–2015), Kunming has made detailed development planning in medicine industry, medicine commerce, Chinese medicine plantation, technological innovation, leading enterprise development, cultivars construction, brand cultivating, research and development platform, and increased investment. The biological medicine industry is expected to have better development in the near future. The recent improvements in air, land and water transport infrastructure have considerably benefited the continuous development of tourism and cultural industry.

### *17.6.2 Issues and Challenges*

Above all, Kunming is one of 14 cities severely short of water due to its location in plateau region. At present, water resource per capita in Kunming is only 1,132 $m^3$, about one-fifth of the Yunnan provincial average and one-second of the national average. Over the recent 30 years, Kunming had been conducting water diversion projects to relax water use issues. Particularly during the drought period 2010–2012, there were 120 middle and small sized rivers without flows of water, 400 small-sized reservoirs, dams and ponds dry up. From January to June 2013, water resources were available for urban residents only at specific time slots. At present, Yunnan province has been approved a 'Dianzhong water diversion project' costing 70 billion RMB in order to solve the water shortage issue within the Dianzhong urban agglomeration region. However, in a long period, the water resource scarcity for living and production in Kunming remains unsolved (Wang and Meng 2013; Guo et al. 2013).

Secondly, the urban construction targeting at 'one lake and four clusters, one lake and four rings' centred on the Dianchi Lake has ensured the economic development of Kunming but has brought about massive pollutions issues and addressed challenges to treat the water pollutions in lakes and river networks across this region (Li et al. 2012; Liu et al. 2012a; Xing et al. 2005). For example, the water pollution in Dianchi Lake reached its peak value in 1999, with not only a long duration but also a large coverage up to 20 $km^2$ and a great depth up to 1 m (Fig. 17.16).

To treat these pollutions, Kunming city has built up 4 water treatment plants in 1990s which treated total water pollution up to 108.46 million tons on a daily basis. Also, two sewage interception projects, one on the North shore of Dianchi and another on bank of Panlong river, were completed for reducing area source pollution (Zhang et al. 1996). Before 2000, totally about 4 billion RMB had been invested on pollution treatment but no clear effects had been achieved. At present,

**Fig. 17.16** Water pollution in the Dianchi Lake. (photo taken by Benmy in July 2009)

the Dianchi Lake is in the category of class 5 (heavy pollution) and listed as one of 'three lakes and three rivers' by the State Council, which will be given priority for treatment at national level. It is hard to predict if treatment of water pollution in surrounding lakes and protection of their ecology is achievable as urban expansion is always accompanied by the expansion of industry and infrastructure. The invested Dian-Burma oil pipe and oil chemical industry project may worsen the Dianchi ecological and environmental vulnerability and pollute Fuxian Lake and other surrounding water resources. The potential damage to local ecological environment has arose the local people and led to protests (Fig. 17.17). Obviously, the future development of Kunming must follow principle of sustainable development otherwise would pay greater price (Liu et al. 2012b).

Finally, limited land supply in Kunming can hardly maintain its urban expansion. Kunming has unique topography, composed of flat land, tableland and highland, which are highly connected by more than 20 rivers. Together with the two mountain ranges-Gongwang mountain chain and Liang Wang mountain chain, from South to North, a mountain-river pattern has been formed in the region. Before 1990s, Kunming was expanded to South Dianchi, then to North district between 1990 and 2000 but to Chenggong after 2000s. Objectively, Kunming should adopt the strategy of compact city instead of low-density sprawl in the future (White 2002; Forman 1995).


**Fig. 17.17** Public protest against the project of PX, oil processing plant (photo taken by an anonymous photographer in May 2013)

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# Part III
# Japanese Experiences

# Chapter 18
# Changes in the Spatial Patterns of Occupational Structure in the Tokyo Metropolitan Area After the Bubble Economy

**Ryo Koizumi and Yoshiki Wakabayashi**

**Abstract** This study examined the spatial patterns of the Tokyo metropolitan area in terms of the occupation structure and its transformation after the collapse of the bubble economy. To overcome technical problems of the previous studies on the urban spatial structure, we adopted grid square unit data and made analysis using spatial autocorrelation indices with geographic information systems. Spatial autocorrelation analysis of the spatial pattern of occupational structure in 2005 confirmed the findings obtained in previous studies. Hence, the basic spatial structure of social areas in the Tokyo metropolitan area has been maintained. However, the conventional finding, obtained from the analysis of administrative unit, that socioeconomic status shows a concentric pattern in the suburbs was not necessarily supported by the analysis of grid square units, which shows a radial pattern along the railroad lines. Particularly in the suburbs, the tendency of occupation groups to vary with the distance from the railroad has been strengthened. This suggests that not only "diversification" but also "polarization" of the suburbs has progressed.

**Keywords** GIS • Occupational structure • Spatial autocorrelation • Spatial pattern • Tokyo

## 18.1 Introduction

Since the 1990s, the social structure built in Japan after World War II has changed drastically. By comparing Japan with Western countries, Machimura (2009) pointed out that change in Japanese society is characterized by its temporal compression; in other words, it occurred in a short period, with simultaneous changes in industry and the education system. Although industrialization led to the leveling of the social structure, the occupation movement has declined after the rapid economic

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growth period. This change is reflected in expanding disparities in household incomes since the late 1980s. In addition, in the late 1980s, the bubble economy brought both soaring land prices, particularly in Tokyo, and large-scale population movement from the inner area to the suburbs, thus expanding the Tokyo metropolitan area (TMA).

The aim of this study is to clarify TMA's spatial patterns of occupational structure after the bubble economy's collapse in the early 1990s, by considering three aspects of change: deepening social polarization, changing demographic structure, and the trend of housing provision. To overcome technical problems of the previous studies on the urban spatial structure of TMA, we adopt grid square unit data and make analysis using spatial autocorrelation indices with geographic information systems (GIS).

In the subsequent section, we briefly overview the previous studies of the urban spatial structure of TMA to discuss the background of the recent changes. After describing the data and method for this study with the problems of the previous studies in mind, we analyze the spatial patterns of occupational structure in TMA after the period of the bubble economy using GIS.

## 18.2 Background of the Recent Changes of Urban Spatial Structure

The spatial patterns of TMA's residential structure have been studied mainly in urban geography and urban sociology. In urban geography, Fukuhara (1977) and Tomita and Kouno (1990) applied factorial ecology analysis to the pre-1980 TMA. After that, numerous studies of factorial ecology were conducted in the area. These studies commonly indicate that the occupation structure representing socioeconomic status shows a sectoral pattern.

After the 1990s, such studies have been accumulated in urban sociology. These studies were conducted mainly from two perspectives: "a world city hypothesis" (Friedmann 1986) and "social polarization" (Sassen 2001). They used geographical techniques including the social atlas/maps and regional classification. After the 1990s, Kurasawa and Asakawa (2004) and Asakawa (2006) observed a tendency in TMA for a shift in the spatial distribution of occupation structure from a sectoral to a concentric pattern. Asakawa (2006) remarked that this change is attributable to socioeconomic ordering of residential areas by their distance from central Tokyo and reinforcement of the concentric land use pattern based on economic rationality. In addition, these observations suggest that concentric and sectoral patterns tend to be mixed in large cities (Morikawa 1975, p. 659).

In contrast, recent studies of urban geography have directed an attention to the change in the amount of population, considering movement and the demographic change in age structure. Esaki (2006) noted the recent trend of "the end of suburbanization" with low birthrates and aging, as well as a decrease in long-distance

population movement. The "centripetal population movement" is accompanying the decrease in population movement from Tokyo's 23 Wards to the suburbs. However, this trend does not necessarily imply that the population returned to the central city from the suburbs. Instead, it resulted from a tendency for young adult people, who have been considered usually move to the suburbs to buy their first house, to remain in Tokyo's 23 Wards (Esaki 2006, pp. 87–88). In addition, aging and rapid population decline cannot be avoided in residential suburbs because they have a biased age structure and a decreased population inflow (Naganuma et al. 2006).

To explain these changes in the Tokyo metropolitan area's spatial structure after the bubble economy period, we describe three aspects of change: deepening social polarization, changing demographic structure, and the trend of housing provision.

### *18.2.1 Deepening Social Polarization*

After the 1980s, globalization and the service economy brought considerable change to industry and employment in world cities, including Tokyo. A typical example is the decrease in the number of skilled workers because of the declining manufacturing industry and increase in the number of highly specialized workers involved in the new global economy and financial systems. In addition, low-paid service jobs that do not require any specialization have increased. These phenomena were called "dual city" by Mollenkopf and Castells (1991) and "social polarization" by Sassen (2001). Empirical studies in North America and Europe revealed that these changes happened particularly in cities with many multinational enterprises and immigrants (Hamnett 1994; Baum 1997). Mizuno (2010) reviewed the reorganization of large cities, focusing on the principle of financial capital, the global city, and the creative class. In particular, he indicated that movement of investment money led to globalization of risk by the securitization of real estate.

In Japan, particularly after the 1990s, polarization of social class because of globalization and the neoliberal policy accompanying the increasing poor population became a serious problem (Tachibanaki 1998; Yamada 2004). It is expected that social class polarization will appear conspicuously in world cities. As a world city, Tokyo is considerably affected by globalization. Sonobe (2001, pp. 43–49) and Machimura (2009) summarized the factors affecting this process into three points: First, Tokyo became a member of the world cities. As Sassen (2001) noted, the polarization dividing the elite and the underclass progressed in the world cities, which became a foundation for the international economy, including multinational enterprise. In addition, an increasing international competition required companies to adopt a flexible wage system and wage restraint to cut costs (Castells 1989). Second, deindustrialization and the information society caused employment mismatch, separation of the labor market, and a shift to the higher service industry sectors and high-tech industries. In addition, information technologies accompanying a fixed form of duties caused a decrease in the number of clerical jobs and differentiation among white-collar workers. In response, the Japanese Government revised

the Worker Dispatching Act after the 1990s, leading to increases in irregular employment of young people. Third, neoliberal public policy caused a retreat in welfare and protection of workers because it emphasized market mechanisms. In accordance with economic globalization and the national finance crisis, the ruling Liberal Democratic Party in Japan adopted a neoliberal policy similar to that of the ruling Republican Party in the United States. The examples were the deregulation policy and the Act on Special Measures Concerning Urban Renaissance in 2002, both promoted urban renewal in the metropolitan core through private companies' capital. Forty percent of the special urban renaissance districts under this act were concentrated in Tokyo's inner area. Global money and funds from local banks flew into these districts through real estate securitization. Yabe (2008) indicated that the development of real estate securitization promoted diversification of urban space in Tokyo.

A series of studies by urban sociologists has examined social polarization in Japan. Machimura (1994, 2009) analyzed the change in the number of employees by industry in Tokyo during the 1980s, finding that a sign of social polarization appeared in the increased establishment of the service industry and white-collar workers. In addition, urban geographers examined this trend for Tokyo's 23 Wards. Narita (2005) analyzed the changes in the socioeconomic attributes and income of residents in Tokyo during the 1980s; Toyoda (2011) analyzed changes in income level from 1998 to 2008, reporting that the difference between areas had enlarged. By employing data of occupational constitution and household income, Toyoda (1999) stated that new spatial patterns were observed in social polarization, including white-collar inflow to the bay area and increase of service sector's blue-collar workers in and around the subcenters of Tokyo, namely Shinjuku and Ikebukuro.

### *18.2.2 Demographic Structure and Female Labor Force*

Japanese demographic structure is characterized by the first "baby boomers," born during 1945–1949, just after the end of World War II, and the second baby boom, when they had children. During the economic recession after the bubble economy collapse until the boom after 2002, the first baby boomers began to retire, and the second baby boomers entered the labor market. This had considerably affected Tokyo's residential structure. For example, in the 1960s, population movement caused housing shortages and congestion because many of the first baby boomers migrated into the metropolitan area during the period of high economic growth. As a result, urbanization of the Tokyo metropolitan area spread outward because of residential movement to the suburbs where boomers acquired houses. In contrast, the second baby boomers, born in TMA and having lived mainly in the metropolitan suburbs, are called "the second generation suburbanites." Their choices of residence and course of life are expected to affect the metropolitan area's future considerably.

Notable changes occurred in occupational composition in the 20 years between 1985 and 2005 (Table 18.1). First, the number of employees greatly increased: in the study area, it rose by 1,450,000, with women numbering 1,190,000. Second,

**Table 18.1** Changes in occupational composition in TMA (1985–2005)

| | 1985 | (%) | 1995 | (%) | 2005 | (%) |
|---|---|---|---|---|---|---|
| White-collar workers | 5,388,635 | 40.9 | 6,578,911 | 43.1 | 6,371,059 | 43.5 |
| Gray-collar workers | 3,199,868 | 24.3 | 3,915,793 | 25.6 | 3,976,014 | 27.2 |
| Blue-collar workers | 4,194,256 | 31.8 | 4,377,891 | 28.7 | 3,908,933 | 26.7 |
| Other | 397,397 | 3.0 | 393,993 | 2.6 | 383,770 | 2.6 |
| Total | 13,180,156 | 100.0 | 15,266,588 | 100.0 | 14,639,776 | 100.0 |

*Source*: Population census

the numbers of not only white-collar workers but also gray-collar workers increased remarkably. This reflects the increase in the number of working women in the late 1980s, owing to the progress of a service economy. On the other hand, the number of blue-collar workers greatly decreased: its ratio to the total employees fell from 31.8 to 26.7 %.

### *18.2.3 Trend of Housing Provision*

As mentioned previously, during the period of high economic growth, the first baby boomers' movement into the metropolitan area caused housing problems in Tokyo's inner area. A major aim of Japanese housing policy was to provide the middle class with houses by establishing the Housing Loan Corporation (Nakazawa 2006). However, this housing provision could not keep up with the demand since continuous high economic growth drew more population. This situation became a social problem.

On the basis of the baby-boom generation, who first rented narrow apartments in the central area and bought houses in the suburbs as their life stages progressed, Watanabe (1978) developed a migration model of this process. Thus, housing provision expanded to Tokyo's outskirts, with rising land prices accompanying the economic growth. In other words, acquisition of a house necessarily pushes people to the suburbs. This can be confirmed by extensive expansion of the densely inhabited district (DID) in the Tokyo metropolitan area (Fig. 18.1). The expansion of the DID advanced remarkably between 1965 and 1970. This trend continued until the 1990s, although its pace slowed temporarily in the early 1980s. In this way, the first baby boomers' housing demands produced a metropolitan area that was spreading horizontally.

When the first baby boomers moved to the suburbs, they either purchased detached houses developed by private companies or condominiums in public housing complexes. In such standardized homes, the residents' demographic character tends to be homogeneous. An image of the "standard family," composed of a married couple with children, was reflected in the housing units' designs. The "standard family" assumes the wife to be a full-time homemaker and the husband to be the main breadwinner (Honda 2008). However, the establishment of the Equal Employment

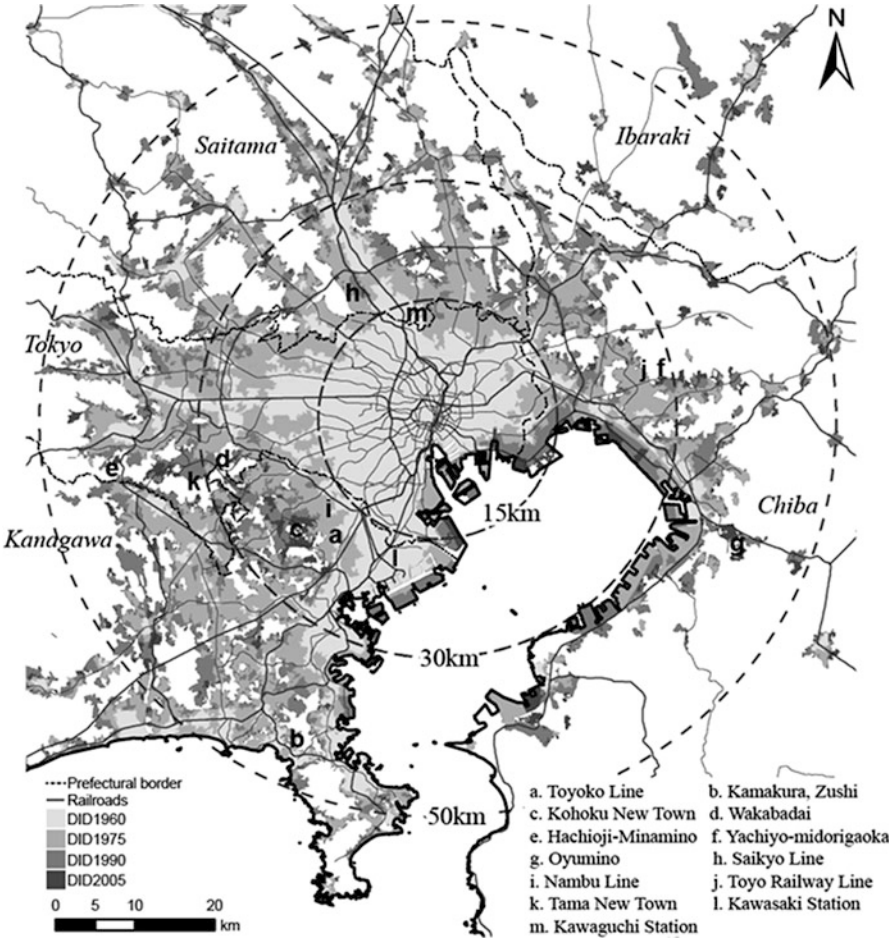


**Fig. 18.1** The expansion of the densely inhabited district (DID) in the Tokyo Metropolitan Area (1960–2005)

Opportunity Law in 1986 promoted women's participation in the labor market. This made it difficult for typical Japanese companies to depend on a conventional family norm. Conversely, an increasing number of female workers is considered a cause of declining marriage rate. As the rate of unmarried men and women continued to rise, the number of one-person households increased greatly. Hence, the second baby boomers' housing demands differed from that of their parents.

In response to diversification of households, housing demands were also diversified. The floor space required by nuclear families declined because the number of children per household declined. In addition, low birthrates, an aging population, and women's social advancement led to an increase in one-person households, thus effecting a demographic change in the inner Tokyo area (Tomita 2004). Single

women who work at downtown offices and live alone tend to attach a great importance to proximity to workplace in their residential choices (Wakabayashi et al. 2002). In Tokyo's 23 Wards, where population recovery became apparent between 1995 and 2000, Miyazawa and Abe (2005) observed many highly educated white-collar workers; single-person, 30-something households; and couples without children. However, the variation among districts was considerable, producing regional differences within Tokyo's 23 Wards.

These trends are related to the dimension of family status in social area analysis and might change the spatial pattern of this dimension. For example, if the nuclear family with children that often moved to the suburbs before the bubble economy period remains in the downtown area and its outskirts, the aging demographic ratio will drop, leading to diversification of household composition. In addition, Yamada (2008) examined condominium locations and their relationship to changes in land prices between 1995 and 2005, within a range of 15 km from Tokyo Station. His research revealed quite different tendencies between the western/southwestern and the eastern parts of the downtown area. On the other hand, most suburbs witness a change in generations, and sorting and selection of residential areas have progressed under decreased housing demand (Kawaguchi 2007). By comparing two Tokyo metropolitan area suburbs, Nakazawa et al. (2008) suggested the possibility that suburbs from which residents had formerly commuted downtown had shifted to proximity-oriented commuters, thus changing the residents' social class as well.

However, diversified housing demands were not satisfied by expansion of residences beyond commuting distance, but by vertical expansion in built-up inner areas. Such a new housing provision necessarily entails rebuilding and redevelopment, and these changes cope with the demographic changes mentioned previously. The centripetal population movement (Toshin-Kaiki) and "the end of suburbanization" describe this process. However, whether these changes affect social polarization associated with the social status dimension needs to be examined.

## 18.3 Data and Method

The study area is TMA within 50 km from central Tokyo (Tokyo Station). This area approximately covers the municipalities where 5 % or more workers commute to Tokyo's 23 Wards (Koizumi 2010). Previous studies of the urban spatial structure of TMA have the following technical problems.

First, a number of previous studies employed factor analysis or cluster analysis to analyze residential structure of cities. Nevertheless, it is difficult to compare factors or clusters obtained from different input variables. A solution is the separate analysis of spatial patterns of the variables used in factor analysis. For example, Kurasawa and Asakawa (2004) gave similar names to regional clusters obtained from different time periods. However, as indicated by Yano and Kato (1988) and Machimura (2005), factor composition and clusters depend on the input variables.

In addition, Kurasawa and Asakawa (2004) adopted a large number of variables, although Asakawa (2006) reduced the number of variables to 19, in which nine were related to occupational composition. Therefore, occupational composition probably affected the analytical result.

To avoid these problems, we should adopt variables representing main factors of the social area analysis to examine the spatial pattern separately and in detail. Since Sonobe's (2001) three hypotheses about the social polarization of the city, viz., a world city hypothesis, a deindustrialization hypothesis, and a public policy hypothesis, are commonly based on the notion that transformation of industrial structure led to change of occupation structure, we adopted variables representing socioeconomic status. The number of workers by occupational group from the national population census was used because occupation can be regarded as a direct index of social status in Japan, where income data for small areal units are not available.

Hence, we analyze the change in occupational structure after the bubble economy's collapse between 1995 and 2005 mainly using the population census data. The occupational structure is captured by classifying jobs into white-collar and blue-collar. The white-collar ratio is defined as the proportion of the sum of "administrative and managerial workers," "professional and engineering workers," and "clerical workers" to the total number of workers. The blue-collar ratio is defined as the proportion of the sum of "transport and machine operation workers" and "manufacturing process workers" to the total number of workers.

Second, previous studies tended to interpret the spatial patterns appeared on maps not objectively but subjectively. Hence, the findings obtained were likely to depend on the representation of the maps and affected by arbitrary interpretation. To understand the spatial patterns objectively, this study employed the spatial autocorrelation index of Moran's $I$ and its local version (Anselin 1995; Fotheringham et al. 2000).

Third, most previous studies used the administrative unit as a unit area. Though analysis using the administrative unit has some advantages in the abundance of information provided, it has the disadvantage of misunderstanding of spatial patterns owing to the shape of the administrative unit. Furthermore, the areal unit should be as homogeneous as possible, with equal size and shape. In particular, the administrative unit changed because of municipal mergers or administrative reorganization especially after the late 1990s. Analyses using the administrative unit tend to reduce the homogeneity of the unit area, and these changes make chronological comparison difficult. This problem is related to the Modifiable Areal Unit Problem (MAUP): the influence of scale and zoning of the unit area on spatial analysis. To reduce the effect of these problems, the grid square unit (third level, Japanese geodetic reference system) is employed as a unit area. In the analysis of TMA using grid square statistics, the author used the Third Grid Square (Japanese geodetic reference system) within 50 km from Tokyo Station, where 200 or more people reside. Third Area Partition is also called the Basic Grid Square that demarcated by dividing a Secondary Area Partition, corresponding to one page of 1:25,000 topographic maps, into 100 (10 by 10) equal parts vertically and horizontally.

## 18.4 Changes in the Spatial Patterns of Occupational Structure in TMA

### *18.4.1 Spatial Patterns of Occupational Groups*

The distribution of the white-collar ratio exhibits a sectoral pattern within the 15 km from downtown Tokyo, approximately equivalent to Tokyo's 23 Wards; the ratio is lower in the eastern part and higher in the southwestern part corresponding to the topographical differences between upland and lowland (Fig. 18.2). In the areas outside of the 15-km zone, a radial pattern in which higher areas are extended along railroad lines to the suburbs is observed. Even in the same distance zone, the ratio is higher in the southwestern sector along the Tokyu Toyoko Line. In urban sociology, this area has been called the "white-collar belt" (Kurasawa and Asakawa 2004; Asakawa 2006). Within "white-collar belt" extending to the south-west part of TMA, Shonan area such as Kamakura and Zushi Cities are located apart from central Tokyo. In contrast, a higher ratio of blue-collar workers is observed in the east side of Tokyo's 23 Wards corresponding to the Shitamachi Lowland. The blue-collar belt extends to the suburbs relatively remote from the railroad lines.

To identify this distribution closely, Fig. 18.3 shows the areal units positioned in the first and third quadrant of the Moran's scatter diagram with p-values for Local Moran statistic below 0.05. The within-15 km zone shows a sectoral pattern; however, no clear pattern can be found in the eastern part that constitutes the blue-collar belt. In the area outside the 15-km zone, we detect a radial pattern in which the blue-collar belt fills the gaps of the white-collar belt expanding along railroad lines.

Comparison of Moran's *I* statistic for white-collar and blue-collar ratios between 1995 and 2005 shows a strong positive spatial autocorrelation although the value of *I* has slightly decreased (Table 18.2). This implies that the uneven spatial distribution of each occupational group has been moderated, but the residential segregation of occupational structure has been maintained across the Tokyo metropolitan area.

During the period between 1995 and 2005, the white-collar ratio rose generally in the inner area of Tokyo and fell in the suburbs. In contrast, the blue-collar ratio fell as a whole except for the suburbs of 30–50 km zones (Fig. 18.4). These tendencies show a concentric pattern within the 15-km and 30–50-km zones. However, a radial pattern along railroad lines appears in the 15–30 km zone, where marked population increase during the rapid economic growth period in the 1960s has caused the inflow of white-collar workers and suburbanization (Kurasawa and Asakawa 2004; Asakawa 2006). Detailed analysis revealed that the inflow of white-collar workers was limited to the regions stretching along the railroad lines. For example, the number of white-collar workers increased in the areas around the stations of Kohoku New Town and Wakabadai (Kawasaki City), Hachioji-Minamino (Hachioji City), Yachiyo-midorigaoka (Yachiyo City), and Oyumino (Chiba City), but decreased in the areas away from railroad lines. Hence, the growth of white-collar ratio is limited to regions around specific stations.

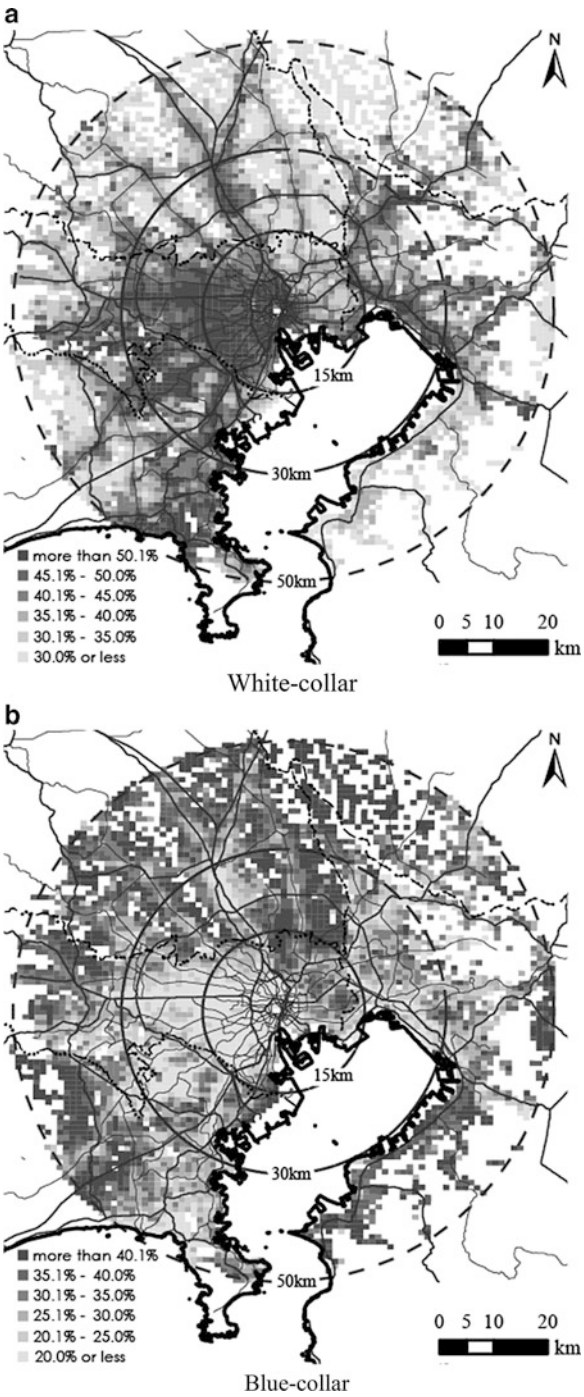


**Fig. 18.2** Ratio of white-collar workers (**a**) and blue-collar workers (**b**) (2005; by grid square statistics unit)

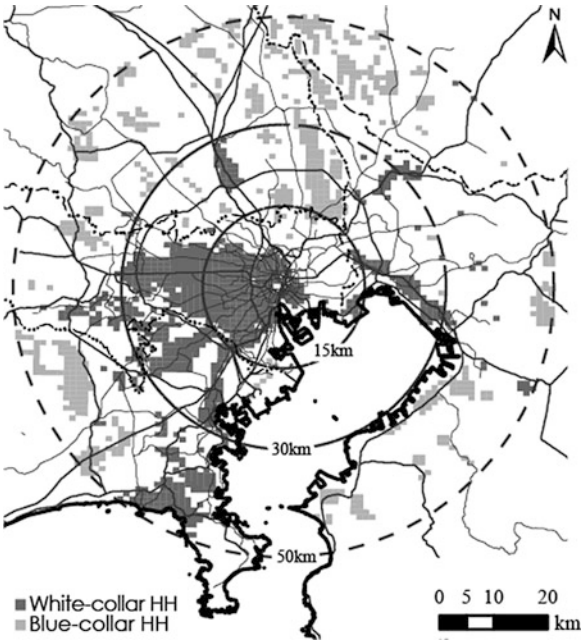


**Fig. 18.3** Spatial units with significant Local Moran values for white-collar and blue collar ratios (2005, by grid square statistics unit)

**Table 18.2** Moran's *I* values

| | 1995 | P-value | 2005 | P-value |
|---|---|---|---|---|
| White-collar ratio | 0.681 | <0.01 | 0.636 | <0.01 |
| Blue-collar ratio | 0.752 | <0.01 | 0.712 | <0.01 |

### *18.4.2 Background of the Change*

I will examine the background of such change with regard to the amount of population. Within the 15-km zone, the amount of white-collar population significantly increased in the eastern part, around 10 km away from downtown Tokyo, and decreased in the western part (Fig. 18.5a). However, the change of white-collar ratio in the northwestern part is not large because the total number of employees decreased. In the zone outside 15 km from central Tokyo, there are many districts where white-collar population has decreased. Exceptionally large increases are found in the vicinity of the JR Saikyo Line, JR Nambu Line, and Tokyu Toyoko Line, and the areas of Tama New Town and Kohoku New Town, easily accessible from downtown Tokyo. In these districts, large-scale housing estates were developed and the white-collar ratio rose.

On the other hand, the blue-collar population decreased considerably in central Tokyo and increased in the circumference of TMA (Fig. 18.5b). Within the 15-km

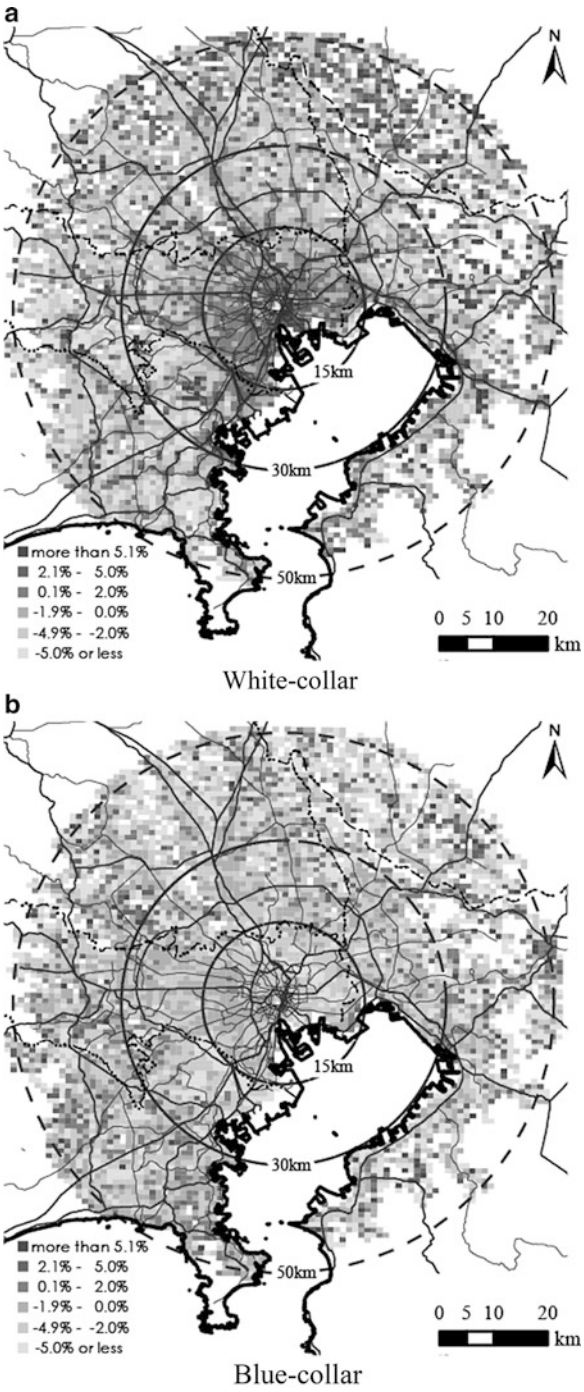


**Fig. 18.4** Changes in the ratio of white-collar (**a**) and blue-collar (**b**) workers (1995–2005; by grid square statistics unit)

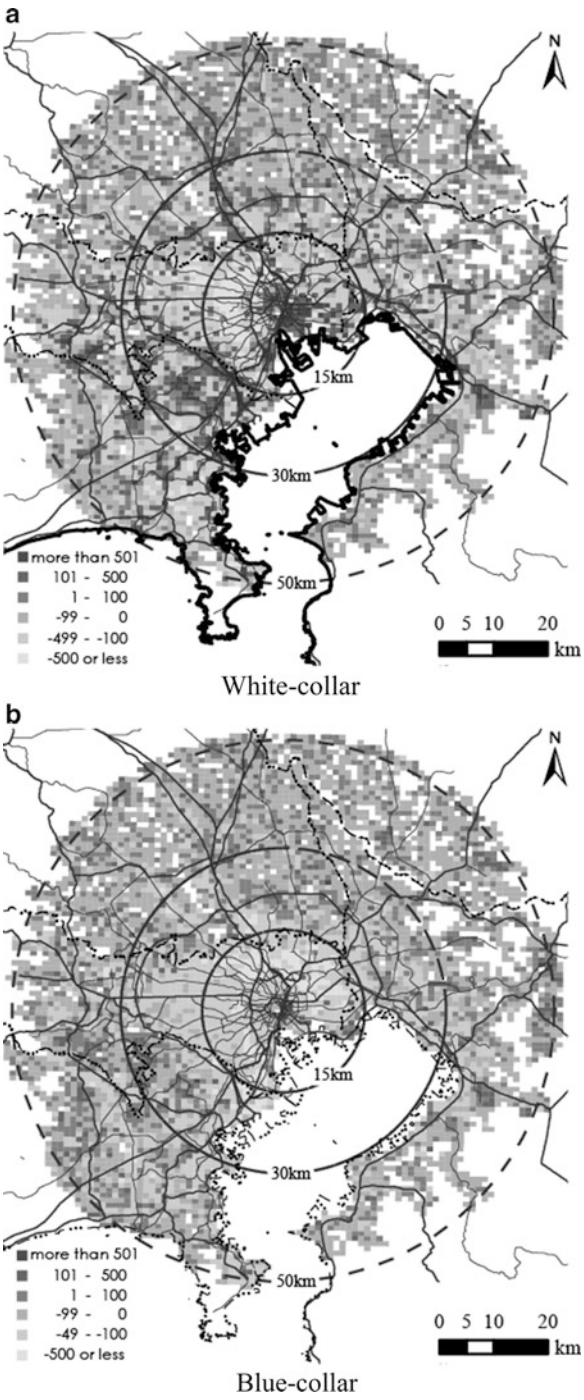


**Fig. 18.5** Changes in the number of white-collar (**a**) and blue-collar (**b**) workers (1995–2005; by grid square statistics unit)

zone, particularly large decreases are observed in the eastern-northwestern part. In this region, the growth of the white-collar ratio did not necessarily lead to an increase in the white-collar population; this implies that the relative white-collarization has grown.

In contrast, the blue-collar ratio significantly decreased around railroad stations where large scale redevelopment had proceeded (e.g., Kawasaki and Kawaguchi Stations). This may be because of the inflow of white-collar population into the redeveloped area around the station. Accompanying the absolute prominence of white-collar workers in these areas, a kind of gentrification occurred, with the replacement of the residents. In this way, both the amount and ratio of white-collar population have increased in existing clusters through the strengthening tendency of accumulation.

