KOLKATA – THE COLONIAL CITY IN TRANSITION

REFLECTIONS IN GEOGRAPHIES OF URBAN INDIA

Edited by

Sumana Bandyopadhyay

'In today's climate-risked and uncertain world, the past and present of the city must be understood. This learning will determine the practice of sustainability and liveability in our habitats. This book is that story of transition, of one of the greatest cities of our world. It needs to be read so that we can know the why and what of Kolkata and how it must evolve in the future.'

Sunita Narain, *Centre for Science and Environment, New Delhi, India*

'In capturing the dynamics of Kolkata through history, spatial fragmentation, architectural transformation, waves of migration, displacements, environmental challenges, development deficits and deprivation, employing deductive and inductive tools of analysis, the volume does not lose emotion, passion, and cultural context. It talks of the past not just to reminiscence its glory but to contextualize the present and underline the need to transcend a few features to strengthen the human face of the city.'

Amitabh Kundu, *Distinguished Fellow, Research Information System for Developing Countries; Senior Fellow, Sustainable Cities and Transport program, WRI Indi; and former Professor and Dean, Jawaharlal Nehru University, India*

Kolkata – The Colonial City in Transition

This book explores the spatial characteristics of the city of Kolkata in India in terms of the physical, economic, social, political, and environmental aspects of urban geography, and focuses upon the inherent processes that impact its transformation. It discusses different facets of urban geography and highlights the contemporary challenges of a major primate city in South Asia, which represents the conflicts between the traditional and the modern, the rich and the poor, the skyscrapers and the shanties. With its detailed empirical research and mapping exercises based on real-time remote sensing data, the book offers an understanding of a range of contemporary urban issues. It examines the spatial consequences of urban sprawl, land-use changes, ecological crisis, climate change, critical disasters, dynamics of the peri-urban interface, neighborhood restructuring, debates around heritage conservation, housing poverty, gray spaces, governance, and the political landscape of the city.

This book will be useful to students, teachers, and researchers of geography, especially human geography and urban geography, urban studies, urban development and planning, regional planning, social geography, governance, ecology, economics, and South Asian studies. It will also benefit urban planners, development professionals, and those interested in the study of the city of Kolkata and its transformations.

Sumana Bandyopadhyay is Professor of Geography at University of Calcutta and President of Regional Science Association, India. Her research interests are in human geography and urban geography. She has co-edited five volumes under the Contemporary South Asian Studies Series in association with South Asian Democratic Federation, an EU think tank, and an independent volume on Housing Accessibility in South Asia. She has undertaken several research projects including UGC-DRS, World Bank short-term consultancy and collaborative research with UKERI (Newton Fund), Deakin University, Habitat University, and has been invited to join the InteRAI Fellows Network towards modification of InteRAI MH tools for the Indian context. As RSA President, she organises international events, creating platforms for young researchers to build research networks and pursue collaborative learning. She worked as Member, Council at Large of the RSA International and presently is member of the Council of Pacific Regional Science Organisation (PRSCO). She is on the Editorial Boards of *Regional Science Policy and Practice*, *Asian Journal of Regional Science,* and *the Geographical Review of India,* and is Life Fellow of the Indian Society for Ecological Economics, Regional Science Association India, Institute of Indian Geographers, and Member of The Regional Science Academy.

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Foreword

Since the thoughtful writings of two Nobel laureates – Gunnar Myrdal (1968) on the Asian Drama and Jan Tinbergen (1953) on structural analysis of poverty in the developing world – the problem of imbalanced growth has captured the attention of both scientists and policy makers. Unequal development is a regretful, but in many cases inevitable, consequence of economic progress. And their painful impacts are often most visible in big cities and large metropolitan areas, as is clearly witnessed in cities like Lagos or Sao Paulo. This observation seems to suggest that big cities are the source of much evil, not only socioeconomic inequality or poverty, but also environmental degradation, deplorable human health conditions, or low access to education. It should be noted, however, that structural inequality problems and related liveability issues are not a necessary 'fate' of any big city in developing or emerging economies.

In an article by Nijkamp (2008), it is argued that in principle cities are the 'masters of their own fate' and have many opportunities to recover from socioeconomic decline, environmental decay, or poor health conditions. Cities have – through their agglomeration advantages and creative 'milieu' – great possibilities to improve their performance in many dimensions. This long-range strategic development goal is called XXQ (the highest possible achievement of urban quality). This goal calls for a mobilisation of all available resources in the urban territory, ranging from technological assets to human and social capital. The conceptual model underlying this 'strategy of hope' for big urban areas was in a recent publication referred to as 'the resourceful region' (Nijkamp 2016). We may then address the question whether we can find traces of promising new developments in cities which were historically seen as 'islands of decay without any hope'.

This book – so skilfully produced by Sumana Bandyopadhyay and her colleagues – forms a welcome addition to the international literature on the economics of hope. This volume – baptised: *Kolkata: The Colonial City in Transition* – provides not only an extraordinarily interesting and informed collection of studies on the challenges faced by large cities in the developing world, but also on the new opportunities shaped by human, social, institutional, and technological intelligence in Kolkata. When I visited this city in the mid-1980s, Kolkata was still the prototype of a megacity

without any clear perspective; it was a symbol of 'the Asian Drama'. But those who visit nowadays Kolkata see a different city, a city that is booming, with many new well-crafted residential districts, a city where high-tech has made a rapid entry, and a city with a wealth of great educational institutions. Understandably, the success of Kolkata attracts in turn new flows of migrants, so that sometimes the impression may come about that the urban development does not make much progress. However, one should not forget that – despite the relatively weak industrial structure and the urban infrastructure – the city has managed to provide millions of people a decent subsistence level, which is a remarkable achievement compared to the immediate post-WWII period. Clearly, there is much scope for improvement, but any drastic transformation from a low-prosperity city to a city with a decent living for the majority of the inhabitants is usually a matter of one – in most cases two – generations.

This book on the development potential of Kolkata provides a kaleidoscope picture of the many facts and facets of the urban economy of Kolkata. Sustainable urban development is obviously not a simple panacea for many problems in a complex city like Kolkata, as a balanced and healthy urban life is related to all aspects of human society. The book does not only pay attention to slums and poverty, but also water management and sewerage systems, historical-cultural heritage, urban density and green amenities, housing provisions, as well as disaster impact assessments. This collection of studies depicts the complex force field of Kolkata, while emphasising the unique character of this great city. It is a fine example of fascinating urban geography that focuses the attention on the multiplicity of serious challenges faced by megacities in transition. It is a welcome addition to a previous study, *Calcutta: The Living City* (Chaudhuri 1991), which provided an interesting overview of human life (including economic, social, and cultural dimensions) in the city in the last part of the last century. The present study – published more than three decades later – is richer in scope and offers a balanced perspective on the sunny side and the shadow side of this dynamic megacity which is confronted with so many socioeconomic, environmental, demographic, and land-use dilemmas. In developing sustainable strategies for Kolkata, the city has to look forward (including climate challenges, population demography and political-cultural tensions). Many of these challenges are mapped out in this fascinating study. It is a rich source of reference and a 'must read' for everyone interested in the bottlenecks and opportunities of big cities in the Global South. The editor ought to be commended on the production of a great scientific opus.

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Preface – Introducing Kolkata: A Quaint Window to the Global South

The enduring enigma of the name *City of Joy*, given to Calcutta by French novelist Dominique Lapierre in a captivating novel (published in 1985) that portrayed both the disastrous and humane side of the quintessential city, Kolkata, surely conjures up imaginations of sorts. While no Indian city has made a mark in the Global Cities Index, India has shown a promising future. In the 2014 Kearney's Report, Kolkata was the 14th Emerging City that lists the *'rising cities of tomorrow'* – in their next report in 2015, putting to rest its 'rising' status, it tops amongst Indian cities as one of the *fastest growing cities*, growing to what? I wonder . . . a giant metropolis that's unsustainable and unable to fend for itself? Will it ever be an all-encompassing 'liveable city'? Its long-standing tryst with poverty, low levels of investments, and compromised governance put forth many questions about its future. The city has its strengths – its multicultural identity, political consciousness, an intricately woven social fabric, and unfailing tolerance. Thoughts cross my mind as I try to make sense of the insensible – I recall an old McKinsey Report (2010) on 'India's Urban Awakening: Building *Inclusive Cities*'. It makes a sweeping claim of $ 2.2 trillion to put Indian urbanisation in order. Notwithstanding the lack of transparency, weak governance, and inherent corruption, global giants have been pushing for private participation as the welfare state eases out onto the backseat, justifying their failures by cleverly leveraging the need for global capital to create global cities.