Moreover, the blue-collar belt has blurred because of a decrease in the absolute number of blue-collar population rather than because of the inflow of white-collar population. In other words, the rise of the white-collar ratio and the increased white-collar population brought about "discrimination of the suburbs" and "centripetal movement of population."

## 18.5 Conclusion

This chapter examined the spatial pattern of occupational structure of TMA and change in it after the bubble economy period. The results confirmed the spatial patterns reported by previous studies of Kurasawa (1986), Kurasawa and Asakawa (2004), and Asakawa (2006). Hence, the basic structure of social areas in TMA was maintained. However, there were minor differences in tendencies between the result from the data of the administrative units and that of the grid square units. Although previous studies reported a concentric pattern was obtained from analysis by the administrative unit, we obtained a radial pattern along suburban railroad lines from the analysis by grid square unit. Detailed analysis of the spatial pattern within the inner area of Tokyo in this study revealed that social areas are defined by the landform boundary between upland and lowland.

The TMA's spatial patterns of occupational structure are particularly characterized by contrast between the zones inside and outside of 15 km from central Tokyo, roughly corresponding to Tokyo's 23 Wards. Owing to relatively small administrative units and a high-density railway network within the 15-km zone, the results from the administrative units and the grid square units were similar. On the other hand, in the suburbs outside of the 15-km zone, a radial pattern along the railroad lines appeared in the analysis by grid square units, dissimilar to the analysis by administrative unit. This can be because of the relatively large size of the administrative units and a wide disparity in suburban accessibility to railroads.

The changes from a sector pattern to a concentric pattern in the socioeconomic status indicated by Kurasawa and Asakawa (2004) and Asakawa (2006) can be observed in the result from the analysis by administrative unit. In the analysis of this

study by grid square unit, the tendency to a sectoral pattern such as this was found in the 15-km zone from central Tokyo and the outer fringe zone of the metropolitan area. This seems to reflect the growth in the number of white-collar workers caused by housing development in the inner area of TMA.

These findings imply that the spatial aspect of social polarization in TMA was promoted by the inflow of white-collar workers into the inner district between 1995 and 2000. Although this study focused on the analysis of occupation structure, the results of the analysis reflect changes in the way of working, the type of families, residential choice, and urban development.

Social polarization will enhance the filtering of households in the housing market. Moreover, the population of the generation which newly acquires houses will decrease, and the number of young people born in the metropolitan area will increase (National Institute of Population and Social Security Research 2005). Immobilization of residence is more likely to advance in the future because filtering in the housing market is promoted mainly by economic factors such as land prices. Hence, spatial segregation between occupational groups is likely to be fixed as shown in this study.

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# Chapter 19
# Characteristics of the Community Activities in Narita New Town in the Tokyo Metropolitan Area

**Tomoko Kubo and Keisuke Matsui**

**Abstract** This study clarified the sustainability of residential suburbs with a progressively aging population via the elucidation of the characteristics of community activities in Narita new town in the Tokyo metropolitan area. We conducted a questionnaire survey and interviews, resulting in the clarification of the following points. Many residents of Narita new town were employed by companies in neighboring areas, particularly the Narita International Airport and its affiliated businesses, which enabled close proximity between workplaces and residences. Regarding the age composition of heads of households, roughly half were classified as family households, although there were greater numbers of elderly households in districts that residents had entered prior to the 1980s. In this new town, the main community activities are those chiefly conducted by residents of each district, i.e., by community and neighborhood associations in coordination with public authorities for purposes such as enhancing the convenience of everyday life in each district, and also hobby and group activities that utilize facilities within this town. Male residents participated in community activities from their working-age periods onward, and female residents actively participated in group activities. We can consider that Narita New Town's livability has increased, and a town in which residents of diverse age structure and income brackets can live comfortably has been formed.

**Keywords** Resident characteristics • Community activities • Narita Furusato-Matsuri festival • Narita new town • The Tokyo metropolitan area

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## 19.1 Introduction

It is common knowledge that the growth of suburban areas was strikingly evident in developed regions such as North America and Europe after the Second World War, as central cities at the cores of urban areas headed towards stagnation. Ishikawa (2008) indicates the following factors as the causes of suburbanization in Japan: (1) overflow of hyper-accumulated populations into urban outskirts, (2) rises in income levels and the formation and enlargement of a new middle class oriented towards suburban housing, (3) worsening living environments in central cities because of industrial clustering, (4) development of transport systems connecting urban centers and suburbs, and (5) municipal policies that aimed to disperse congestion.

This urbanization was accelerated by the development of new towns. New towns in Japan are different from those in the United Kingdom in that they have been formed only by the supply of housing, creating virtually no employment opportunities within the developed sites (Kitagawa 2004).

Large-scale new towns in Japan have been built mainly around the three major metropolitan areas of Tokyo, the Kyoto–Osaka–Kobe conurbation, and Nagoya. Most of these suburban residential areas were commuter towns separate from working districts, with the prerequisite of connections to the central city by public transport (particularly rail).

In contrast, some suburban residential areas situated within 60 km of urban centers were built with the purpose of close proximity between residences and workplaces, as can be seen from the fact that their locations are unfavorable for commuter belts. In particular, Narita new town (Chiba prefecture) and Tsukuba science city (Ibaraki prefecture), which were constructed with the aims of reducing congestion in central Tokyo and distributing functions, have residential districts adjoining working districts, including international airport or research facilities such as a national university, and thus are representative examples of suburban residential areas that are independent based on the proximity of residences and workplaces.

Although it is unnecessary to utilize an explanatory diagram of the counter-urbanization and re-urbanization experienced by the metropolitan regions of North America and Europe, there seems to be a similar trend of stagnant urban population growth in Japan's three major metropolitan areas, which are said to be strongly afferent towards the urban centers (Ishikawa 2008). Investigation into the sustainability of residential suburbs in Japan, where the decreasing fertility rates and aging population progress conspicuously and a period of rapid population decrease is looming, can be considered a pressing issue.

Thus, this paper aims to examine the sustainability of the residential suburbs of metropolitan areas by elucidating the characteristics of community activities in Narita new town, which is representative of independent suburban residential developments that feature close proximity between residences and workplaces.

## 19.2 Research Background and Method

### *19.2.1 Characteristics of Residential Suburbs in Japan*

The provision of suburban residential areas in Japan has increased rapidly since the 1960s. As homes acquired by persons born in nonmetropolitan regions, these areas have become receptacles for populations concentrated in metropolitan regions; residential suburbs in Japan were developed as commuter towns for the households of company employees originally born in nonmetropolitan regions who commuted to urban centers (Tani 1997; Kawaguchi 1997). Suburban residential developments that utilized Howard's concept of "Garden Cities," such as Letchworth, were comparatively independent settlements with a foundation of close proximity between residences and workplaces; but the provision of residential districts based on this kind of concept in Japan is limited. According to Fukuhara (2001), there were debates whether to build independent residential areas or commuter towns during the initial plans for Tama new town (Tokyo) and Senri new town (Osaka), but development of commuter towns was chosen as the solution to serious housing shortages.

The following two points can be indicated as characteristics of residential suburbs as commuter towns. First, population aging among the residents is rapidly progressing. In research that addresses districts such as Senri new town, there are concerns that the simultaneous influx of residents who are homogeneous in both age and family structure (Kaneshiro 1983) and the aging of residents and the outflow of the non-aging population are leading to an advance in the aging of whole residential areas (Naganuma et al. 2006).

The second characteristic is the spatial homogeneity of suburban residential areas. With a homogenous housing supply, and the influx and settlement of residents who have reached similar ages and life events (Yui 1999), the suburbs are considered to be experientially homogenous spaces. Regarding suburban homogeneity, Nakazawa et al. (2008) examined whether the aging of the first generation and the settlement or departure of the second generation were progressing similarly via a case study on two residential suburbs located at similar distances from central Tokyo. The results showed that the changes in generations triggered the manifestation of subtle differences in aspects such as social classes in the comparatively homogenous characteristics of the residents in the first generation and that suburban residential areas are not necessarily living spaces that possess homogeneous qualities. Based on these findings, it can be considered that research that takes the diversity of residential suburbs into account is becoming increasingly important. In particular, research on independent residential suburbs is limited, and empirical evidence of the characteristics of residents and the actual forms of communities in these areas is yet to be obtained.

In Europe and America, there is a collection of studies on residential suburbs from the perspective of gender. Watson (1980), in research conducted in the United Kingdom, showed that households that fall outside of the traditional nuclear family are being excluded by housing policies and supply. The study also states that the concept of the family that has been maintained within housing supply limits the role

of women domestically, and women are placed in a subordinate position by patriarchal relationships. Furthermore, Rose (1980) asserts that in the suburbs, division of labor by gender roles, i.e., men's productive labor (outside the home) and women's reproductive labor (within the home), is presupposed and that an ideologically close relationship can be seen between the possession of suburban housing and female domestic roles. Kageyama (2004) also points out that Japanese housing has become a gendered space and that the housing system has been maintained via patriarchal roles.

This division of labor by gender roles is also identified in the aspects of the operation and maintenance of communities. In suburban residential developments, female residents are the main bearers of responsibility for the community (Ichibangase 2003), and male residents, who had no points of contact with the area during their working years, use retirement as an opportunity to obtain help from female residents to participate in local activities (Kimura 2006).

However, it is questionable whether these characteristics apply to the independent model of residential suburbs. In contrast to the commuter town model of residential suburbs, in which comparatively homogenous residents live in neighborhoods of detached houses, a variety of housing is supplied within the independent model of residential suburbs, and the attributes of the residents are also diverse. Furthermore, male residents, whose workplaces are within or close to their areas of residence, have greater potential for spending longer amounts of time in the area during their working years compared with those in communities in the commuter town model.

### *19.2.2 Community as a Research Perspective*

This paper focuses on community as a perspective of research on suburban residential areas. Community is a much-debated concept within urban sociology. Various communities are considered to exist: those divided by the boundaries of residential areas; social systems formed by residents; communities formed by feelings of affinity or human relationships regardless of regional connections; those with a role as ideology; and Wundtian communities typified by the gay culture in San Francisco (Bell and Newby 1976; Schmalenbach 1977; Hetherington 1990; Savage and Warde 1993). In this study, community expresses a social system formed in a locality through various activities within an area defined by the boundaries of residential districts, namely, activities with an aspect of asset management, such as the actions of a community association or residential management association, or cultural activities that emphasize psychological bonds between residents. With regard to friendships and group activities, these include connections formed by residents outside the framework of the residential district, and some exist beyond the regional boundaries of Narita new town. Such activities, however, are embedded in the social system of Narita new town, in which diverse activities interact in a multilayered, organic way and thus are incorporated into the subject of this research.

### *19.2.3 Survey Method*

As the survey method, we conducted analysis of materials such as official minutes related to local events in Narita new town; interviews with staff of the Narita new town's federation of community associations, and with staff of the community and neighborhood associations that constitute this federation; and interviews with and questionnaire surveys to residents. The field survey was conducted in November 2008 and from May to August 2009. In this study, with the cooperation of the Narita new town's federation of community associations and the respective community associations, we distributed a questionnaire in four districts, all of which differ in terms of the configuration and supply period of the housing built for sale. In District A, we distributed questionnaires to 110 households and received responses from 23. In District B, questionnaires were distributed to 120 households and received 24 responses. In District C, questionnaires were sent to 110 households and received 38 responses, and in District D, we received 11 responses among 100 households. We asked staff of the Narita New Town's federation of community associations and the respective community associations about issues such as measures towards local events and the internal structures of the community associations organized within each district. In the questionnaire survey, we inquired into the state of participation in cultural activities and other activities hosted by community associations and also about the friendships and characteristics of residents.

## 19.3 Regional Characteristics of Narita New Town

### *19.3.1 History of New Town Development and Land Use*

Narita new town, the target region of this study, is in Narita city, Chiba prefecture, located within 50 km of central Tokyo, 8 km west of the Narita International Airport, and 2 km west of the JR Narita station (Fig. 19.1). The population of Narita New Town is approximately 33,000 (as of 2013), with roughly 14,000 households. These correspond to over one-quarter of both the population and number of households in the whole of Narita City, which according to the 2012 national census was approximately 128,000 people and 52,000 households.

Narita new town's shape is formed over 2.5 km from east to west and 3 km from north to south, and it consists of hilly terrain between 10 and 40 m above sea level. Regarding land use, 231.5 ha (47.9 %) is residential land, 96 ha (19.9 %) is used for roads, and 60.1 ha (12.4 %) is used for parks (City Planning Division, Urban Department, Narita city 2007).

Narita new town is an urban district the entire area of which was established collectively as a new housing and urban development project by the Chiba Public Enterprise Bureau in 1968. Its history includes the fact that the district was planned in order to provide a pleasant residential environment for workers connected to the

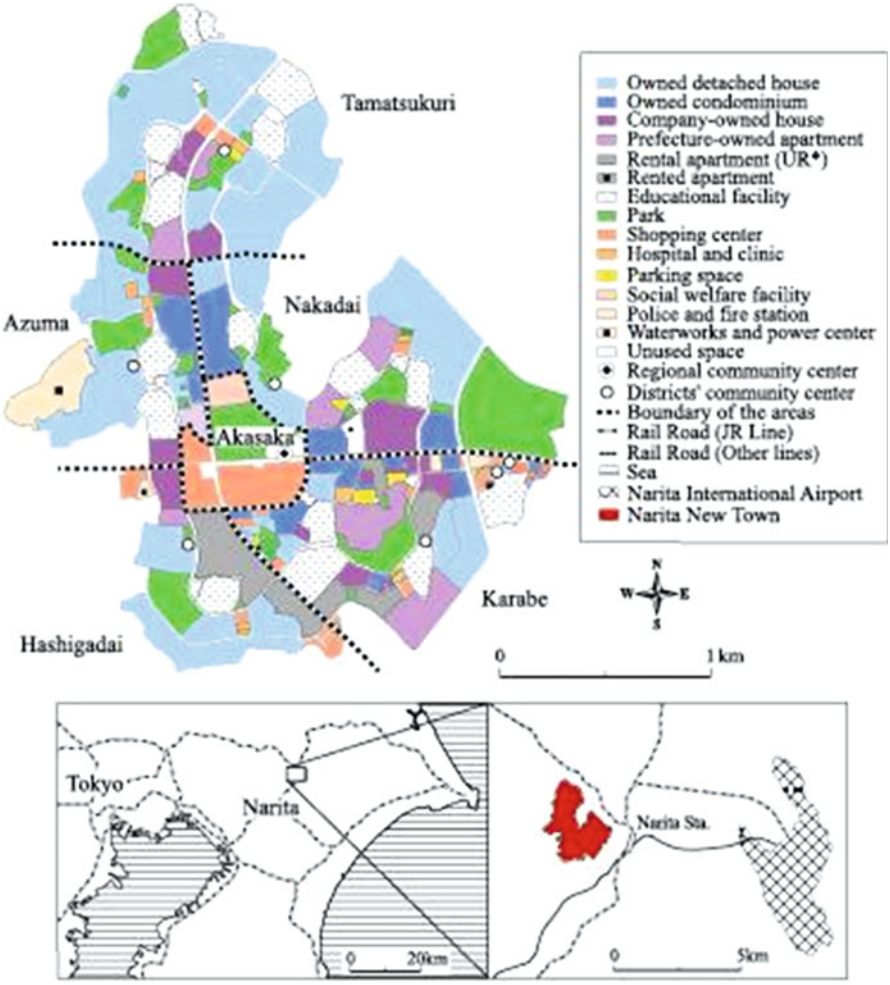


**Fig. 19.1** Land use of Narita town, 2009. *Note*: Compass is common for all figures. *UR* urban renaissance. *Source*: Kubo et al. (2010a, b)

Narita International Airport, accompanying the opening of the airport in 1978. As Narita new town is situated 50 km from central Tokyo, it was originally planned as an independent new town. Most residential suburbs in Japan are commuter towns that presuppose traveling to work in city centers, but Narita New Town was regarded to be established as a suburban residential area based on Howard's Garden City concept, which utilizes close proximity between residences and workplaces. In order to create a rich living environment within walking distance, commercial zones such as Akasaka were established as regional centers, with shopping centers in each area as sub-centers, and green walkways connecting these were created. The green walkways are pedestrian-only routes designed so that cars cannot enter,

in order to protect children and elderly persons within the residential complexes. These green walkways connect housing, schools, commercial facilities, and so on within each district and thus support living environments that are accessible by walking.

The sale of real estate lots in Nakadai and Karabe areas began in 1970, and occupancy began in Narita new town in 1972. Development proceeded clockwise from the east part of Nakadai, in the sequence of Karabe, Hashigadai, Azuma, the west section of Tamatsukuri, the east section of Tamatsukuri, and then the west part of Nakadai.

Figure 19.1 shows residential land use in Narita New Town. Akasaka area is the center of the entire new town, with a concentration of commercial and business functions, and no distribution of housing can be seen. In contrast, residential land use in the surrounding areas is prominent. In Nakadai area, which was the first to offer housing supply, there were detached housing lots for sale as well as rental housing via the former Japan Housing Corporation (now known as "UR," the Urban Renaissance Agency); dormitories, company housing, and private condominium housing are located in the zones facing the main street. Nakadai Elementary School was opened in Nakadai area in 1972, followed by Nakadai Junior High School in 1973. In Karabe area, which was next to be developed, detached housing lots for sale, rental condominium housing, dormitories, company housing, and various amenities including commercial facilities are intermixed. From the inception of its development, Karabe area contained a concentration of rental housing via UR and company housing for airline companies. In recent years, because of the redevelopment of sites formerly used for company housing, the supply of housing built for sale aimed at young households is thriving in this area. In Karabe area, Nishi Junior High School opened in 1964, followed by Karabe and Niiyama Elementary School in 1973 and 1977 respectively. Hashigadai area is mostly occupied by detached housing built for sale and rental condominium housing. Hashigadai 3-chome is an area with a cluster of rental housing via UR, public housing, and company housing, whereas 1-chome and 2-chome contrastingly contain only detached housing built for sale. Hashigadai Elementary School was opened in 1975. Whereas the majority of Azuma area is occupied by detached housing built for sale and rental housing via UR, prefectural public housing can also be seen. In this area, Azuma Elementary School and Azuma Junior High School were opened in 1978. Although detached housing built for sale accounts for most of Tamatsukuri area, there are considerable numbers of dormitories, company housing, and condominium housing via UR. Tamatsukuri Elementary School was opened in this area in 1981, followed by Jinguji Elementary School and Tamatsukuri Junior High School in 1984. Additionally, Tamatsukuri area is the farthest from Narita's stations on both the JR and Keisei railway lines, and thus its convenience in terms of public transport was inferior to other areas. However, owing to the 2010 opening of Narita Yukawa station on the Narita Sky Access Line in the northern tip of Tamatsukuri area, new development of detached housing built for sale has taken place. Furthermore, a central community center has been built in

Akasaka area, as well as additional community centers in other areas, which are used as bases for community activities by the residents, such as group activities.

The characteristics of the districts that we used as case studies are as follows. The district A consists of detached housing built for sale and was developed in the 1980s. The district B was also developed in the 1980s and is an area of condominium real estate, namely, four-story buildings without elevators. The district C contains detached housing built for sale; approximately 110 housing lots were sold between the 1980s and the 2000s. Finally, in the district D, detached housing built for sale was supplied because of the redevelopment of land formerly used for the Japan Airlines company housing.

### *19.3.2 Characteristics of Residents*

The age distribution of the heads of households that responded to the questionnaire (96 households) was as follows: 11.4 % of heads of household were in their thirties or younger, 16.7 % were in their forties, 20.8 % were in their fifties, 31.3 % were in their sixties, and 17.7 % were in their seventies or older. The highest proportion of senior households were in the district B, where 66.7 % of heads of household were in their sixties, and in the district A, with 56.5 %. We can consider the cause of this to be that both of these districts were established when real estate lot sales first begin in Narita new town and that these households have been in continuous residence since then. Diverse age distribution can be seen in the district C, and 90 % or so of heads of household in the district D were in their forties or younger.

With regards to household structure, roughly half (49) of the respondent households were families with children of school age, followed by households occupied solely by married couples in their fifties or older. For most of these latter households, the couples' children were adults and had left home. Additionally, other household structures include working adults living with their parents and cohabitation of multiple generations.

Next, we examined the period in which housing was purchased and the form of home ownership, it is clear that many reside in houses that they bought as new constructions, with a strong tendency toward purchasing at the time when real estate lots in each district went on sale. However, most of the households that purchased pre-owned housing are living in condominium real estate or detached housing in the district C, which we can assume to be owing to the fact that many of these residences were built on spacious lots with large numbers of rooms. In the district D, all of the households that purchased real estate bought newly constructed condominium housing.

Regarding the relationship between the head of household's occupation and workplace, 18 heads of household worked for airline companies and 6 worked for aviation-related industries; thus, heads of household engaged in occupations connected to the airport accounted for 25 % of the total. Although 18 heads of household were workers at the Narita International Airport, others commuted into

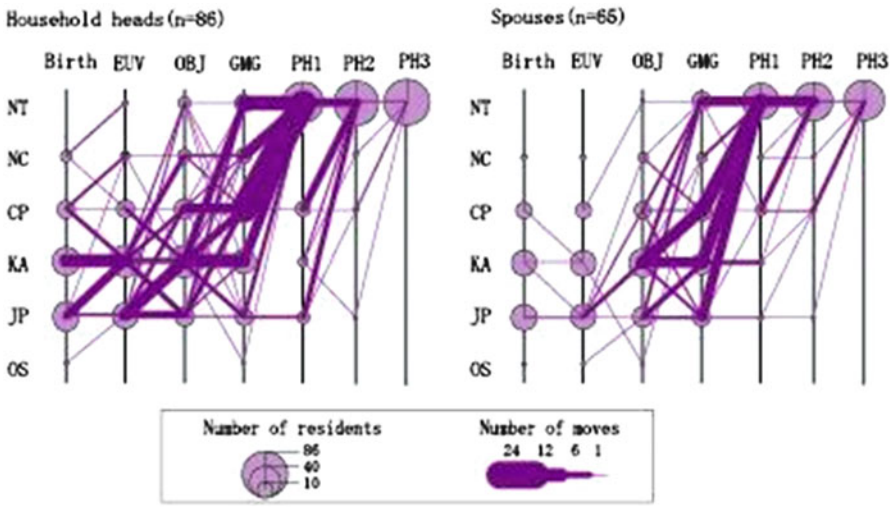


**Fig. 19.2** Life-pass of residents in Narita New Town (2009). *Note*: *NT* Narita new town, *NC* Narita city (excluding Narita New Town), *CP* Chiba Prefecture (excluding Narita City), *KA* Kanto area (excluding Chiba Pref.), *JP* Japan (excluding Kanto area), *OS* Overseas, *EUV* Entering universities, *OBJ* obtaining jobs, *GMG* getting married, *PH 1 (2, 3)* Purchasing Houses for the first (second, third) times (s). *Source*: Author's qurestionnaires

Tokyo for airport-related work, including at Haneda Airport. Additionally, 30 heads of household had already retired from their work, accounting for 31.3 % of the total.

There were 39 heads of household engaged in work unrelated to the Narita International Airport or affiliated businesses. These included occupations such as civil servants of Chiba prefecture, postal workers, and employees of general private enterprises. The majority of spouses of heads of household were full-time home-makers; the suburbanite attribute of the widespread "company employee and housewife family" was thus confirmed in Narita new town.

If we examine the households' residential histories in terms of their previous areas of residence and residential statuses, many of the households had moved within Narita new town, with 34.4 % relocating within the area. In particular, many residents had moved from rental housing, public housing via the Employment Development Association, or prefectural housing at the time of their marriages and subsequently purchased real estate, or they had purchased real estate after living in dormitories or company housing.

The life trajectories of the households that responded to the questionnaire are shown in Fig. 19.2. Among the household heads (left), an active tendency toward migration can be observed from the period of entering university, with wide-ranging movement both domestically and overseas, which was also seen at the time of marriage. In the case of heads of household employed by airport-related companies, we can consider that these migration tendencies were affected by the fact that relocation to jobs at domestic airports is common. Migration into

Narita new town was highest during the initial period of purchasing real estate, although there were also a considerable number of households that moved to Narita new town at the time of marriage. Furthermore, it is evident that many residents had repeatedly purchased housing within Narita new town. In contrast, the spouses of heads of household made few migrations before marriage, and it can be considered that their main movements consisted of relocations accompanying their families.

## 19.4 Community Activities in Narita New Town

### *19.4.1 Overview of Community Activities*

In this section, we clarifies aspects such as activities and frequency of participation by residents for each category of community activities in Narita new town. The analysis in this section will aggregate the respective questionnaire responses from both the heads of household and their spouses. Because the number of responses varies between questions, we analyzed the responses received for each question.

Community activities in Narita new town can be broadly divided into two categories. The first consists of activities mainly conducted by residents of each area or district, i.e., by community and neighborhood associations in coordination with public authorities for purposes such as enhancing the convenience of everyday life in each area or district. The sphere of the activities and participating members are residents in the same area or district, and these activities are conducted at the level of local connections. The second category consists of hobby and group activities that utilize facilities within Narita new town and are not necessarily organizations of residents of the same area or district. In this study, we address the two categories separately, referring to the former as "regional activities" and the latter as "group activities."

The principal agents of regional activities are community associations and neighborhood associations composed of residents of each district of Narita new town. These associations conduct activities such as voluntary disaster management, women's groups, and clubs for elderly residents. Most of these community and neighborhood associations are constituent members of a top-level organization, Narita new town's federation of community associations. Through the federation, the requirements of the residents of Narita new town are conveyed to the public authorities, and information and services are in turn provided by the authorities to the residents. Activities such as environmental improvement projects, environmental beautification campaigns (i.e. street clean-up strategy), Narita new town crime prevention patrol, a youth health promotion committee, and a Narita city senior citizens' meeting have been conducted via this federation of community associations, as pivotal organizations.

The sphere of group activities contains some areas of overlap with regional activities, but group activities have the function of connecting fellow residents over

a wider range that transcends the district level. Furthermore, many of the various events held in Narita new town, including the "Narita Furusato-Matsuri" and "Community Center Matsuri" festivals, are principally organized by the federation of community associations and by activity groups within Narita new town. Because of this, we can consider that these two regional activities provide important opportunities for Narita new town residents to participate locally.

## *19.4.2 Participation in Community Activities*

### 19.4.2.1 Regional Activities

If we examine the questionnaire respondents' experiences of participating in regional activities, participation in community and neighborhood associations in each district is very high, although a disparity can be observed between districts. In the districts A, B, and C, the ratio of participation was above 85 % of respondents, in contrast to a rather low 58.3 % in the district D. This shows that because occupation of housing in the district D only started in 2005, its community has not yet matured.

Next, regarding the respondents' participation in activities such as voluntary disaster management organizations, environmental beautification campaigns, crime prevention patrol, and environmental improvement projects, the ratio of participation in voluntary disaster management organizations was 21.9 % in the district A and 10.4 % in the district C, whereas it was 45.7 % in the district B and 33.3 % in the district D. From this result, it was apparent that the districts with condominium housing (B and D) showed higher figures than did the detached housing districts (A and C), demonstrating a stronger awareness of disaster prevention.

However, whereas the participation ratio of environmental beautification campaigns was high in the detached housing districts, A (78.1 %) and C (79.1 %), the proportion was low in the districts with condominium housing, B (48.6 %) and D (41.7 %). In the case of condominium real estate, the main factors that affect preservation of the property value are the exterior appearance of the condominium building, the spaces for common use, and each dwelling unit; contrastingly, in detached housing districts, not only individual houses but also the attributes of gardens and the entire neighborhood block affect the property value. It can be considered that this is a cause of the disparity between the districts.

The ratio of participation in the crime prevention patrol in the districts A and B was high, and we found that the greater the number of long-term residents in a district, the higher the proportion of participation in activities conducted across the whole of Narita new town. On the other hand, in the district D, where the duration of residence thus far is short, although the ratio of participation in activities at the level of each community association was high, participation in activities held by the federation of community associations and activities organized across the whole of Narita new town is not progressing. A trend was confirmed whereby participation in

activities held by bodies such as the federation of community associations, in addition to activities at the community association level, increased as the duration of residence grew longer. Moreover, this also applied to the frequency of participation in women's groups and clubs for the elderly held by community associations, the youth health promotion committee organized by the federation, and the Narita city senior citizens' meeting. The ratio of participation in Narita Furusato-Matsuri, organized by the federation of community associations, is similar to that of participation in community and neighborhood associations and is high across all four districts.

#### 19.4.2.2 Group Activities

Next, we will examine the group activities. The most common activities are sports and recreation such as gymnastics, baseball, tennis, and volleyball, followed by hobby activities including handicrafts, indoor games, musical instrument performances, and cooking clubs. Other group activities consist of study groups of English conversation, penmanship, volunteering, and so on. Regarding frequency of participation, group activities were regularly conducted in the districts A and C, with over 50 % of respondents taking part four or more times per month. Group activities were in general held more frequently than were regional activities. In the districts A and B, similar to regional activities, many group activities were triggered by other activities within the same district owing to the fact that there are a large number of long-term resident households.

In the district C, in addition to the facts that the period of real estate sale was long and the residents had a broad age structure, information about activities held at various facilities was easy to obtain because the district is close to facilities that act as bases for group activities, such as the central community center and the social welfare hall. Cases were observed whereby residents participated because of their interest in the activity itself. We will describe the example of a man living in the district C who formerly worked for an airline company and was at the time retired. Although he had a great deal of social interaction with friends from his time at the airline company, he also belonged to a *Go* (traditional Chinese board game) group at the central community center as a routine activity, playing *Go* three times a week or more.

Furthermore, in the district D, where there are many family households of working age and the duration of residence is short, we saw cases in which residents not only participated in groups that already existed in Narita new town but also organized groups themselves using Narita new town facilities as bases for activities. A male employee of an airline company who lived in the district D organized a group for playing Okinawan music and conducted activities in neighboring municipalities such as Sakura city as well as at the Narita new town central community center. This Okinawan music group carried out activities and attracted not only Narita new town residents but also members from within Chiba prefecture and the

Tokyo metropolitan area who had obtained information from the Internet and other sources.

Regarding their commencing group activities, most residents responded that they had done so after the year 2000. In the districts A and B, 40 % of residents responded "since 2000 or later," in contrast to 70 % in the districts C and D. Among residents who answered "in the 1980s," the district A was the most common. In interviews with residents from the district A, there was a case in which a resident had created a child-centered baseball team during their child-raising years, and even after their children became adults, continued activities in which children and parents could interact. In this way, an activity started by the resident in the 1980s, which corresponded to their child-rearing years, changed format in accordance with the residents' growth and remained as a group activity.

In terms of sites for activities, most were conducted within Narita new town. In particular, many residents replied that they used other community centers and facilities in Narita new town more than their own neighborhood community centers. Thus, we were able to confirm that interaction between people within Narita new town that transcends the district level was thriving. Among those who responded "Others" there were a small number of residents whose spheres of activities extended to neighboring cities or even outside of Chiba prefecture. These people were mainly residents of the district C and D, and it can be considered that they were continuing activities they had started before moving to Narita new town. Finally, when we inquired into the reasons for commencing group activities, the most common response was "Due to interest in the activity." The reason "The activity site is close to my home" was also an important factor, but these responses were not as numerous as having interest in the activity, perhaps because activity sites were not necessarily limited to within residents' own neighborhoods, as described above. The next most frequent answer was "To make friends," which was widespread among residents of the districts A, B, and C. This was followed by the reasons "Recommended by a friend or acquaintance" and "Recommended by a family member."

#### 19.4.2.3 Residents' Friendships

The average numbers of friends among residents who responded to the questionnaire survey was 13.3 in the district A, 16.1 in the district B, 15.6 in the district C, and 17.9 in the district D. Regarding the friends' places of residence, most lived in the same neighborhood; the proportions were high in the district A, at 47.3 %, and the district B, at 42.2 %. In contrast, the district C (32.9 % of residents' friends) and the district D (13.9 %) showed lower figures than did the districts A and B. However, the proportions of friends living in a different neighborhood within Narita new town were broadly similar in the districts A, C and D. We can consider this to be because a high proportion of interpersonal relationships among Narita new town residents are simultaneously local connections and work connections, because many households

in these districts are employed by the Narita International Airport and affiliated businesses.

Regarding friendship connections, for residents who had lived at their current homes for a long period, a strong correlation could be seen between regional activities in their own neighborhoods, or group activities within Narita new town, and the formation of friendships triggered by these. To cite an example, a male resident of the District A, a retired postal worker, frequently played *mahjong* and took golfing trips with residents he had become friends with through activities such as those of the community association in the district. In addition, he had organized sporting group activities centered around the same friends, and his friendships within the district had expanded through district community association activities.

In the district B, a resident who had experience as staff of the residential management association formed a group called *Goraku-kai*. The members of *Goraku-kai* were mostly male, and at the time of the survey, most were retirees. They held social gatherings and also ran a stall at the aforementioned Narita Furusato-Matsuri festival; through such activities, the members contributed to the locality and also to their own sense of purpose. When the group was initially formed, the founder's purpose, as an experienced former staff member of the residential management association, was as an advisor to new staff in the residential management association. Furthermore, the association played a large role in cementing friendships; there were few opportunities for fellow residents who shared the same assets to meet each other, because residents employed by airport-affiliated businesses arrived home at irregular times owing to their shift patterns. By participating in *Goraku-kai*, fellow residents formed connections who had become acquainted via community activities in the district.

In the district D, where many residents were in their child-raising years, activities by alumni associations formed by experienced former members of parents' associations, such as PTAs, were observed. The *Oyaji-no-kai* group, mainly composed of fathers who had previously participated in PTA activities, is an example of this. According to the chairman of the federation of community associations, *Oyaji-no-kai*, the participants of which are men in their working years, at the time constituted four groups within Narita new town, beginning with the district D. A male resident of the district D participated in PTA activities when his children attended elementary school. During his interaction with other parents and guardians he met through his activities as a PTA staff member, he developed a motivation for action not only by mothers but also by fathers themselves, and thus he established *Oyaji-no-kai*. In addition to promoting friendship between members, *Oyaji-no-kai* plays the role of taking care of local children through other activities such as participation in events at elementary schools and running a stall at the Narita Furusato-Matsuri festival. There were consistent numbers of friends made through children in the districts B, C, and D.

Next, the most common trigger for making friends for residents of the districts B, C, and D was through work. This is because most residents of these three districts are of working age. The proportion was high in the district B, where in addition to residents of households of working age, many retired residents continued to have

interaction with friends they made during their working years. The ratio, however, was low in the district A. In the interview survey, we observed a trend whereby more residents of the district A were employees of general private enterprises in Chiba prefecture, civil servants, or self-employed than were working for the Narita International Airport and its related industries. Because a consistent number of residents who were employees of the Narita International Airport or affiliated enterprises had purchased their homes after living in company housing in Narita new town, it was common for there to be some overlap between their work friends and their neighborhood friends. For other occupations, however, this overlap between work friends and neighborhood residents did not necessarily exist, so it can be considered that friendships formed in the neighborhood will increase.

Regarding the matter of friends from college days, residents in the district D had the most, followed by those in the district C, which is a similarly new district. The greater the number of young households, the higher the number of friends from the residents' college days. A female resident of the district D, whose parents lived within Narita city, had moved to Narita new town on the occasion of her marriage. Her best friend was a friend from college, and that friend was also living in Narita new town, in the vicinity of the district D. The woman had moved to the district D in 2005 but had had difficulty in participating regularly in regional and group activities because of marriage and childbirth. As a result, her main interaction had been with her friend from her college days.

## 19.5 The Narita Furusato-Matsuri Festival Administration and Resident Participation

In this section, we will elucidate the community activities and characteristics of resident groups connected to the administration of the Narita Furusato-Matsuri festival, which is an important regional event in Narita new town, and clarify the attributes of community activities in Narita new town.

### *19.5.1 Festival Administration*

Narita Furusato-Matsuri is a significant regional event operated by the residents of Narita new town (Fig. 19.3). It is held annually over 2–3 days in late August and is visited by roughly 100,000 people during the festival period. Among these visitors, approximately 60 % are residents of Narita new town, 30 % are residents of other areas in Narita city, and 10 % are residents of other surrounding regions (according to Narita Furusato-Matsuri executive committee data). Narita Furusato-Matsuri was inaugurated with the aim of organizing coordination between local residents, and it celebrated its 30th anniversary in 2009. Stalls are set up and parades take place on a section of road extending from the BonBelta department store to the Keiyo Bank on

**Fig. 19.3** Narita Furusato-Matsuri

**Fig. 19.4** Stall tenants operated by residents

Nishiguchi-Odori street, and three stages are installed in the district center square and the space around BonBelta for performances.

Narita Furusato-Matsuri is operated by around 35 community associations and neighborhood associations that constitute Narita new town's federation of community associations. These organizations conduct the administration of the festival and participate as stall tenants (Fig. 19.4).

The main source of income for the administrative costs of the festival is the contributions from each community and neighborhood association, in addition to community funds from resident households (500 yen per household). Moreover, in addition to donations from over 200 private enterprises and individuals within Narita city and subsidies from the municipal government, since 2007, the festival has also recruited sponsors, collecting funds via advertising fees.

In terms of supporting companies, participation from private enterprises in Narita city and businesses that have branches within Narita city is high.

**Fig. 19.5** Lottery for residents

Such businesses include banks, post offices, hospitals and clinics, construction companies, and various other companies. Airport-affiliated businesses and hotels support the festival in ways such as setting up stalls run by their employees, in addition to giving donations. Supporting companies also provide prizes for the festival lottery. These lottery prizes are supplied by large-scale retailers and supermarkets that have stores in Narita city, as well as long-established restaurants within the city. Particular excitement is generated as residents who enter the lottery gather around a specially installed stage for the announcement of the prizewinners (Fig. 19.5).

### *19.5.2 Resident Participation in the Festival*

Three stages are set up on the festival site where performances are made by the local junior high schools' brass bands, groups that conduct activities at the central community center, and others (Fig. 19.6). The performers are mainly Narita new town residents, and the number of groups that apply to perform increases year by year.

Prefecture-wide organizations such as dance and music groups and Narita *Eisa Churaumi-kai* (Okinawan dance) can be seen. Participation by groups whose bases are in Chiba or other prefectures, such as the Chiba *Hanagasa* Society ("Flower Hat" dance), was also observed.

The results of our survey of the frequency of resident participation in Narita Furusato-Matsuri demonstrated that across all districts, more residents participated as spectators than as members of stalls, performers, or festival staff. In the districts A and C, more residents participated as members of stalls, performers, or staff, whereas in the districts B and D, more residents participated as spectators. A noteworthy point was that participation by the heads of household, mainly male residents, was higher in comparison with participation by spouses. Although the

**Fig. 19.6** Dance performances by resident's groups

majority of participation by spouses in each district was as spectators, heads of household were frequently involved as members of stalls, performers, or staff, and furthermore, participation by heads of household as spectators was also higher than was that of their spouses. Among members of festival stalls and stage performers, an ensemble group of *Oyaji-no-kai* and other middle-aged men could be seen, and the active participation of male residents in the festival was confirmed (Fig. 19.7).

An issue raised by Narita Furusato-Matsuri is the existence of community and neighborhood associations that are not members of the federation of community associations. As of 2007, there were 2,381 households in community and neighborhood associations that were nonmembers of the federation of community associations, meaning that 16.5 % of the total of 14,373 households had not yet joined the federation. Inquiries from non-federation community and neighborhood associations and from the general population regarding the festival lottery tickets, which are distributed via federation member community and neighborhood associations, are increasing, and the federation is taking measures such as appealing to

**Fig. 19.7** Stall tenants run by Oyaji-no-kai

**Fig. 19.8** Parade of portable shrine

nonmember community associations to join. Cross-generational interchange within Narita new town is cited as the future role of Narita Furusato-Matsuri.

During Narita Furusato-Matsuri, the portable shrine owned by Narita new town's federation of community associations or the Karabe district's community association and a children's portable shrine, are paraded around the festival site (Fig. 19.8). At the 2009 festival, the sight of the children's portable shrine could be seen paraded around the festival site, carried by elementary school children living in the Hashigadai district, and then subsequently carried to the Hashigadai district and paraded there in order to enliven the festivities within the residential district. In the Hashigadai district, where differences in the configuration of residents within the same area can be observed owing to factors such as residential status and the period of real estate sale, cross-generational interchange has been organized through the festival.

### *19.5.3 Festival Participation and Settlement in the Region*

As described earlier, male participation in regional activities in Narita new town is conspicuous, and we confirmed the existence of group activities for the purpose of regional contribution or interaction between residents, including participation in the federation of community associations. In Narita new town, male residents of a broad range of generations from young to elderly are becoming involved locally with ease via regional activities or group activities. We use a case study below to illustrate how a resident became firmly settled in the region through participation in Narita Furusato-Matsuri.

We will describe the case of a male resident (hereafter "Mr. X") in his seventies who is a staff member of Narita new town's federation of community associations. Mr. X purchased detached housing in the district A in 1984 and moved into Narita new town. Both Mr. X, the head of household, and his spouse were born in the Tokyo metropolitan area, where Mr. X had been employed before moving to Narita new town. His workplace, however, changed to Togane city in Chiba prefecture, he also managed a book and stationery store within Narita city. He had taken on a staff position in Narita new town's federation of community associations in 1999 or so. Since Mr. X had become a staff member, Narita Furusato-Matsuri had developed significantly. It was owing to the efforts of Mr. X, together with the staff of the federation of community associations and the staff of each community and neighborhood associations, that a range of measures in accordance with various policies of the festival, such as "A Happy, Safe and Secure Festival", "A Trash-free, Clean Festival," and "A Regionally-focused Festival," were devised.

In addition to Mr. X's endeavors, coordination with city councilors from Narita new town who worked as advisors to Narita new town's federation of community associations led to the reflection of residents' needs in the municipal government. As of 2009, there were seven city councilors from Narita new town. Not only current councilors but also former councilors are actively involved in improving the convenience of everyday life in Narita new town. For example, there was a case in the Tamatsukuri district in which a former city councilor played the main role in debating how to utilize the former site of a closed shopping center, via coordination with Chiba prefectural authorities, and the site was reopened in a new form. Furthermore, there was also a case in the Hashigadai district, in which the residents' sense of settlement in the district was surveyed and attempts to improve the safety and livability of the district were made.

Next, we will describe the case of the district B's *Goraku-kai*, which ran the most popular stall at Narita Furusato-Matsuri. *Goraku-kai*'s members prepared a stock of prizes and operated a lottery tent where one play costs 100 yen. None of the lots were blank, so all players were sure to win a prize such as toys, drinks, or traditional candies. The day's proceeds were used to buy food and drinks for *Goraku-kai*'s members. One member told us that the purpose of running the stall

was not for profit but for the members' enjoyment. In this way, community activities can build friendships through operating stalls at the festival in addition to the groups' primary activities, and it can be said that this contributes to people's construction of social networks within the new town.

The sight of male residents actively working at the festival was also frequently observed outside of *Goraku-kai*. The existence of chiefly male organizations provides a chance for a broad range of generations to participate in community activities. Friendships between residents are cemented by running a stall with their fellow group members, and we can consider that male residents are cultivating feelings of attachment towards Narita new town via the opportunity of such friendships.

## 19.6 Characteristics of Community Activities in Narita New Town

### *19.6.1 Residents' Settlement and Frequency of Participation in Community Activities*

In Narita new town, differences in frequency of participation in regional activities can be seen by residential districts. Specifically, we observed a trend whereby the more long-term residents there were in a district, the higher the frequency of participation in both regional and group activities by residents. In districts containing many households that had been there for short durations, community activities had not developed fully, and frequency of participation in community activities within the district was low. Furthermore, when the period of home purchase coincides with marriage or birth and growth of children, it can be difficult to begin new regional activities, and the same trend was seen for group activities. Regarding friendships, the number of friends in the same district increased with the duration of residence, and we also observed a trend whereby short-term resident households had more friends from their college days or other relationships. This was affected by the residents' native regions as well as duration of residence. Because land and housing prices were booming at the initial stage of Narita new town's development and the commuter belt extended over a wide area during this period, residents included commuters to the Tokyo metropolitan area, Chiba city, and other locations. Land prices, however, have fallen since Japan's bubble economy, and influx from Narita city and surrounding areas is becoming prominent in addition to households employed by airport-affiliated businesses. It can be said that differences in the characteristics of residents, which are influenced by these types of changes in socioeconomic conditions, are affecting friendships.

### *19.6.2 Proximity Between Residences and Workplaces and the Participation of Male Residents in Community Activities*

In Narita new town, the participation of male residents in community activities was comparatively active. In addition to activities such as *Oyaji-no-kai* and *Goraku-kai*, male staff members of the federation of community associations could be seen devising plans and working hard toward developing the festival, interacting with residents, and making regional contributions.

Kimura (2006) elucidated the process whereby male retirees in suburban areas, seeking local points of contact after retirement, participate in regional activities. In general, most suburban residential developments in Japan were planned as commuter towns for workers who would travel to the urban centers of major cities, and most residents are the households of urban commuter company employees. Such workers tend not to participate in regional activities until they retire, and retirement is an opportunity to come into contact with their area. Furthermore, there was a trend towards utilizing the knowledge and experience cultivated during their working years to make regional contributions, not only to enrich their own lifestyles.

Because Narita new town is located 50 km from central Tokyo and close to the Narita International Airport, it was developed from its inception as an independent residential suburb based on close proximity between residences and the primary workplace. As a result, for most of male residents employed by airline companies or airport-affiliated businesses, there is no major separation between work-based interpersonal relationships and local interpersonal relationships, and the latter are often formed during their working years. Even for employees outside of airport-related industries, many households have workplaces within Narita city. Thus, conditions exist that allow work connections and local connections to be simultaneous. It can be said that because of this consistency, a characteristic of Narita new town is that many male residents have been easily able to create organizations and play active roles within their regions from their working years onwards.

Moreover, Narita Furusato-Matsuri plays a major role as an opportunity for strengthening the local connections of male residents who participate in regional activities during their working years. In other words, this is not merely a residential area with close proximity between residences and workplaces; the festival is functioning as an arena for residents to contribute to their own region. Furthermore, the efforts of city councilors from Narita new town and staff of the federation of community associations are a significant factor in developing the festival itself. Additionally, the airport is a major industry within Narita city; airport-affiliated businesses are an important element, not only through regularly supplying young workers to Narita new town as human resources for regional contribution but also through participating in regional events including the festival.

## 19.7 Conclusion

In this study, we aimed to consider the sustainability of residential suburbs with a progressively aging population via the elucidation of the characteristics of community activities in Narita new town. We conducted a questionnaire survey and interviews, resulting in the clarification of the following points.

For many residents of Narita new town, the heads of household were employed by companies in Chiba prefecture, particularly the Narita International Airport and its affiliated businesses, which enabled close proximity between workplaces and residences. Regarding the age composition of heads of households, roughly half were classified as family households, although there were greater numbers of elderly households in districts that residents had entered prior to the 1980s.

In Narita new town, the main community activities are those chiefly conducted by residents of each district, i.e., by community and neighborhood associations in coordination with public authorities for purposes such as enhancing the convenience of everyday life in each district, and also hobby and group activities that utilize facilities within Narita new town. Active participation in these activities was observed in detached housing districts with many long-term residents, whereas participation was passive in condominium housing among occupants with short durations of residence.

The study, however, confirmed the existence of activities such as the *Oyaji-no-kai* and *Goraku-kai* groups, which were participated in by male residents regardless of duration of residence. These groups were formed during the founders' working years, and they performed functions such as making regional contributions and strengthening the friendships between participants. Participation in the Narita Furusato-Matsuri festival played an important role as an opportunity for male residents to deepen local connections and develop feelings of attachment to Narita new town.

In Narita new town, male residents participated in community activities from their working years onward, and female residents actively participated in group activities. In contrast to the commuter town model, in which men are included in the community after retirement under female guidance, the independent Narita new town has arenas for respective activities by males and females, and a trend was observed in which male residents developed interactions such as group activities from the local connections they had made during their working years. In addition to independent locational factors, conditions had arisen that allowed for work and local connections to be simultaneous owing to the employment opportunities provided by the Narita International Airport, and this enabled male residents to participate in the community from an early stage. Via the rich cultivation of both community activities for enhancing the quality of life in Narita new town and group activities for intensifying interaction between residents, we can consider that Narita new town's livability has increased, and a town in which residents of diverse age structure and income brackets can live comfortably has been formed. Whether such characteristics apply to all new towns in the independent model of

residential suburbs is a question for future research. However, it was demonstrated that there are large differences between the forms of communities in the commuter town model of residential suburbs and those in the independent model, and at the same time, the importance of the existence of such proactive community activities in terms of the sustainability of residential suburbs was clarified.

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# Part IV
# Other Asian Mega Cities Experiences

# Chapter 20
# Singapore's Global City Challenges: National Identity, Cosmopolitan Aspirations, Migrant Requirements

**Victor R. Savage**

**Abstract** This paper argues that while urbanisation is an inevitable trend and process around the world, it carries with it the seeds of political discontent, social unrest and economic challenges. Even for a relatively politically stable city-state like Singapore, the exposure to global forces (globalisation; geopolitical changes; international economic competition) and national challenges (foreign labour; employment; health care, housing) is testing the political management and governance of its ruling party. The important urban trend is that second echelon cities (below eight million people) are likely in the coming decades to be the drivers and catalyst of development in the world and hence states need to move away from mega-city development.

**Keywords** Cosmopolitites • Different spaces • Global city • Second echelon cities • Urbanisation

## 20.1 Introduction

Urbanisation refers to the process of growth in population living in towns, sub-urban areas, cities and mega-cities as well as a new means of livelihood within the nucleated entities. It was only made possible by the agricultural revolution. The birth of cities developed in the Tigris and Euphrates River Valleys some 4,000 B.C. and now 6,000 years later, the urban revolution seems to be completing its course. The *Homo sapien* as an urban dweller is thus a new phenomenon that represents less than five percent of human history. The development of urban living was a slow process and shifted according to regional developments. In A.D. 1,000, the ten largest cities were in the Old World; by 1900 most of the largest cities were in industrial Western Europe and by 2000, the tropical developing world had seven of the top ten cities (Brown 2001). In 1600, only 1.6 % of Europe's population lived in

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cities of 100,000 inhabitants and by 1800, it was still only 2.2 % (Wolf 1982). By 1900, it was Britain that became the first urbanised society in the world. The rest of industrial Western Europe followed suit by the twentieth century when over 75 % of the population was classified as urban. Unlike the agrarian phase of dispersed settlements and land colonisation, the urban phase led to a reversal of human settlement patterns. With urbanisation, the population is concentrated and nucleated in specific nodes and centres. Urbanisation took off because of the capitalist mode of production, industrialisation and the development of wage labourers. In turn cities became integrated in "regional networks into worldwide orchestration" that "subjected them to a rhythm of global scope" (Wolf 1982). The separation of the city and rural spheres of living were thus twentieth-century developments. While agriculture created a general centrifugal spatial dispersal of population towards arable lands, urbanisation has been propelled by centripetal forces towards nodes, centres and places.

The speed at which urbanisation is taking place around the developing world and the sheer volume of population drifting into cities is unprecedented in human history. In the last 25 years, the poorer countries have witnessed phenomenal urban expansion. For example in 1980, 50 % of all urban dwellers lived in the 112 poorest countries but by 2005 it had increased to 62 % while only 38 % of urban dwellers lived in the richer 96 nations (Chafe 2007). In Asia alone 44 million people are added annually to cities. Urbanisation represents various important changes in society. Demographically speaking, the growth of urbanisation can only take place if food and agricultural production is efficient and effective.

In economic terms, urbanisation is a barometer of a country's per capita incomes: the correlation coefficient is around 0.75 and 0.80. Hence it is no wonder that the level of urbanisation is often seen as synonymous with economic development. The high urban levels in the developed world also correlate with the high per capita incomes. Cities were often seen as the innovators of human creative endeavours or the point of contact of foreign cultural innovative ideas that were diffused to other parts of a kingdom. This is what Fernand Braudel (1973) meant when he noted that towns are "electric transformers". Hence the American historian Donald Wyatt (1984) noted how twelfth-century Buddhism in Thailand transferred not only religion but also ideas on science, law, medicine and the letters through the Thai mandala royal cities. The global testimony of the economic value of cities today is based on the fact 84 % of global GDP comes from urban areas with 600 cities accounting for 60 % of GDP of which 50 % are in Asia (Lohani 2013).

The thesis in this essay is that the future of global urbanisation is positive and even optimistic but it requires 'national' political systems to catch up with global changes and traditional cultures must be given new expressions within a world culture. The future of cities is not going to be in mega-cities but in the massive growth and development of second echelon cities (below eight million) which will become the drivers of the global economy and set the benchmarks for urban quality living in the twenty-first century. Contrary to what Niall Ferguson (2012) argues that mega cities will "play a defining role in the twenty-first century", the reality on the ground is not so rosy for the future of mega-cities. According to Asian

Development Bank Vice President Dr Bindu Lohani, the current projections show that the current 23 mega cities (population of ten million and above) contribute to 14 % of the global GDP but by 2025 their share will drop to 10 %. On the other hand 577 second-tier cities will account for 50 % of the global GDP by 2025. Secondly, the more important development in urbanisation is the urban status of the city as a global and international city taking on events on a world stage and engaging in global economic flows. With globalisation, many second-tier regional cities can become global players adding to creative services, innovative designs, and state of the art industrial activities. New local ideas can be tested globally and the successful innovations can become global benchmarks. A more democratised global market allows for a plethora of many good ideas and innovations. The local resistance to global change can undermine a society's movement up the social ladder and enjoy better quality of living. Cities provide the locus for such possibilities provided environmental issues, widening social gaps, and quality social systems are managed well.

Singapore is a classic example of a second-tier global city which has become the arch-type electric transformer at a regional and global stage—a city not developed out of religious and spiritual influences but one catalysed by economic, cultural and strategic confluences. Singapore can never reasonably be a mega-city because it is limited by its island spatial size but it certainly has achieved global status. The reasons for Singapore's rise as a successful city-state have been told many times. But no city and polity is stagnant and now we see political problems and social challenges in Singapore which require a new compact between government and citizens and new methods for governance. This article thus aims at trying to identify the factors which give rise to the political tensions involved in making Singapore a global city and at the same time answering the nationalistic Singaporean demands of its resident population. These problems arise because Singapore has a twin status of being a global city as well as a city-state.

## 20.2 The Singapore Success Story

Cities like Singapore remain the catalyst for development by their global locus and regional positionality as innovative centres, power brokers, trading pivots, cultural magnets and economic dynamos. Singapore's success story to date underscores how effectively it has translated its urban development process into a global currency. Its city-state status has become an international brand and a benchmark for other cities and states in the developing world. Singapore's success story however is not without political stresses, economic challenges, social tensions and cultural strains.

Like other developing states around the world, the groundswell of social discontent is beginning to rear its head in Singapore politics as well. But this ground swell of mass social and political tensions has less to do with ineffective governance or political corruption and more to do with the inherent tensions of trying to

keep Singapore relevant in a global environment and at the same time meet its nationalistic obligations of its electorate. The government's traditional political prescription of 'command and control' might have handled past national challenges, but this time round, the issue of political management is a lot more difficult. Foreigners in Singapore are baffled by the Singaporean discontent given that the government is relatively uncorrupt, provides a good economic system, maintains low unemployment and produces generally all the social, cultural, environmental and political national goods.

Singapore's success story is best documented in its founding father, Lee Kuan Yew's (2010) book, *From Third World to First*. The accolades for Singapore continue to make headlines and news nearly every month. What is remarkable about Singapore's success story is not so much its changing status to First World development but the speed at which this change took place—in 50 years. Singapore's per capita income has moved from a mere US$1,000 in 1959 to over US$50,000 in 2012. It now ranks among the top 10 countries in the world in terms of per capita income based on both the World Bank and International Monetary Fund (IMF) global rankings. In 2013 Singapore's Finance Minister Tharman Shanmugaratnam was named the best Finance Minister of the Year by Euromoney magazine. In 2013, Singapore became Asia's largest forex centre and third largest in the world after London and New York. The Standard Chartered Development Index ranked Singapore fourth out of 31 countries for sustainable development in recognition for its education systems and ability to address climate change (Chan 2013). Singapore is also both a happy and peaceful city-state. Amongst the Chinese population in Mainland China, Hong Kong, Singapore and Taiwan, the Singapore Chinese are the "happiest" (Lee and Lai 2013). Of the 162 countries in the world Singapore is ranked as the 25 most peaceful country along with many of the developed countries in the West (Wee 2014, Global Peace Index).

What makes a developed state? On the one hand there are the hardware of a state—good infrastructure, quality bureaucratic institutions, good educational systems and the maintenance of infrastructure. On the other hand and perhaps more important is the development of software of the state—the quality of governance, the development and deft use of Nye's (2011) soft and smart power, and quality of skilled labour. Based on the ruling party's socialistic ideological leanings, the Singapore government invested in three highly subsidised activities: public health, housing and education. These are the pillars of Singapore's success story for its first 50 years. All three areas gave its multi-racial, multi-lingual and multi-religious society a common base.

The down side of Singapore's glowing success as a global city is underscored by its increasingly vocal local population, their increasing nationalistic interests and the fact its aging population lacks until recently the safety nets for a trouble-free retirement. The government in 2014 has introduced the health plans for the 'pioneer generation'—those above the age of mid-60s in 2014. Ironically the government's increasing drift to laissez-faire capitalistic interests in dealing with varied social goods has made Singaporeans increasingly nervous and worried about their future stake in the country. Just as good news about Singapore hits the mass media there is

equally troubling news that undergirds the worry in Singaporeans. In the 2013 IMD World Competitiveness poll Singapore slipped from third to fifth position (Foo 2013). Despite its growing aging population, Singapore faces a shortfall in nurses, with increasing numbers of foreigners (over 50 %) taking over the jobs. At the population growth side, Singapore had the slowest growth rate in 2013—its 1.6 % growth was the slowest in 9 years (Tham and Wong 2013). Environmental activists Geh Min wondered whether Singapore had become a "home or hotel" for Singaporeans. As she noted: "Singapore has evolved from a nation by chance to nationhood by choice. Let us not deteriorate into a city-state of convenience: a hotel rather than a home" (Geh 2013). To add to the Singaporean concerns of heavy traffic jams, packed commuter trains, long housing waits, rising costs and competition from foreigners for jobs, the government's White Paper proposal in February 2013 to increase the population to 6.9 million by 2020 created a frenzied howl from Singaporeans across a wide spectrum. The government had to go into damage control to temper local outrage and concerns of having more foreigners in Singapore. As Prime Minister Lee Hsien Loong noted in Parliament, the population projections are not cast in stone: "Beyond 2020, things are still vague. Nearer 2020, we will review population projections and policy settings again" (Lee 2013).

## 20.3 The Singapore Challenges

Foreigners find it difficult to imagine why Singaporeans are unhappy with their government and political system. Through foreign lens, Singapore is seen as a 'paradise' and human-developed utopia. But society is a product of complex forces—cultural, political, economic, historical, environmental and social which mix together and provide challenging combinations. For some, Singapore is a stressed free environment, for others it is a pressure cooker. The reasons for the Singapore political tensions are a product of three macro problems which are discussed below.

### *20.3.1 Global City Versus City-State*

Singapore is a unique country—it carries two identities at the same time. Comparisons of Singapore globally are thus complex. On the one hand, Singapore is a city aspiring all the time to be a "world" and "global" city. Emeritus Senior Minister Goh Chok Tong captured this dilemma best when he wondered what Singaporeans wanted: "Do we want to be a global city, or should Singapore be a regional centre?" (Wong 2013). On the other hand Singaporeans see themselves as a product of a state with nationalistic demands and needs. These two entities do not often jell and hence produce varied political tensions. As a global city, the government has to perpetually try to ensure Singapore is recognised internationally. This means that

Singapore is often compared and benched marked with other global cities like London, New York, Tokyo and Paris. This global city status however comes with a price. All global cities have cosmopolitan populations, are home to varied nationalities, are magnets for overseas migrants and labour refugees, and are open to global mass media. A global city cannot have a resident population that is overtly nationalistic and insular. It cannot have people who are xenophobic. A global city needs a resident population which prides itself as being culturally, religiously and racially tolerant.

This is a city of diverse foods and cuisines, varied cultural activities, a heterogeneous arts scene and openness to all types of people of varied social backgrounds. Like what French philosopher and sociologist Henri Lefebvre (1991) talks about in his 'production of space' the key identity of a city and more so a global city is "difference" and "contradictory space"—a spatial entity which is not reducible to a system but one that thrives on social and cultural differences of dispersion and repulsion, attraction and rejection, "apparent and real spaces", spaces of "domination and appropriation". In his words: ". . .that new space 'differential space'" as he calls it is different from abstract space which "tends towards homogeneity, towards the elimination of existing differences or peculiarities, a new space cannot be born (produced) unless it accentuates differences" (Lefebvre 1991).

If Singapore wants to become a global and world city, it needs to create the social and cultural environment that allows for 'differences' to thrive in its city and with its population. Only with this diverse political and social environment will Singapore create the right ingredients for creativity, innovation and an ability to remain a global leader in all its endeavours socially, culturally and economically. In short, 'differences' create new spaces and environments for a lively and thriving, city. Each foreign ethnic and cultural group which fertilises the work force, businesses and corporations, class rooms and tertiary institutes, places of worship, markets, shops and eating and drinking venues, festive occasions adds to the fecundity of a creative city. The multi-cultural flavors create the buzz in Singapore and enliven the urban landscape.

Yet this tolerance for 'differences' undergirds a more democratic political system: one that is responsive to other voices and criticisms of government policies. In Singapore, no one can deny that the political system is now more open than it was 15 years ago or even 10 years ago. This has been a product of both changes in governance and the technological revolution. The power of social media has become an independent voice of many unheard voice before—people of all sectors and ages comment, criticise and communicate on all matters. The power of social media provides an alternative to the print and non-print channels of information.

Maintaining a global city has quite different requirements for keeping a national population happy and under control. As a city-state Singapore has little choice. Unlike London and New York which fall within wider state territories, Singapore has no real state boundaries except its city-state borders. Yet the influx of foreigners in Singapore which characterise its global city status has a down side to Singaporean perceptions. As a state, Singaporeans want national privileges—it wants special treatment from its large reservoir of foreigners. Singaporeans who have been

brought up under the umbrella of meritocracy want ironically affirmative action to be practiced. Given the government's persistence of gung-ho political agendas have created major political schisms between the electorate and the ruling party. The old school political style of Lee Kuan Yew's "conviction politics" (followed by I know best what to do) is no more valid amongst Singaporeans. The unanswered political national demands which fell on the government deaf ears have cost the government seats in the 2011 general elections and the 2012 by-election in Ponggol East. Singaporeans want a Singaporean Singapore—where policies are tailored for the welfare and benefit of Singaporeans. Yet in a global city where social justice must underpin democratic rights the question is whether foreign workers are treated fairly. There is no doubt that Singapore's current success cannot be achieved without foreign workers support. The aging population of Singaporeans coupled with its poor fertility rates creates a major labour crunch. Singapore needs a lot more health care and service industry workers if it is to maintain a socially sustainable system and to compete successfully as a global city. The ideas that foreign workers are seen as threats to jobs and employment, viewed as cheap labour and hence denying Singaporeans from higher paid incomes have to be tempered with economic reality. The change in the economic system to higher paid local jobs no doubt will help but the shortage of labour in key social and economic areas cannot be circumvented by blind nationalistic demands.

### *20.3.2 The Changing Political Environment*

The November 2013 there was wide spread debate in the social media on a former top civil servant Ngiam Tong Dow's comments on the political system and government. At first sight Ngiam seemed to be parroting the general public consensus about the government's challenges in dealing with the many national problems that have arisen of late. Though Ngiam has changed his views, he felt the cabinet members today lacked the same political courage and vision to deal with problems as in the past—clearly he felt the old generation was more vocal in the past. In short, he felt that the old guard politicians were bolder in vision and the current leaders were cautious. But on closer examination, this view seems to be a rather simplistic reflection of the situation then and now. While I am not endorsing the government's criticisms of Ngiam's views, comparing time periods or different countries and cultures is not always an easy task and in many cases can be erroneous.

The political environment in Singapore has greatly changed over the last two decades and making comparisons of past and present is not so simple unless we accept everything has remained constant. Three important changes have taken place which has altered the political landscape in Singapore. Firstly, Singapore has since 1959 been developing at breakneck speed with many double digit growth figures annually and per capita incomes of Singapore have risen dramatically. This has indeed helped to undergird a massive change in Singapore society in a short span of time. Singaporeans today are more affluent, educated, well informed and

travelled and clearly more vocal about issues. Singaporeans in general are not living merely on bread and butter issues. This means that government leaders are put on their toes with regard to national issues. Convincing the Singapore public is no easy task on any national issue—Singaporeans, young and old are independent thinkers.

Despite the seeming wealth of the city-state in per capita income, Singapore's Gini coefficient (0.46) is similar to many developing countries rather than the developed countries in Europe (Koh 2013). Singapore's bus drivers and cleaners for example earn one quarter of what their compatriots earn in Denmark, Finland. Norway and Sweden (Koh 2013). This means that Singapore's population faces wide disparities of wealth which is a disturbing sign for future political and social stability of the city-state.

Secondly, the technological revolution in mass communication has meant that information travels widely and quickly on all issues by email, Twitter, SMS, Facebook and other forms of communication and social media. Hence any politician has to think twice about liberally making statements because any wrong statement could go viral and lead to a mass media storm. Thirdly, as Singapore has gone up the value chain as a country, the competition to stay afloat is challenging. The government is no more competing with other developing countries but with developed economies and well educated and skilled working populations. To be a cabinet minister is a lot more difficult today when one has to think of sustaining Singapore's economic advantage and ensuring the state remains sustainable. All these three issues make Lee Kuan Yew's "conviction" politics a lot more daunting and difficult to maintain in the current domestic and international milieu. Increasingly the ruling party has to play more to the electorate gallery, even if current leaders say they do not. If the current leadership wants to win votes it has to 'play politics' and not maintain a moral high ground or just try to win a political debate and argument.

Singapore today has a different challenge. Regionally, its neighbours still view her economic prowess and international ascendency with concern and sometimes jaded eyes. Internationally Singapore has to cope with a more fluid international political landscape. It was easier dealing with international relations in a bi-power world under the Cold War period. Today with a more diversified multi-power system, Singapore has to maintain its relations evenly over a broader spectrum of regional and international states with influence. Keeping especially equal-distance between two countries such as China and the US is a difficult political tight-rope to navigate. China is closer to home and wants the region as its geopolitical turf; America is further away but in the Singaporean leadership's eyes is clearly an important global power with enormous intellectual punch. Hence the Singapore leaders today have to be deft politicians with considerable political skills in negotiating an international mine-field of varied power relationships. Moreover keeping this international perspective in mind and responding to a more articulate and aggressive population is not easy. It is difficult for Singaporeans to also understand the nuanced complexity of Singapore's international and regional political challenges. While national policies need to be synchronised with the global political scenario Singaporeans have focused their attention on domestic national problems at an end in itself.

### 20.3.3 Singapore Cultural Challenges: Foreigners Versus Heart-Landers

The crux of Singapore's evolving culture lies with how Singaporeans view migrants and foreigners. Ironically while the city-state is made up of predominantly migrants, current 'Singaporeans' have become hostile and uneasy with the new wave of immigrants and labour migrants from China, India, the rest of Asia and further a field. In his recent July 2013 play, *Cook A Pot of Curry* Malay playright, Alfian Sa'at, provided vignettes of different cultural clashes in Singapore between foreigners and the local population. The first scene opens with the issue of how a Chinese family quarreled with their Indian neighbour because they could not stand the smell of curry—forcing the Indian family to cook curries only when the Chinese family was not home. But the most poignant part of the play was about the Malays in Singapore. The play demonstrates that while current Chinese Singaporeans take umbrage about new immigrants, they are oblivious to how Singapore's Malays have been feeling all this time when their island had been usurped by immigrants since the time of Raffles' landing.

Historically speaking, Singapore is an immigrant society like the United States and Australia—but while the US keeps taking on immigrants readily, Singaporeans are less welcoming about new migrants. The tensions of immigration and foreign migrants continue to bedevil local politics and there is resentment from Singaporeans about foreigners populating the city-state and taking on jobs. Yet, for a 'global' and international city, the 'nationalistic' stirrings from Singaporeans seem difficult to comprehend. Many foreigners say that London and New York are more cosmopolitan and accepting of migrants than Singapore. Foreign residents feel uneasy in Singapore—certainly even close neighbours like Malaysians feel cautious about declaring they are Malaysians for fear of some local negative rebuttal.

The politics in Singapore seem to be based on heartlanders versus cosmopolites, local versus foreigners, global versus national perspectives—political schisms which are equally worrying for sustaining Singapore at a globally competitive edge. In an aging society, Singaporeans need to worry about political 'myopic' models elsewhere which are certainly not right. In Japan, nationalism has overtaken the forces of globalization—the result is a moribund economy for over 25 years. Even as Asian voices seem to lend weight to the idea of "Asia Rising' in the twenty-first century (Mahubhani 2008), the creative, innovative and dynamic economy of the United States cannot be overlooked or marginalised. The West still commands a massive advantage in intellectual power, which the World Bank notes is the sustainable mainstay of the developed countries—77 % of global wealth comes from intellectual power. In the top 20 Universities in the World, nearly 90 % are found in the developed West—Asia has only a couple of Universities which are ranked in the top 20. Furthermore the discovery of shale gas in the US has added a huge impetus to the American economy—rebooting its business and positive economic outlook for the twenty-first century. The American economic and intellectual dynamism comes no

less from its openness to foreigners, its migrant society, its cosmopolitan outlook, its democratic system and its international engagements.

Singapore's future as a modern city that is known to punch above its weight will not lie in increasing political myopia and cultural xenophobia. Singaporeans need to compete with foreigners and engage the larger international community in order to safeguard its global city status and its economic sustainability. All cities need this openness to ideas, peoples, talents, innovations, cultural change and economic competition to remain globally relevant. The world is a much more interrelated village than it has ever been in its whole history—people and organisms are being transported around in greater numbers and more quickly. Information is more difficult to contain and kept 'secret' with social media and IT-related instantaneous devices.

The global information environment changes state diplomacy and international relationships. In the *Tommy Koh reader*, Ambassador Koh (2013) argues against the Morgenthau 'realist' paradigm of the 'territorial state' where power and foreign policy relationships tend to be geographically deterministic and argues that small city-states like Singapore can in fact have global significance way above its geographical size. But this means the government and diplomats of Singapore have had to do a lot more work in international conferences, meeting circuits and international media networks to ensure the tiny Republic is on the global radar screens and actively engaged in international forums. Tommy Koh like many of Singapore's leaders while accepting at times environmental determinism, have politically put their faith in 'environmental possibilism'—the idea that through science, technology, institutions, efficient management and good governance, society and peoples don't have to be prisoners of their geographical limitations. Hence unlike large countries that can rely on their geographical size, natural resources and military power, small city-states like Singapore have to rely on their diplomatic skills, knowledge power, leadership prowess and pragmatic policies to ride the rough international political currents and volatile economic changes. Singapore is fortunate thus far to have a percipient leadership and good governance—it is difficult to say what will happen in future.

This does not mean however all social media and democratic systems are a blessing for societies. They can be also powerful forces in political instability and a means of undermining institutions and governments. More freedom does not necessarily translate to more democracy, greater transparency and better social stability. As Fareed Zakaria (2007) argues in his book on the freedom of democracy, the trend towards "illiberal democracy" is undermining freedoms and democracy even in America because groups with sectarian interests (religious, economic, social, cultural) are championing their causes with little respect for ensuring the national 'common good'. This thesis undermines British historian, Niall Ferguson's (2012) argument that the future of the world lies in better institutionalization and in particular democratic institutions.

In Singapore, the Prime Minister's 2013 National Day rally speech has come back to its earlier socialistic paradigms. After two decades of flirting with liberal capitalistic initiatives, the government is coming back to offering its citizens its

political well tested menu of socialist's prescriptions: subsidized housing, life-long health care and good subsidised education. These are clear social safety net winners and the government has come back to its political and ideological roots. The speech was publicly well received and there seems to be some political quiet. But the translation of political intent needs to be implemented quickly and fairly.

## 20.4 Reflections

The global trend towards population agglomerations and urbanisation is an inevitable process that will accelerate in the twenty-first century. With greater technological revolutions in transport, energy, housing, and health, dense populations have better chances of enjoying an economy of size, better access to social (education, health) and cultural (theatres, cinemas, museums, festivals) amenities and diverse opportunities for work in towns and cities. But cities cannot be allowed to grow spontaneously. Cities need to be properly planned to ensure the urban populations are cared for and enjoy a better quality of life. Relying on market forces clearly provides for volatile situations of contraction and expansion of cities and leads inevitably to major Clearly the current figures of life expectancy demonstrate that nowhere in human history has there been a better quality of life than currently. Life expectancy has increased from 35 years in the nineteenth century to 67 years in 2000 (Lomborg 2001).