I would like to stop to explain why I call the city 'a quaint window' – the global south is geographically defined; it is a broadly defining term, implying less-developed countries, industrialising slowly, bearing histories of colonialism, cities defined by primacy, demographically overbearing, marked by poverty and more. Exceptions are evident, like Singapore, which has succeeded in achieving a development trajectory, but located at the heart of the Global South. One must be reminded, at this juncture, about the problems of the geographically defined Global South – it doesn't include Australia (geographically way south), and China is another regional entity that defies such boundaries. The over-arching drive of cities in this broadly defined region is to match up with their northern counterparts that are better organised, more efficient, have lower population densities, well-managed

provision of amenities, well-organised transport systems etc. The agenda of globalization that removes *intellegently-chosen* barriers and brings us closer helps define how and what we must aim to improve. The megacities of India that are ahead in the race, like New Delhi, Mumbai, Bengaluru, and Hyderabad, are established destinations of global capital. Kolkata has been more *quaint* in this sense – slow to adapt, holding on to traditions, resisting the 'all-pervasive' spatial transformation, as if not sure whether to hold on to its long-standing communist ideologies or take the leap into an unknown future of being washed ashore by corporatization. While explaining the impacts of globalization to my post-graduate students, I've never been able to adequately explain why a process that wants to show the world how to remove boundaries and borders for the sake of human progress at the same time makes more complicated visa regulations – just when I was beginning to say globalization removes the boundaries 'for free trade' I have to tell them, 'Wait! But there are umpteen rules for crossing the same boundaries when you're travelling'. These boundaries are hard to cross in numerous instances. Certainly, for instance, the world has many barriers when it comes to poor migrants in search of a decent livelihood.

Before we completely succumb to the 'global' fairyland, I dream of taking a quick look at what we may never find again: the lanes steeped in history, the nooks and corners portrayed by my teacher Professor Sunil Munshi in his book '*Thikana Kolkata*' (Bengali for 'The Address of Kolkata'), that finds hidden non-descript buildings where seeds of revolution were sown, crazily undulating pavements waiting to give broken bones and epidural brain clots to those who walk them, the potholed roads we drive on, where every few years opposition members can plant seedlings, jeering at the elected representatives about the state of the roads – the heritage buildings I explored as a child, lived through, and those I never found time to see even after living in this city for the last 50 years. My city has transformed, and it is, for me, a quaint window to look out at the other Indian 'global' cities – was the slowness good or bad for the city? Perhaps we are more inclined to 'good' as we now find amidst the curse of Covid that large streams of people are choosing to leave big cities in the Western world, preferring to live in better environs. Here, in another part of the world, large streams of hapless migrants left big cities as they were left without jobs, and thus without food and shelter. The subtle difference in the growth story is that while Calcutta evolved into Kolkata, it stopped short of becoming the contemporary Global City, though it has grown at an impossible pace in terms of densities, which has pushed its ecological limits. Notwithstanding this growth, the 'far from complete spatial transformation' that Prof. Chakravorty studied 25 years ago still bears the same tag! This is why the book plans to open with his contribution (Chapter 1). Perhaps it will be helpful to add a few lines here to put the city into its geographical context: a very brief overview of the city for the readers who are not so familiar with Calcutta/Kolkata.

The story of this city goes back to the *zamindaars* (Indian equivalent of elite landowners) Subarna Roy Choudhury, who owned the three villages of Kalikata, Gobindopur, and Sutanati, gifted to the family by the Mughal Emperor in the early 1600s (not much is known of its unique identities before that, except it was part of the Mughal Empire). The British arrived here in 1690, looking to establish the headquarters of East India Company, but later made it the colonial capital until they shifted the capital to Delhi in 1911. From 1690–1911 – a period of 220-some years – as influential, shrewd traders and colonisers, it is the British who transformed the settlement into a city, pronounced and spelt it as Calcutta. In 2001, the Government of West Bengal decided to bring back the Bengali pronunciation, and officially renamed Calcutta as 'Kolkata'. The name change never made a difference to the Bengalis; in their language, it was always Kolkata. The city always responded – whether to an Anglicized *Calcutta*, a Bengali *Kolkata*, or to the sound of *Kalkatta*, used by the migrants from northern India. The peopling of the region by the creative, culturally sensitive Bengalis who lived through the passing waves in history – the quaint village life followed by the economic relevance of the region during the rise of the trading port of Tamralipta, Job Charnocks identification of the site for establishing the seat of colonial administration, the struggle for independence from the British colonisers, of renaissance and social reforms in education and womens' empowerment led by Rammohan Roy and Ishwar Chandra Vidyasagar, and its rich cultural heritage shaped by the likes of Rabindranath Tagore, Sarat Chandra Chattopadhyay, and Upendrakishore Roy, are the various phases that have crystallised in the composite history of this city. Intermittent flows of migration occurred through its chequered history and today, the Marwaris from Rajasthan, traders and businessmen from Gujarat, service sector experts from Bihar, Uttar Pradesh, Tamil Nadu, and entrepreneurs from various states of India are intrinsically woven into the fabric of the city. They spread across the city, often in enclaves, that tell the story of the socio-cultural niches across neighbourhoods. The British left behind their imprints in the Anglo-Indian community personified by sites like Bow Barracks, New Market, and surrounding areas. The Armenian and Chinese enclaves add colorful dimensions to the geography of the city. The churches and buildings dotting the colonial business district are reflections of this past.

Kolkata is a unique city with more insights than one can imagine. From the travelers' dialogues or the passionate citizens' views, every perception matters to the critical geographer who views the 'everyday lives' in social space. Set upon one of the largest deltaic zones of the world, it has evolved through Independent India's urbanisation history – it has gone through the sorrow of separation and the crisis of identities, post-colonial development, decades of communist rule, subsequently changing political landscapes, a slow onset of globalization and accumulation of private capital, emerging capital-driven urban spaces that challenge the relevance of its heritage, the

merging of the unique Bengali culture into the cosmopolitan spheres, and the enduring but quiet cultural activism to retain everything traditional, through the iconic festivals (like Durga Puja), food, clothing, cinema, and music. Kolkata has been and always will be a complex cultural space, lived and experienced through histories and geographies of urbanism. This book is an attempt to capture a few frames inherent in this process of transformation.

About the Book

This compilation attempts to take the reader through the different facets of urban geography, intricately linked with the way the city has transformed and evolved from its colonial past to the neoliberal present. A city is first a complex organic entity that nurtures myriad aspects in the story of its evolution – it is a misnomer that such aspects can all be captured in one book. This is an attempt to open little doors like the tiny Alice in Wonderland. Looking through one window to another as best as I could capture and compile, through the lenses of a geographer envisioning the city and capturing the different aspects of its spatial entity – enriched by researchers with diverse interests and expertise, through both genres of physical and human geography, sometimes aerially, through remotely sensed data and sometimes through everyday encounters.

The first section of the book is named **Rethinking Histories of Space-Place-People**. Histories and geographies merge in this section as a nuanced understanding that the transformation of space by the geographer is never complete without understanding its history, or how the spatial structures and entities have evolved temporally. This is precisely in tune with the reason qualitative genres in geography begin with an understanding of the space-time dynamics. Geographers also apply *image processing* methods upon satellite images to analyse changing land character, changes in river systems, changing coastlines and forest covers. The opening chapter is a revised reprint of Prof. Sanjoy Chakraborty's paper entitled 'From Colonial City to Globalizing City? The Far from Complete Spatial Transformation of Calcutta: An Update after 25 Years', a geographer's commentary on the transformation of the city's spatial history that sets the pretext for how the city lived through the all-encompassing 'transition' that this book attempts to focus upon. A re-look at the original chapter he wrote 25 years ago sets the ground for the book. What follows is a myriad (and hopefully colourful) journey comprising the contemporary debates around its heritage in Chapter 2, the restructuring of neighbourhoods in Chapter 3, the history of displacements in Chapter 4, its housing policies in Chapter 5, its transforming *gray-spaces* (Chapter 6) and a look at the chequered journey of traditional houses of North Calcutta, bearing the legacies of the past and confronted with a cruel reality of speculation in the land market and the pressures therein (Chapter 7). This section closes with an account of the political landscape of Kolkata, written by a political geographer.