The worrying trend of growing urbanization however is twofold. Firstly, will mega cities become an increasing norm in the twenty-first century? Can governments manage such massive agglomerations of population which will require social, cultural, health, economic and environmental services needed to prevent human disasters? Or will mega cities revert to being human disasters and create ungovernable situations of mega proportions? Fortunately the figures show a decreasing importance in mega cities in the future and hopefully other second-tier cities will rise and create a more democratic distribution of global urbanisation. Smaller cities will provide more manageable systems, responsive political institutions, easily managed planning projects and at the same time ensure a competition for services and goods at the global level. This gives hope to the many second-tier cities in Asia, India, China, the Middle East and Southeast Asia.

Secondly, the biggest threat to global urbanisation trends lies within cities. City governments and residents are their own biggest enemies. While in the past global events changed the course of the rise and fall of cities, today the rise and fall of cities will depend on the political entrepreneurship of governments and political leaders. Take the classic example of the city of Bilbao. It rose out of the ashes of a fallen industrial base with the foresight and tenacity of its mayor to invest in a museum of fine arts. Against all public odds, he decided to pay huge amounts of money to architect Frank Geary to build the Guggenheim art museum which rejuvenated the city and its economic renewal—the rest is now history.

Yet maintaining the relevance and sustainability of a city is no easy task. In Singapore the government is perpetually re-inventing itself to ensure it remains a

global city—international in outlook, global in relationships, and cosmopolitan in cultural interests. Singapore's Achilles heel is its resident citizen population—if it clamours for greater nationalistic concerns it will undermine the goose that has laid the golden eggs for several decades. With success come also the seeds of destruction. If Singaporeans become too insular, nationalistic and too smug about their success as a global city-state, it could very well reverse the trend it has so painstakingly developed. Clearly while the government is highly ranked for its preparedness for change, its society is less prepared so. According to KPMG's "Change Readiness Index" (CRI), in the analysis of 90 countries Singapore tops the list as a country most prepared for "change"—yet these rankings for change are for "enterprise" and "government" and less so for "people and civil society" (Quah 2013). Much of Singapore's success lies with global perceptions of what it represents and this can be easily damaged—and spiral downwards will be faster than development upwards. Ireland is a good example of how within 3 months its whole economic buoyancy and confidence was reversed. What spooked its economic confidence? Clearly that confidence was fragile and easily damaged in global eyes.

In Singapore, the current cascading impacts of globalisation, migrant labour imports, internet and smart phone social media, global–local tensions, its aging population, and widening disparities of wealth have conjured in the Singaporean mentality social discontent and a political tinderbox for political change. The Singapore software of more inclusive governance needs closer restructuring. The city-state government needs to manage these issues carefully and urgently. Indeed as Aung San Suu Kyi noted in her visit to Singapore in September 2013, Singapore could learn from Myanmar about human relationships: "Perhaps Singapore could learn from us a more relaxed way of life. Perhaps warmer and closer family relationships" (Au Yong 2013). Hence the political leaders have to ensure that the economic thrust and equation of Singapore's stellar development needs to be tempered with other social and cultural concerns. Singaporeans must have a good social safety net for retirement and for the underprivileged and at the same time continue to set its eyes on the global market and maintain itself as a confident thriving city-state on the international radar screens. At the end of the day all political issues are relative and Singapore vis-a-viz other global cities and governments have to be understood and managed within their own national systems.

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# Chapter 21
# Spatial Dynamics of the Automobile Industry in the Extended Bangkok Metropolitan Region

**Yoshimi Une**

**Abstract** This chapter aims to reveal the spatial dynamics in the Expanded Bangkok Metropolitan Region, through analyzing the development of industrial estates and the geographical expansion of automobile industries centered on Japanese firms. In Thailand, Development of industrial estates in private sector has been more active, compared to public sector. It causes competitions for industrial estate developments. In addition, the industrialization of Eastern Seaboard region initiated by the government has promoted the economic development. As a result, many industrial estates have developed in the Extended Bangkok Metropolitan Region (EBMR). Thailand has developed automobile manufacturers since 1960s centering on Japanese firms. Japanese automobile manufacturer firms considered Thailand as being central to Southeast Asia as a whole, and from the latter half of 1990s the base for exports to global market. In response to this initiative, many automobile component suppliers, both Japanese and local, have established their facilities in Thailand. The sites they chose were mainly located in newly developed industrial estates in the suburbs of Bangkok Metropolitan Region. Increase of Foreign Direct Investment (FDI) into major cities of Southeast Asia after 1980s caused such phenomena as concentration of business operations and increasing population of the new middle class occurring at the heart of such cities, as well as development of industrial estates and expansion of urban areas. Konagaya (1997, 1999) named this sort of new urbanization as "FDI driven New Middle Class City". While Konagaya (1997, 1999) proposed this concept keeping Jakarta Metropolitan Region in mind, this can be applied to explain phenomena observed in Bangkok Metropolitan Region (BMR) as well. Among others, the automobile industries in Thailand are considered to have contributed much to the expansion of BMR. This is because the industry generally requires various related industries situated nearby and, combined together, their expansion has had an enormous influence over regional economy. In fact, Thailand's automobile industries have developed mainly driven by FDI, especially from Japan. Many Japanese automobile firms and parts suppliers are

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located in industrial estates in the suburbs of BMR. In this chapter, attempts are made to reveal the spatial dynamics in the EMBR, through analyzing the development of industrial estates and the geographical expansion of automobile industries centered on Japanese firms.

**Keywords** Automobile industry • Economic development of suburbs • Industrial estate • Japanese automobile firms • Spatial dynamics

## 21.1 Expansion of Bangkok Metropolitan Region and Industrial Decentralization Policy

### *21.1.1 Increase in Population of Bangkok Metropolitan Region*

Thailand is a typical example where its capital (Bangkok) is the primate city. Population, economic and other activities are heavily concentrated on Bangkok and its suburban provinces, creating a sharp disparity between such area and other regions of Thailand. Robinson (1995) designated the capital Bangkok and its adjacent five provinces as "Bangkok Metropolitan Region" (BMR) and the area after adding other provinces of Saraburi, Ayutthaya, Samut Songkhram, Ratchaburi, Petchaburi, Chachoengsao, Chonburi and Rayong province as "Extended Bangkok Metropolitan Region" (Robinson 1995) (Fig. 21.1). Figure 21.2 shows the transition of population in these regions. Clearly, the increase in population of Thailand firstly took place in the BMR and expanded into its suburban areas. Such population

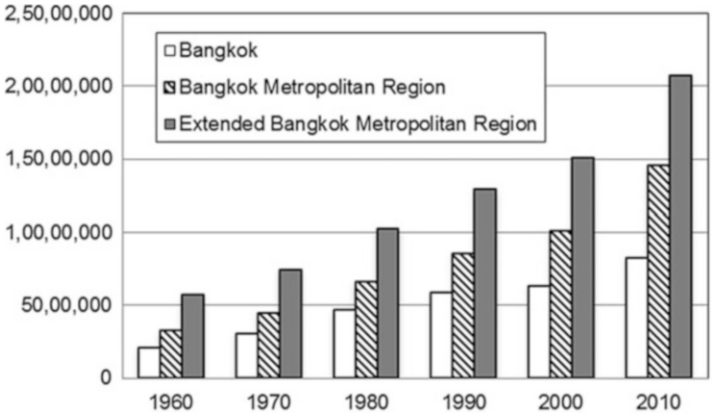


**Fig. 21.1** Population change in the Bangkok regional structure. *Notes:* Bangkok Metropolitan Region = Bangkok, Nonthaburi, Samut Prakan, Pathum Thani, Samut Sakhon and Nakhon Pathom province. Extended Bangkok Metropolitan Region = Bangkok Metropolitan Region, Saraburi, Ayutthaya, Samut Songkhram, Ratchaburi, Petchaburi, Chachoengsao, Chonburi and Rayong. *Source:* National Statistical Office Thailand (1960, 1970, 1980, 1990, 2000, 2010) Population and Housing Census

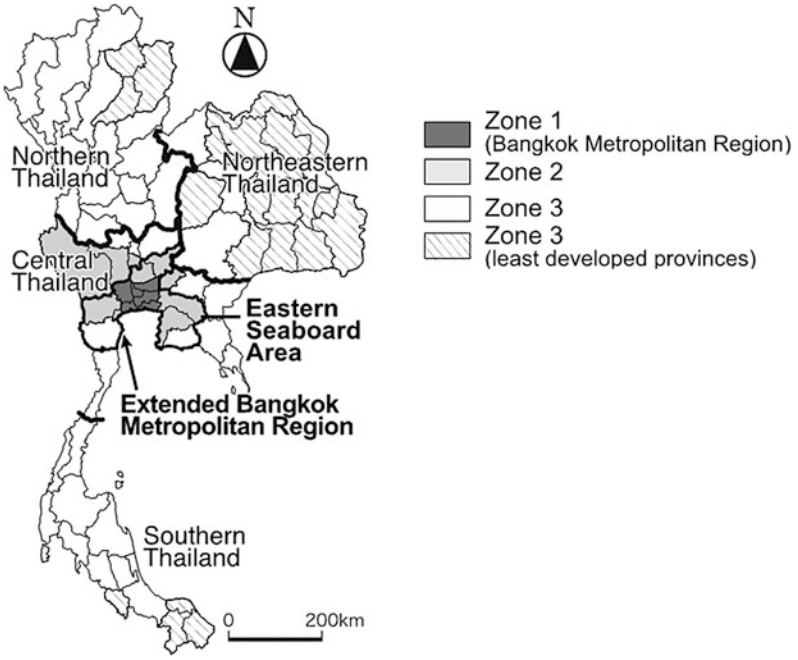


**Fig. 21.2** Zone structure and regional spatial structure in Thailand. *Source:* Robinson (1995)

increase was made possible by the development of social and industrial infrastructure such as expressways and industrial estates, the industrial decentralization policy and Eastern Seaboard Area Project initiated by the government.

### *21.1.2 Development of Industrial Estate and Industrial Decentralization Policy of Thailand*

Thailand has achieved its industrialization and economic growth through implementing programs for promoting foreign capitals. Main places where foreign firms made investments were industrial estates. The country aimed at industrialization through equipping industrial estates with infrastructures and then attracted foreign manufacturing industries into them. Those estates not only promoted industrialization of adjacent rural areas but also contributed to the economic development of suburban areas of the BMR.

The progress in the development of industrial estates in Thailand has been closely related to the government's policy for industrial decentralization. Two government programs mainly promoted the industrial decentralization. One was Eastern Seaboard Area Project as part of its Fifth and Sixth Economic and Social Development Plan. The other was the addition of a zone system into the Investment

Promotion Act. These are two important programs that significantly influenced the formation of industrial estates and their spatial arrangements in the country.

First, the Board of Investment (BOI) is the public authority to attract industrial investments in Thailand. Incentives by BOI are not granted to each firm but to each industrial development project. And, not all of development projects are entitled to the incentives; only the designated industrial sectors[1] are subject to possible incentives. Since 1980s, concentration of people, assets and money into BMR became intense due to the rapid economic growth. To cope with this, the government, through BOI, implemented full-scale industrial decentralization policies by introducing the zone system in the Investment Promotion Act from 1987. The zone system divides the country into three regions and grants more attractive incentives with increasing distance from the BMR. In addition, the system differentiates industrial sites inside industrial estates from those outside the estates although they are in the same zone, by granting the former more attractive incentives (Fig. 21.1). Zone1 is for the BMR. Zone2 consists of adjacent provinces to Zone1 and Phuket Province widely known for its sightseeing industry, with the total of 12 provinces. All other 58 provinces belong to Zone3. Inside Zone3, some least developed provinces offer the most attractive incentives, regardless of whether an industrial site is inside a designated industrial estate. Principal incentives under the investment promotion program by BOI include lower rates or exemption of corporate income tax, import duties on machinery and import duties on raw materials and parts that are assembled into exporting goods. Each rates or exemption and its effective period are determined by the zone and whether an applicable facility is located inside the industrial estate. Additional incentives are granted regardless of location or the zone, such as allowing total equity ownership by foreign capitals and relaxed criteria and procedures for obtaining work permit for foreign experts and engineers.

Eastern Seaboard Area Project is as important as the zone system in terms of Thailand's industrial decentralization policy. National projects of Thailand are named as "National Economic and Social Development Plan" and have been implemented since 1961. It was under the fifth and sixth National Economic and Social Development Plan (1982–1991) that the Eastern Seaboard Area (Chachoengsao, Chonburi and Rayong province) Project was implemented. Its objective was to mitigate the excessive concentration of industries into BMR and to establish a new industrial structure, through developing the area located southeast of Bangkok (Kaothien 1995). Its core projects are development of petrochemical industry in Map Ta Phut area at Rayong, construction of international seaport in Laem Chabang area at Chonburi and development of assembly manufacturers for utilizing the seaport. In addition, infrastructures such as an expressway linking the area with Bangkok and an electric power plant were constructed as part of the

[1] Seven industrial sectors with total of 154 subcategories (i.e. Agriculture and agricultural products; mining, ceramics and basic materials; the light industries; metal product, machinery and transportation apparatus; electronic and electrical components; chemistry, paper and plastic; service and public accommodation) are designated as of February 2009.

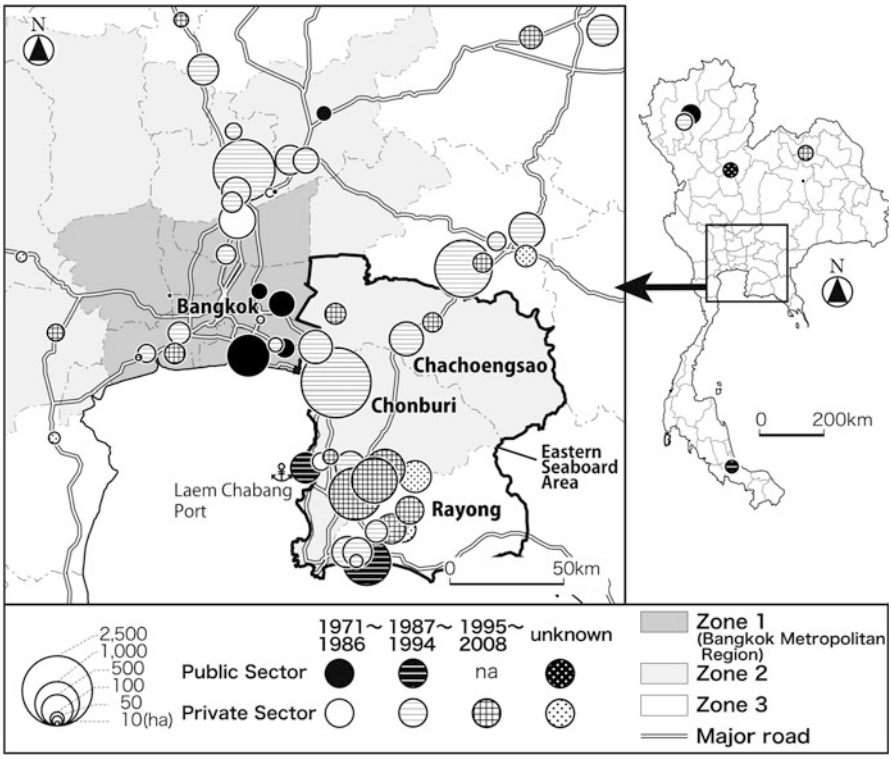


**Fig. 21.3** Spatial pattern of industrial estate in Thailand. *Source:* Website of Industrial Estate Authority of Thailand, Board of Investment and ASEAN-Japan Centre, AIPICARU (1996), JETRO (2002, 2004)

project. As discussed above, the government of Thailand, on one hand, introduced the zone system whereby nation-wide industrial decentralization and introduction of industries into the industrial estates were promoted, while on the other hand the government prioritized the development of new industrial infrastructure in the eastern seaboard area through the Eastern Seaboard Area Project, in an aim of forming a newly industrialized region that can be an alternative to BMR. As a result, numerous industrial estates have been developed in the eastern seaboard area which enjoys both of government incentive programs.

## 21.2 Geographical and Social Attributes of Industrial Estates

Until 1980s, there were no more than ten industrial estates located inside the BMR (Fig. 21.3). At that time, public sector developers played the central role of establishing such estates. However, in 1987, these circumstances changed drastically

and the estate developments entered the new era. The government introduced the zone system and initiated the Eastern Seaboard Area Project as mentioned earlier, in an aim to mitigate the excessive concentration of industries into the BMR, which had become apparent during 1980s. As a result, development of new industrial estates conducted by private sector developers became brisk in the suburbs of the Region since the latter half of 1980s. Among others, such developments were concentrated on the Eastern Seaboard Area. Since the latter half of 1990s, growth in the number of newly started developments has slowed down due to the Asian currency and economic crisis. Nevertheless, expansions of sites within the existing estates have continued. Total number of industrial estates stands at 68, as of 2008.

Approximately 90 % of industrial estates have been developed by the private sector. Among such developers, eight of them have established more than one estates. These large-scale developers have been the driving force of industrial estate development in Thailand. In the meantime, those estates by the public sector have been developed as part of government's program in an aim of industrializing the less developed regions.

Hemaraj Group and Amata Group are the two typical large-scale private developers. They have striven to differentiate themselves through specializing in areas where they have advantages. Hemaraj Group focuses on development and management of industrial estates in the southern part of eastern seaboard area as well as introducing automobile related industries. In addition to such development projects run by itself, it acquired some industrial estates in the southern part of eastern seaboard area that had been under different ownership, thereby intensifying its orientation and specialization in developing the area. Amata Group, on the other hand, focuses on attracting investment by Japanese manufacturers which have the highest number of firms and amount of capital. Many of Japanese automobile firms and their suppliers have their facilities in the group's industrial estates.

## 21.3 Automobile Industry in Thailand: Its Development and Footprints

### *21.3.1 Outline of Automobile Industry in Southeast Asia*

During 1960s and 1970s, the "ASEAN 4" (Thailand, Indonesia, Malaysia and Philippines) countries initiated government programs for the domestic production of automobiles and started such production through attracting investments by foreign automobile firms, chiefly Japanese. Still after the year 2000, Japanese firms have generally been the primary sector in automobile industries of these countries and therefore business strategies of Japanese and other foreign multinational firms have had considerable influence over the automobile industries as a whole.

Until the middle of 1980s, the production in the ASEAN 4 was less than 100,000 units for each and mainly for their domestic markets. In the latter half of 1980s, the

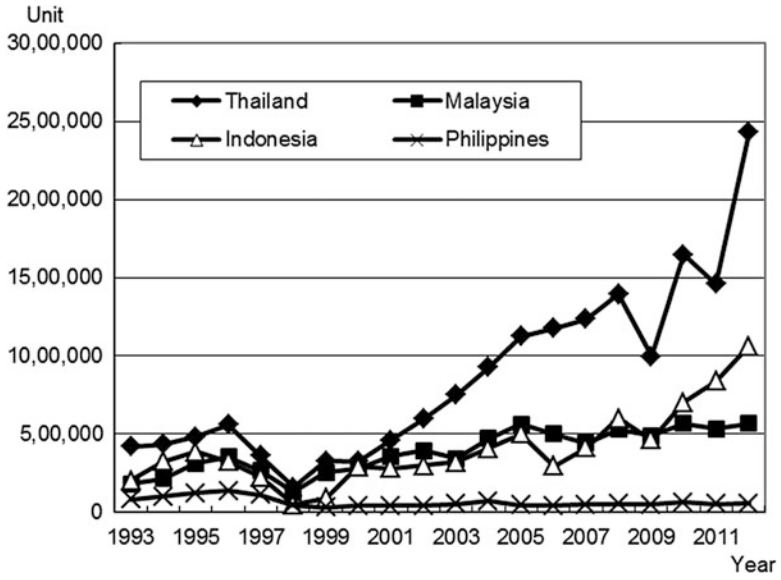


**Fig. 21.4** Trend of production volume in Thailand, Malaysia, Indonesia and Philippines. *Source:* International Organization of Motor Vehicle Manufacturers (2014)

production volumes began to increase, boosted by their rapid economic growths. The increase continued steadily into the middle of 1990s, until being seriously hit by the Asian currency and economic crisis in 1997 (Fig. 21.4). The crisis pushed down the production drastically and, above all, the drop of production in volume in 1998 was so steep that the number of units for the year fell as low as the level of 10 years earlier. However, the economies began to recover and grow again around 2000s, and so did the numbers, regaining in 2005 the level of production equivalent to the one in pre-crisis period. Among other countries, the growth in Thailand since the year 2000 has been remarkable, surpassing all other countries in Southeast Asia.

### *21.3.2 The Asian Currency and Economic Crisis and Thailand's Export Drive of Automobiles to World Markets*

The Asian currency and economic crisis drastically pushed down domestic production and sales of automobiles and compelled Thailand's auto industry to realign its strategies. In fact, domestic production and sales in the country in 1996 had been 559,428 units and 589,126 units respectively but they dropped 158,130 and 144,065 respectively in 1998. This caused Japanese auto makers to drastically cut down their operations at assembly lines, since they had targeted the domestic market and expanded the production capacity in the course of the country's rapid economic growth.

To cope with this situation, each firm took such measures as having the manufacturing work transferred from their parent firm in Japan or laying off workers (Japanese Chamber of Commerce, Bangkok 2003). Thailand government, for its part, implemented economic stimulus policies including lowering personal income tax and offering monetary assistances to small and medium sized enterprises. And, more importantly, Japanese auto makers redesigned their strategies toward operations in the country. Under the new strategy, those Thailand facilities would now be utilized to assemble automobiles for exports (Mizuho Research Institute 2003). As a result, they are now playing the role as exporters of compact cars and 1-ton pickup trucks to global markets, driving the rapid increase in automobile production volume in the country since 1999.

In the meantime, the automobile industry in Southeast Asia centering on Japanese auto makers have established mutually complementary production networks of parts and finished cars, utilizing the regional free trade system such as AFTA. Thailand plays a key role in the regional production network of automobile productions. Japanese auto makers, having established their production facilities around Southeast Asia, get their key components manufactured in Philippines or Indonesia and transport them to Thailand for final assembly and exports. In this entire production network, Thailand is functioning as a key exporting location as well as a hub of automobile industry network in Southeast Asia.

## 21.4 Spatial Development of Automobile Industries in Thailand

### *21.4.1 Geographical Expansion of Japanese Automobile Manufacturers*

As of 2013, there are 21 automobile manufacturers with 24 facilities in total. Japanese firms account for 10 firms with 13 facilities in the total. The rest are European or American multinational automobile firms or locally-owned firms operate as contract manufacturers for them.

The peak periods of the facility establishments were 1960s and 1990s. The former were in response to Industrial investment Promotion Act enacted in 1960 and centered on the BMR (Fig. 21.5). The latter were triggered by the lifting of barrier by the government in 1993 on the establishment of new automobile assembly facilities. The new facilities built in 1990s were categorized into those established by firms making their first entry into Thailand, or those added as the second factory by the firms that had already existed there. To focus on those constructed during 1990s, all of them chose industrial estates in suburban areas of BMR as their locations.

Shifting of locations outside the metropolitan area can be attributed to the "push" factor in order to avoid disadvantages of excessive concentration including chronic

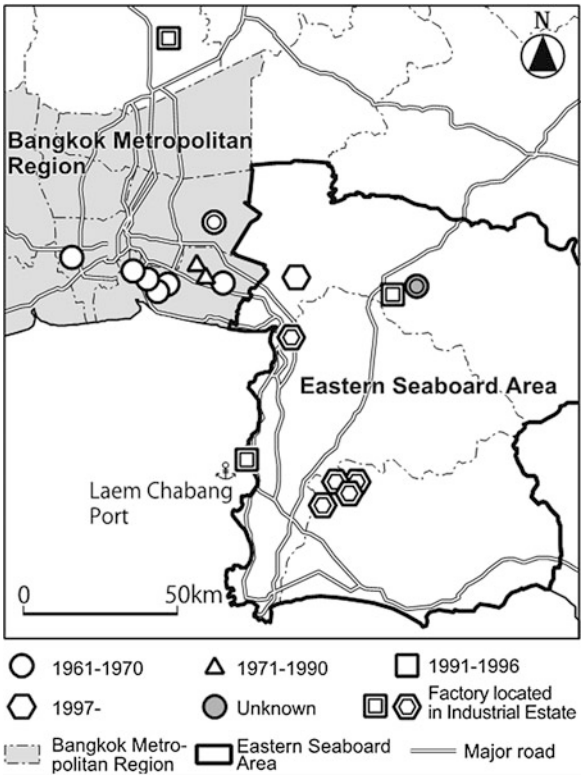


**Fig. 21.5** Locations of automobile assembly plants in Thailand. *Source:* Japanese Chamber of Commerce, Bangkok (2003), Field Survey (2003–2008)

traffic congestion, shortage of land and skyrocketing land prices, and the "pull" factors from suburban areas by new industrial estates, construction of expressways and the zone system introduced by BOI. Among other regions, Eastern Seaboard had advantages of having its industrial estates close to each other and a nearby Laem Chabang Port which is the largest cargo seaport of the country. Automobile manufacturers valued these advantages highly and therefore chose this region as the site for their new facilities.

### *21.4.2 Locations and their Expansions of Japanese Automobile Parts Suppliers*

Japanese automobile parts suppliers began their advancements into Thailand from 1960s, as automobile manufacturers did. Looking back on how they selected sites for facilities development, two turning points are observed as to the characteristics of such selections. First turning point was in 1988 following the year when BOI introduced the zone system. Second was in 1993 when the government lifted the barrier to the establishment of new automobile assembly facilities.

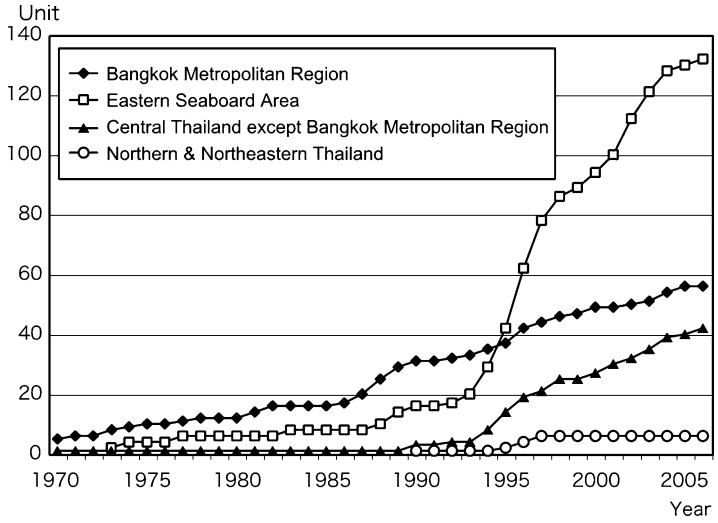


**Fig. 21.6** Transition of Japanese automobile parts films in Thailand. *Source*: Toyo Keizai (2007)

As Lecler (2002) pointed out, until around 1987, main locations for Japanese automobile parts suppliers were inside the BMR and few of them were in other regions (Fig. 21.6). Since 1988, however, the number of such Japanese suppliers began to increase remarkably. Those new facilities were mainly located inside the BMR, but advancements into the Eastern Seaboard Region increased as well.

After the second turning point in 1993, the number of new supplier firms making their advancements and their locations showed drastic changes from before. As many as 109 new firms made their entries into the country in just 5 years until 1995 and most of them landed at the eastern seaboard. Advances into the BMR, on the other hand, did not increase as much as before, so that the eastern seaboard surpassed Bangkok in 1995, in terms of the number of newly established manufacturing facility.

Two factors can be pointed out as causes for such a rapid increase of Japanese suppliers at that time. First, the unprecedented appreciation of Yen at the time seriously deteriorated price competitiveness of exports from Japan and made it inevitable for Japanese firms to begin or accelerate offshore production. In addition, the demand for local production in Thailand increased as more and more automobile manufacturers began to construct or announced their plans to construct their facilities in the country, stimulated by the peaking economic growth and the lifting of the barrier to the establishment of new automobile assembly facilities in 1993. It can be concluded that these were the background of the rapid advancement and expansion of Japanese automobile parts suppliers into Thailand. Further, many of them made their entries into the eastern seaboard region where they can enjoy incentives granted by BOI as part of the zone system and where new automobile assembly plants were being constructed.

Many of Japanese automobile parts suppliers in the suburbs of BMR are located in industrial estates. They account for 80 % of the total and the percentage has got higher as time went by. Especially in the Eastern Seaboard region, 121 firms out of the total of 132 are located inside industrial estates. The ratio for the BMR, by contrast, is low at 48 %. Another characteristics for the Japanese firms are that they are concentrated in specific estates such as Amata Nakorn or Eastern Seaboard. In the meantime, many of Thai firms are located in the BMR such as the Bangkok capital, and not in industrial estates.

## 21.5 Conclusion

Thailand has developed automobile manufacturers since 1960s centering on Japanese firms and is now one of the biggest car producing countries in Asia. Each of the Japanese automobile manufacturers firms considered Thailand as being central to Southeast Asia as a whole, and from the latter half of 1990s the base for exports to global market. In response to this initiative, many automobile components suppliers, both Japanese and local, have established their facilities in this country. The sites they chose were mainly located in industrial estates newly developed in the suburbs of BMR.

Industrial estates are developed either by public sector or private sector. Developers in private sector have been more active, causing competitions for industrial estate developments. These active developments can be considered as one of the driving forces of continuing urbanization of Bangkok Metropolitan suburbs. In addition, the industrialization of Eastern Seaboard region initiated by the government has promoted the economic development as well as establishment of many industrial estates in the region. As a result, the concentration of automobile industries in Thailand has spread from BMR to its suburbs especially to the Eastern Seaboard region.

Based on observations as above, it can be concluded that Thailand has succeeded in dispersing the excessive concentration of economic activities in Bangkok to the Extended Bangkok Metropolitan Region. However, as the geographical distribution of industrial estates and automobile manufacturers indicate, development of agricultural areas can hardly be observed, where industrialization has been stagnant. Therefore, from the case studies in this chapter, one can also argue that, in view of Thailand as a whole, the economic development of the country has made its progress only in Bangkok and its suburbs, and industrialization of its rural areas has shown little progress. One of the causes for the military coup and the mass demonstrations that followed is said to have been the economic disparity between Bangkok and rural areas. This incident represents how outstanding Bangkok's economic development has been, in contrast with other parts of Thailand. Many issues remain for Thailand to achieve its balanced development nationwide.

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# Chapter 22
# Jabodetabek Megacity: From City Development Toward Urban Complex Management System

**E. Rustiadi, D.O. Pribadi, A.E. Pravitasari, G.S. Indraprahasta, and L.S. Iman**

**Abstract** Jabodetabek has developed from the small and separated city regions into a larger and unified megacity. This area consists of Jakarta as the core city and its surrounding areas namely Bogor, Depok, Tangerang and Bekasi. Recently Jabodetabek has become the largest megacity in Indonesia and plays the most important role within social, economic and political aspects. However, lack of planning capacity to deal with growing complexity in managing this area should be seriously remarked. The objective of this paper is to describe the dynamics of Jabodetabek starting from the early city development toward the future megacity development. It is divided into three sections comprising planning and development history; recent status of social-economic and physical-environmental situation; and future challenges that should be anticipated to achieve sustainable development. Obviously, planning and development strategy need to be transformed into adaptive, inclusive and integrated approaches within a continues incremental process to reach the development vision.

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**Keywords** Complex system • Development status • Future development • Jabodetabek megacity • Planning history

## 22.1 Introduction

According to 2010s Population Census, Indonesia's total urban population is estimated to have reached more than 118 million people or about 50 % of the national total population. As in most developing countries, urbanization in Indonesia is characterized by heavy concentrations of urban population only in a few large cities. This tendency has been growing at an increasingly faster rate in the globalization era. The urban areas, especially large cities and megacities offer infrastructures and facilities as well as access to capital, labor and market for secondary and tertiary economic activities. The megacities have developed as concentrated economic activities, capital, and people facilitated by relatively better transportation and communication technologies.

Jabodetabek region is the largest urban concentration in Indonesia involving several administrative regions, it consists of three major provinces: Capital City of Jakarta, Banten (Tangerang Regency, Tangerang Municipality and South Tangerang Municipality) and West Java Province (Regency and Municipality of Bogor, Regency and Municipality of Bekasi, and Depok Municipality) with Jakarta as its center and Bodetabek (Bogor, Depok, Tangerang and Bekasi) as its suburban areas (*hinterland*) (see Fig. 22.1). Jabodetabek has a strategic role in the national development, particularly the economic, political, and socio-cultural structures. The growing socioeconomic concentration and activities in Jakarta and its surrounding areas have attracted migrants, particularly those from rural areas.

In spite of the conceptual unity, Jakarta and the surrounding regencies and municipalities governments have found it extremely hard to carry out well-coordinated policies as urbanized areas have expanded farther beyond the environs


**Fig. 22.1** Administrative Map of Jabodetabek

of Jabotabek following the expansion of the highway network. Due to suburbanization, Jabodetabek region is experiencing the growth of fringe areas which is more rapid than the core of the region and as a lifestyle involving a daily commuting to job places in Jakarta City.

Being significantly different from the urbanization and suburbanization process in USA and Europe, studies on Asian countries have stressed that the continuing outward expansion of the biggest metropolitan region has eroded the longstanding distinction between rural and urban (McGee 1991). The urbanization in east and south of Asian countries is characterized by the blurred distinction between 'rural' and 'urban' (McGee 1991, 1994, 1995; McGee and Robinson 1995). Some urban characteristics appear in rural areas, both physically and socioeconomically (Firman and Dharmapatni 1994; Firman 1997, 2003). Both agricultural and non-agricultural activities take place side by side in the adjacent areas of the urban centers, while the urban physical development extends beyond city administrative boundaries.

The trend of urban transformation in Jabodetabek has been driven by economic expansion such industrial complex and new satellite towns, and it has resulted in extended areas of mixed land use of city peripheries (Rustiadi and Kitamura 1998; Rustiadi et al. 1999; Rustiadi and Panuju 2000, 2002). By employing spatial statistics, Rustiadi et al. (1999) showed the land use mixture in suburban areas of Jabodetabek Region as well as in Tokyo Metropolitan suburbs (Rustiadi and Panuju 2000). McGee (1995) labels this phenomenon 'mega-urbanization' (Lin 1994; McGee 1995; Jones 2002), whereas in his earlier work he calls this phenomenon 'Kotadesasi' a phrase coined from the Indonesian language (Bahasa Indonesia) means the process of socioeconomic and physical integration between urban areas (Kota) and rural areas (Desa) (McGee 1991). Aguilar and Ward (2002) also identified similar phenomenon in Latin America. Despite McGee's "desakota" concept, many scholars have tried to develop various terms to describe the phenomena related to this region-based urbanization such as "extended metropolitan region" (McGee and Greenberg 1992), "mega urban regions" (McGee and Robinson 1995), "global city-regions" (Scott 2001), and "megacities".

Furthermore, Ginsburg et al. (1991) explained the region-based urbanization in East Asia and Southeast Asia, where large cities are often located in wet-rice production areas. Due to its labor-intensive nature of wet-rice agriculture, even before the period of industrialization, it had been common in these areas to have a population density almost equal to the cities in pre-industrialized Europe. The labor demand of wet-rice farming fluctuates from season to season, and this has prompted farmers to engage in various non-agricultural activities, such as petty trade and small-scale industry (McGee 1991). Various observers have pointed out that urbanization in Indonesia as well as other Southeast and East Asia countries are not centripetal, but rather proceeds as the formation of vast city-regions.

As a functional mega urban system, Jabodetabek region is still undergoing physical growth and the development of various activities. Various interests and rapid development in Jabodetabek have great impact on the spatial aspects and decreased carrying capacity of the environment. The results of the study by Rustiadi

et al. (2009) showed that the carrying capacity of the environment, especially land and water in Java Island, where Jabodetabek lies, is already overshot.

Spatial pattern in Jabodetabek region is characterized by spatial inconsistencies that occurred between existing land use and spatial plan. This condition generally occurs in urban areas and their surrounding areas. Inconsistencies also occurred between spatial planning (RTRW) and land capability (as a proxy of carrying capacity). These inconsistencies have caused some problems, such as land conflict as well as environmental degradation which may impact on the occurrence of anthropogenic disasters (floods, landslides, and so on). The previous research stated that there have been land use inconsistencies in Jabodetabek (2001) by 8.50 % of the total area (Nurhasanah 2004) and in 2010, there were 10.21 % inconsistent actual land use (Rustiadi et al. 2012). It requires a significant breakthrough to improve the controlling system of spatial planning effectively and gear it into a more efficient, productive and competitive Global Megacity.

## 22.2 Planning History and Related Development Issues

Jabodetabek development path could not be separated from the development of Jakarta. After the independence, Jakarta development has been growing rapidly. Moreover, this development ran progressively after the end of the Dutch aggression on 27 December 1949. During this post-independence aggression, Yogyakarta became an Indonesia capital city. In 1960, Jakarta position as the capital city was strengthened by the issuance of Government Regulation (2/1961) and in 1964 the Law 10/1964 was published. Laws and regulations related to Jakarta had been issued again after the 1997–1998 Indonesia economic crisis, namely Law 34/1999 and Law 29/2007.