The physical-ecological views of the city in transformation are contained in the second section, **Ekistics of a Deltaic City**. This section contains chapters that focus upon the ekistics and its critical ecological parameters. The city of Kolkata is unique in its locational character, which is best explored by geographers. Prof. Sunil Munshi beautifully sums up the unique locational character of Calcutta '*. . . upon the fringes of the active delta, hardly a few feet above sea level*' and its location '*along the track of tropical cyclones coming up from the Bay of Bengal, gives it a unique environmental characteristic, not found in any other populous metropolis of the world*'. With this physical setting, at the heart of a disaster-prone sub-region bounded by the largest mangrove ecosystem in the Sundarbans, this city has undergone expansion and agglomerations (shifting of the core and peripheries, emergence of new nodes), changing its nature and character over time. Chapter 9 traces this urban expansion by use of geospatial analysis of changing land use and land cover, using the geographers' domain knowledge of methods of assessing urban built-up densities and their temporal changes. This chapter makes clear conclusions on the direction and magnitude of urban expansion, and Chapter 10 follows up by assessing the differential development of the peri-urban fringes identified in the earlier chapter. Due to its deltaic location, the water-based ecosystem of Kolkata has gained much relevance in its ecological existence. However, its limits are constantly pushed by planners, nudged by growing anthropogenic needs, and eventually it is the sustainable future that is compromised. The expansion of built-up spaces that epitomize a city eventually lead to irreversible changes in the ecosystem that may be difficult to trace, but the localized impacts are evident through analysis of surface temperature changes that eventually convert the city's ecosystem into emerging new patterns of local climate zones, as presented in Chapter 11. Chapter 12 traces the urban hydrology from colonial times to the present, giving a detailed account of the city's hydrological history and how man-made canal systems added sustainability to the natural drainage system. Chapter 13 focusses on transformation of the wetlands, a critical ecosystem that very few cities are endowed with. Chapter 14 attempts to assess ecosystem services provided by water bodies that dot the urban landscape. Together these chapters prepare the grounds for understanding impacts of climate change for the region as a whole. This is critical in assessing the vulnerability of the communities living upfront in terms of the coastal and deltaic ecosystem, which may succumb to the pressures created by urbanisation in the long run.

The third section, named **Critical Planning Issues of the City**, deals with three major hazards that have created a sense of impending doom – health and education are the pillars of development – as Covid wreaked havoc and is imminently crucial to manage. A medical professional contributes to Chapter 15 with a case study approach to identify socio-demographics of a small sample from a dedicated Covid hospital in an attempt to identify causalities, reported from a work in progress as the definitions are changing

with subsequent waves. On the other hand, a much slower, latent, but imminent crisis has already set in with the collapse of Government-aided schools and the lack of political will to recognize and confront the crisis. Given the rich history of education in Bengal, it is a crucial dimension as the presence or absence of these schools will determine the future of education among the urban poor – many of whom have migrated from the rural hinterlands in search of a better life for their children. A collapsing education system is perhaps the worst thing to happen to any society, at any institutional level, and is addressed in Chapter 16. Chapter 17 discusses the crisis of slums facing man-made hazards like fires on the one hand and re-building lives after storms and super-cyclones like Amphan on the other. Chapter 18 takes up the case of planning imperatives as we woke up to a ravaged city in the aftermath of Amphan. Chapter 19 gives an account of Municipal Finance, perhaps the most important amongst all issues, as sustenance of all urban functions depend upon its wise and efficient utilization.

The attempt of this book is to begin a journey of exploring geographies of urban India in contemporary times. Some titles, like the iconic 'Calcutta: The Living City' by Prof. Sukanta Chaudhuri and 'Calcutta's Urban Future' compiled by Prof. Biplab Dasgupta and published three decades ago, helped me understand the nuances of the city as a student and have inspired this compilation.

Note: In the text, 'Calcutta' and 'Kolkata' have been used in the names of organizations depending on whether the context predates the change in the name of the city on 1 January 2001.

Sumana Bandyopadhyay

Acknowledgements

The compilation of this book is the result of my dream to see a book on urban geographies of Kolkata and the dedicated research work of many scholars passionate about the city they were born in or lived and worked in. I am indebted to each one of them who came forward to share their research for this volume. The seeds of this compilation were sown when I joined the Department of Geography of the University of Calcutta in 2006, where I was a little surprised to find that Urban Geography was not offered as a subject to the post-graduate Geography students, while many researchers pursued their doctoral studies on different geographical aspects of the city. My teachers who initiated my interest in Urban Geography and helped sustain it perhaps do not know how they touched my life – Prof. Sumita Ghosh and Dr. Sharmila Ray in Loreto College, Dr. Satish Kumar, Prof. Amitabh Kundu, and Prof. Atiya Habib in CSRD, JNU and Prof. A. Ramanathan and Prof. K Narayanan in HSS, IIT Bombay. My students in the postgraduate Departments of Geography at the Universities of Vidyasagar, Kalyani, and Calcutta helped me sustain my interest as a learner of Human Geography, and within its domain, urban geography. Initiating the proposal for the introduction of Urban Geography as a special paper in my department at Calcutta University was made possible by Prof. Sunil Munshi, the great educator who has been an inspiration for me through the years, and Prof. Sukla Bhaduri, my senior colleague who nurtured the same passion for the subject. My first doctoral research scholars at the University of Calcutta were motivated and driven. The research team we built together in the tiny room at the end of the corridor of the Eastern Wing has seen changing faces and spaces, but the enduring love for the city has stayed on, as more and more students gravitated towards urban studies. Sima Maji left us for her heavenly abode, but her love and her books stayed with us. I acknowledge her sincere dedicated spirit that lives on among us and in this volume.

The contributions to this book have been made by young research students, senior and stalwart researcher colleagues – I humbly acknowledge each and every contribution. I wish to thank Debarpita Banerjee for her support with formatting and editing the manuscript, Kanika Basu and Shankhajit Sen for their key inputs in shaping some of the chapters.

I thank Prof. Sanjoy Chakravorty for readily agreeing to revisit his own paper after 25 years and Prof. Marcuse, Prof. Kempen, and Prof. Wiley for their support with the publication rights. I recall feeling ecstatic knowing Prof. Peter Nijkamp reviewed my first international publication back in 2004, and I continued admiring his contributions to the Regional Science community through the years; his encouragement is reflected once again in the foreword he wrote for this volume.

Away from the academic and professional world, the support of my parents gives me all the strength – they allowed me to make my choices in life, mostly without doubts. My brother Sumanu keeps me grounded at all times and Abhijit, my husband, supports my work-life balance to the core. Shinjan, my fifteen-year-old, lights up my life – I am indebted to the synergies of their presence in my life.

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Abbreviations

ADB	Asian Development Bank
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ARDS	Acute Respiratory Distress Syndrome
AR5	Fifth Assessment Report
APC Rd.	Acharya Prafulla Chandra Road
BBD Bag	Binoy-Badal-Dinesh Bag
BDPS	Ballygunge Drainage Pumping Station
BJP	Bharatiya Janata Party
BSUP	Basic Service for the Urban Poor
BT	Brightness Temperature
CARG	Compound annual rates of growth
CBD	Central Business District
CCE	Continuous and Comprehensive Evaluation
CDP	Carbon Disclosure Project
CFR	Case Fatality Rate
CIT	Calcutta Improvement Trust
CITU	Centre of Indian Trade Unions
CLIS	Credit Linked Interest Subsidy
CMC	Calcutta Municipal Corporation
CMDA	Calcutta Metropolitan Development Authority
CMPO	Calcutta Metropolitan Planning Organization
CPI	Communist Party of India
CPI(M)	Communist Party of India (Marxist)
CPT	Calcutta Port Trust
CWSN	Children with Special Needs
DFID	Department of International Development
DLPS	Dhapa Lock Pumping Station
DN	Digital Numbers
DPEP	District Primary Education Project
ECW	East Calcutta Wetlands
EKW	East Kolkata Wetlands
EWS	Economically Weaker Sections

EKWMA	East Kolkata Wetlands Management Authority
E. M. Bypass	Eastern Metropolitan Bypass
ESI	Ecosystem Service Index
ETM+	Enhanced Thematic Mapper Plus
FB	Forward Block
FDI	Foreign Direct Investment
FGD	Focus Group Discussion
GAP	Ganga Action Plan
GAPS	Government Aided Primary Schools
GBP	British Pound Sterling
GDP	Gross Domestic Product
GE	Google Earth
GG	Government grant
GHG	Greenhouse Gas
GST	Goods and Services Tax
Ha.	Hectares
HH	Households
HRIDAY	Heritage City Development and Augmentation Yojana
HSC	Hawker Sangram Committee
ICE	Institution of Civil Engineers
IEDC	Integrated Education for the Disabled Children
IHSDP	Integrated Housing and Slum Development Programme
INC	Indian National Congress
INTACH	Indian National Trust for Art and Cultural Heritage
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
KEIP	Kolkata Environment Improvement Project
KIT	Kolkata Improvement Trust
KMC	Kolkata Municipal Corporation
KMDA	Kolkata Metropolitan Development Authority
KML	Keyhole Markup Language
KPSC	Kolkata Primary School Council
LCZ	Local Climate Zone
LIG	Low Income Groups
LST	Land Surface Temperature
LUDCP	Land Use and Development Control Plan
LULC	Land use and land cover
MAM	March, April, May
MCGM	Municipal Corporation of Greater Mumbai
MDG	Millennium Development Goal
MEA	Millennium Ecosystem Assessment
MFCS	Mudialy Fishermen's Co-operative Society
MIG	Middle Income Groups
MGD	Million Gallons