### *22.2.1 Jakarta Planning After Indonesia Independence*

Jakarta metropolitan concept actually has been known since 1950. In this year, an initial report was published to introduce the idea of metropolitan regions and metropolitan concept under the name “Jakarta Raya”. This idea was in accordance with the vision of Soekarno (President of Indonesia at that time) to build the national capital. This concept was introduced by a committee group between Indonesian and Dutch planners under the Ministry of Public Works and Engineering. This idea and concept became more concrete in 1952 with the term ‘Concept Plan’ for Greater Jakarta. This plan was based on the garden city scheme and its four development principles. Spatial structure developed in this plan was a concentric development model where Freedom (*Merdeka*) Square became the center, surrounded by several highways and greenbelt as an urban development boundary (Silver 2008).

In 1959, after 2 years of process chaired by Kenneth A. Watts, the Jakarta detail plan was finally approved by the Municipality of Greater Jakarta. This plan was known as the 'Outline Plan' which had a better detail rate than the previous plan. This plan also used better statistical data and information in the process. Based on the calculations made by the consultant, this plan required huge fund which cannot be fulfilled by the public development funds. As a consequence, most of the housing construction was suggested to be provided by private developers. In addition, as an in-between strategy, temporary housing was allowed to accommodate the rapidly growing population. Furthermore, Jakarta was inhabited by so many migrants from rural areas which still had strong roots and culture of rural lifestyle. This migration issue became a serious problem and attention for urban planners and academics. Migration had increased rapidly especially when the Japanese started to occupy Indonesia in 1942. Attempts to carry out the reduction of migration by creating more attractiveness in the origin area in the 1950s became one of the discourse raised by the University of Indonesia academic—H. J. Heeren. The combination of housing policy, the lack of infrastructure services, and the inability to resist the flow of migrants later became the cause of slums and squatter mushrooming in Jakarta. The satellite towns concept to accommodate residential areas in the future development was also discussed in this plan. Tangerang, Bekasi, and Bogor were identified as a satellite towns concept to avoid the overcrowding population in Jakarta (Silver 2008).

Although at that time the Outline Plan was made as good as possible, its implementation was constrained by the intervention of President Soekarno who did not like to be regulated by his servient and the plan made by it. One of the modern plan produced and had got rejection from President Soekarno, because of previous reason, was the development of electric tram which would connect Djatinegara to Matraman and Kramat to Senen (Silver 2008). In 1960, Kenneth A. Watts was also proposing to develop the existing towns surrounding Jakarta, in particular Bekasi to the east, Tangerang to the west, and Bogor to the south as an alternative to overcome overpopulation in Jakarta. To improve connectivity with these growth poles, the construction of the road network was needed (Silver 2008).

### *22.2.2 The Modern Metropolis and Master Plan 1965–1985*

Recommendations contained in the Outline Plan and various consultations conducted by Kenneth A. Watts became the basis for making more detailed and practical development schemes, most notably the Master Plan 1965–1985 (Silver 2008). The Master Plan also marked a new Indonesian development era of Soeharto as Indonesia's second president who had replaced Soekarno. Furthermore, Jakarta had a new governor, Ali Sadikin, who became a part of history because of his strength of leadership. The Master Plan also confirmed Law 10/1964 regarding the position of Jakarta as the capital city of Indonesia. As the capital, this Master Plan was also made so that Jakarta, as the capital, has a high standard of international city.

Master Plan 1965–1985 also confirmed that all issues which hit Jakarta were mostly due to land use and control problem. Much of the land was controlled by government agencies acting on their own without the agreement of Jakarta leader. After the Master Plan was officially approved, further analysis was done based on the assumption that the construction of Jakarta should consider a regional perspective. The result was the need to create an integral plan between Jakarta and its surrounding cities forming Jabotabek (Jakarta, Bogor, Tangerang, Bekasi). However, compared with the concept of Jakarta and satellite cities planned in the Outline Plan, the Master Plan 1965–1985 had more emphasis on strategies that respond to local needs. If Ali Sadikin focused on local problems of Jakarta, Indonesia's United-Nations-financed consultants who helped prepare the Outline Plan and Master Plan 1965–1985 still held regional concept for future Jakarta development. The outer limits of the planning area were designated by Cikarang watershed to the east, Cisadane watershed to the west, and the mountain range to the south of Bogor (Silver 2008).

The planning concept of Jabotabek formally started in 1973 by the Ministry of Public Works, assisted by Dutch planners. One of the most important considerations in the preparation of an effective plan is the accurate data and the direction of *kampung* development in Jakarta. *Kampungs* in this perspective could not be treated as temporary slums, but they were permanent settlement depicting rural life to urban transition. One of the principles in this plan scheme was to use the railway lines to determine the development path of new settlement clusters. One such cluster was Depok which was projected to accommodate the overspill from the medium-low income residents of Jakarta. The Master Plan also planned protected areas because it has crucial protective function as the area between Bogor and Cibinong as the source of water, agricultural land in the north Bekasi, the east of Jakarta, the north and west of Tangerang which was also destined for the airport. The chairman of Dutch consultant team, L. Giebels, proposed to establish an organization to implement the Jabotebek Plan. The term of Jabodetabek was also introduced by L. Giebels (Suselo 2003). In 1976 (Presidential Instruction 13/1976), Indonesia's government established Jabotabek Cooperation Body (*Badan Kerja Sama Pembangunan* or BKSP) of the joint secretariat of the Government of DKI Jakarta and West Java Province. In 1976, Jabotabek planning funding was taken over by the World Bank from the United Nations and Dutch consultants. In 1980, Jabotabek Metropolitan Development Plan (JMDP) was produced for the first time (Silver 2008).

### *22.2.3 Urban Sprawl and the Rise of Botabek*

In 1983 when the Jabotabek team revised the 1980 plan, they kept their eyes open to the process of revised Jakarta 1985–2005 master plan which was also underway (Silver 2008). Development of public transport seemed to have no place in the 1980s until 1990s period. Dutch planners who had developed their vision in mass

transportation system connecting sub-urban development centers were considered too expensive. The Indonesian government and real estate developers chose to build housing in the suburbs by developing from highway network which had been built by President Sukarno in the 1960s. The completion of Jagorawi highway project in 1978 was the foundation stone of expansion of Jakarta toll road network system. In the following year, 1988, built-up area in Bogor, Tangerang, and Bekasi had reached 110,000 ha, or more than three times as much as built-up area in Jakarta. Large-scale residential projects—such as Bumi Serpong Damai—and those of medium-scale, combined with toll road network development and relatively cheaper land prices had made sub-urban areas surrounding Jakarta grow rapidly (Silver 2008).

In 1985 to 1999 period, the policy of the National Land Agency (BPN or *Badan Pertanahan Nasional*), which easily gave permission to build 80,000 ha of land in the outskirts of Jakarta provided incentives to cause urban sprawl. In Jakarta itself, land price was increasing rapidly and followed by the growing number of business complex developments. As a result of higher intensity of development in the elite area of Central Jakarta, many lower-middle income residents had been displaced. During the 1984–1994 period, the total population in Central Jakarta decreased by 15 % and became the only city in Jakarta which had experienced population decline. The growth of the property sector was also in correlation with Indonesia's economic growth in the early 1990s when Indonesia was classified as one of the Asian tigers (Winarso and Firman 2002; Silver 2008).

In addition to the property sector, manufacturing industry sector was also growing rapidly, especially in the outskirts of Jakarta. In 1985, Jabotabek produced 31 % of national industrial output, especially for textiles, electrical equipment, printing, publishing, and other chemical industry products (Firman and Dharmapatni 1994). The development of manufacturing industry in Jabotabek had gotten support from domestic and foreign investment, which the latest investment was largely dominated by Japan, South Korea, Hong Kong, and Singapore (Firman and Dharmapatni 1994).

As a consequence of uncontrolled development, environmental aspects had received negative impacts. Many farmers and their agricultural land were displaced due to construction of housing, industry, and other growing economic activities in Botabek. Physical development in this period often had not paid attention to environmental functions, for example development in Depok and Serpong which actually functioned as water recharge areas for Jakarta (Firman and Dharmapatni 1994).

### *22.2.4 Property Boom, Economic Crisis, and Its Recovery*

The development of property sector which was increasingly out of control was suspected to be one of the main triggers of Indonesia's economic crisis in 1997 (Winarso and Firman 2002). The real demand of the property was actually not very

high; many investments were speculative and not based on actual need. This property development had surely sucked out a lot of loans from the banks and when the property sector collapsed, the financial sector was going to crash as its impact. Many infrastructures built in Jabotabek had high profit seeking motive, rather than delivering better services to the citizen. Economic crisis which hit in 1997 destroyed the booming property sector in Jabotabek.

The economic crisis had impacted on increasing abandon and idle land due to failed and uncompleted projects. Residential development in the periphery region has decreased significantly, followed by the industrial development in Bekasi and Tangerang. Many workers in Jakarta chose to go back to their hometowns due to being unemployed. Some migrants in Jakarta tried to take advantage of abandoned and idle land for urban agriculture activities (Indraprahasta 2013). The other phenomenon occurred was entering informal jobs such as street vendors and itinerant traders (Firman 1999). One year after the economic crisis, Indonesia experienced a change in the governmental and political structure, entering the regional autonomy era (Law 22/1999 and Law 25/1999). Economic development that was previously nuanced so national and centered around Jakarta had tried to expand by providing other municipalities (*kota*) and regencies (*kabupaten*) more authority to dig and utilize their own potentials. In the context of overall urban development in the 1998–2001 period, there was no significant progress of improvement (Firman 2002). This situation also applied to Jabotabek which run in accordance with its own recovery mechanism. Within this period, political aspect development had attracted more attention than economy. Directly and indirectly, changes in governmental structure had assisted Jabotabek in the recovery process.

### *22.2.5 Jabodetabek in Democratric Era and Economy Acceleration*

Starting from 2004, the Indonesian governmental system has begun to find its ideal form, followed by the improving of national economic performance. This has a critical implication to the practice of spatial planning which had gained more attention and respect. Law 24/1992 which has been revised to Law 26/2007 was intended to strengthen spatial planning function in the development policy. As a result, the entire spatial planning in all regions of Indonesia should be revised in accordance with this new law, including Jakarta Spatial Plan. According to National Spatial Plan or RTRWN (Government Regulation 26/2008), Jabodetabek functions as the center of national activities in the national urban system. Depok municipality which has been continuously growing as an urban area had entered into the Jabo(**de**)tabek acronym. In addition, the attention to the regional system of Jabodetabek as a whole has led Jabodetabek-Punjur (Puncak Cianjur) as a "national strategic area". This area is planned to have two roles at once, namely as economic driver (Jabodetabek) and environmental protection (Punjur). To provide stronger direction of Jabodetabek-Punjur development, the Indonesian government had

made Jabodetabekpunjur Spatial Plan (Presidential Decree 54/2008). This period was also characterized by the demand to provide more participatory process as well as greater attention to environmental aspects. As an inherent complement of mainstreaming environment aspect in development policy, new environmental regulation requires all spatial planning documents to be examined through strategic environmental assessment or SEA (KLHS or *kajian lingkungan hidup strategis*) process (Law 32/2009).

The stronger and more robust decentralization and local autonomy practices as well as the improving performance of the national economy, development in Bodetabek find its enthusiasm again. There is also an indication of post-suburbia symptom experiencing in Jabodetabek (Hudalah and Firman 2012). In addition to continue-growing residential development, the manufacturing industry in the suburbs has also contributed increasingly to GDRP. The contribution of this sector in GDRP increased significantly from 24.6 % in 1985–1990 to 59.8 % in 2000–2005 and foreign direct investment (FDI) has played an important role in this increase trend (Hudalah and Firman 2012). Bekasi itself has emerged as a concentration of manufacturing industry development area in Jabodetabek. In the Asian level, Jabebaka industrial zone (which is located in Bekasi) with an area of 5,600 ha become the largest industrial estate in Southeast Asia (Hudalah and Firman 2012).

The symptom of mega-urbanization also emerged between Jabodetabek and Bandung Metropolitan Area reflected from the formation of urban belt along 200 miles between Jakarta and Bandung (Firman 2009). This condition arose as a result of the opening of Cipularang (Cikampek, Purwakarta, Padalarang) toll road. This road has also encouraged the proliferation of industrial areas to the east of Jabodetabek, especially Karawang. The growing variety of industries in the region would threaten Karawang as a strategic region of food producers (paddy field) in Indonesia.

The current national policy is likely to facilitate economic capitalism in Jabodetabek, which can be reflected by the presence of the Master Plan of Acceleration and Expansion of Indonesia's Economic Development (*Master Plan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia* or MP3EI) 2011–2015. MP3EI puts Jabodetabek as 1 of 22 major economic activities. Jabodetabek became 1 of 2 territorial-form activity of the 22 main economic activities. One other territory is a national strategic area (*kawasan strategis nasional*) of Sunda Strait; 20 other major economic activities are in the form of economic products.

## 22.3 Current Jabodetabek Megacity Development

### *22.3.1 Demography*

Jabodetabek megacity covering an area of approximately 7,000 $km^2$, and had a total population of more than 26.7 million in 2010. The population of Jakarta city as the core of Jabodetabek was 8,502,818 and Bodetabek was 18,253,144 (Rustiadi et al. 2012). Jakarta reached its peak population growth in the periods of 1961–

1971 (55 %) and 1971–1981 (42 %). In those periods, the population increase in Jakarta was much greater than that of Bodetabek region. However, after 1981, the rate of population growth in Bodetabek has changed significantly and always been higher than that of Jakarta. In the period of 1981–1991, the population growth in Bodetabek and Jakarta were 68 % and 8 % respectively. This indicates that the population growth in Jabodetabek is no longer happening in Jakarta as the core, but it is distributed in Bodetabek region as its hinterland.

The highest population growth of Jakarta occurred in the period of 1961–1971. The highest population growth in the suburban areas of Jakarta (Bodetabek) happened in the period of 1981–1991. When the suburbanization was reaching its peak, the Jakarta population was already less than that of Bodetabek. Between 1991 and 2000 there was a decrease population growth in both Jakarta and Bodetabek. This was caused by the economic crisis in Asia, which also had an impact on the economy and population growth in Indonesia. However, in the period of 2000–2010 the number of population in Bodetabek increased again. It is necessary to examine this, which also becomes a major question: Is re-suburbanization happening again in Bodetabek in those periods.

Based on Rustiadi et al. (2012), the population share of Jabodetabek to the national population was increased from 6.10 % in 1961 to 11.26 % in 2010, but the proportion of the Jakarta city population to the total Jabodetabek population declined over time, from 49.1 % in 1961 to only 31.8 % in 2010. This reflects the suburbanization process in the peripheral areas.

### *22.3.2 Migration, Poverty and Informal Workers*

Jabodetabek as the biggest economic center in Indonesia has powerful attractiveness that has pulled many people from other areas to come, live and work. Excessive in-migration has significantly contributed on rapid population growth and urbanization. Accelerating population growth has caused many problems related to providing sufficient infrastructure and maintaining the sustainability of the urban environment.

Based on the Central Bureau of Statistics (BPS), high in-migration not only happened in Jakarta but also in its surrounding area called Bodetabek. It could be seen in Table 22.1 that number of migrants who moved to Jabodetabek consist of

**Table 22.1** Migration Characteristic in Jabodetabek

| Area | Population number | Migrant from outside Jabodetabek | |
|---|---|---|---|
| | | Number | % |
| Jakarta | 9,556,049 | 1,427,933 | 14.94 |
| Bodetabek | 18,320,530 | 2,630,119 | 14.36 |
| Jabodetabek | 27,876,579 | 4,058,052 | 14.56 |

*Source*: Analysis on Population Census Data 2010 established by BPS

**Table 22.2** Poverty Characteristic in Jabodetabek

| Area | Population number | Poor population | | Almost poor population | | Vulnerable population | |
|---|---|---|---|---|---|---|---|
| | | Number | % | Number | % | Number | % |
| Jakarta | 9,557,798 | 475,008 | 4.97 | 728,604 | 7.62 | 1,203,612 | 12.59 |
| Bodetabek | 18,290,356 | 1,145,939 | 6.27 | 2,148,489 | 11.75 | 3,294,428 | 18.01 |
| Jabodetabek | 27,848,154 | 1,620,947 | 5.82 | 2,877,093 | 10.33 | 4,498,040 | 16.15 |

*Source*: Analysis on Integrated Basis Data for the Development of Social Security Program 2011 established by TPN2K

1,427,933 people who live in Jakarta and 2,630,119 people who live in Bodetabek. Although the number of migrants in Bodetabek is twice as Jakarta, the percentages are relatively similar. Clearly, the expansion of urban area beyond Jakarta has developed new pull factor that attracts more number of people.

In total, the number of migrants in Jabodetabek reached 4,058,052 people or 14.56 % of the total population. This number is relatively high and contribute significantly in the population growth. Instead, the number could be higher if the migrants that have lived less than 5 years, which are not defined as a migrant in BPS data, is also counted. Parallel with government plan to accelerate economic growth of Jabodetabek, the number of migrants will continue to increase in the future.

Numerous problems will increase if the pace of population growth persists. Various services including infrastructure, housing, education, health, job opportunities, water, energy, food, waste treatment, green open space, etc. will be difficult to provide. Therefore it should be anticipated by starting to develop the alternative urban development concept such as vertical growth, smart growth, compact city and so forth.

The other social problem in Jabodetabek is urban poverty. Along with the increasing share of urban inhabitants within the total population, the number of poor people in urban area is also growing. In addition, many poor people are interested to move to urban areas because high economic growth in the cities offers many alternative occupations within formal and informal sector.

In 2011, the National Task Force for Poverty Alleviation (*Tim Nasional Percepatan Penanggulangan Kemiskinan*—TNP2K) has established integrated basis data for the development of social security program. They collected data of 40 % population with the lowest prosperity. This population is divided into four categories including very poor, poor, almost poor and vulnerable poor based on a poverty line established by BPS in 2011 which is Rp 233,740/capita/month.

The first two categories include number of people who get income below the poverty line, while the rest include number of people who get income slightly above the poverty line. Within this paper, all of vulnerable people were only divided into two groups comprising poor population (below the poverty line) and almost poor population (slightly above the poverty line).

It could be seen in Table 22.2 that the number of poor people just 4.97 % of the total population in Jakarta and 6.27 % of the total population in Bodetabek. However, the number of almost poor people is higher which reached 7.62 % of the total population in Jakarta and 11.75 % of the total population in Bodetabek.

It showed that many people will be easily fall down to the below poverty line if there is a shock within the economic system.

Afterward, the number of vulnerable population in Bodetabek is higher than Jakarta. It showed that accumulation of vulnerable people mostly happened in the urban fringe of Jakarta. This area is characterized by mix urban-rural livelihoods, therefore seemingly the conflict between urban and rural has lessened prosperity of the people.

In total, the number of vulnerable population in Jabodetabek is relatively high which reached 4,498,040 people or 16.15 % of the total population. Thus if the economic system becomes unstable, the number of people who live below the poverty line will become threefold. It should be anticipated because there are a lot of global–local issues that will threaten Jabodetabek social-economic system in the future.

The next social problem that become important issue is the existence of the informal sector. The informal activities have become the easier entrance for migrants to get involved in urban economic activities and earn any income, and also important to support formal workers that have limited wage. The competitiveness of Indonesian economic that rely on low wage labor actually is supported by the existence of the informal sector that could provide various cheap products.

Actually the problem of the informal sector is not related to its existence but how to minimize its negative impact on Jabodetabek development. It is known that the informal sector in developing countries is disorganized, thus it produces numerous negative externalities such as congestion, waste, slum areas, crime, etc. It could be seen in Table 22.3 that the informal workers in Jabodetabek could be divided into 4 groups comprising self employed; self employed with temporary workers; free worker; and unpaid worker. Self employed is a person who has own business or offer a particular skill such as tailor, carpenter, builder, serviceman, etc. Self employed with temporary workers is a self employed who is helped by impermanent worker or sometimes unpaid worker. Free worker is a person who doesn't have permanent employer. Unpaid worker is a person who works without payment and usually this person work on his/her family.

Informal workers in Jabodetabek were dominated by self employed which reached 22.22 % of the total labor. It was followed by free workers 7.74 %, unpaid workers 2.01 %, and self employed with temporary workers 1.25 %. In total the number of informal workers in Jabodetabek reached 33.22 % of total labor. This number is quite high since one third of labor in Jabodetabek work in the informal sector.

In general, the number of informal workers in Bodetabek is higher than Jakarta. It might be caused by the high pace of urbanization in this area whereby the interaction between urban and rural has opened more opportunities for the informal sector development. Still, it needs to be managed and organized in order to avoid chaotic development as well as negative externalities that could harm the public life.

**Table 22.3** Informal Workers Characteristic in Jabodetabek

| Area | Labor number | Self employed | | Self employed with temporary workers | | Free workers | | Unpaid Workers | | Informal workers | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | % | Number | % | Number | % | Number | % | Number | % |
| Jakarta | 4,285,981 | 849,563 | 19.82 | 46,704 | 1.09 | 248,386 | 5.80 | 77,310 | 1.80 | 1,221,963 | 28.51 |
| Bodetabek | 7,175,529 | 1,697,212 | 23.65 | 97,126 | 1.35 | 638,766 | 8.90 | 153,004 | 2.13 | 2,586,108 | 36.04 |
| Jabodetabek | 11,461,510 | 2,546,775 | 22.22 | 143,830 | 1.25 | 887,152 | 7.74 | 230,314 | 2.01 | 3,808,071 | 33.22 |

*Source*: Analysis on Population Census Data 2010 established by BPS

### 22.3.3 Economy

Jabodetabek Metropolitan Area becomes a center of national economic activities that are characterized by high population density and intensive spatial interaction with other regions. In national economy, Jabodetabek contributed 25.52 % of total national GDP in 2010, 17.92 % contributed by Jakarta city and 7.59 % contributed by Bodetabek (Rustiadi et al. 2012).

Based on the contribution of each sector to the total GDP of Java Island in 2010, Jabodetabek contributed 76.8 % for finance, 60.7 % for construction and building, and 56.6 % for transportation (Rustiadi et al. 2012). Other sectors which also had significant contribution were industrial sector; government services; electricity, gas and water; as well as trade, hotel and restaurants with the percentages respectively 43.8, 41.6, 41.3 and 36.5 %. The other two sectors which are agriculture and mining had small contribution, respectively 3.7 and 5.8 %. Jabodetabek's GDP contributed around 42.8 % to the total GDP of Java Island.

In terms of number of employees which works in each sector, it indicates that the financial sector as the biggest contributor to GDP also contributed most to employment at around 47 %. On the other hand, other sectors with a quite high number of employment are electricity, gas and water (38 %); transportation (31.2 %); services (27.8 %); trade, hotel and restaurants (27.6 %); industries (27 %) and other sectors (39.5 %).

Related to the productivity defined as the comparison of GDP to the total employment, it shows that Jabodetabek had the productivity of Rp 48.55 million/worker per year, whereas non Jabodetabek region (*rest of Java*) had the productivity of Rp 15 million/worker per year. This shows that high productivity in terms of GDP in Jabodetabek area is greater than the rest of Java.

In the Jabodetabek itself, there were three dominant sectors which have high contribution to the total Jabodetabek's GDP comprising: industrial sector (28.36 %), financial sector (20.66 %) and also trade, hotel and restaurant sectors (20.24 %).

### 22.3.4 Land Use/Cover Change (Built-Up Area Development)

Studies on land use change including urbanization have regarded a region as either an aggregated (lumped) system or a disaggregated (distributed) system. The aggregated system is used to estimate only the amount of the land use change considering the region as a mass (Hansen 1959; Mfungahema and Kitamura 1998; Rustiadi and Kitamura 1998; Wang and Zhou 1999), while the disaggregated one aims to simulate the land use change amount as well as the spatial distribution of land use types (Wu 1998; Yeh and Li 1998).

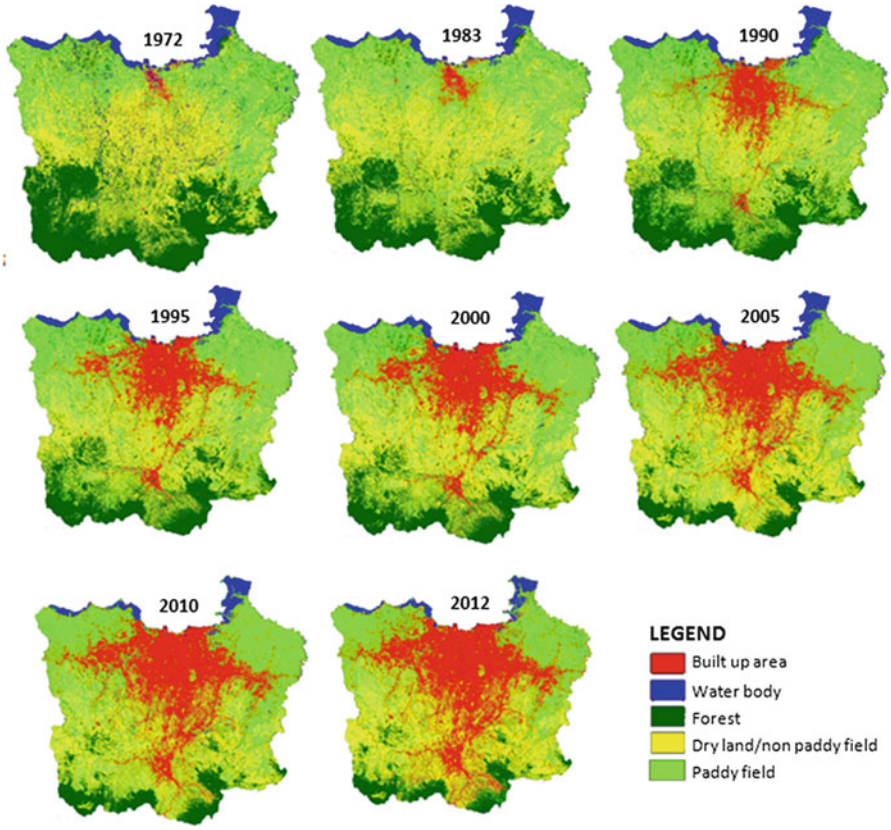


**Fig. 22.2** Map of land use/cover in Jabodetabek in 1972–2012

Land use change is generally affected by both natural factors, such as geographical and soil characteristics, and socioeconomic factors, such as population growth, development plans, land use control, zoning and other related laws. Land use changes in Jabodetabek were dominantly caused by land conversion into the concentrated urban activities. Land conversion in this region tends to increase every year. In Jabodetabek, many fertile farmlands and other greenery areas converted to built up areas (settlement, industries, commercial services and others). The resulting images of land use/cover changes (LUCC) from 1972 to 2012 are presented in Fig. 22.2.

In 1972, the built-up area in Jabodetabek was still very limited (around 6,500 ha) and most of them were concentrated in Jakarta. On the other hand, we found some forest area distributed in Bogor and Depok. In the same year, land dominantly used for dry land (non paddy field) approximately 230,000 ha. In 1983, built up area was increased from 6,500 ha (1972) to 12,000 ha. We found that some part of the forest areas converted into paddy field and dry land (non paddy field), so the paddy field

and dry land were increased respectively from 173,000 and 230,000 ha to 215,000 and 235,000 ha. Based on land use/cover map of Jabodetabek in 1990, it can be seen that built-up area in Jakarta was getting wider. This phenomenon was also happening in Bogor, Tangerang, and Bekasi. Most of urban expansion in those areas during that period come from the conversion of dry lands and forest areas. Then, for more than 20 years, the built-up area in Jabodetabek was increasing as well as its distribution. The urban expansion spread out especially along the major highways.

Rapid land conversion in Jabodetabek occurred due to several factors such as the increasing number of population, which requires more space for housing and facilities development. From 1995 until 2012, built up area in Jabodetabek was growing rapidly. During those periods, urban area in Bogor, Depok, Tangerang and Bekasi were also expanding. During that time, almost the whole area of Jakarta was urbanized. Many hectares of forest area, especially in Bogor were converted and tends to decrease over the time.

For more than two decades, the utilization of built-up area was no longer controllable. The development of housing and industrial areas was growing more rapidly. Most of the dry land and paddy field in Bekasi and Tangerang were also changed into built up areas. In Depok were previously dominated by dry land had turned into settlement and industrial areas by 2010.

The land conversion from paddy field and dry land to built-up areas has had a significant impact on the condition of the surrounding areas. Since the expansion of urban area, the land conversion for housing and built-up area continues to increase. The land use of the forest area was falling significantly. Approximately 71 % or 152,000 ha of forest have disappeared from Jabodetabek through land conversion during 1972–2012. Dry land has also reduced by 31 % or 71,000 ha, whereas the built up area has expanded 31-folds from that of 1972 (increased around 195,000 ha during the same period). This reflects a rapid conversion rate over time.

### *22.3.5 Environmental Problems*

The suburbanization has led to the conversion of primary agricultural land and green open space (also including forest area) and created environmental problems as a result of the land conversion without considering the function, capacity and suitability of the land itself. Environmental damage was getting worse in Jabodetabek over the time as shown in some studies which analyzed the environmental carrying capacity of Jabodetabek and Java island (KLH 2007; Rustiadi et al. 2009, 2010).

The real impact of the overshot carrying capacity is the increasing anthropogenic disasters (such as flood and landslides) in the Jabodetabek region in terms of quantity, intensity and distribution. Figures 22.3 and 22.4 showed respectively the distribution maps of flooding and landslides occurred in each village of Jabodetabek in 2000, 2003, 2006, 2008, and 2011. The data were obtained from village potential statistic data (PODES) established by the Central Statistic Agency (BPS).

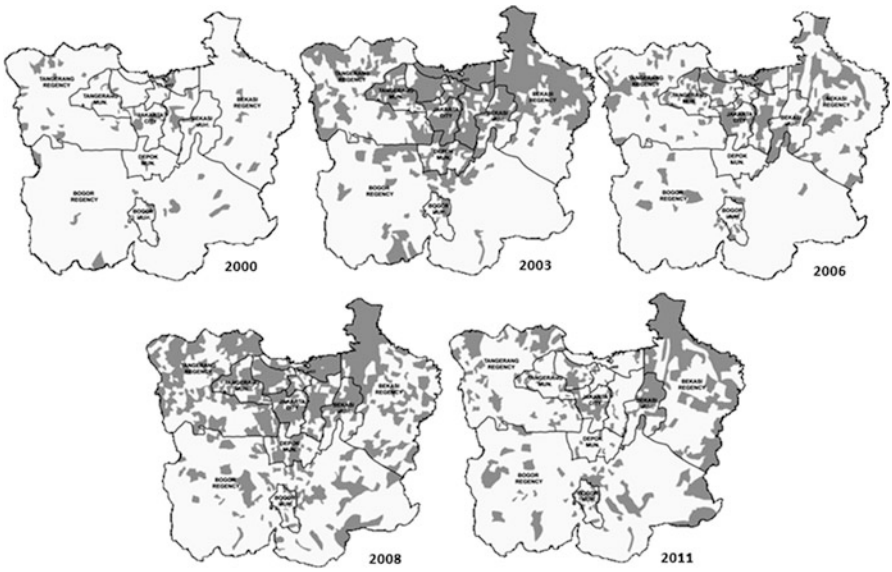


**Fig. 22.3** Map of Flood Distribution in Jabodetabek. Based on PODES Data in 2000–2011

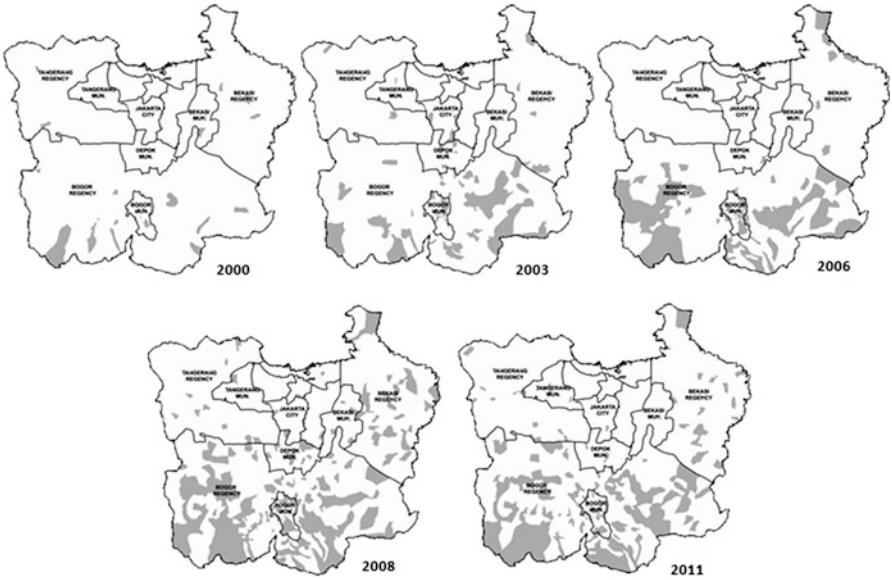


**Fig. 22.4** Map of Landslide Distribution in Jabodetabek. Based on PODES Data in 2000–2011

In 2000, the number of villages experiencing floods was 102 or around 6 % of the total number of villages. In 2003, the number goes up, involving 609 villages (around 35.9 %). Then, in 2006 and 2008, the percentage of villages struck by floods respectively were around 19.5 and 37.9 %. Afterward, in 2011, the number of villages experiencing floods was only 338 (22.6 %). This pattern indicated the 5 years cycle of floods whereby in 2003 and 2008 the number of villages hit by flood increased.

Meanwhile, the number and percentage of villages experiencing landslides in Jabodetabek from 2000 to 2008 were also increasing over the time. It can be seen that the number of villages experiencing landslides in 2000 was only 26 (or around 1.53 %). But during 11 years (from 2000 to 2011), the number of villages and the percentage tends to increase, i.e. reaching 95 villages (5.6 %) in 2003, 134 villages (7.9 %) in 2006, 305 villages (17.94 %) in 2008, and 170 villages (11.37 %) in 2011.

The environmental issues and anthropogenic disasters are not merely caused by technical aspects but also non-technical such as institutional issues in which land control issues are included. The capacity of a planning system is determined by the institutional capacity to control the natural resource exploitation. The government role is much needed in this case. Unfortunately, a discrepancy between regulation, policies and planning concerning the current exploitation or utilization oftenly occurs.

Essentially, the frequent incidences of anthropogenic disasters are caused by the inconsistency in spatial planning as a result of some factors for instance: (1) the existing land use is not complying with the existing spatial planning; and (2) spatial planning is not in line with the regulations/principles. In addition, land use change provides many economic and social benefits, but comes at a substantial economic cost to society. Land conservation is a critical element in achieving long–term economic growth and sustainable development. Land use policy, however, must strike a balance between private property rights and the public interest.

## 22.4 Future Development of Jabodetabek Megacity as a Complex System

Jabodetabek has developed from the city region into megacity that exhibit a very complex system. Base on explanation in the previous section, the pace of urbanization in this area is very high and the urban area has expanded beyond the administrative boundaries. The connectivity among regency/municipality has become more intense and covers multidimensional facets comprising demographic, economic, social, cultural and environmental.

The regional complex system within Jabodetabek megacity is characterized by mutual interaction among subsystems which be present on a different scale, function, activities, and sub-region. Thus interaction among subsystems and its implication on managing Jabodetabek would be further explained in the following section.

### 22.4.1 Global–Local Interaction

Jabodetabek Metropolitan Area is initially developed in order to accelerate economic growth whereby the connectivity with the global market should be strengthened. It was expected to attract global investment that could stimulate the leap of economic growth. As occurred in other Asian cities, it has created numerous manufacturing industries based on the integration of global capital and region's cheap labor, then it develops a regional value chain of supply, production and sales (Dahiya 2012). Accordingly, by mid-1990s the development of this area appeared to be heading toward global city status (Firman 1999).

Dazzled by tremendous economic growth, raising of various issues within the local scope seemingly is neglected by the government. Excessive in-migration, raising informal activity, increasing urban poverty have impacted on congestion, emerging slum areas, widening income disparity, etc. While rapid urbanization as a result of economic growth has caused natural and agricultural land conversion, food insecurity, environmental degradation, etc.

Finally the contact between global and local is inevitable. Because they are often conflicting each other, then it has caused many troubles. Base on a global perspective, worsen local situation have made a lot of difficulties to increase their productivity and efficiency. Whereas, most of the local people against global economic activities that do not give significant impact on increasing local prosperity.

Surprisingly, nowadays local issues have grown up toward a global scale, whereas global capital started to expand their business to the local scope. Many city governments, NGOs and world aid organizations have started to devote much attention to the improvement of local urban life. Therefore some local issues such as congestion, urban poverty, slum area, environmental risk etc. have become common problems that should be resolved together. On the other hand the global economic network has developed their influence to the local level, although their role seems to give good and bad effects simultaneously. The initiative of global company to develop CSR (Corporate Social Responsibility) program has given a lot of benefit to the local people. However, the expansion of their business comprising the development of cheap and mass products, supermarket and mini-market network, and easier financial credit have threatened the existence of local economic activities.

Obviously, global–local interaction has become interrelated and more complicated than before. Recently, many global issues such as climate change, food insecurity and increasing price of energy are closely related to people daily life in Jabodetabek. On the other hand local issues such as increasing environmental risk, congestion, urban poverty, and informal worker have directly impacted on decreasing productivity and efficiency of global economic activities.

Unfortunately, planning capacity to deal with complicated global–local interaction is still limited. An integrated development policy that could put all of the good initiatives into planning is really required. Therefore all people or institutions that will participate in resolving local problems could fully understand what has been done and should be done. This kind of planning called as collaborative planning,

and it is more than just participatory planning that has been simplified into a public meeting and consultation.

Furthermore, the capability to recognize local economic activities should be increased, thus the objective of Jabodetabek to reach global economic competitiveness doesn't threat local economic development. Recent studies reveal that local and informal economic activity has a significant contribution in the urban economics in developing countries (Goethert 2013). Since many urban dweller also involved within this informal economic activity, then it could strengthen people prosperity as well as resilience of the city.

### *22.4.2 Economy-Ecological Interaction*

Nowadays the role of Jabodetabek in the national economy is still dominant although the decentralization policy has been implemented since year 2000. Instead of distributing economic value, the economic polarization in Jabodetabek after decentralization era is even stronger than before. As described by Dahiya (2012) megacities in Asia act as dominant forces in both regional and global economies due to their important role in political power, financial capacity, and knowledge development.

The position of Jabodetabek has become more important since the last global economic crisis in 2008. Indonesia, India, and China are the three Asian countries which still had positive economic growth. In order to sustain the growth, the government intends to push the economic performance by focusing economic investment in the existing urban area especially Jabodetabek.

Along with the extending urbanization and growing population within Jabodetabek, many scholars have warned about the raising of environmental risk. The concern about environmental degradation has been acknowledged in a report by the United Nations Environment Program (UNEP) in 1983 (Douglass 1989). However, urbanization has continued to sprawl, thus the environmental degradation keeps accelerating and has turned into an environmental hazard. The most important hazard in Jabodetabek is a flood that has caused many losses including life and material (Douglass 2013).

Obviously, environmental aspect should be seriously considered in the planning. It should be connected and embedded into the economic development scenario. Unfortunately it is not easy to be done because the relationship between economic and ecological system within megacities has been developed into the more complicated interactions.

Regarding to this complexity, preventing environmental hazards through infrastructure engineering, spatial zoning or environmental valuation will be insufficient. Focus of planning instrument need to be directed to connectivity, circularity, and dynamics. Connectivity means developing connections between economic and ecological system. Circularity means how to manage flows between both systems

that has been connected. Dynamics means how to lead this connectivity and circularity into continual improvement toward a better system.

Related to the connectivity, some initiatives that bring nature into the urban life is really important. In the past paradigm, urban and nature has become unconnected because urban is regarded as a place for the development of artificial systems. The development of green open space which is provided not only for supporting human amenities but also conserving the life of local species is really interesting idea. Related to the circularity, urban waste management that promotes activities to reduce, reused, recycling and recovery could be seen as a case to develop circularity. It could be expanded into managing the cycle of energy, food, and water. Related to dynamics, the planning paradigm that view megacities as an organic system that has capabilities to learn, adapt, change and develop is really important. This will lead the connectivity and circularity toward achieving development visions. It is important for the megacities development which have to deal with various economic-ecological issues within global and local scale that always change time to time.

### *22.4.3 Urban–Rural Interaction*

Urban–rural interaction in Jabodetabek has persisted for more than three decades since the emerging of desakota concept by McGee (1991). Actually, it had happened a long time before McGee recognized this area as a desakota region. Many scholars regarded this area as a specific feature within Asian megacities. Extending urbanization has penetrated this dense agricultural area and caused chaotic urban–rural land use as well as mixed urban–rural livelihoods.

Currently there is a strong debate concerning the future of desakota region. McGee (2010) argued that the existence of this area has become more important since the volatility of fuel and food price in the global market has threatened food security within megacity. It is related to the capability of this area to produce food as well as provide various ecosystem services. On the other hand, the development of industrial estates within peri-urban Jabodetabek has converted the chaotic land use into the planned and new cities, and this is believed as a sign of the end desakota region (Hudalah and Firman 2012).

Obviously, the development of industrial estates that neglect the important role of desakota region showed the absence of urban–rural linkage conception in a planning. Douglass (1998) has proposed the idea of developing urban–rural linkage policy in order to manage desakota region. It is focused on managing the flow of people, production, commodities, capital/income and information between urban and rural. In terms of spatial, it is implemented in the form of a hierarchical urban system comprising the mutual connectivity among big and middle cities within urban, and small cities within rural. Unfortunately, it failed to be implemented because a hierarchical urban system is hardly to define within mixed urban–rural livelihoods in desakota region.

Therefore up till now the urban policy still neglect the importance of rural area, whereas rural development only focus on developing on-farm activities. Within this situation, linking urban–rural system in Asian megacities still becomes a challenge that should be resolved. Instead of relying on the urban hierarchical system, a new approach is needed to manage the mixed urban–rural livelihood.

One of the solutions that could be offered is developing hybrid urban–rural development system within desakota region. Urban activities in desakota region will differ from urban activities in the urban area. It could be similar to the eco-village conception whereby modern life in this area is developed within an eco-friendly infrastructure. Transportation, energy, water, housing, and industrial development need to be designed properly in order to reduce resources used and produce a clean and healthy environment. It will become important to support the quality of natural and agricultural land adjacent to this urban area.

On the other hand, agricultural activities in desakota are different from rural agriculture because they should adapt to the urban system and urban environment. Therefore, intensive agriculture that usually uses chemical substance should be changed into organic farming that produce fresh and healthy products. Besides, the farming technique should be developed toward eco-friendly ways in order to increase the role of agriculture land in providing environmental services. Malaque and Yokohari (2007) argued that segmented farmland patches that remain in urban fringe areas could provide various services including the capacities for water retention capability, micro climate control, conservation of visual quality, and the supply of safe, fresh food. Surely, the farmer should get additional payment for the ecosystem services provided by their agricultural land.

### *22.4.4 Multiple Local Government Interaction*

Lack of coordination among local government within Jabodetabek has become a classical issue that unresolved yet until now. Instead of developing integrated action, the policy has been fragmented in more numbers of provinces, municipality and regencies. At province level, the establishment of Banten Province in the year 2000, has separated Tangerang municipal and Tangerang district from West Java Province. Therefore Jabodetabek that previously comprising Jakarta and West Java Provinces has changed to an area that covers Jakarta, West Java and Banten Provinces. At municipality/regency level, Depok that previously was part of Bogor district has become a new municipal in the year 1999, while South Tangerang that previously was part of Tangerang Regency has become a new municipal in 2008.

The emerging of new province and municipals in Jabodetabek is related to the urbanization process. When certain area is urbanized and have sufficient income and population, then it will develop into a new municipal. Following this trend, government policy within Jabodetabek will become more fragmented in the future. It will exacerbate the problem because spatial discontinues of development policy will increase, even each municipal/regency will compete each other for getting higher local income.

Apparently, developing integrated governance within Jabodetabek is extremely difficult although most of stakeholders know that it is required to reach sustainable development. Many initiatives such as the formation of coordinating government institution and establishing particular President Regulation to manage this area have not given any significant effect. The idea to form a particular government institution for managing Jabodetabek region also has been proposed, but it is difficult to be realized because all local governments tend to against this idea.

Seemingly, relying on government initiatives in order to build multiple local government interaction will be ineffective. As suggested by Laquian (2008) a good policy should be pushed by the involvement of civil society groups, supported by social and mass media that enable citizen to get information and participate actively in public decision making. It means inclusive development needs to be developed to face the problem of fragmented governance in Jabodetabek.

In order to stimulate the involvement of the citizen, people concern about development policies should be strengthened by raising their capacity through the learning process and information dissemination. Jabodetabek as the center of knowledge with the advanced information technology has a capability to increase the capacity of people to participate in the public policy. As Laquian (2008) stated policies and strategies that achieve the welfare of the whole society will overcome the particular interest of specific groups including separated local government.

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# Chapter 23
# Metro Manila's Challenges: Flooding, Housing and Mobility

**Yves Boquet**

**Abstract** Among the many challenges faced by MetroManila, the National Capital Region of the Philippines, three appear as the most pressing issues for the everydaylife of its citizens: housing, flooding and traffic. The rapid increase in population of the metropolitan area had led to a mushrooming of substandard housing and squatting, sometimes in danger areas such as waterways and transport lanes. In a tropical context of heavy monsoon rains and frequent typhoons, riverside slums impeding the flow of water appear as one of the reasons—not the only one—why Manila floods, when at the same time people are placed at high risk. Coupled with a lack of available space throughout the metropolis, the high population density is a major factor of road congestion across the NCR, especially since rail-based public transit is quite insufficient to insure the efficient mobility of people. Tackling these problems may require a new governance for MetroManila, both in expanding its spatial scope and in strengthening its metro-wide powers, since floods are linked to water basins including Laguna Lake, and many relocation sites for evicted squatters are outside the limits of the 17-municipalities official MetroManila.

**Keywords** Flooding • Manila • Philippines • Sub-standard housing • Urban mobility

## 23.1 Introduction

The National Capital Region of the Philippines is currently home to about 12 million people. One of the most populated urban areas in the world, it is also among the most densely populated. A combination of high density, fast population growth, rapid motorization, and exposure to major risks, present a series of challenges for Metropolitan Manila and appear to be an obstacle to a sustainable development of the urban area (Jimenez and Velazquez 1989), both in terms of the future growth of Manila and the Philippines, and in terms of daily life of its residents.

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Manila, as a West Pacific rim-of-fire city, is considered as one of the large world cities most at risk for natural disasters. Sitting on top of the West Valley Fault, near the Manila Bay Fault and the Manila Trench, it is at a constant risk of a catastrophic earthquake with a strong potential for tsunamis, and under the threat of two major volcanoes (Heiken 2013): Mt Pinatubo, which erupted in 1991 in the world's most powerful volcanic event of the twentieth century, 100 km to the NNW, and Mt Taal 60 km to the SSE.

MetroManila is sandwiched between Manila Bay to the west and Laguna de Bay to the east. Both bodies of water communicate through the Pasig river, which runs in the center of the metropolitan area, with numerous small creeks, esteros, prone to flooding during the rainy season. The November 2013 Yolanda/Haiyan disaster in Tacloban, Leyte, has confirmed the position of the Philippines as a prime target for devastating typhoons. In 2009, Manila suffered many deaths due to another tropical cyclone, Ondoy/Ketsana. A first major challenge of Manila is to mitigate the risk of flooding, which may be enhanced in the coming years by the effects of global warming (sea-level rise and more intense storms), as in many coastal megacities in Asia (Yeung 2001; Yumul et al. 2011; Porio et al. 2013).

The population growth has been faster than the ability to provide decent housing, so many people live in substandard housing units, slums found in all sizes and locations, from university grounds and rail track sides to riverbanks and cemeteries. A second challenge is therefore to develop policies for allowing a decent way of life to millions of people.

Manila's congestion is also evident in terms of vehicular traffic, contributing to a high level of pollution with smoke-belching buses, jeepneys and trisikel operated in a myriad of small enterprises, with a certain despise of operators for regulations and safety. Meanwhile, rail-based public transit, both at the metropolitan and interregional level, is quite insufficient to solve the current woes of traffic. A third challenge of MetroManila, therefore, is to improve mobility and air quality for its residents, keeping in sight the co-benefits of smoother traffic, less carbon/GHG emissions and an improved attractiveness for international investors.

These three challenges are linked to each other. The rapid growth of the urbanized area has reduced the ability of the ground to absorb excess water, since a large part of what is now built and paved in MetroManila was still farmland, rice growing land barely 40 years ago. Many squatters have built their houses on the banks or directly on the rivers of the city, impeding the flow of water. The lack of efficient waste treatment has led to a piling up of garbage in the water. Flooding is of course a major contributor to traffic jams, and the building of walls and over-passes, aimed at protecting the walking public from the dangers of motorized traffic, has in turn channeled the flow of water in ways that aggravate locally the flooding events during the rainy season.

How to answer these challenges? The governance of MetroManila is multiform. MetroManila itself is made up of 17 municipalities (Caloocan, Las Piñas, Makati, Malabon, Mandaluyong, Manila, Marikina, Muntinlupa, Navotas, Parañaque, Pasay, Pasig, Pateros, Quezon City, San Juan, Taguig, Valenzuela) with locally strong mayors, who may use their position as a steppingstone to the presidency or

the vice-presidency of the country. These municipalities are competing to attract investment and corporations, as indicated by the efforts of Quezon City to catch-up on other cities by developing its own CBD, at the expense of thousands of low-income people whose houses are being torn down. At the same time, a Metropolitan Manila Development Agency (MMDA), is theoretically in charge of many urban problems (disaster management, traffic, . . .) but has to deal with other agencies, with overlapping mandates. Finally, in the context of a relatively weak government undermined by corruption at all levels, a good part of urban planning is in fact led by private developers who control large tracts of land inherited from the Spanish style of colonization.

## 23.2 Manila's Density and Expansion

Greater Manila is a classic case of excessive concentration of people and economic activity on the small territory of a national capital city. It accounts for 35.7 % of the Philippines' economic output, 18 % of its population and 28 % of its motor vehicles, on barely 0.2 % of the country's land area. The population density of Manila is among the highest of the major metropolitan areas in the world with a comparable land area. It is almost twice as dense as New York City, for example, and only surpassed by Mumbai and Dhaka.

The official population of Metro Manila (17 cities and municipalities of the National Capital region, 639 $km^2$) was, according to the 2010 population census, approaching 12 million people. The largest city in population (and area) is Quezon City (2.7 millions), followed by Manila stricto sensu (1.7 million) and Caloocan (1.5 million). Six other cities (Pasig, Taguig, Parañaque, Valenzuela, Las Piñas, Makati) have more than a half-million residents. Densities are high: 18,113 people/$km^2$ for the entire National Capital Region, with much higher values in the central area (Manila City 43,079, Mandaluyong 27,138, Caloocan 25,907). Sixteen of the seventeen municipalities of Greater Manila have a population density of more than 10,000 people/$km^2$, with Muntinlupa in the south very close to that statistical threshold (9,699). At a finer scale, some parts of Manila city are among the most dense urban neighborhoods anywhere in the world: 91,637 in congressional district 1 (West Tondo), 51,304 in district 2 (East Tondo), 46,990 in district 4 (Sampaloc).

What is now the NCR had only 5.93 million people in 1980, but the population—and therefore the density of population—has doubled in just 30 years, and is projected to continue to grow, reaching maybe 16 million by 2020. If the population of Manila city itself has now reached a peak (only +1,3 % between 1980 and 2010), growth has been very strong in other municipalities. Quezon City had 397,990 residents in 1960, 1,165,865 in 1980, reached two millions in 1995, and gained more than 700,000 in the last 15 years (Fig. 23.1).

The dense, congested, urbanized area spreads now well beyond the boundaries of the National Capital Region, towards the provinces of Bulacan to the north, Rizal to the east, Cavite and Laguna to the south. Bulacan had 1,096,000 residents in

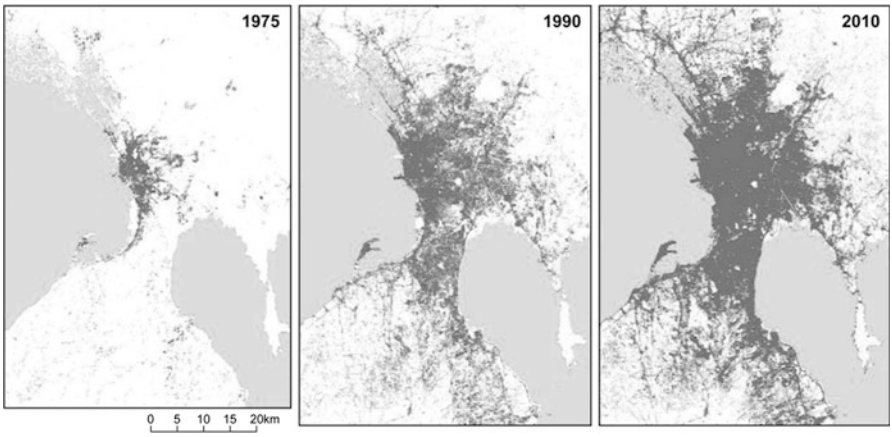


**Fig. 23.1** Urbanized area

1980, 1,784,000 in 1995, 2,924,000 in 2010. Its population density jumped from 391 to 1,045 in 30 years, with pockets of high density in municipalities adjacent to MetroManila: San Jose del Monte more than tripled from 142,047 to 454,553 residents in just 20 years (1990–2010) for a population density of more than 4,300 people/km$^2$. In Rizal province, Taytay (289,000 residents) had a density of 7,447 in 2010, while Antipolo grew from 69,000 to 677,741 inhabitants in 30 years. Looking south, Cavite province went from 1,152,534 to 3,090,691 residents between 1990 and 2010 and Laguna province from 1,370,232 to 2,669,847. San Pedro (Laguna) has a density of more than 12,000. Dasmariñas and Bacoor (Cavite) are home to more than a half-million people each, Calamba (Laguna) to almost 400,000.

Much of this population increase is attributable to massive rural–urban migration since the Second World War. People from all over the country are attracted to Manila by higher incomes and greater livelihood opportunities in the metropolitan area and its surroundings, while new industrial parks and residential subdivisions have sprouted between rice fields on the outskirts of the nation's capital. Maps, aerial pictures and satellite imagery show clearly a pattern fitting largely the desakota model developed by McGee (1991): a vast peri-urban region surrounding the metropolitan core as far as 50 km away from Manila (Calamba is located 55 km away from the historical center of Manila). Areas of intense wet rice agriculture are mixed with nonagricultural activities that often stretch along freeway corridors between cities (North Luzon expressway from Caloocan to Bulacan and Pampanga provinces, South Luzon expressway to Calamba, Manila–Cavite Expressway). Areas formerly devoted to agriculture have been converted into export processing zones (Kelly 2009), golf courses, suburban housing tracts and elite gated communities (Zoleta-Nantes 1992; Kelly 1999; Murakami and Palijon 2005; Malaque and Yokohari 2007). As the poor concentrate into the heart of the metropolitan area, American-style sprawl replete with shopping malls has seen the upper-middle class

move to the suburbs. In the specific context of the Philippines, with vast parcels of land controlled by longtime owners of "haciendas" dating back to the Spanish colonization, the conversion of land can proceed quickly, since the landowners are well connected to political power, both at the national and local level (Kelly 1998, 2003). Real estate development is one of the main elements of wealth building in the Philippines, even if there is some strong resistance by farmers groups (Ortega 2012), particularly in the well-publicized case of Hacienda Luisita, an estate controlled by the family of the current president of the Philippines.

It has become obvious that "Manila" is not just the city of Manila alone (now only the n°2 city in the country, behind its "suburb" Quezon City) or Metro Manila (aka National Capital Region), but that the real metropolitan Manila is larger than the official perimeter of 17 cities. "MegaManila", including the four adjacent provinces (Bulacan, Rizal, Laguna, Cavite) now has about 25 million people. It is estimated that the daytime population of MetroManila is now about 16 million people, with massive commuting especially from the south (Laguna and Cavite), and that the functional Manila includes peripheral areas in adjacent provinces and even beyond, since the port of Batangas (to the south) is playing a larger role in the movement of goods, the Clark airport in Angeles City (Pampanga) is now de facto the second airport for Manila and possibly the future major point of entry in the Philippines, while the export processing zones at Clark and Subic Bay (Zambales) are major manufacturing centers. All these places are located about 100 km away from Manila.

What is developing is an extended metropolitan region, with multiple cores, including in the central area, where the CBDs of Makati, Ortigas (Mandaluyong/Pasig) and Bonifacio Global City (Taguig/Makati) appear as edge cities larger than the business district of Manila City and dominated by an ethic of privatization of public space in the quest for global city-ness (Shatkin 2008; Hogan 2012; Boquet 2013a). In a classic dual-city contrast observed in many world cities, these areas are islands of world connectedness and gentrification (Garrido 2013; Roderos 2013) in a sea of poverty and slums.

## 23.3 The Challenge of Floods

Every year, destructive floods paralyze businesses and work in the Philippine capital of Manila and surrounding provinces for several days. Filipinos, including Manileños, have become accustomed to it and have built an image of resilience (Bankoff 2007; Nagai 2012), which is often hailed by political authorities as the "Filipino spirit".

2013 was no exception. In the middle of August, Metro Manila found itself in an all-too-familiar situation: after 3 days of nonstop rain caused by the southwest "habagat" monsoon enhanced by the proximity of tropical storm Maring/Trami, the metropolis was brought to a standstill by widespread flooding. The MMDA estimated that up to 50 % of the metropolitan area was flooded. Cities in the southern area of the National Capital Region—Pasay, Parañaque, Muntinlupa, and Las

Piñas—were the hardest hit, and placed into a state of calamity by the national government. Schools and universities were closed for a week. Even without a typhoon such as Ondoy/Ketsana (2009), heavy downpours—lasting only several hours but dropping 50–100 mm of rain—cause major disruptions across the sprawling megacity. It has happened twice in the summer of 2013, when on June 17 and September 10, late-afternoon torrential rains stopped traffic in many parts of the area.

Metro Manila's topography makes it a natural target for flooding: it lies in the mountain-surrounded flat area between Laguna Lake in the southeast and Manila Bay in the northwest. There are four major rivers, the Pasig, Marikina, San Juan and Tullahan, plus all their tributaries and the artificial drains, the esteros. North of the city, a good part of Bulacan and Pampanga provinces are also extremely prone to flooding. This already vulnerable topography has been altered dramatically in the past few decades, thanks to rapid urbanization (Bankoff 2003).

The plain areas are the easiest settlement areas for people, first for agriculture (rice cultivation), then for urban development. With the development of more housing subdivisions on what were once rice fields, the construction of more office buildings, shopping malls and residential condominiums in the cities, and the paving of more streets and parking lots, a layer of nonporous concrete now covers many more parts of the land. Thus, rain and floodwaters cannot seep into the underground aquifers as they used to do. They have to stay atop all that concrete. The result: runoff and floods.

For years, development has proceeded practically unchecked. Zoning laws were ignored, regulations were not enforced, lessons from the past were not learned, protected areas were built over. In the early years of Quezon City, for example, large open spaces were set aside for watersheds and parks in already identified flood-prone areas, but quickly these patches of green were developed with homes, industrial and business centers, schools and government offices. A ridge along the west bank of the Marikina River, which should have been preserved as a watershed, was paved over as exclusive subdivisions (La Vista, Loyola Grand Villas, Blue Ridge, and Ayala Heights), schools (Ateneo de Manila and Miriam College) or settled as slums. Indiscriminate commercial and residential developments, and roadworks, have blocked the path of many rivers in Metro Manila, resulting in many occurrences of localized flooding.

Areas in the northern part of Greater Manila (provinces of Pampanga, Bataan, Bulacan, and NCR cities of Caloocan, Malabon, Navotas and Valenzuela) have experienced floods which in recent years appear alarmingly more frequent, higher, more widespread, and take longer to subside than in previous years. Flooding in these areas is largely a consequence of unchecked urbanization (increased paved areas, proliferation of informal settlements), fishponds that block water channels, deforestation, and improper garbage disposal. Excessive groundwater extraction, rise in local sea levels and the subsidence of compacted delta deposits—enhanced by the mass of volcanic ashes deposited by lahar flows after the Pinatubo eruption of 1991—are additional factors that contribute greatly to the flooding of areas near Manila Bay (Laquian 2005; Rodolfo and Siringan 2006; Sales 2009).

Another reason for flooding in Metro Manila is intense logging in the mountains. Uncontrolled forestry has left many uphill areas in the Philippines bald. Without tree roots to hold the soil together, rainwater easily erodes the mountainsides, carrying topsoils downstream. Over the years, silt has made the waterways shallower so that they can hold less and less water and easily overflow their banks. When the floods recede, they leave a thick layer of mud. The reservoirs of the dams are also now much shallower and therefore can hold less water because much of their watersheds are also denuded; hence they reach their spilling levels faster and go dry faster in summer.

To the South of MetroManila, Laguna de Bay is a shallow lake (second largest freshwater lake in Southeast Asia, after Cambodia's Tonle Sap) whose capacity to act as a moderator to floods is limited, as shown by the intense flooding in parts of Laguna province and southern sections of MetroManila in August 2012. When the lake is full, it overflows, since the Pasig River is not powerful enough to evacuate the surplus water brought by all the streams flowing into it (Nauta et al. 2003). Laguna Lake is also now much shallower because of siltation. Therefore, it can hold less of the water flowing down from the mountainsides and the plains surrounding it, including Metro Manila. The lake should be dredged to make it deeper and hold more water.

To mitigate chronic flooding in Metro Manila, several approaches have been attempted. First of all, a number of dams have been built over the years in the mountains east of Metro Manila, with the multiple goal of providing electricity, guaranteeing water for irrigated rice fields, providing water for metropolitan residents, and retaining excess water in times of heavy rain. They are La Mesa Dam in Quezon City, Angat Dam and Ipo Dam in Bulacan province, and Pantagaban Dam (1977) in Nueva Ecija. However, in every rainy season, there are difficult choices to make about the correct timing to open the floodgates and release millions of liters of water to keep the dams from overflowing. Between 1980 and 1986, excavation of the 10-kilometre long Mangahan Floodway diversion channel was implemented in the southeastern part of the metropolitan area, linking the Marikina River to Laguna de Bay, so that the lake can be used as a temporary catchment basin in times of intense rainfall. The flow of water out of Laguna de Bay has been regulated by the construction of locks (Napindan Hydraulic Control Structure) to control the reverse overflow into the lake. But if the Manggahan Floodway has lessened flood conditions in central Manila, it now contributes to heavier flooding of the coastal areas of Taguig, Taytay, and other towns in Laguna and Rizal provinces alongside the lake, precisely where the metropolitan expansion is now taking place.

Worse, the Mangahan Floodway, as some other waterbodies, is one of the sites where informal settlers have established their dwellings. In Metro Manila, the banks of rivers, canals, and esteros are frequently used by settlers. Their makeshift housing often encroaches onto available waterways, blocking the access of maintenance personnel and equipment and reducing their capacity to handle discharge. Even though the urban poor are not the only ones responsible for such encroachments, since governmental, commercial, and industrial concerns also play a significant role, they have been pointed out repeatedly as major factors of flooding, alongside with

the huge amount of garbage left on street corners, dumped on vacant lots, or thrown into waterways, clogging the network of drainage canals, posing a considerable risk to health (mosquito-borne diseases such as malaria or dengue fever, and intestinal diseases), and greatly increasing the likelihood of flood. Should, therefore, the eradication of slums be a major policy tool to fight floods in Manila?

## 23.4 The Challenge of Housing: Squatters and Urban Development

In 2003, slums ("informal" neighborhoods, "squatter areas") were scattered in 526 repertoried sites all across MetroManila (Ragragio 2003). They are home to about four million people, or one third of the population of agglomeration (Arimah 2010; Alcazaren 2011). Their population is growing at an alarming rate of 8 % per year (Ballesteros 2010). They are located in central parts of the metro area and on its outskirts, on private or public vacant lands, alongside the many urban bodies of water, also near garbage dumps, along railroad tracks, under bridges, near factories, cemeteries, bus terminals and subway stations, even on the grounds of university campuses (Galeon 2008). The homes are made of plywood scraps, corrugated tin roofs, and plastic tarpaulin. The materials are taken from wherever they can be found. If significant slums are easily located, the mode of settlement of the poor of Manila is generally dispersed. Some squatter settlements, labeled "looban" ("inside places" in tagalog) are hidden inside housing blocks, while the access to "eskinitas" is possible only though narrow alleyways. The megacity is compartimentalized, fragmented between affluent areas of posh villas protected by armed guards (Rockwell Drive in Makati) and "iskwater" areas (Guadalupe Viejo in the same part of Makati), between international style shopping malls and crowded markets (Pinches 1994; Connell 1999; Gueguen 2007). All Metro Manila municipalities harbor at least 15 % of their population in slums, some more than 50 % (Pasay).

In view of the difficult living conditions of slum dwellers (poverty, unemployment, unsafe dwellings, flood risk, fire hazards, domestic violence, prostitution, child labor, crime, drug dealing), the challenges to properly house several million people appear enormous (Starke 1996) and the choices difficult (Werlin 1999; Berner 2000; Porio and Crisol 2004; Llanto 2007; Gonzalez 2009).

Should the policy be to do nothing and consider that shantytowns are only a symptom of uncontrolled population growth and will eventually disappear with the expected decline in fertility? Should it be to "upgrade" slums? Should it be to eradicate slums, either by chasing away their residents, relocating them or developing major programs of public housing in situ (Guerrero 1977)? If the government chooses to regularize the legal status of informal settlements, will it attract more settlers? Should squatters receive titles to urban lands of better value? Are squatters "parasites" in the city or actors of its development? Are squatters individuals on their own or communities with their own solidarities and homegrown economies

(Porio 2002; Nakanishi 2006)? Many residents run small "sari sari" stores, carry goods in the market, transport passengers in pedicabs (bicycles with sidecars), sell homemade food to their neighbors. Some work in factories, as janitors at the airport or in office buildings, as salespeople in malls, even as teachers. Hidden from view, but close to modern business centers, squatters are part of the fabric of the global city (Shatkin 2004).

Slum policies in Manila have been difficult to follow, since they have changed often over time. In 1947, the young Philippine government had created the People's Homesite and Housing Corporation (PHHC). In the following years, five other agencies were created to meet the challenge of housing: Presidential Assistant on Housing and Resettlement Agency (PAHRA), Tondo Foreshore Development Authority (TFDA), Central Institute for the Training and Relocation of Urban Squatters (CITRUS), Presidential Committee for Housing and Urban Resettlement (PRECHUR), Sapang Palay Development Committee (SPDC). To end the confusion, the NHA (National Housing Authority) was finally created in 1975 by F. Marcos under Presidential Decree 757. The new agency, responsible for the production of housing for low-income families, took over and integrated the functions of the abolished agencies. Three weeks later, under martial law, F. Marcos criminalized Filipino informal settlers (Presidential Decree 772: "Penalizing Squatting and Other Similar Acts"). This allowed evictions without justification. In 1977, the Law n°555 (Slum Improvement and Resettlement Program Act) seemed to favor in situ slum upgrading, while providing for a transfer of residents, but the following year the perspective changed again. In 1978, the NHA was attached to a new ministry, the Ministry of Human Settlements (MHS). Presidential Decree 1,396 created the National Capital Region, including 17 towns detached from Rizal province, and Imelda Marcos, wife of the president, became its governor. The same decree created a Human Settlements Development Corporation, responsible for implementing urban renewal policies (slum clearance) and the development of the Bagong Lipunan ("New Company") relocation sites.

In March 1986, Government Decree n°10, an early post-Marcos measure, placed the NHA under direct administration of the President of the Philippines. It must coordinate its efforts with other state agencies, such as the MMDA (MetroManila Development Authority), the LLDA (Laguna Lake Development Agency), and provincial and municipal governments. The 1992 "Lina Law", named after Senator J. Lina (Law n° 7279, Urban Development and Housing Act) specifies under what specific conditions to undertake evictions and destruction of homes. They can only proceed when (a) people live in places considered dangerous (esteros, railways, landfills shorelines) or in public spaces (sidewalks, roads, parks and playgrounds), (b) public infrastructure projects already funded are ready to be implemented, (c) after a judicial decision ordering expulsion or demolition. The law aims to "raise the life standard of disadvantaged citizens and homeless in urban areas and resettlement areas" by providing decent housing at an affordable cost and access to basic services and employment. The government supports "priority development sites" identified as "good for social housing". The law n°8,368 (Anti-Squatting Law Repeal Act of 1997) abolished the Marcos decree of 1975, decriminalizing the

squatters, even if the 1992 text promises severe penalties (fines and imprisonment) for "professional squatters" exploiting the poor by charging exorbitant rents and illegally residing on private or public land even when they can afford to live in legal housing.

In 2008, President Gloria Arroyo (Decree 708) required municipalities to establish local agencies (Local Housing Boards) for the implementation of expulsion procedures, while Decree 803 (May 2009) created a metropolitan agency (MMIAC, MetroManila Inter-Agency Committee) to coordinate the establishment of shelters for squatters threatened with eviction.

Today, in the Philippines, evictions of informal settlers are controlled and people are no longer considered criminals. Many local NGOs help them to better defend their rights. But if the squatters are tolerated, they are still considered as a "problem to solve" and the fundamental trend in the Philippines for the last 20 years is not to improve the living conditions of people in slums but rather the construction of housing replacement to proceed with eviction and demolition.

In the 2008–2011 period, 532 operations of squatter sites demolition have been conducted in Metro Manila, affecting 166,092 families (for an average of 312 families by action, which shows the magnitude of the effort). Ninety-three of these eviction events (17 %) were justified by the safety of residents (flood or fire prone areas). They involved 75,709 families (46 % of total, average 814 families per transaction). The largest number of cases (284, 53 % of the total) were motivated by court decisions, disputes about the illegal appropriation of land, affecting 19,747 families (12 % of the total, average of 70 families by deportation: ten times less than evictions for safety reasons). One hundred nine expulsions (20 %) for 57,850 households (35 %) were motivated by infrastructure projects: redevelopment of rail corridors, widening of streets, water projects (average 531 families). Three-quarters of the evictions were ordered by local authorities. The number of evictions appears to have increased after the end of the presidency of Gloria Arroyo, who had signed several decrees allocating government land for the construction of housing for the poor, while her successor Benigno Aquino did not.

In recent years and months, certain operations of evictions have mobilized the interest of the press, due to the violent battles between settlers armed with rocks and Molotov cocktails on one side, and demolition workers supported by police armed with tear gas and water cannons, on the other side. Foremost is the Sitio San Roque in Quezon City, where a large squatter settlement is to be eliminated to make space for the future Quezon City CBD (Lagman 2012), a major real estate operation on a site next to two major shopping malls and important transport terminals. In Pasay, the eviction of squatters in the Baclaran neighborhood was politically difficult due to the presence of a large mosque. The expulsion was seen by some as an attack on the Muslim minority. Other showcase evictions were linked to projects to revive rail service (Northrail project in the hyper-dense Santa Mesa neighborhood of Manila, and in Valenzuela and Malabon). In Tondo, the huge squatter settlement adjacent to the garbage disposal site poetically (ironically?) nicknamed "Smokey Mountain" was dismantled with a massive operation of transfers of its residents towards a site in Batangas province, 2–3 h south by bus. However most people

came back and started to work again sifting through the new pile of garbage nearby, "Smokey Mountain 2". Public housing efforts in the area were of mediocre quality, and some of the buildings (the Vitas Tenements) had to be demolished due to faulty construction. In Quezon City, after a tragic landslide in 2,000 killed scores of people in the Payatas landfill, relocation of some survivors was implemented (Gaillard and Cadag 2009).

In Manila, a high density megacity, the question of flood risk and vulnerability has pushed to the forefront the issue of illegal housing built on the edge of rivers (Zoleta-Nantes 2000; Bankoff 2003; Porio 2011; Nagai 2012). Some slums are built in dangerous places, deemed unsafe for regular housing, alongside fault lines, unstable slopes, riverbanks. Their inhabitants are confronted daily with substandard housing and a degraded physical environment resulting from the failure to provide adequate public services (drainage, garbage disposal, electricity, water supply). Overcrowding increases the risk of respiratory disease, water contamination and poor disposal of household and human waste are sources of gastrointestinal problems (*E. coli* bacteria), skin diseases, cholera, typhoid and other infectious diseases such as leptospirosis. Living near landfills exposes the poor to harmful bacteria, dioxins, carcinogenic pollutants that undermine people's health from an early age, while standing waters favor mosquitoes carrying dengue fever or malaria.

This environmental dimension (Jimenez and Velazquez 1989) coupled with a growing concern about the health risks is now a growing motivation to evict poor residents in Greater Manila, especially since the major Ketsana/Ondoy typhoon of September 2009, in the name of protection of urban waterways against pollution and flood prevention.