MMRDA	Mumbai Metropolitan Region Development Authority
MNCs	Multinational Corporations
MSME	Micro, small, and medium enterprise
MSS	Multi-spectral Scanner
MT	Metric Tons
MUEPA	Ministry of Urban Employment and Poverty Alleviation
NAPA	National Adaptation Programme of Action
NAPM	National Alliance of People's Movements
NASVI	National Association of Street Vendors of India
NDC	Nationally Determined Contributions
ND-GAIN UA	Notre Dame Global Adaptation Initiative Urban Assessment
NDVI	Normalized Difference Vegetation Index
NEP	National Economic Policy
NGO	Non-governmental Organisation
NLCP	National Lake Conservation Plan
NTR	Non-tax revenue
OECD	Organisation for Economic Co-operation and Development
OLI	Operational Land Imager
OR	Own Resource
PBPS	Palmer Bazar Pumping Station
PMAY-HFA (U)	Pradhan Mantri Awas Yojana- Housing for All (Urban)
PPP	Public-Private Partnership
RAF	Rapid Action Force
RAY	Rajiv Awas Yojana
RAWES	Rapid Assessment of Wetland Ecosystem Services
RF	Random Forest
RFP	Request for Proposal
RS and GIS	Remote Sensing and Geographic Information System
RSP	Revolutionary Socialist Party
RTE	Right to Education
SAP	Special Action Plan
SEQI	School Education Quality Index
SEZ	Special Economic Zone
SI	School Inspectors
SSA	Sarva Shiksha Abhiyan
SSM	Sarva Shiksha Mission
STP	Sewage Treatment Plants
TCPO	Town and Country Planning Organisation
TE	Total Expenditure
TIR	Thermal Infrared
TM	Thematic Mapper
TMC	Trinamool Congress
TOA	Top of the atmosphere

TOD	Transit-Oriented Development
TP	Tollygunge-Panchannnagram
TR	Total Receipt
TVC	Town Vending Committees
TXR	Tax Revenue
UA	Urban Agglomeration
UEE	Universal Elementary Education
UHI	Urban Heat Island
UIG	Urban Infrastructure and Governance
ULBS	Urban Local Bodies
ULCRA	Urban Land Ceiling and Regulation Act
UNDRR	United Nations Office for Disaster Risk Reduction
USGS	United States Geological Survey
WBBPE	West Bengal Board of Primary Education
WBHB	West Bengal Housing Board
WBHIDCO	West Bengal Housing Infrastructure Development Corporation
WBPCB	West Bengal Pollution Control Board
WHO	World Health Organisation
WIFS	Weekly Iron and Folic Acid Supplementation
WUDAPT	World Urban Database and Access Portal Tools

Part I

Rethinking Histories of Space-Place-People

1 From Colonial City to Globalizing City?

The Far-From-Complete Spatial Transformation of Calcutta: An Update after 25 Years

Sanjoy Chakravorty[1]

This chapter was first drafted in 1996 – 25 years ago – at the invitation of the eminent urbanists Peter Marcuse and Ronal van Kempen. When the editor of this volume (Sumana Bandyopadhyay) requested a reprint of the paper, I became intrigued by the possibility of evaluating the ideas and prognostications generated a quarter century ago. It is a rare opportunity to revisit one's own words and prophesies and test them against reality, how things have actually turned out. I was delighted to do it. Consequently, this chapter has an unusual format. What follows is a reprint of what was published originally. At the end of the chapter is a new section – called '25 years later' – in which I briefly outline the changes that have actually taken place. As it turned out, some of my conjectures were on the mark, but there were several unanticipated developments, especially in the rise of the service sector, a booming land market, and middle- class demand for new housing. These changes were not specific to Calcutta because they were evident in all of metropolitan India. These changes did not transform Calcutta (now officially called Kolkata) into a global city, but may have inched some parts of it closer to that exalted status than it was a quarter century ago.

*

Like the proverbial Hindi deity, Calcutta has had many names: 'city of palaces' (in the 19th century), 'city of dreadful night' (Kipling's description at the turn of this century), 'city of joy' (in the dreadful book and movie of recent years), 'dying city' (by the late Rajiv Gandhi, Prime Minister of India 1984–89); its recent rulers have proclaimed that they would like the city to be known as the 'gateway to the Asian tigers' (in media promoting the investment virtues of the city and the state). In postmodern parlance, these many names reflect the many histories and realities of the city – its colonial past, industrial decline, and hope for resurgence in the present and near future. Interestingly, these names also hint at the many geographies of the city – its palaces and hovels, wealth and poverty – and, analyzed chronologically, the names offer some insight into the spatial structure of the city.

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This chapter focuses on intra-urban (or intra-metropolitan) distribution of wealth and poverty in Calcutta as an Indian case study. The intriguing question raised at the outset is: 'is there a new spatial order within cities'? This is really a two-part question: one, is there something new about the spatial structure of cities today and tomorrow, something fundamentally different from the same cities in the past; and two, is this a generalizable model *worldwide*? For much of this chapter I will try to answer the first part with reference to Calcutta, leaving enough signposts along the way to be able to deal with the second question at the end.

The default model (analytical framework for many studies in the original book) and hypothesis appear to have been proposed, to a large extent, with the 'western' city and economy in mind, especially its American variant. This default framework uses the new industrial divide, or the transition to a post-Fordist economy as the fundamental element defining the past and present structure of urban areas. The argument, very simply put, is that industrialisation and manufacturing-led economic growth created the 'old' urban structure; deindustrialisation or service sector-led global economic expansion is in the process of creating a 'new' urban structure. There are a number of reasons why this model cannot begin to apply to "Third World" contexts in general, and its cities in particular. The so-called Third World encompasses a great diversity of development levels, political-economic structures and histories, and levels of integration into the global economy; their city (and country) sizes are diverse, their city functions are rarely comparable to developed nation city functions, their public sector is much more active in urban land markets, the CBD is more important as the locus of employment, rent gradients are more unilinear and steep moving away from the CBD – all factors leading to distinct monocentric cities as opposed to the clearly established polycentric cities of the west. Above all, deindustrialisation in the west actually implies its opposite in the Third World, i.e., increased industrialisation, presumably in its urban centres. In fact, a more appropriate argument is that there is no singular Third World and that perhaps none of the many different political-economic-historical systems that make up the Third World bear any resemblance to the system described in the opening hypothesis. These arguments and questions deserve far more space than in an introduction to this case history, and since that space appears to be unavailable, I will focus on the Calcutta story as a case history (not to be used to draw generalizations about India or the Third World) while pointing out some of the more serious disagreements with the editors' hypothesis along the way.

It is clear that the two-stage Fordist/post-Fordist model cannot adequately describe the economic and urban development of India, particularly its colonial cities (and perhaps some other once-colonised third world nations and cities). Rather, a three-stage model may be more appropriate, where the three stages are (1) colonial economy during the first global period, (2)

post-colonial (or command) economy during the nationalist period, and (3) post-command/reform economy, during the second global period. The relationship between colonisation and urban development in the colonised countries has been discussed quite exhaustively (see King, 1976). Many of these cities, usually ports, were created specifically for colonial extraction: i.e., to act as points of transshipment of commodities from the colonised region and processed goods to it, and as seats of administration. Their primary links were to the international economy rather than to the regional economy. In the post-colonial or nationalist phase, the idea of 'development' as opposed to exploitation came to the fore; key ideas such as import-substituting industry, big push, infant industry protection, balanced growth, self-sufficiency, etc., dictated the policies of the relatively inward-looking newly formed nation-states. And now, a combination of the failures of import-substituting industrialisation in the south and the demand for new markets and production centres in the north, have forced many developing nations *back* to the global market. Post-Fordism does not describe this period as accurately as the term mixed-Fordism does, for large-scale capital-intensive production still has to take place somewhere – in the current global shift, in an ironic turn of events, it is the developing nations which are home to Fordist industry. I argue that these three stages are characterized by distinct modes and relations of production and investment, policy, and goals, and consequently they also characterize distinct spatial forms. In the next section I will briefly outline this three-stage history of Calcutta (with the last stage still in its formative phase), and show how the spatial order has been shaped by the dominant ideology of production.