Some 300,000–500,000 people are affected by the plans to eradicate illegal settlements alongside the rivers of the agglomeration (Pasig, Marikina, San Juan, Napindan, Tullahan, Catmon), the esteros, the shores of Laguna de Bay and the Bay of Manila, as well as the Mangahan Floodway. Squatters in the esteros and alongside the Pasig river use them as a water resource, but also as toilets and dumps. The foul-smelling water surface is littered with trash. It is difficult to treat these wastes, especially as Manila lacks space for his garbage management. Two-thirds of the solid waste materials floating in the Pasig, blocking the flow of water, are attributed to residents of slums.

In 1999, President Estrada created the Pasig River Rehabilitation Commission, with the mission to restore the river to its original state as a recreational site and an axis of transportation (Lazo 2012; Lopez 2012). This commission works with other government agencies, tracking polluters and squatters, planting trees, controlling garbage and water quality. In 1999 and 2000, 10,000 people were evicted from the banks of the Pasig, but the brutality of evictions led the Asian Development Bank to intervene, threatening to suspend financial support to prevent forced evictions. After he assumed power in 2010, President Aquino reaffirmed the importance of the reconquest of the Pasig River, increasing the budget for the commission and setting an ambitious goal of cleaning up all waterways in Greater Manila by the end of his term in 2016. Some results are already spectacular; alongside the 2900 m of the Estero de Paco (Arboleda 2012), one of the most filthy open-air

sewers of the city, the shacks of tin and plywood established on top the river have given way to a tree-lined promenade. The water, although still polluted, is now free of trash, partly because the nearby public market vendors have stopped throwing their garbage into the water. It is already observed that floods there appear less serious than in the past because the flow of water is not blocked anymore by the accumulation of debris.

In August 2012, after a major monsoon flood, the Philippine government announced that it was ready to forcibly evict slum dwellers on the Pasig river because their houses blocked the flow of water and contributed to severe flooding in the city, forcing an emergency evacuation of 350,000 families in the metropolitan area. Interior Secretary J. Robredo proposed to transfer forcibly 10,000–20,000 settlers per year from areas with a high risk of flooding, while, according to press reports, Public Works Secretary R. Singson said he had received presidential instructions authorizing him to dynamite the houses of recalcitrant people. Such extreme proposals angered the inhabitants of slums and housing rights activists, quick to note that even F. Marcos had never considered such measures.

The question remains of what to do with the people evicted. The Philippine government has selected for displaced slum dwellers a number of sites in the neighboring provinces of Metro Manila, sometimes much farther away (Zoleta-Nantes 2006). Specific relocation sites have been identified for relocation projects concerning rail tracks, waste dumps or riverbanks. Calauan, Cabuyao and San Pedro Tunasan (Laguna), Carmona, Trece Martires, Dasmariñas and General Mariano Alvarez (Cavite), San Jose del Monte (Bulacan) and Rodriguez (Rizal) are among the municipalities that have allocated land for the relocation of the people moved from Manila. The relocation sites are often given bureaucratic names ("Phase 1", "Southville 8C", "Northville 4", "Phase 6 Towerville"...), sometimes more positive names: "Bagong Silang" (Renaissance), "Bagong Bayan" (New Village), "Bagong Buhay" (New Life), "Kasiglahan" (Vitality) (Fig. 23.2).

These relocation sites, however, have been widely rejected by the affected populations, for several reasons: a feeling of uprooting, the lack of jobs (leading to long costly commutes to places of work), the lack of food availability, poor quality housing (sad-looking rows of poorly equipped houses), tight regulations prohibiting many activities (hanging clothes, smoking, making any noise after curfew) and giving to the transferred people a feeling of limited freedom. The allocation of mediocre farmland (2 ha per family) suggested by President Aquino cannot solve problems. These are not farmers who are being relocated out of the city, but long time urban dwellers. Relocating a janitor or a garbage recycler to the rural Philippines does not make him a rice farmer. When, freshly disembarked from the military trucks that transported them from Manila, former slum dwellers realize that water supply is incomplete, there is no sewage, no electricity, unfinished grounds, and no jobs or shops nearby, the illusion of a better life quickly dissipates and a quick return to Manila is the solution (Yamamoto 1996). In some cases, relocation sites are themselves at-risk places (flooding areas, on slopes prone to landslides, near fault lines).

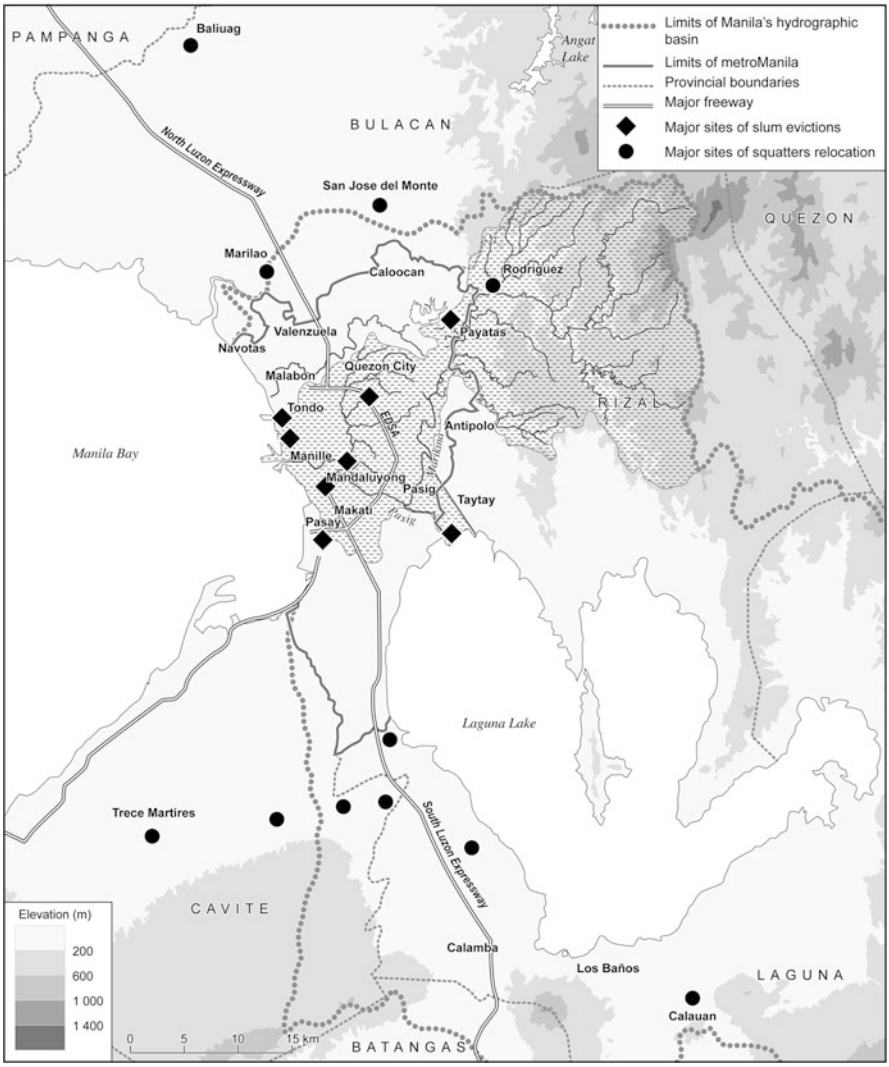


**Fig. 23.2** MetroManila and Laguna Lake

The recent trend is for more housing types, with a growing participation of the private sector (through the funding of resettlement sites by charitable foundations) and the choice of more central locations. The "Medium-Rise Public Housing Program" has selected 15 sites to relocate the people displaced from the Pasig River (five in Caloocan, two in Mandaluyong and Pasig, one each in Malabon, Manila, Muntinlupa, Pasay, Taguig and Quezon City) for buildings of four to five floors as close to the jobs as possible (Cruz 2012).

## 23.5 The Challenge of Daily Mobility

The urban density of Manila is one the highest of the world and the rate of motorization far exceeds the street capacity to handle traffic. The joint processes of globalization, outsourcing, and the relocalization of manufacturing activities have been accompanied by a rise in the purchasing powers of many people, as in other developing Asian countries, which has allowed them to acquire motorized vehicles, motorbikes and automobiles, even if profound inequalities exist in regard to the capacity to acquire a vehicle (Cervero 2013). In Metropolitan Manila, according to MMDA data (Vergel de Dios 2009), there are currently 5,034 km of roads (37 km of tolled expressways, 992 km of "national roads", 2,366 km of "local roads" and 1,639 km of "private/subdivision roads"). In 2008, Manila counted 1.7 million registered motor vehicles, of which almost 10 % (163,000) were registered for-hire vehicles: buses, jeepneys and trisikel.

It has resulted in a rapidly increasing congestion of the streets, since the urban fabric is traditionally made of narrow roads not suitable for heavy traffic. The density both of roads per square kilometer and roads per resident appears very low in Manila, compared to other metropolitan areas (Boquet 2013b). There are simply not enough roads to allow for smooth traffic. Many parts of Manila experience heavy traffic congestion, especially in areas of high population density (more than 70,000 people/km$^2$ in Tondo) and narrow streets in old neighborhoods such as Quiapo (Manila) or Guadalupe (Makati). In these areas, street vending encroaches on the limited road space, further slowing down an already busy vehicular traffic, largely made of jeepneys and trisikel. Heavy downpours during the rainy season, from June to November, make some low-lying streets often impassable, due to widespread flooding (Zoleta-Nantes 2000; Bankoff 2003; Alcazaren 2013).

This issue cannot be solved quickly, unless there is drastic redesign of the whole urban fabric, which only China has attempted on a large scale. Congestion not only slows down considerably the speed of travel, and therefore diminishes the efficiency of the overall economy, but also has nefarious effects on the environment (air pollution) and public health (chronic asthma, bronchitis, eye irritation). It also is blamed for an excessive use of fossil fuels.

The setting of the city between Manila Bay to the West and Laguna de Bay to the South limits the opportunities to spread traffic from the south on many axes of circulation. Built in the 1940s, the circumferential highway EDSA, named after historian Epifanio de los Santos, seems permanently clogged by traffic, even if the newer C-5 beltway tries to provide some relief. The excellent accessibility of EDSA sites has clearly attracted a lot of commercial investment and strategic implantation. But this abundance of shopping centers, office plazas, and places of employment generates at the same time an enormous amount of traffic on EDSA. According to MMDA data, about 350,000 people use the EDSA roadway everyday (156,000 vehicles, with a density of 565 vehicles/km.

Buses, provincial and local, represent a large part of the traffic on EDSA, and are often blamed for the traffic woes (Boquet 2013c). The most common problems

are: too many transport providers, unreliable service, and irregular and/or unpredictable frequency. Route coverage is poor, because buses concentrate on few corridors while neglecting other parts of the city. This results in low profitability, leading to poor quality vehicles, a poor safety performance, exaggerated pollution and mediocre consideration for passengers (Vergel de Dios 2009).

Seven thousand seven hundred thirty-six, or about 60 %, of the 13,067 registered buses plying Metro Manila roads are provincial buses, linking the Manila metropolitan area with regions across the Philippines. Even if other parts of Manila have bus terminals (Gil Puyat in Pasay, Sampaloc near Quiapo), most companies have established their terminals alongside EDSA, with major concentrations in Pasay and in the Cubao-Kamuning stretch.

What could be the solutions to solve Manila's traffic problems, particularly alongside EDSA, which appears clearly as the major circulation problem in the Manila region? Answers to traffic problems have been considered or experimented in many cities around the world, and in Asia in particular (Cervero 1998; Ieda 2010; Suzuki et al. 2013). Based on these experiences, three major possible policy options can be suggested: improve rail-based mass transit, increase the availability of road space, and reduce the number of buses.

Over the last two or three decades, many cities in Asia have developed impressive heavy rail transit systems designed to increase the share of rail in the commuter transportation mix. However, Manila has made timid efforts in that regard, with only three lines at this time (two lines of the LRT, Light Rail Transit and the MRT, Metropolitan Rail Transit, running alongside Edsa from Makati to Quezon City), the smallest network of any major Asian city, except for Mumbai and Jakarta, which have no metro rail transit at this time, even though they have suburban trains. Manila's three lines carry only 1.1 million passengers per day, much less than in comparable sized cities in other Asian countries. An expansion of the rail transit system in Manila is needed. While routes of future new lines have been drawn for a long time, financing for construction has not been secured. There are also issues with land ownership along the planned routes, and with clearing the right-of-way where ground-level rail track already exists, since it is often colonized by squatters. Reducing the crowds on EDSA-MRT trains would require a huge effort to develop alternate routes. At the present time, the choice for most people is to either endure overcrowded trains or suffer traffic jams in EDSA-plying buses.

Developing new road infrastructure means investing heavily in state-of-the-art overpasses and urban elevated roads, in the Shanghai mode. Where should these roads be built? Since EDSA is the major metropolitan-wide traffic problem, should it be widened? The concentration of shopping malls and office towers alongside its route makes it difficult, considering that EDSA for most of its length is already a very large roadway, almost a freeway in some sections. Should a super-EDSA, above the current one, be built? There are logistical problems in some area such as Cubao where the LRT 2 already crosses above the MRT, which is itself running above the EDSA roadway. In a metropolitan area potentially prone to major earthquakes, would it be wise to make thousand of cars "fly" on skyways 30–40 m above ground? There is also the classic dilemma of building for more cars,

which allows smoother traffic for a while until the new road space fills and the whole process of widening must be started again.

Reducing the number of cars on the road has been attempted in 2003 with a vehicular license scheme banning on certain days vehicles with certain license plate ending numbers. It is very easy to go around this restriction. Some have suggested using the vehicle type as the base for restrictions: no Toyotas on Mondays, no Hondas on Tuesday… Is it feasible? A Toyota ban on some days would create huge uproar. Would it also apply to ubiquitous Toyota taxicabs? Should access be linked to the number of passengers, following the example of United States HOV (high occupancy vehicle) lanes? In a societal and economic context closer to the Philippines, Jakarta has implemented a system limiting access to its Central Business District (CBD) to cars carrying at least three people. It may be more difficult to implement in Manila since the CBD is in multiple locations. It would really have an impact if all cities with major CBDs (Makati, Mandaluyong, Taguig, Quezon City) were to act together, under the umbrella of the MMDA. Carpooling should be encouraged and rewarded, possibly with free parking in business centers (Fig. 23.3).

At the current time, Philippine authorities have decided to directly attack the bus problem on EDSA with two complementary measures, aimed at providing more fluidity in bus transit. The first one is to try to put some order in the way people embark and disembark from local buses. Since December 2012, a "bus segregation scheme" divides metropolitan buses in three groups, A (Edsa-Alabang), B (Edsa-Baclaran) and C (others). Alternate bus stops have been erected alongside EDSA: "A" buses can only pick up/drop-off passengers in "A" designated red stops (colored red), while "B" buses stop at blue B stops. "C" buses may use both "A" and "B". The hope is to limit the number of sudden stops of buses and the jockeying into position of rival buses. The A, B or C sign is prominently displayed in the front of the bus. The second measure, which started to take effect on July 15th, 2013, is to plan to remove all provincial buses from EDSA by creating integrated terminals on the outskirts of the metropolitan area, where provincial buses will stop and transfer passengers to metropolitan transportation. The scheme is inspired by what has been done in South Korea (Seoul's Gangnam district) or Indonesia (Surabaya's Purabaya/Bungurasih integrated bus terminal). The first interim "Coastal terminal" is located near Unionwide Mall, between Mall of Asia and Manila's airport, in the southwestern part of the metro area. The goal is to remove all Batangas or Cavite-bound buses from EDSA, therefore starting to reduce the bus-caused congestion. Buses from the LRT1 and MRT end stations and bus routes leading to "Coastal" will allow transfer between local transportation and provincial buses. Two mixed-use terminals (transportation, offices, shopping) are planned for other routes, including one in the new Quezon City CBD, where battles about the shantytown of Sitio San Roque are taking place. This "Vertis terminal" would serve all buses going to northern Luzon.

There is strong resistance from the bus companies to change their traditional ways of operation, but a corresponding decisiveness from the chairman of MMDA and the transportation minister of the Philippines, pushed to act by the growing impatience of the public about traffic jams. However, many unresolved issues


**Fig. 23.3** Manila's bus transport

remain, including the aggressive style of driving of bus conductors, the oversupply of local buses running half-empty, and poor emission standards for buses. Many bus companies are controlled by well-connected personalities, politicians, military officers, showbiz or sports celebrities, who have the political clout to resist attempts to rationalize the supply of bus service and implement strict norms for buses. The same resistance is seen from the many small operators of jeepneys and tricycle, who are politically powerful as a rich source of votes. Political will is necessary to implement measures aimed at taking out of circulation aging and polluting vehicles to reduce vehicular traffic, both on EDSA and on local roads.

## 23.6 Towards a Better Metropolitan Governance?

Manila's three major challenges, housing, flooding and transportation, reflect clearly a difficulty to plan the metropolitan area for the long term.

It is not for lack of grand plans in the history of the city. The Spaniards had established cities in the Philippines following, as in Spanish America, the guidelines of the Leyes de India, with central plazas as the main organizing element of urban space. When the Americans took over, the famous urbanist Daniel Burnham came to the Philippines to draw plans for Manila and the summer capital Baguio, following the ideas of the Garden City Movement, with inspiration taken from US cities such as New York, Washington or Chicago. At the time of the independence of the Philippines, president Manuel Quezon supervised grandiose plans for the new capital, Quezon City, centered on a large 400-hectare green space. The three branches of government would be close together, in one huge elliptical site close to the flagship campus of the university of the Philippines in the Diliman section of Quezon City. Today, however, the House of Representatives is located up north in another part of Quezon City, the Senate holds sessions down south in Pasay City, while the president and the Supreme Court have their offices in Manila, near very crowded neighborhoods prone to heavy flooding. These distant locations create accessibility problems and hinder efficient governance at the national level.

Poor urban planning shows in the lack of significant green spaces in the metropolitan area, with the exception of the wooded campus of UP-Diliman. Air quality is poor in most of the metropolitan area, and the prevalence of slum colonies clogging the waterways aggravates floods. Trade and tourism suffer from the mediocrity of Manila's urban environment.

There is no lack of planning at the level of individual local governments (LGU, local government units) and in private master-planned real estate developments. The problem lies in the fragmented and decentralized governance of the metropolis.

Most large Asian cities, such as Tokyo, Shanghai or Bangkok, are now run as one political unit with a powerful mayor or governor, who can plan at the metropolitan scale. Not so in Manila. The seventeen towns and cities making up the metropolis of Manila are ruled by fiercely independent mayors (and many of their families, in a political system where close relatives of top politicians are there to replace them

when they move up the political ladder). There are powerful hatreds between political clans (the Cojuangco-Aquinos, the Romualdez-Marcoses, the Macapagal-Arroyos, the Estradas, the Binays...). Due to long-term political rivalries at the national level, they rarely talk to each other or cooperate to solve common problems, even if crime, traffic, pollution and floods do not end at political boundaries. But the idea of a merged government has been floated around several times.

As early as 1935, Acting Governor General Eugene A. Gilmore formed a committee to draft a bill creating Greater Manila. This was to include Caloocan, San Juan, Mandaluyong, Makati, Parañaque, portions of Las Piñas and two other sites that eventually would become Quezon City and Pasay City. The bill passed the Senate but floundered in the House. With the coming of independence, the government moved the capital from Manila to Quezon City, created by merging several villages in the suburbs. In 1950 Pasay also became a city. In the following decade, rapid growth pushed President Magsaysay to consider a merger of the three to form a larger city including the small localities of the area (Makati, Mandaluyong...) where real estate interests were starting to develop new business centers. But his untimely death in a plane crash stopped the process.

In 1975, Ferdinand Marcos, by creating the National Capital Region, recognized the need to manage the 17 cities as a whole, but the nomination of the First Lady Imelda Marcos as its first governor, and chairperson of the MMC (Metropolitan Manila Commission) gave it a very political flavor. At that time of martial law, local governments had little say in the management of the metro area. Through partnerships with national government agencies, the MMC started to implement a Metro Manila flood control system, developed a systematic slum policy and started the construction of medium-rise housing throughout the metropolis. It also introduced a coordinated solid waste management system, which included the construction and operation of sanitary landfill sites, and a metro-wide traffic management system. But the population growth made these efforts ineffective for the long term.

After the fall of Ferdinand Marcos in 1986, Corazon Aquino pushed for democratic reforms, including giving more power to local governments. The Marcos-led MMC was eliminated and replaced by the MMDA, with legislative powers over the metropolis given to the Metro Manila Mayors Council, and executive powers to an appointed Chairman (first selected by the mayors themselves, later named by the Philippine president, with cabinet rank). The agency in charge of MetroManila is supposed to tackle many issues, transportation, risk management, public health, garbage management, However, its legitimacy is weakened by the fact that there is no greater Manila official elected by the voters of the entire metropolitan area, and the effectiveness of its action is limited by the overlapping roles of different agencies, quite visible in flood management, housing and also transportation.

As an example, who is really in charge of traffic in Manila? The MMDA? The Land Transportation Office, whose role is to deliver driving licenses and register vehicles? The Department of Public Works and Highways, in charge of road construction? The Land Transportation Franchising and Regulatory Board, which oversees bus companies and jeepneys? The municipalities delivering authorizations for commercial trisikel? The Philippine National Police? The local police? Private

developers blocking access to some subdivisions and forcing traffic to go around them? Municipal governments? In 2003, when the MMDA implemented a "number coding" scheme of vehicles, it was rejected by the mayors of Makati and Mandaluyong, which are homes to two major business districts. After he was elected in July 2013, the new mayor of Manila—and former Philippine president—Joseph Estrada decided unilaterally to stop all buses without a bus terminal in the city of Manila at the entrance of his city, and forced them, with his local police, to turn around, creating major disruptions on some thoroughfares between Quezon City and Manila, generating much protest from both bus companies and bus passengers, as well as fellow mayors of adjacent cities.

To be truly prepared for floods, the government should go beyond political boundaries and approach disaster risk and reduction management at the regional level. This means including the uplands, like the Sierra Madre mountains as well as Laguna Lake, bordered by Rizal and Laguna provinces. But natural watershed boundaries—a major factor in where and how floodwater flows—have long been ignored in planning and governance.

The megacity could be governed as a province, as are many other megacities in Asia, not as a collection of 17 municipalities. Or, as some have proposed, should a new capital for the Philippines be developed outside of Manila?

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# Chapter 24
# Contributions and Challenges of Dhaka's Food System: The Case of Fish Provision

**Markus Keck**

**Abstract** The food system of Bangladesh is currently producing a wide range of contradictions: Domestic food production was increased at unprecedented rates, but not without ecologically damaging side effects. Supply chains work efficient insofar as enough food is transported to the consumers. Nevertheless, stark discrepancies can be detected between the involved actors, from single dominant market makers to the masses of day labourers who can hardly make a living. And even though enough amounts of food are supplied to consumer markets, food security is far from being attained. This chapter sheds light on the extent of dysfunctionalities of Bangladesh's food system from a sustainability perspective by focussing on the capital city of Dhaka. The case of fish provision is taken to discuss present day challenges of the mega city in terms of food production, supply and food security. In the first part, I will discuss recent developments in national fish production and outline the structure of the supply and value chain for fresh fish. In the second part, I focus on the local food market of Dhaka and debate available amounts and seasonally fluctuating prices. In the last part, I will bring together the national and the local perspective to provide proposals for necessary future re-adjustments.

**Keywords** Bangladesh • Dhaka • Fish consumption • Food security • Mega city • Value chain

## 24.1 Global Urbanisation and Food Security

Despite a steady growth of agricultural production around the world, and despite a tremendous increase in the international trade of edibles, global food security is far from being attained. Today, 15 % of the population in the Global South are still undernourished (FAO 2011). Moreover, decades of deregulation and privatization policies together with innovations in the financial sector have led to an unprecedented volatilization of capital to which food prices are particularly

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sensitive (Altvater 2005; Ruel et al. 2010). In addition to that, global environmental change has unforeseeable impacts on food systems worldwide (Ingram et al. 2010). There is mounting evidence that with ongoing urbanisation hunger shifts from rural to urban areas (Ravallion et al. 2007; Ruel et al. 2010). In some countries of the Global South, the incidence of chronic food insecurity is already higher in cities than in rural areas (Cohen and Garrett 2010). This is due to the fact that urban households primarily rely on their income for access to food (Sen 1981; Watts and Bohle 1993). In times of economic, political or ecological crises poor urban households suffer from decreasing purchasing power, as prices of food commodities increase while their income does not (Bohle and Adhikari 2002; Pryer 2003). Urban food security, in turn, is largely a matter of sufficient production and undisturbed food supply chains on one side and societies' class structure and people's access to the labour market on the other.

Drawing on recent research in Dhaka, Bangladesh, in this contribution, the present-day challenges of the urban food system are discussed. National food production figures are presented, the functioning of rural–urban supply chains is explained, and the current situation of food insecurity in the mega city is depicted. Three major findings are drawn from the empirical data: First, it is the resource and technology intensive inland water fisheries in ponds and ditches that are today's major source of fish supply in Dhaka. The overall situation in terms of availability of fish has never been better, albeit with all negative consequences for ground water, soils and biodiversity. Second, as the value chain analysis will show, it is large-scale rural intermediaries who possess power to dominate price building mechanisms. In harsh contrast to their dominant position, the labourers who literally carry the food for the entire city on their shoulders have to face a heavy burden that is constituted by demanding work, extremely low earnings, irregular time slots for taking rest, and miserable living conditions. Third, the mega city of Dhaka is well supplied with fish. Nevertheless, food security is far from being guaranteed, because the majority of fish is out of reach for the urban poor. At that, fish price dynamics indicate that a season of chronic food insecurity (*monga*) is not a phenomenon of rural areas in Bangladesh alone. An urban *monga* in Dhaka can be identified that arises from an increase in food prices by simultaneously invariable earnings and income that most severely threatens the low income groups and the urban poor. These findings call for a reform of urban food security schemes in the capital city of Bangladesh.

## 24.2 The Mega City of Dhaka

Without doubt, the city of Dhaka has seen ups and downs in her more than 400 years history. The French traveler and trade pioneer Jean-Baptiste Tavernier (1676 [2004]), who visited Dhaka in 1666, described a burgeoning city that was provincial capital in the Mughal empire, accommodated a prospering muslin industry and extended to a length of two leagues (almost 10 km) along the bank of Buriganga

river. At that time, the city was said to comprise approximately 200,000 people (Islam 2005).[1] Approximately 200 years later, after the East India Company had taken the city over, the commercial resident James Taylor (1840 [2011]) described Dhaka as being largely decayed with most of the former city area overgrown with jungle and swamps. In 1872, the first census was conducted that recorded for Dhaka a total population of 69,212 people (Siddiqui et al. 2000).

From 1901 to 1911 Dhaka's population size increased from 104,000 to 154,000 people at an average annual growth rate of 4.0 % due to Dhaka's new status as provincial capital of Eastern Bengal and Assam. After the annulation of the partition of Bengal in 1911, however, Dhaka's growth rate decelerated. Massive migration inflows came along with the partition of the subcontinent and led to a regaining growth rate of 3.5 % in between 1941 and 1951 (Islam 2005) and to a rate of 5.2 % from 1951 to 1961. After independence, Dhaka[2] became one of the fastest growing cities worldwide. Her population growth reached a peak from 1961 to 1974 with an average annual rate of 8.9 %. At that time, the city's population jumped from 557,000 to 1.680 million people, mainly due to the political violence in the aftermath of Bangladesh's declared independence in 1971. Afterwards, the city's growth rate slowly decelerated from 5.6 % (1974–1981) to 4.5 % (1981–1991). Within this time period, Dhaka City reached a population size of 3.839 million and the metropolitan area even grew to 6.844 million people (Khatun 2003; Islam 2005). The census of 2001 estimated the population of Dhaka City to be 5.334 million and that of the Metropolitan Area of Dhaka to be 9.673 million (BBS 2007). The average annual growth rate of Dhaka City from 1991 to 2001 was 3.5 %. For the year 2010, Islam (2010) estimates Dhaka to accommodate a total population of 14.230 million people (Fig. 24.1).

Like other megacities Dhaka is today marked by extreme contrasts in close proximity. Dhaka is the seat of government, the centre of political power, and—with most of the garment industry concentrated in and around the metropolis—the workshop of Bangladesh's export-oriented economy. With its vast university

[1] Some historians even speak of a population figure of 900,000 for Dhaka of the 1700s. However, in this regard, I follow other well-known urban scientists who criticize this figure to be unrealistic (Islam 2005, p. 7).

[2] From 1974 onwards, it is distinguished between the population of "Dhaka City" and the population of the "Metropolitan Area of Dhaka". Dhaka City refers to the area of the Dhaka City Corporation (DCC) that comprises 145 $km^2$ and extends from Buriganga river in the south, to Mirpur in the north–west, and Tongi in the north (Islam 2005, p. 8). The Metropolitan Area of Dhaka changes over time. In 1974, it refers to the Dhaka Metropolitan Area (DMA) that covers a territory of 306 $km^2$ including DCC (ibd). From 1981 onwards it refers to Dhaka Statistical Metropolitan Area (DSMA) which covers an area of 797 $km^2$ in 1981 and an area of 1,353 $km^2$ in the following years. The DSMA includes the DMA, the DCC, and the municipalities of Narayanganj and Munshiganj in the south east, Savar in the west, as well as Tongi and Gazipur in the north (ibd). For 2010, "Megacity of Dhaka" is introduced as additional territorial reference category which is congruent with the Dhaka Metropolitan Development Plan (DMDP) and equals an area of 1,528 $km^2$ (Islam 2010). In order to avoid misunderstandings, all figures on growth rates refer to the DCC area only.

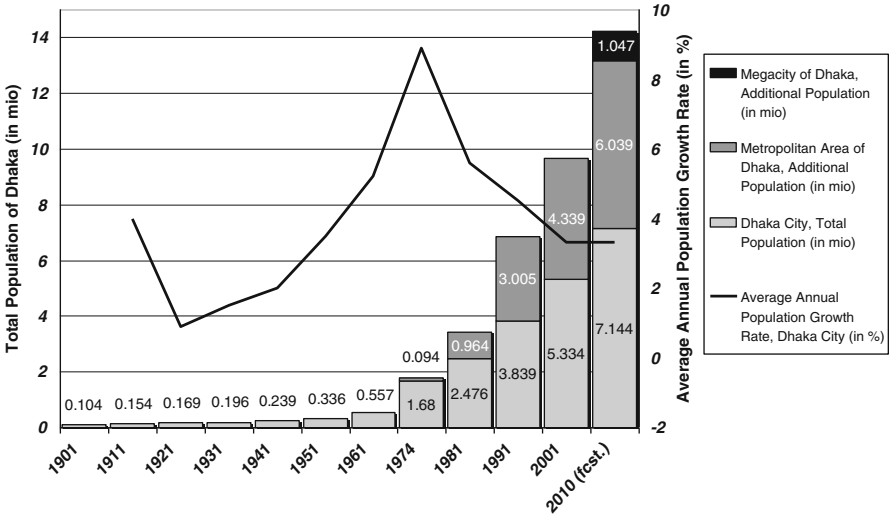



**Fig. 24.1** The Population Growth of Dhaka (1901–2010). *Source*: Khatun (2003), Islam (2005), BBS (2007), Islam (2010). *Notes*: (1) Population figures of "Dhaka City, Total Population (in mio)" refer to Dhaka Municipal resp. Dhaka City Corporation (DCC) area. (2) Population figures of "Metropolitan Area of Dhaka, Additional Population (in mio)" are calculated by taking a specific reference area and subtracting the resp. Figures that refer to the DCC area. The 1974 figure refers to Dhaka Metropolitan Area (DMA). The 1981, 1991 and 2001 figures as well as the 2010 forecast refer to Dhaka Statistical Metropolitan Area (DSMA) in the size of the respective year. (3) The 2010 population forecast of "Megacity of Dhaka, Additional Population (in mio)" refers to the Dhaka Metropolitan Development Plan (DMDP) area

campus and a number of private universities, with its museums, exhibitions and art performances Dhaka is also the cultural heart of the country. Despite this centrality, however, 30–40 % of the population of the city live in marginal, partly illegal settlements under conditions of extreme poverty (World Bank 2007). Providing basic amenities like drinking water and sewerage systems for all inhabitants is beyond the capacities and will of the city's administration (Siddiqui et al. 2010). How much food is necessary to meet the daily demand of a megacity like Dhaka? Where do all the food supplies come from? What does the supply chain look like? Who is profiteering from the current system? And who bears the costs?

In this chapter the case of fish provision is taken to discuss present day challenges of mega cities in terms of food supply and food security. In the first part, I will discuss recent developments in national fish production and outline the structure of the value chain for fresh fish. In the second part, I focus on the local food market of Dhaka to debate available amounts and seasonally fluctuating prices. In the last part, I will bring together the national and the local perspective to provide recommendations for necessary future re-adjustments.

This study was guided by the triangulation of qualitative and quantitative research methods. Qualitative methods used were observations, semi-structured interviews and participatory techniques. Repeated interviews were conducted

with 20 fish wholesalers; 18 actors at various positions along the supply chain, such as pond owners, intermediaries and retailers; and 28 experts from various governmental, non-governmental and academic backgrounds. The major quantitative methods employed were a survey of all food wholesale markets in Dhaka in 2009 (n = 87) and a standardized survey with 242 fish wholesalers in 9 out of 13 wholesale markets within the area of Dhaka City Corporation[3] (DCC), which was conducted between November 2009 and January 2010 (see Keck 2012 for more details).

## 24.3 Fisheries in Bangladesh

According to official data, 1.5 million people are involved in fisheries in Bangladesh, today. As compared to agriculture, fisheries is a much less significant economic sector contributing (in 2006) 4.2 % to the national GDP (MoA 2007) and providing (in 1999) employment to 3.6 % of economically active persons in agriculture (FAO 1999). Nevertheless, fishing plays a significant role in Bangladesh's food system by contributing 62.4 % of the nation's animal and 13.6 % of the total protein intake (BBS 2007).

The vast and diverse inland waters of Bangladesh are inhabited by 260 species of finfish belonging to 55 families, and by 25 species of prawn. Another 475 species of finfish and 38 shrimp species occur in the marine and brackish waters of the Bay of Bengal (Rahman 1997). The total inland water area is estimated to be roughly 4.6 million ha. This area comprises, on the one hand, man-made formations of ponds and ditches with a total area of 305,025 ha, coastal shrimp, prawn and fish farms with a total size of 217,877 ha, and Kaptai Lake, a reservoir that was dammed up for hydropower purposes in the Hill Tracts in Khagrachari with a size of 68,800 ha. On the other hand, it comprises natural formations such as the Sundarbans, a huge mangrove forest with an area of 177,700 ha, ox-bow lakes (*baors*) with a total area of 5,488 ha, depressions which retain water throughout the year (*beels*) with a total area of 114,161 ha, innumerable rivers and estuaries with a total area of 853,863 ha, and flood lands (flood plains and seasonally flooded depressions (*haors*)) in a total size of 2,832,792 ha (Kabir and Amin 2007; DoF 2009). Additionally, Bangladesh commands offshore an Exclusive Economic Zone of 7,853,800 ha (SAU 2011).

Over the last 20 years, Bangladesh's total production of fish shows a significant increase (Fig. 24.2). In the early 1990s (1990–1991 to 1994–1995), the average total annual production amounted to 1.0 million mt (DoF 1993, 2002; Rahman 1997). Until the late 2000s (2004–2005 to 2008–2009) this figure had increased to an amount of roughly 2.5 million mt. For the year 2008–2009, a total production of 2.7 million mt is estimated (DoF 2007, 2009). Over this whole period of time,

[3] On 29 November 2011 the government of Bangladesh split the Dhaka City Corporation into two corporations, North and South. This study was finalized before this dissociation.

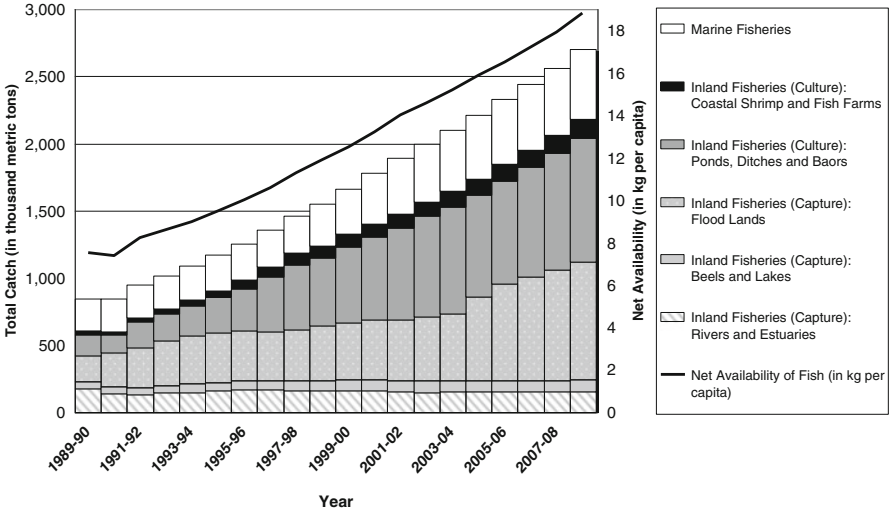



**Fig. 24.2** Total Catch and Net Availability of Fish in Bangladesh (1989–2009). *Source*: DoF (1993, 2002, 2007, 2009), MoA (2007), BBS (2011a)

Bangladesh exported fish that amounted to a more or less constant portion of 2.9 %. In real terms, though, this meant an increase from an average amount of 29,700 mt (early 1990s) to an average of 70,800 mt/year (late 2000s). At that, the net availability of fish (total production minus exports) almost doubled within the same period from an average of 8.5 kg to an average of 17.3 kg per person and year. Due to additional import of frozen fish, mainly from Myanmar and India, the factual availability of fish is even higher.

In the early 1990s, the largest proportion of Bangladesh's annual production stemmed with 31.5 % from captures in flood lands, followed by captures in the Bay of Bengal with 24.7 %, and from aquaculture in ponds, ditches and *baors* with 20.2 %. A significant share of 14.4 % came from capture fisheries in rivers and estuaries (incl. Sundarbans), while the share of coastal shrimp and fish farms was with a portion of 3.5 % ranked last, even behind captures in *beels* and Lake Kaptai that made 5.7 %. Within 20 years, all types of capture fisheries showed a downward trend in respect to their individual shares of the total production. Rivers and estuaries (incl. Sundarbans) lost significance most remarkably, falling from 14.4 to 6.3 % until the late 2000s. At the same time, the role of inland and coastal aquaculture increased significantly. The proportion of fish that stems from ponds, ditches and *baors* increased from 20.2 to 33.7 % and that of coastal shrimp and fish farms from 3.5 to 5.4 % (cf. Fig. 24.2).

The dominant share of fish that is consumed in Bangladesh today stems from inland aquaculture in ponds and ditches (without *boars*). In absolute terms, the annual production more than quadruplicated from an average of 203,600 mt in the early 1990s to an average of 821,400 mt in the late 2000s. The increase in the total production resulted in part from an expansion of the total water area from

**Table 24.1** Distribution of arising costs, net margin and consumers' expenditure for domestically raised Rui carp by value chain actors

| Actors | Activities | Arising costs (in BDT/fish) | Net margin (in BDT/fish) | Consumers' expenditure (in BDT/fish) |
|---|---|---|---|---|
| Hatchery owner | Production | 4.90 (7.4 %) | 2.10 (3.4 %) | 7.00 (5.4 %) |
| Fish farmer | Production | 39.90 (59.9 %) | 20.10 (32.2 %) | 60.00 (46.5 %) |
| *Dalal* | Marketing | 2.50 (3.8 %) | 2.50 (4.0 %) | 5.00 (3.9 %) |
| *Bepari* | Transportation | 7.20 (10.8 %) | 25.60 (41.0 %) | 32.80 (25.4 %) |
| *Arotdar* | Marketing | 4.60 (6.9 %) | 4.60 (7.4 %) | 9.20 (7.1 %) |
| Retailer | Marketing | 7.50 (11.3 %) | 7.50 (12.0 %) | 15.00 (11.6 %) |
| Total | | 66.60 (100.0 %) | 62.40 (100.0 %) | 129.00 (100.0 %) |

*Source*: Estimation based on own survey 2009
*Note*:
1. Arising costs: Hatchery and fish farmers' costs comprise expenses for land lease, fertilizer, insecticides, lime, post-larvae/fry, water, permanent staff, and seasonal labour, and costs that accrue to fish loss. *Beparis*' transportation costs comprise expenses for up- and downloading of trucks, fees for toll collection points (Jamuna Bridge, Faricha Ferry Ghat, etc.), labour and fuel, and costs that accrue to fish loss. The marketing costs of *dalal* and *arotdar* comprise business lease and labour, while the marketing costs of retailers comprise stall fees and transportation
2. The net margin is calculated as the difference between purchase and sales price of respective actors less arising costs. The consumers' expenditure is the sum of arising costs and net margins

146,890 ha in 1992–1993 to 305,025 ha in 2008–2009, but also from an intensification of production that increased from an average of 1.4 mt/ha in 1992–1993 to an average of 3.0 mt/ha in 2008–2009 (DoF 1993, cited after Rahman 1997, p. 101; DoF 2009: Table 24.1). The second largest share of Bangladesh's fish consumption stems from inland capture fisheries in flood plains that comprise the largest water area of all sectors. Its average annual catch more than doubled in the same time from 320,400 to 761,500 mt, or from 113 to 269 kg/ha. Today, catch from marine waters are ranked third with an annual amount of 514,600 mt in 2008–2009. Given the vast water area of the Bay of Bengal, its increase in productivity from 32 to 62 kg/ha must be seen to be remarkable. Until today, the bulk of marine catch (456,200 mt or 92.9 %) stems from artisanal fisheries while trawler fisheries are almost negligible. Even though the share of coastal shrimp and fish farms in total production is still small, its production increase from 35,800 mt in the early 1990s to 131,600 mt in the late 2000s is striking. Similar to the case of ponds and ditches, this increase was the result of an expansion of the water area from 108,280 ha in 1992–1993 (DoF 1993; Rahman 1997) to 217,877 ha in 2008–2009 (DoF 2009) and an intensification from an annual catch of 312 kg/ha in 1992–1993 to 668 kg/ha in 2008–2009. With a quantity of 145,600 mt in 2008–2009, it overtook already the amount provided by rivers and estuaries (138,200 mt), that is the only sector that shows a decline of productivity from the mid-1990s onwards (Fig. 24.2). However, the setback in 2002–2003 and 2003–2004 might be an early indication of the limits of coastal shrimp and fish farming that has to be seen. Today, fish from *beels*

amount to at least 79,200 mt, while the Sundabans (18,500 mt), Kaptai Lake (8,600 mt) and *boars* (5,000 mt) are minor fishing grounds (Department of Fisheries DoF 2009), even though fishing was intensified.

From these figures, it becomes clear that fishery in Bangladesh underwent a substantial change in the last 20 years and must be seen as a success story. Without the increase in productivity, the 142 million people of Bangladesh (BBS 2011a) could not be fed. Nonetheless, fishery has its dark side as well. Especially the downward trend in capture fisheries in rivers and estuaries is alarming. This negative development is attributed to many factors, such as pollution through the use of fertilizer and pesticides in agriculture, through industrial effluents especially in large cities, to flood control measures, the erection of large-scale drainage and irrigation systems, and the encroachment of wetlands (Belton et al. 2011; Sultana 2012). All these features led to the destruction of sanctuaries and hinder migration of fish to their breeding grounds. At the same time, fishery itself contributes to this list of negative factors, as the conversion of wetlands into agricultural land (most notably in the Sundarbans) led to a reduction of biodiversity. The growing use of fertilizer, pesticides and antibiotics in pond fisheries led to residua of heavy metals in the soil and groundwater and that has given reason for public health concerns (World Bank 2006).

## 24.4 The Value Chain for Fish

The major share of fish that is consumed in Bangladesh is carps that are cultivated in ponds and ditches. Thus, the focus of this part is on aquaculture fisheries. Within the value chain[4] for cultivated carps (mainly Rui, Catla, and Mrigal, but also Silver Carp, Grass Carp, Japanese Carp) hatcheries constitute the primary link. Hatchery owners usually command a number of ponds for keeping brood fish, facilities for fish spawning, egg incubation and the rearing of hatchlings to post-larva stage, ponds for nursing post-larvae to fry, and ponds for rearing fry to fingerlings. In hatcheries, fish reproduction is organized in a controlled environment (Lewis et al. 1996): Female carps are transferred to "mother ponds", where they get hormonal treatment by which the fish is brought about to spawn (Jhingran and Pullin 1985). The fertilized fish eggs are moved into special incubators where they are hatched under the constant addition of oxygenated water. For rearing post-larvae to fry and fry to fingerlings ponds are limed (that acts as a general pond disinfectant, effectively stops fluctuations of pH, and promotes mineralization), unwanted fish, predatory insects and harmful vegetation is eradicated, and fertilizer (mainly nitrogen, phosphorus, and potassium that enables the suitable production of zooplankton which forms the main food of post-larvae, fry and hatchlings) is added (Jhingran and Pullin 1985).

[4] Value chains are defined as a "network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer" (Christopher 1998, p. 15).

The pond culture for raising fingerlings is similarly organized. It relies on natural feed but is supplemented with feed and fertilizer.

Aqua culturists – mostly small scale operators who produce some fish as a supplement to farming or other activities – raise most of their fish until an age of 9 month to 1 year when one exemplar weighs approximately 1 kg.[5] Then they are sold to the *dalal*. *Dalal* are independent players who do their business on commission on behalf of a *bepari*. The *bepari*, who is also called the "collector" or "agent", collects the fish and organizes the transportation to Dhaka. Sometimes, local money lender (*mohajan*) provide credit to the *bepari*, who then supplies credit to the *dalal*. Air breathing species like Pangas, Koi or Magur are transported alive in water-filled drums, while the majority of fish is brought in chilled in ice-filled metal boxes or baskets. Most fish reaches Dhaka by truck, where it arrives after a journey of maximally 12 h. At these markets, the fresh fish is sold via commission agents (*arotdars*) in the early morning hours at auction, and is transported by rickshaws or motorized tricycles to the customers, i.e. hawkers who perform door-to-door sale, retailers at kitchen markets, or operators of restaurants and canteens. The major supply chain for fish involves thus the following agents: hatchery owner → fish farmer → *dalal* → *bepari* → *arotdar* → retailer → consumer.

The value chain analysis is performed by taking the example of Rui carp, which is the fish type that is mostly consumed in Dhaka. It is found that 67.3 % of all arising costs are generated at the producers' level, i.e. 7.4 % for nurturing fish in hatcheries and 59.9 % for raising fish in ponds. Due to the small sales amounts of retailers and their comparably high expenses for the rent of their stalls (venders at kitchen markets) and bribes (hawkers), the marketing costs of retailers are second amounting to 11.3 % of the total arising costs. The costs of commission agents are comparably high, with 6.9 and 3.8 % that accrue to *arotdars* and *dalals* respectively. With 10.8 %, transportation costs of *beparis* are considerable as well. The reason is large quantities of water and ice that are needed in transport in order to keep the fish fresh. It is estimated that drums—used for the transportation of fish—are filled with water to an amount of 75–80 %. Likewise, about one third of the total weight of baskets stems from the ice. It was further found that 41.0 % of the total net margin goes into the *beparis*' pocket that makes them the players who gain most of the current system. Nevertheless, in case of successful management, also aqua culturists are in a position to make considerable net margins that amount to 32.2 %. The retailers follow with 12.0 % of the total net margin (Table 24.1).

Figure 24.3 shows how the customers' expenditure is composed. It can be seen that 51.9 % of the consumers' expenditure accrues until the fish farm's gate, of which 33.2 % are costs for cultivation and 18.8 % are the net margin of hatchery owners and fish farmers. By leaving involved costs aside, the greatest share of the consumers' price arises in the hands of the *bepari* with 23.9 %, followed by the pond owner with

[5] Nonetheless, also bigger fishes are available in the market. These are usually older fishes that were used for reproduction purposes. Carps become sexually mature not before the age of 3–4 years. These examples are usually larger and more expensive.

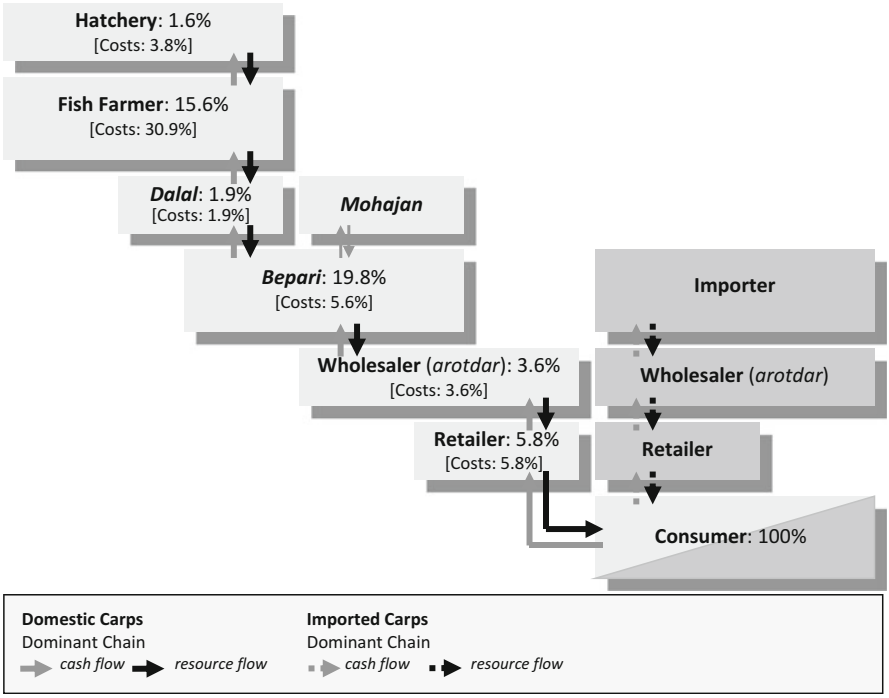



**Fig. 24.3** The Value Chain for Domestic Carps to Dhaka. *Source*: Own survey 2009

17.1 % and the retailer with 5.8 %. In some distance follow the *arotdars* with 3.6 %, the *dalals* with 1.9 % and the hatchery owners with 1.6 %. Thus, it is the *beparis* and the fish farmer who are the dominant players in the fish chain. However, for the case of fish farmers it must be added that they bear a higher risk of making loss as compared to *beparis* who are embedded in multiple networks to various supply regions by which they can assure a constant business despite local or regional supply bottlenecks.

Beside the market makers mentioned above there are countless day- and night labourers involved in Dhaka's fish provision system. In contrast to *beparis*'extensive options for profit making, the labourers have to bear the hardest part—whether in rural areas, on trucks or at urban markets. In Dhaka's wholesale markets e.g. the labourers' work day starts around 1 a.m. when the first trucks approach the city to disembark their perishable freight. Night labourers, who are responsible for the unloading of the metal boxes, drums and baskets with frozen and fresh fish, usually sleep and live on the markets—often under miserable conditions. In the absence of motorized vehicles or conveyor belts, they use rickshaw vans and muscle power to transport the fish from the trucks to the merchants' vending sites. Huge ice blocks are delivered from nearby factories and the workers crush them manually to put them on the piled fish. Until the merchants arrive around 4 a.m., it is the night labourers' responsibility to guard the loads. When the market opens

(usually fish wholesaling takes place between 4:30 and 8:30 a.m.), some lucky ones are asked to give a hand to the merchants and their sales teams.

Usually the night workers organize themselves, with a leader (*sordar*) who gives instructions. He also collects the service charges from the wholesalers when the market is closed and distributes the earnings among the workers. They are paid per weight and earn on average about 100 BDT (that equals about 1.00 EUR) per night. As such they have to face not only a highly demanding work, but also extremely low earnings and irregular time slots for taking rest. All these factors add to their overstrained physical condition and are reflected in the generally poor shape of the workers' bodies which makes them easily distinguishable from the merchants and their staff.

## 24.5 Dhaka's Fish Market

According to own survey data, today there are approximately 4,400 traders running businesses in the 87 food wholesale markets located in Dhaka's centre, i.e. the area of DCC. Taken together they supply more than 9,000 tons of food every single day. By taking the total amount of 707 mt of fresh fish that is sold in Dhaka City every day and by dividing this amount by the city's estimated total population of 7,144 million people in 2010, it turns out that there are 99 g of fish available per capita and day. According to official data, the average quantity of fish intake per person and day for urban areas in Bangladesh in 2010 is 59.9 g (BBS 2011b). Accordingly, the availability of fish in Dhaka equals 165.3 % of the national urban average. By taking the percentage share of different food types into consideration (Fig. 24.4), it can be seen that in Dhaka the consumption of expensive food items (fish, meat, fruits and edible oil) play a more prominent role as compared to other cities in Bangladesh. Similarly, the consumption of rice is lower in Dhaka than in other urban areas. These figures are a clear indicator for the existence of numerous middle

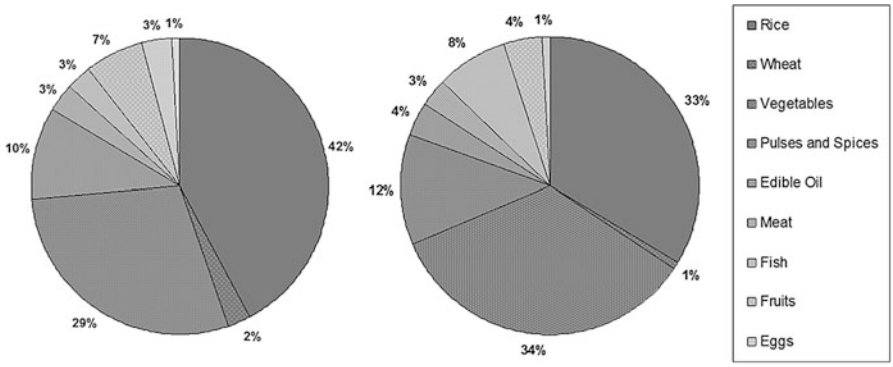



**Fig. 24.4** Food Consumption in Urban Areas and in Dhaka (from *left* to *right*). *Source*: Calculation for 2010, based on BBS (2007): p. 45. *Source*: Own survey 2009–2010

**Table 24.2** Average annual fish wholesale prices in Dhaka (2009–2010)

| Low value fish | Average wholesale price for small fishes (in BDT per kg) | Medium value fish | Average wholesale price for small fishes (in BDT per kg) | High and special value fish | Average wholesale price for small fishes (in BDT per kg) |
|---|---|---|---|---|---|
| Silver carp | 39.60 | Tilapia | 84.90 | Chingri | 149.70 |
| Chanda | 45.00 | Mola | 84.90 | Shol | 165.00 |
| Chapila | 45.00 | Punti | 90.00 | Koral | 182.50 |
| Magur | 52.50 | Rui | 110.0 | Hilsha | 201.30 |
| Poa | 58.70 | Tengra | 113.80 | Boal | 236.70 |
| Rita | 63.30 | Koi | 130.20 | Shing | 346.70 |
| Pangas | 67.10 | | | | |
| Kaski | 68.90 | | | | |
| Taki | 70.00 | | | | |

*Source*: Own survey 2009–2010

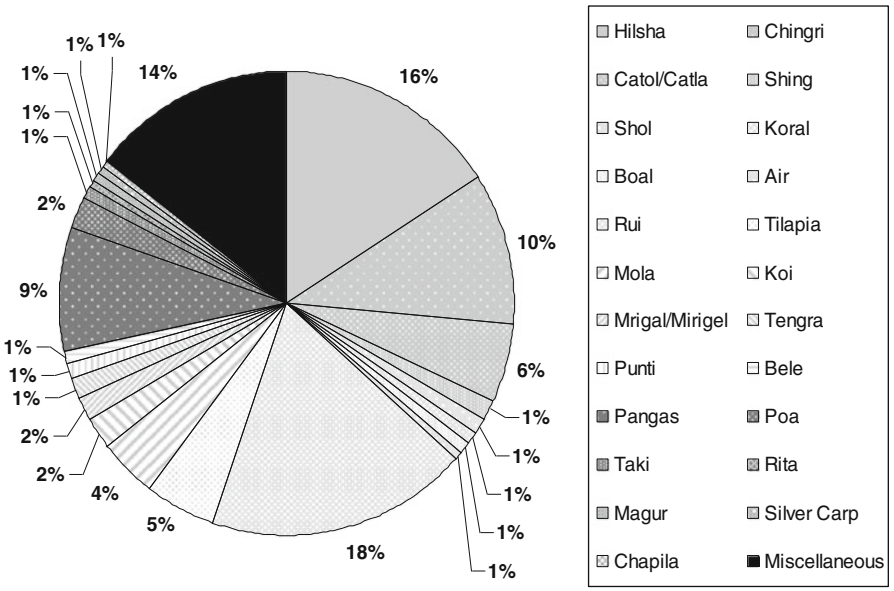
*Note*:

1. Average annual prices are taken to even the price variability of the individual fish types throughout the year in order to get more general figures. The average annual wholesale price is calculated by the formula: PØ = [P(th)*th] + [P(tl)*tl]/12. P(th) is the price during high season, that is multiplied by the number of months in which this season is prevalent (th). P(tl) is the price during low season, that is similarly multiplied by the number of months in which this season lasts (tl). The result is then divided by 12 month
2. In the course of the survey, the curreny rate for 100 BDT changed from 0.973 EUR (15.12.2009) to 1.011 EUR (01.01.2010) to 0.984 EUR (15.01.2010) (cf. http://www.bankenverband.de/service/waehrungsrechner). By taking the mean of these three, the average rate in the time of the survey was 0.989 EUR

and upper class people in Dhaka whose higher incomes allow them to substitute staples like rice by superior and more expensive food.

Fish can be categorized according to price in order to reveal a more detailed picture on the present situation of food consumption of different socio-economic sections in Dhaka. Going by their price levels, three categories of fish are distinguished, that are low value, medium value and high value fish (Table 24.2). Low value fish comprise Silver Carp, Chanda, Chapila, Magur, Poa, Rita, Pangas, Kaski, and Taki. If any, it is these fishes that are affordable for the urban poor with prices that range from 39.60 to 70.00 BDT per kg in case of small fishes (at an average of 56.70 BDT). Medium value fish types are Tilapia, Mola, Punti, Rui, Tengra and Koi with prices that range from 84.90 to 130.20 BDT per kg (at an average of 102.40 BDT). Finally, Chingri (shrimp), Shol, Koral, Hilsha, Boal and Shing can be subsumed under the high value category with prices that range from 149.70 to 346.70 BDT per kg (at an average of 213.60 BDT).[6] These latter fish species are far beyond the scope of the

[6] For this study, it was consciously decided to take the native fish names as they are prevalent in Bangladesh. Anyone who is interested in the scientific names of these fishes, is referred to information that is available online under: http://en.wikipedia.org/wiki/List_of_fishes_in_Bangladesh.




n=233

**Fig. 24.5** Fish Consumption in Dhaka. *Source*: Own survey 2009–2010

urban poor. This becomes obvious by recalling the fact that night labourers or rickshaw pullers—one of the main jobs of urban poor male workers in Dhaka (World Bank 2007)—usually earn not more than 100 BDT per day. This situation applies not only to jobs in the so-called informal sector, but also to formal jobs in export-oriented industries like the garment industry in which the majority of urban poor female workers is employed. From 2007 until 2009, when the field-work was conducted, the minimum wage of a female garment worker was officially fixed to the amount of 1,662 BDT per month. These few examples show that the majority of fish is too costly for the urban poor.

As it can be seen in Fig. 24.5, those types of fish that are mostly consumed[7] in Dhaka are Rui (18.5 %), Hilsha (15.9 %) and Chingri (10.5 %). Also Pangas (8.7 %), Catla (5.7 %), Tilapia (5.2 %) and Mola (4.0 %) take considerable proportions. Fish types with individual shares of above one percent are further Koi (2.3 %), Poa (2.1 %), Mrigal (1.6 %), Tengra (1.4 %), Shing (1.3 %), Shol (1.2 %) and Punti (1.1 %). By leaving the 14.4 % of miscellaneous fish aside for which no price data is available, it can be seen that the bulk of Dhaka's fish supplies (42.9 %) belongs to the high value category. 40.8 % have to be addressed as medium value fish, while the share of low value fish amounts to only 16.4 %.

[7] These figures are based on the volume of sales in the markets of Dhaka.

By taking the different types of fish and their respective prices, one gets into the position to get a sort of negative image of Dhaka's society. Generally speaking, it can be assumed that low value fish is mainly consumed by the urban poor, middle value fish is mainly consumed by the middle class, and high value fish is mainly consumed by the upper class. Based on this assumption it is possible to calculate the fish availability individually for each of these income groups: Based on own calculations it is estimated that upon a number of 2.9 million middle class people an average of 99 g of fish per person and day was bestowed. In contrast to this figure, upon 2.2 million people of the upper class an average amount of 135 g of fish per head per day was bestowed, while upon 2.0 million poor people in Dhaka an average of only 58 g per capita and day was bestowed. Even though these figures must be read with caution, as they do not reflect real consumption figures, but only the availability of fish on the markets, they provide a hint at the prevalent socio-economic disparities in Dhaka City. They show how poverty hinders a large portion of Dhaka's population to access Bangladesh's main source of animal protein provision. Due to the fact that similar consumption patterns are likely for fresh vegetables and fruits, the case of fish is just one example that highlights the fact that almost one third of Dhaka's population—mostly those workers who keep Dhaka's food system and its export oriented industries running—is systematically excluded from affording socially valued and physically healthy food. As such, poverty is not just an abstract idea that comes about by categorizing people. It is real conditions that factually pierce down to the very bodies of individual human beings.

## 24.6 Urban *Monga*

Bangladesh's fish supply basically follows the country's annual flood cycle. The main season of capture fisheries in the floodlands starts shortly before the monsoon rainfalls in Jyaistha (May/June) and lasts until the beginning of the post-monsoon phase in Asvin (September/October). Marine capture fisheries have their high season mostly in between Asarh (June/July) and Kartik (October/November). The main season for harvesting fish from ponds, ditches and baors begins later and lasts from Kartik until the end of the dry season in Falgun (February/March). The dry winter time is also the main season for capture fisheries in perennial rivers, beels and in Lake Kaptai that is most intensely done from Magh (January/February) to Baisakh (April/May). From the main fish varieties that are sold at Dhaka's markets, seven have their high season in the first half of the (Bangladeshi) year (s. Fig. 24.6). The remaining 14 varieties have their high season in the second half of the (Bangladehsi) year.

Figure 24.6 shows that two temporal bottlenecks of fish supply can be identified, one from Caitra to Baisakh, and one during Asvin. These supply bottlenecks are translated in the market as seasonal price changes, shown in Table 24.3. Pangas, a low value fish that is consumed a lot, has an average wholesale price of 58.20 BDT per kg for small fishes during high season that lasts for 3 months from Jyaistha

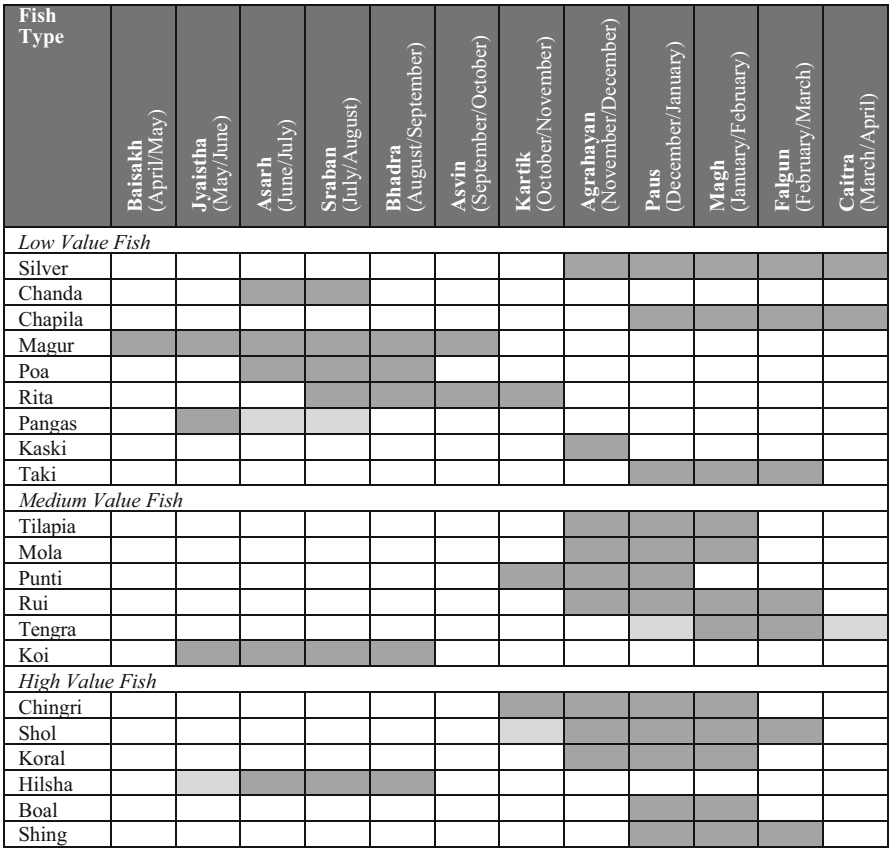



**Fig. 24.6** Seasonal Changes in Supply at Dhaka's Fish Markets. *Source*: Own survey 2009–2010. *Note*: *Squares in dark gray colour* indicate high season, *squares in light gray colour* indicate mid-season, and *squares in white colour* indicate low season (n = 241)

to Sraban. During the rest of the year, its price rises to an average of 72.50 BDT per kg, which means an increase by 24.6 %. The seasonal price variation of other fish that is consumed in Dhaka ranges from 7.50 BDT in case of Chapila to 106.70 BDT in case of Shing or from 18.8 % (Chapila) to 150.0 % (Chanda). As such, Pangas is an example of medium seasonal price changes. By calculating the mean figures, it turns out that prices for low value fish during off-season are on average 54.0 % higher than during high season. Prices for high value fish vary from low to high seasons only by 47.7 %, and those of medium value fish by 42.6 %. Accordingly, low value fish shows the most extreme seasonal price changes.

In regard to capture fisheries in rivers, the temporal bottlenecks stem from the natural fish behaviour and their cycles of migration, breeding and growing. In regard to fisheries in floodplains, they are the outcome of high precipitation during summer that let the rivers, ditches and canals overflow their banks onto low-lying areas. The lean season of aquaculture is related to the lack of fry and fingerlings to

**Table 24.3** Seasonal Price Changes of Major Fish Types at Dhaka's Wholesale Markets

| Fish species | Average price, past high season (in BDT per kg) | Standard deviation (in BDT per kg) | Average price, past low season (in BDT per kg) | Standard deviation (in BDT per kg) |
|---|---|---|---|---|
| Silver carp | 25.00 | – | 50.00 | – |
| Chanda | 20.00 | – | 50.00 | – |
| Chapila | 40.00 | 14.10 | 47.50 | 10.60 |
| Magur | 45.00 | – | 60.00 | – |
| Poa | 44.70 | 15.40 | 65.00 | 30.20 |
| Rita | 50.00 | – | 70.00 | – |
| Pangas | 58.20 | 25.60 | 72.50 | 30.60 |
| Kaski | 56.70 | 11.50 | 70.00 | 17.30 |
| Taki | 53.30 | 16.10 | 80.00 | 0.00 |
| Tilapia | 66.70 | 16.80 | 91.00 | 19.80 |
| Mola | 68.50 | 17.70 | 90.60 | 23.10 |
| Punti | 60.00 | – | 100.00 | – |
| Rui | 93.30 | 24.30 | 118.50 | 28.90 |
| Tengra | 83.80 | 35.40 | 128.80 | 54.50 |
| Koi | 106.70 | 23.30 | 148.90 | 45.90 |
| Chingri | 122.90 | 86.80 | 163.40 | 105.90 |
| Shol | 130.00 | 65.60 | 190.00 | 55.70 |
| Koral | 130.00 | – | 200.00 | – |
| Hilsha | 140.30 | 74.50 | 233.80 | 136.70 |
| Boal | 170.00 | – | 250.00 | – |
| Shing | 270.00 | 166.40 | 376.70 | 92.90 |

*Source*: Own survey 2009–2010

stock early in the year, the lack of water due to ponds drying up during this period, and the low productivity during the winter due to low temperatures.

In North-Western parts of rural Bangladesh, the notion of *monga* addresses the season of food scarcity and prevalent hunger. *Monga* arises from an employment and income deficit that is most severe before *aman* rice is harvested (mainly in the months of Asvin and Kartik), but also occurs in the time before *boro* rice is harvested (mainly in the month of Caitra) (Zug 2006). It is said to mainly affect the peasants and sharecroppers of rural Bangladesh whose income is directly or indirectly based on agriculture, as the stocks that stem from the previous harvest become depleted while, at the same time, it takes at least two further months for the next harvest to come. However, the argument that I want to make at this point is that *monga* is not a rural phenomenon alone. As poverty is currently shifting from rural to urban areas, it is necessary and urgent to understand the effects of this seasonal scarcity in Bangladesh's cities as well.

The most obvious effect is that prices rise as the general supply decreases. In Dhaka, though, this effect is aggravated due to the seasonal in-migration of rural poor who come to the city to find a job, to be fed by governmental safety net

programs, or simply to beg in order to secure at least a minimum of food and income. Besides the general lack of income opportunities during that time, it is river erosion and floods that destroy the belongings and livelihoods of people who are then forced to follow the general flows of migrants to the cities. From 2007 to 2011, an additional factor had to be added, that was Ramadan which took place in the very time of *monga*. Thus, in the particular years of this research, the seasonal price variability in Dhaka was influenced by the general decline in supplies at that time, the increase in demand due to temporal in-migration of people from rural areas, and rising prices due to Ramadan.

## 24.7 Future Challenges of Dhaka's Food System

This study has shown that contradictions and dysfunctionalities of Dhaka's food system are found in respect to all three dimensions of the sustainability notion: In regard to ecological sustainability it was shown that Bangladesh is a natural habitat for fish production due to its location in the world's largest river delta with its thousands of ponds, canals, rivers, *haors* and *beels*, and its vicinity to the ocean. This fact, however, should not hide that with the breeding and rearing of carps, it is the resource and technology intensive inland water fisheries in ponds and ditches that are today's major source of fish in Bangladesh. The technologisation of fisheries makes Bangladesh to meet its fish demand in the first place. The South Asian situation in terms of availability of fish has never been better—not least due to the impressive increases in productivity with all negative consequences for ground water, soils and biodiversity.

In terms to economic sustainability the value chain analysis made clear that the *beparis* dominate the price determination along the fish chain. Furthermore, stark discrepancies were found to exist between the involved actors. In harsh contrast to the extensive options of market makers for profit making, the labourers who literally carry the food for the entire city on their shoulders have to face a heavy burden that is constituted by demanding work, extremely low earnings, irregular time slots for taking rest, and miserable living conditions. As such, the bitter irony of Dhaka's fish provision system is that those people, who carry the food for the mega city on their shoulders, are themselves most vulnerable to food insecurity and related health risks.

In regard to social sustainability it was shown that the mega city of Dhaka is currently well supplied with fish. Nevertheless, food security in Dhaka is far from being attained. Still more than a quarter (28 %) of Dhaka's population (World Bank 2007) lives in a situation of severe poverty and undernourishment while, at the same time, considerable wealth and opulence exists. The consumption figures reflect these socio-economic disparities in Bangladesh's capital: The average amount of fish that bestows to the urban poor makes up less than half (58 g per person and day) the amount that bestows to upper class people (135 g per person and day). The majority of fish is simply out of reach for the urban poor. Furthermore, a claim was

made for conceiving the annual *monga* season to be not a phenomenon of rural areas in Bangladesh alone. The urban *monga* in Dhaka can be understood as a seasonally re-occurring period of food insecurity that arises from an increase in food prices by simultaneously invariable earnings and income that most severely threatens the low income groups. The case study showed that prices for low value fish do change most intensely in between high and low season. Thus, of all people who live in Dhaka, it is the urban poor who are not only threatened by high prices, but also by comparatively high temporal price variability.

In order to transform Dhaka's food system in a more sustainable way, three future challenges must be met: First, awareness among urban consumers must be raised of the ecological impact of the present fish provision system. Environmentally damaging side effects are not a phenomenon of the export-oriented shrimp industry alone, but are serious for domestic consumption as well. More knowledge is needed to understand the potentials of alternative ways of urban food consumption and their impacts on rural production areas. Second, the ongoing reproduction of stark socio-economic disparities by means of exploitative practices in the urban labour market must be pushed onto the centre of public attention. Governmental and non-governmental organisations are requested to campaign against neo-feudalistic attitudes among Bangladesh's burgeoning middle and upper class. Support must be given to grass root level workers organizations throughout the country. Third, food insecurity in Bangladesh must be understood to be an urgent urban challenge as well. Accordingly, main governmental and non-governmental emphasis must be given to craft effective food aid schemes for the country's cities—especially for the time of *monga*. So far, respective programmes do not probably help the urban poor to overcome the burden of rising food prices. Consequently, the mega city's most vulnerable are left alone in the very situation in which support would be needed the most.

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