However, the Calcutta story would be poorly understood without mention of two factors that, though not unique to itself, are rather different from developed nation contexts. First, I must highlight the importance of the size and function of the 'informal' sector in Calcutta's economy: by most estimates this collection of urban workers comprises 40 percent or more of the Calcutta labour force, in occupations from garbage collection, material transport, home delivery of consumer products, to small crafts and manufacturing (leather products, printing, etc.). The notion of formal 'flexible production and accumulation' (see Storper and Walker, 1989) that some scholars argue is reshaping urban space in the developed world has long been an aspect of the conditions of production in third world cities like Calcutta. One sub-sector of this informal economy is of particular interest in analyzing the spatial distribution of income and wealth: the domestic servants, ubiquitous in upper and upper middle-class residences, have lived and continue to live in close proximity to their employers. I will argue that it is essential to have an understanding of the spatial distribution of the informal sector, particularly the domestic service element, and its relationship to capital and technology, to understand the geography of poverty and affluence in Calcutta.

A Brief History of Calcutta Metropolis

Calcutta is the capital of the state of West Bengal and the primate city of Eastern India, with a hinterland of over 220 million, a mostly poor rural population (comprising the states of Bihar, Orissa, Assam, etc.).[2] As shown in Figure 1.1, the city is located on the east bank of the river Hughli, considered the 'wrong' side because the partition of India at independence in 1947 left much of the hinterland on the west of the river. The city's size and shape have obviously changed over the 300 years of its existence. The size shown in all the graphics here conform to the city's pre-1984 boundaries.[3] The city of Calcutta is small – 104 sq. kms. (excluding the most recent additions) – and extremely congested (the density at the business core is around 95,000 persons/sq. km., reputedly the highest in the world: United Nations, 1993). In the following paragraphs I describe the growth of Calcutta, the city and the metropolis, over the last three hundred years into its present size.

Colonial Economy: Calcutta in Ascendance

In 1690, an English merchant named Job Charnok arranged to lease three villages (named Kolikata, Gobindapur, and Sutanuti) by the river Hughli in order to set up a trading post. In 1698, Fort William was established by the river for defensive purposes, and a large open area was cleared around the fort for military engagements. The fort and the open area (called Maidan) formed the core of the city that emerged rather rapidly. The English traders' territorial expansion soon brought them into conflict with the local rulers, and a decisive battle in 1757 at Plassey (about 120 kms. north of Calcutta) left the victorious traders in sole control of the Bengal region. In 1763, a large area made up of Bengal (including present-day Bangladesh), Bihar, and Orissa was placed under the control of Fort William, or the territorial domain of Calcutta. In 1780, work began on building a marine yard and dock in Kidderpore, but the effort was abandoned temporarily and taken up later. By this time Calcutta had become a significant trading and administrative centre, and in 1794, the Governor General of Bengal Province, Lord Cornwallis, decided the official delineation of the city boundaries.[4]

In 1835, industry began in the Calcutta region, but not in the city: the first jute mill was established in Rishra, a suburb (for lack of a better term).[5] Jute, used for making bags, carpets, and low-cost clothing, became the mainstay of the region's economy till the middle of the 20th century. Other jute mills were established (usually) along the west bank of the river, towards the north of the city. Thus, industry in Calcutta began in the suburbs and continued to be located in the suburbs through another 100 years of colonial rule and 50 years of independence.

In 1854, Haora station was built on the 'correct' side or west of the river, and in 1880 steamships began arriving at the now-complete Kidderpore docks. By the end of the 19th century, Calcutta was a powerful metropolitan

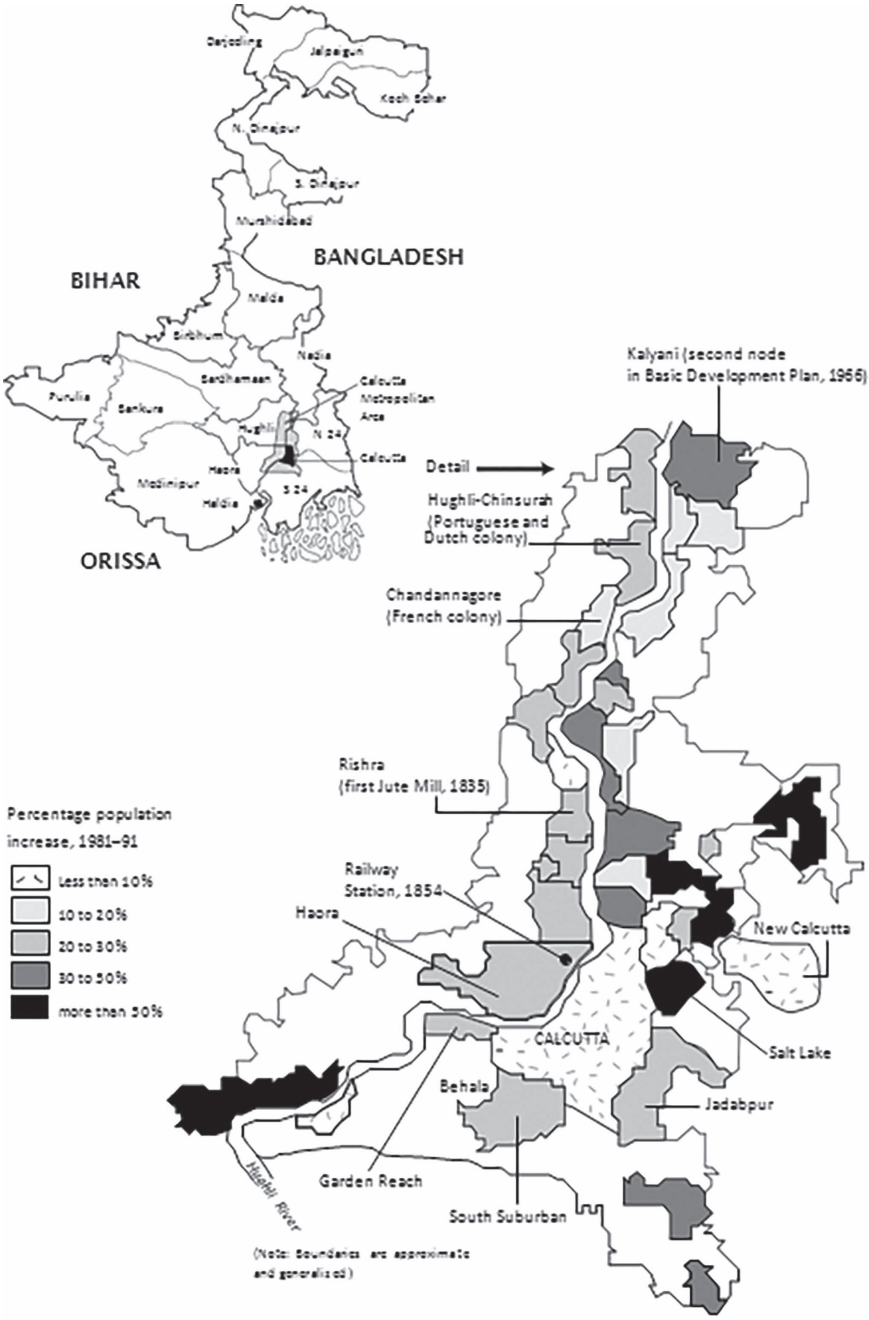

Figure 1.1 Calcutta City and Metropolis: regional and historical context

centre and the British capital in India (often called the second city of the British Empire) – a city of palaces and hovels. In 1912, the capital was shifted to Delhi, and a period of stagnation began for Calcutta and Bengal. Some engineering industries (medium-scale metal and iron works) owned largely by Britishers were located in the industrial belt along the river,[6] but world demand for jute products was on the decline (interrupted only by increased demand during the two world wars).

The Command Economy: Calcutta in Decline

Independence in 1947 was especially traumatic for Calcutta. First, religious strife led to a massive migration of Hindus from the newly formed East Pakistan to the city; there was some Muslim out-migration, but in smaller numbers. Second, a significant portion of Calcutta's hinterland (mainly the jute-growing region) now became part of another, hostile country. Despite these problems, the city was in an enviable position by Indian standards: till 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 (which has since declined to rank #7). It was also clear, however, that the city and the region were in decline. Delhi had long replaced Calcutta as the political capital, and now Mumbai began replacing it as the economic capital of India. Hastening this decline was the Freight Equalization Policy of 1956, which equalized prices of 'essential' items like steel and coal nationwide, while prices of private sector-produced items (like textiles) were not controlled. The eastern region, the centre of coal and steel production, was hardest hit.

The post-colonial economy's fundamental thrust was toward import substituting industrialisation. In keeping with the dominant development paradigm of the time (see Harrod, 1948; Lewis, 1954; Domar, 1957), the emphasis was on industrialisation-led economic growth, infant industry protection, and heavy state involvement in the ownership of key industrial infrastructure sectors like power generation, iron and steel, etc. (Ahluwalia, 1985). This heavy Fordist industry tended not to be located in the existing core cities (like Calcutta, Mumbai, Delhi, or Madras [now Chennai]), but in smaller urban areas, lower in the urban hierarchy (like Ahmedabad, Pune, etc.), or in newly created potential 'growth centres' (like Durgapur, Raurkela, etc.),[7] or (in the case of small-scale manufacturing) in the suburban industrial belts around the old colonial cities. The core cities continued to serve as centres of regional and/or national administration (with increasingly large bureaucracies in the public sector, and expanding offices in the private sector), trade and commerce, small-scale industry, and services in general. That is, the economic functions of the colonial cities in general, and Calcutta in particular, did not fundamentally change after independence; they had largely been non-industrial and service-oriented to begin with, and they continued to play these roles.

In Calcutta, however, unlike the other major cities in India, the hinterland remained generally unindustrialised (with the states of Bihar and Orissa at the bottom of every development index), and very little new industry moved into the agglomeration around the city. This situation was exacerbated by political developments from the early 1960s when centrist, leftist, and radical forces fought for control of the State.[8] Between 1967 and 1971, the State was in political turmoil, with a succession of coalition governments unable to bring order, and in a literally bloody fight the centrist and leftist forces combined to crush the radical, revolutionary movement (see Mallick, 1993). This period (1970–72) was also marked by a second large migration wave – this time of refugees from the newly formed Bangladesh, then at war with Pakistan.

The centrists (Congress Party) ruled with a massive majority till 1977, but were unable to stem the steady decline of the city, the State, or the region. Since 1977, the leftists have been in power; they have concentrated their efforts on rural development, particularly in quite successful land redistribution policies (see Kohli, 1987). Calcutta in the meantime has faced what may be called 'benign neglect'. The city and metropolis have seen capital flight to the west and north, the degradation of aging infrastructure, a scramble for upper-middle class housing construction, and increasing corruption and inefficiency at all levels of municipal authority.

Liberalization and Globalization: Calcutta Reinvented

If this description paints a gloomy picture of Calcutta and eastern India while the rest of the country was increasingly prosperous, it is incomplete. As the following account indicates, the overall accomplishments of the command economy were quite mixed:

> Between 1950 and 1990, (Indian) national output increased 4.6 times, the volume of industrial output 12 times, food-grains production 3.5 times, pig iron and steel 10 times, electricity 43 times, motor vehicles 70 times . . . the crude death rate declined from 27 per thousand of population to 12, and infant mortality from 170 per thousand to 89 . . . life expectancy at birth increased from 41 to 61 years . . . However, on the flip side, the number of persons below subsistence level now equals the country's total population in 1951, and the number of job seekers has increased 100 times . . . about one third of the country suffers from malnutrition . . . 60 percent of the country's population does not have access to safe drinking water, 48 percent are illiterate . . . There is a clear trend of widening regional disparities . . . The ratio of per-capita income (of Punjab to that of Bihar) has increased from 1.9 in 1960–61 to 3.4 in 1989–90 . . . the coefficient of variation (of per-capita incomes) has increased from 0.22 in 1960–61 to 0.33 in 1988–89 . . .
>
> (Swamy, 1994: 18–21)

The figures above portray the dualistic nature of Indian development: industrial growth whose benefits have not trickled down, and at the same time have exacerbated regional imbalances. The figures also underline the notion that, starting from a very small industrial base at independence (one designed for colonial extraction), Indian industry has matured in some sectors. Nevertheless, India's economic performance has been much poorer than the NICs of East and Southeast Asia, and somewhat comparable nations like Brazil and China. There seemed to be general agreement that India was a 'shackled giant', bound by a nexus of controls, subsidies, and licenses, which led to a vicious cycle of stagnation, high cost, and inefficiency (Ahluwalia, 1985).

India had in the past sometimes been forced to 'open the economy' when faced with serious balance of payments crises (Lal, 1995). But with the ascension of Rajiv Gandhi to the Prime-ministership in 1984, the beginnings of a hegemonic intellectual change appear to have taken place. Mr. Gandhi's inclination to open India was clear, but had to be tempered to suit his party's populist mission and was eventually overtaken by an arms import scandal (see Corbridge, 1991; Kohli, 1989). There were important but small steps taken then. The reforms announced in July 1991, apparently triggered again by a foreign exchange crisis, went much further by making it easier for foreign capital to enter the country by largely removing entry barriers such as industrial licensing and equity participation limits. Foreign investment was welcomed in 31 high-priority sectors, and in additional key infrastructure areas such as power, petroleum, telecommunication, air transport, ports, and shipping.

When I first wrote this paper in early 1996, the reforms seemed to have succeeded in breathing new life into the Indian economy. By 1995, four years after the initiation of reforms, foreign exchange reserves were at $20 billion, up from $1 billion at the time of crisis; industrial growth was up to 8% compared to 0.6% in 1991–92 (Government of India, 1995). The volume of the proposed investments (about Rs. 4170 billion in early 1995) was about four times the size of the Indian budget: Rs. 1122 billion for 1994–95.[9] But by late 1998, economic growth was at a standstill, and it had become apparent that only a small proportion of the proposed new investments (especially foreign investments) were being implemented on the ground.

For West Bengal, the liberalization process appeared to have been heavensent.[10] Of all the *proposed* new investment after the beginning of the structural reform process, almost 60% was concentrated in five states (Gujarat, Karnataka, Maharashtra, Tamil Nadu, and West Bengal), all leading urban states with large cities, whereas backward states like Bihar and Madhya Pradesh had less than 1% each. Gujarat appeared to be the leading investment magnet, with West Bengal a close second. But by 1998, a clearer picture had emerged: Gujarat is still by far the leading investment destination, but West Bengal is far behind – with less than 5% of the total *real* investment, it is nowhere near the leading states. The picture is a little better as far as FDI is concerned, but only marginally so.[11] The spatial distribution of the new

investment in West Bengal is also illuminating. About 35% of the small-scale investment (up to $150 million each) is in the Calcutta metropolitan area; a substantial proportion of this investment is in the city in the service sector (office complexes, theme parks, transportation), and a large proportion is in manufacturing in the industrial suburbs. The bulk of both the small- and large-scale investments, however, are targeted to two ports (both south of the city and currently outside the area defined as the Calcutta Metropolitan Area): these are a new port at Kulpi (about 30 kms. from the city), and the industrial complex in Haldia (about 50 kms. from the city). The latter, with about a quarter of all small-scale investments and two-thirds of all large-scale investments, is in the process of becoming a major industrial enclave.

Closer to the city, two recent developments are noteworthy (for details see Chakravorty and Gupta, 1996). First, the Calcutta Metropolitan Development Authority (CMDA) is implementing the Government of India's Mega City Programme – Calcutta is one of five agglomerations (Mumbai, Chennai, Bangalore, and Hyderabad are the others) that are receiving special funding for the first time for infrastructure improvements. In keeping with the new liberalization philosophy, these new projects are to have significant cost recovery or surplus generation components. The CMDA, in response, has moved away from its acknowledged expertise in slum improvement to housing, new area development, and building commercial facilities.[12] Much of these new investments (estimated to be over 80% of the metropolitan total) are targeted to the city and its immediate surroundings, where it is clear that the city is congested and overbuilt and has experienced serious out-migration over the preceding three decades.

The second development relates to the creation of new towns adjoining and to the east of Calcutta city. One of these, named New Calcutta (see Figure 1.1), is designed to house 500,000 people (78% of whom will be middle- and upper-income earners), among high-technology oriented office complexes and open spaces. Despite some environmental concerns – the designated area has considerable amounts of protected wetlands – work on the ground has begun despite some unexpected difficulties in land acquisition; the State Housing Board, which is now in charge of the project, expects to sell housing units from 2000.[13]

The Spatial Structure of Calcutta

The Colonial City

At inception, the colonisers (then merely traders) sought to establish terms of trade favorable to the home country; later, after gaining complete territorial control, they used the colonised regions as sources of raw material to be processed in industrial England and as captive markets for the processed products. The colonial city was a centre of administration, a port, and a European residential enclave. This city's structure (as shown in Figure 1.2)

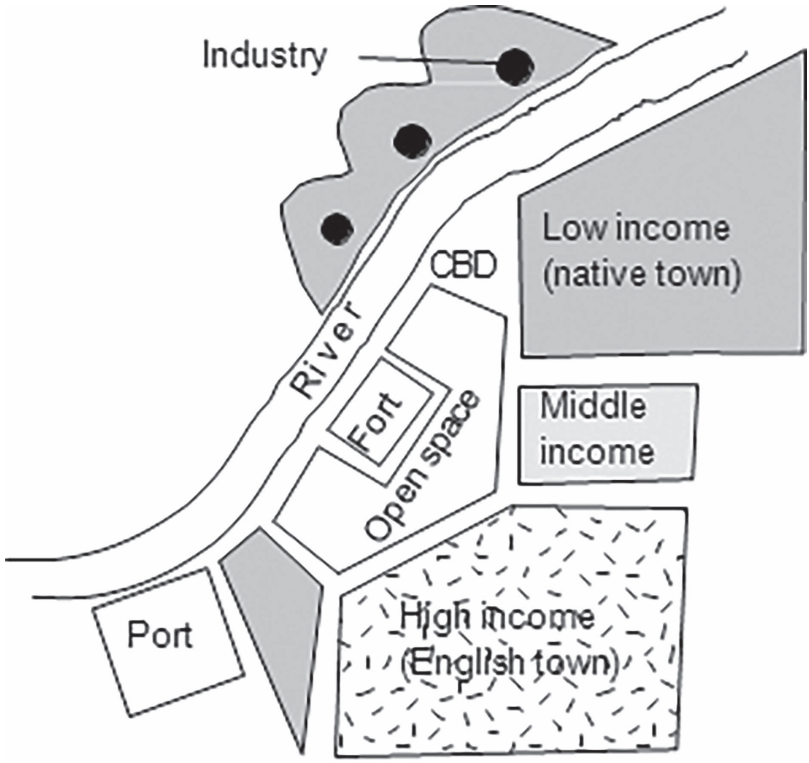

Figure 1.2 The spatial structure of colonial Calcutta

was deeply divided – the important spatial divide being that between the colonisers (living in high-amenity, well-serviced areas) and the natives (living in unplanned, congested, poorly-serviced areas). Describing a model of the South Asian colonial city, Dutt (1993: 361) writes:

> The European town . . . had spacious bungalows, elegant apartment houses, planned streets, trees on both sides of the streets . . . clubs for afternoon and evening get-togethers . . . The open space was reserved for . . . Western recreational facilities, such as race and golf courses, soccer and cricket. When domestic water supply, electric connections, and sewage links were available or technically possible, the European town residents utilized them fully, whereas their use was quite restricted to the native town.

Calcutta city, then, started growing around an empty core (the fort and Maidan), with English town growing south and southwest of Park Street

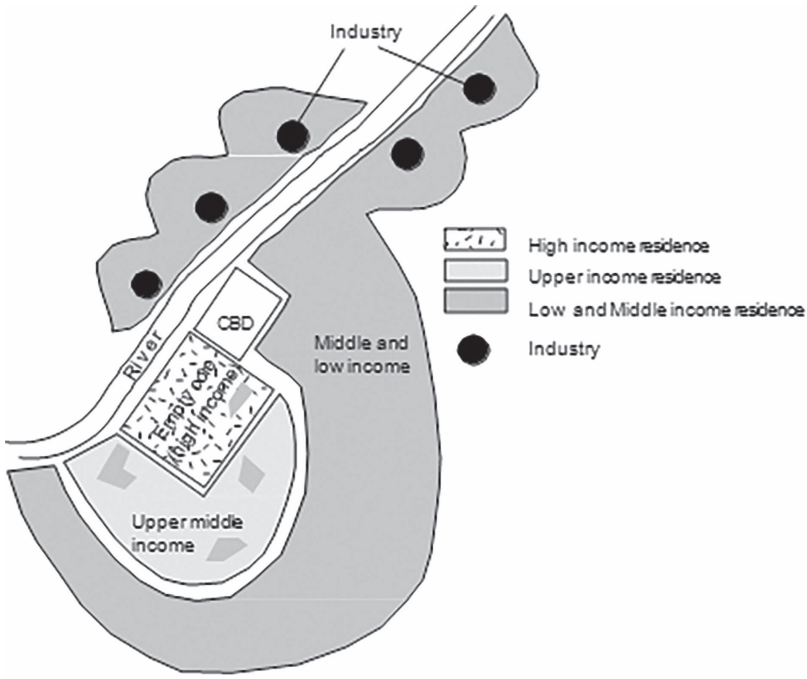

Figure 1.3 The spatial structure of post-colonial Calcutta

(see Figure 1.3), an area of Eurasian and mixed-marriage residences (i.e., an Anglo-Indian enclave) immediately to its north, and the area further north and east being occupied by the natives (working as merchants, traders, and clerks for the British administrative system). However, it would be wrong to presume that this spatial division by race and class was strictly enforced.[14] The first wave of poor migrants to the city did not come to work in factories (because none existed), but to service the lavish lifestyles of the British. They settled in small slums within English town, 'or how else could the rich get servants, cooks, darwans, chowkidars, cleaners, gardeners, dhobis and the rest? Labour was abundant and cheap and it paid to keep the slums within the city, in fact nearer the mansions' (Munshi, 1975: 111). Bardhan Roy (1994) argues that the domestic services were needed from early morning to late night, and as a result the dwellings of the poorest could be seen within walking distance of most luxurious areas of the city. I shall show later that this basic structure, created in the 18th century, still dominates the spatial pattern of work and home in the city.

The second wave of migrants came seeking employment in the engineering units and jute and textile mills that began west of the river from the middle

of the 19th century, and to work for large transportation projects (Haora station in 1854, Sealdah station in 1856, the Calcutta tramways, and the Kidderpore docks). All of these activities (except the tramways) took place on the fringes of or outside the city boundaries of the time; the new slum areas, as a result, began growing in these fringe areas.[15] Not surprisingly, the low-income occupations were somewhat linguistically segregated: Bengalis in the clerical professions, Biharis as rickshaw pullers, porters, and factory labour, Oriyas in domestic service and plumbing, gas, and electrical works. Their slums also tended to retain occupational and linguistic identities, as did Muslim slums (specialising in labour for soap and leather factories on the eastern and southern fringes). This structure within the city was replicated in miniature in the riverside industrial suburbs; these had small high-amenity areas (large estates as living space during the work-week for the British owners and managers), surrounded by a small middle-income area, and low-income areas where the factory labour lived.

The Post-Colonial City

With the achievement of independence in 1947, the spatial divisions of the colonial city (demarcated by class and race barriers) were largely retained, with the native upper class (capital and landowners, political leaders, and top government officials) now occupying the privileged space once reserved for the colonisers. The refugee inflow from East Pakistan, however, introduced an unexpected spatial twist. As Goswami (1990: 92) writes:

> The influx of refugees really brought the city's elite face-to-face with the urban problems that were brewing for a long time. In the first place, unlike previous migrants, who were clearly subalterns, the typical displaced families were vocal and considered it a political right to be gainfully re-settled in the city. They belonged to the same culture background as the city's intelligentsia, and demanded to be heard. Second, they settled in areas that were perilously close to affluent South Calcutta neighborhoods: Behala and Chetla bordered Alipur, Kasba and Dhakuria were just next to Baligunj and Gariahat, Jadabpur was not too far from the mansions of Southern Avenue, and the brown and white sahibs could no longer go to play golf without seeing the slums in Tollygunj. The new urban poor could not be put out of sight in the unmentionable parts of north Calcutta.[16]

The inherited (colonial) space was divided into quarters, or ghettoes: British, mixed-race, and native town bordering the centre (with slums interspersed in every quarter; see Figure 1.2). The new (post-colonial) space retained much of this inheritance, with the race divisions being replaced by class divisions. In addition, population pressure forced the city to grow outward, with the farthest areas being occupied by the low-income population. As depicted in Figure 1.3, the quartered structure of the colonial city

was replaced by concentric half-circles, with income declining with distance from the centre. However, as also suggested in Figure 2b, the area north of the empty core is missing the middle-income ring. This area, adjacent to the CBD and Burrabazaar (a large wholesale market), was the native town during the colonial period; its infrastructure deficiencies have increased over time, and the absence of planning and investment here is evident in its congested lanes and by-lanes, open drainage, and generally miserable living conditions. As expected, this area (north Calcutta) does not house the elite or the upper-income population.[17]

The spatial distribution of the low-income population at two time periods (1965 and 1983) is shown in Figures 1.4 and 1.5. In general, the two maps are similar – the significant difference is in the proliferation of slum areas in the far south (Jadabpur) in the latter period.

This is not surprising, since as suggested earlier, north Calcutta has been completely congested for some time; any growth in poor areas has had to take place in the south (which is also a refugee stronghold and a bastion of

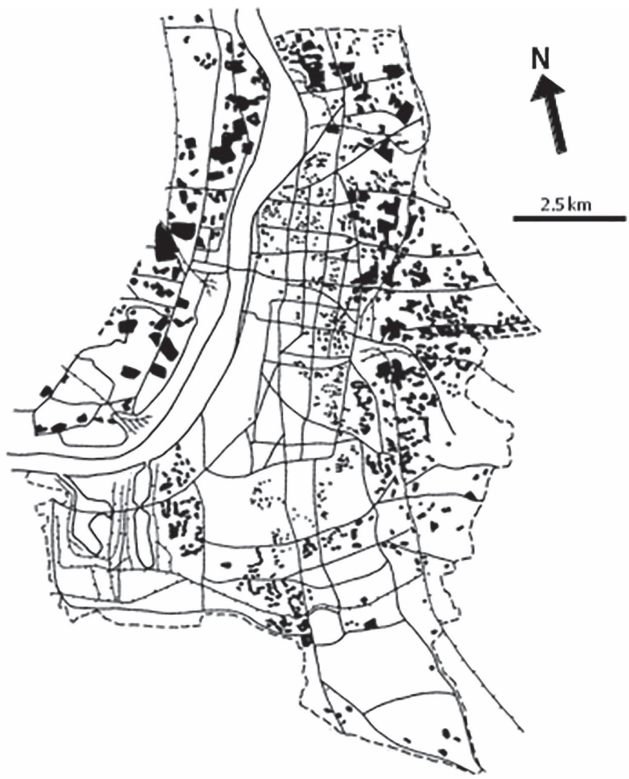

Figure 1.4 The distribution of slums in Calcutta City, 1965
Source: Adapted from Basic Development Plan, CMPO, 1966

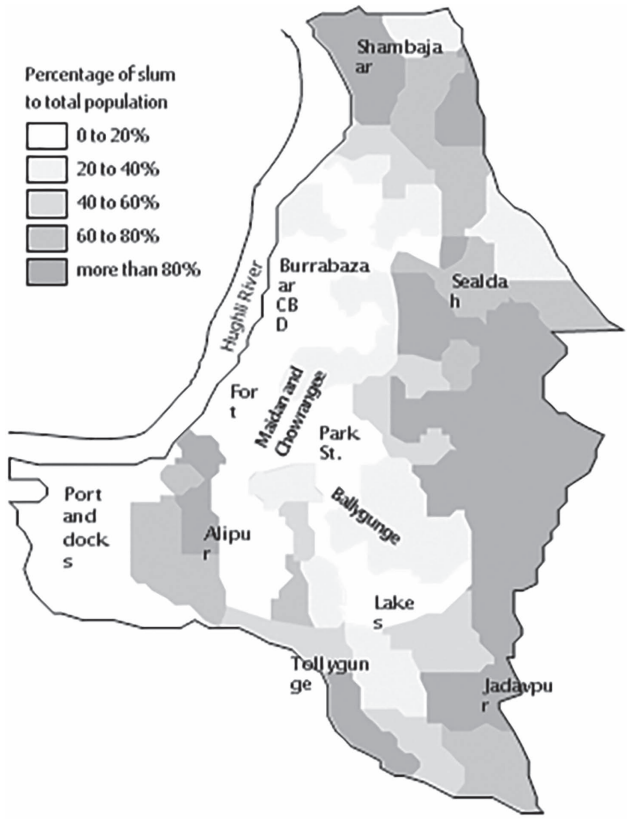

Figure 1.5 The distribution of slums in Calcutta City, 1983
Source: Adapted from CMDA Bustee Improvement Sector Document in *Bardhan Roy (1994*

leftist politics). Two additional points should be noted: first, many slums are located on the least desirable public land (along railway tracks and open sewerage and drainage lines); and second, the location of Calcutta's poorest, its pavement dwellers (or homeless population), is in many ways the opposite of that of the slum population. An extensive survey of the pavement dwellers was done in 1971 during the Census of India. This survey, and one carried out by the CMDA in 1987, found about 50–55,000 homeless persons in the city, and about four times that number in the metropolis (Mukherjee and Racine, 1986; Bandopadhyay, 1990). The city homeless were (and still are) concentrated in the CBD, Burrabazaar, and Chowrangee, and are also found in the high-income areas of Park Street and Alipur. As expected, there are few pavement dwellers in the slums.[18]

Some residential segregation by occupation, religion, caste, and ethnicity continued into the post-colonial period. Two points should be noted in this regard. First, the ghettoes are not large (i.e., unlike in the U.S. where the Black population in cities like Detroit and Philadelphia are concentrated in large contiguous areas). For instance, one can find (in east Calcutta) a low-caste Hindu leather worker bustee of say 15,000 people adjacent to an equally large Muslim leather worker or tailor bustee. Second, this pattern of spatial separation is not confined to the poor: the business elite, which is generally non-Bengali, occupies the centre; of special interest are the Marwaris (a group of very prosperous entrepreneurs from Rajasthan), who tend to live in enclaves in the Burrabazaar and Park Street areas. Professional South Indians tend to reside around the Lakes, and professional Bengalis live in south Calcutta.

The Post-Reform City

India's structural reform is a relatively recent event. Some spatial changes in the seven post-reform years are noticeable, but at this moment, it is difficult to foresee the post-reform spatial structure with certainty. First, there is no guarantee that the reform process will continue in its present form, though it increasingly seems that a significant change has taken place in a society traditionally slow to change. The aftermath of the 1996 and 1998 elections suggests that regardless of the ideology of the group in power, the reforms will continue, and that it may be impossible to return to the centralised nationalist development ideology of the recent past. Second, our singular interest in economic outcomes in spatial terms may blind us to a perhaps more significant transformation in Indian society, where there is increasing (and more acceptable) social, cultural, and technological polarisation.[19] The reforms are significant (just as independence was) in more than economic terms. It has raised a number of unresolved intellectual and political questions about nationalism, regionalism, governance, decentralization, inequality, and secularism. The resolution of these questions may influence the spatial structure of urban society as deeply as the economic actions of domestic and global actors. Therefore, given the absence of structural stability and the lack of hard data for the post-reform period, I have to rely on declared intentions and plans, and my often-idiosyncratic personal observations to formulate the following speculative analysis.

The most significant new spatial component of the reforms in Calcutta are its new town projects, particularly New Calcutta (see Figure 1.1). New Town projects in the Calcutta metropolis have a long history. In the late 1960s, following the recommendations of the Basic Development plan, one was created at Kalyani (see Figure 1.1) at great expense and to resounding failure. Kalyani was a planned city where the state government would have relocated, but for the fact that the government employees refused to move. The city still has paved streets overgrown with weeds and streetlamps

that were never lit – a perfect example of a planning disaster. Salt Lake, a new town closer to the city, was begun in the mid-1970s. This upper-income enclave is considered successful – it has a population of around 150,000 now, and is expected to grow to 250,000. Salt Lake has no slums; its residents' biggest and most persistent complaint concerns the difficulty of obtaining affordable and reliable domestic servants (the old bourgeois complaint that 'good help is so hard to find'). Many state government offices have relocated to the Salt Lake township (the Chief Minister has moved his residence there from south Calcutta), and many of the region's electronic production units are also located there.

New Calcutta can be expected to be successful for the same reasons that Salt Lake has been successful: it is close enough to Calcutta city for a relatively easy commute (for employment or services), and as a planned development it will bypass the city's ills – poor infrastructure, slums, and poverty. This new town will have 100,000 dwelling units (spread over 8.4 sq. km.), 1.5 sq. km. for a new business district and commercial complexes, 2.2 sq. km. for 'modern, pollution-free industries', and 13.1 sq. km. of water bodies and green areas (including a golf course).[20] A strong selling point of this new town is to be its proximity to Calcutta's recently expanded international airport – clearly the planners want this development to contain new (rather than relocated) industry that is high-tech and/or global in nature.

Can New Calcutta succeed without slums, or will its success depend on its ability to keep out slums? I believe that the answer to this question will partly lie in the degree of capital-labour substitution in the sphere of domestic production. Day (1992) discusses the capital-labour relationship in an analysis of housework in North America in the 20th century. She argues for a progressive model in which increasing industrialisation led to higher wages, more women in the workforce, and the availability of domestic appliances like the range, refrigerator, washer, dryer, and vacuum cleaner. As the supply of servants (usually recent immigrant women) fell, the wealthiest households continued to hire servants, but the middle-income groups did without, and substituted capital for labour. In India, the most visible signs of liberalisation are colas, fast food, and domestic appliances – specifically the washer, dryer, and microwave oven (the refrigerator has been around for some time, and the vacuum cleaner is available, but generally considered unnecessary). New Calcutta is clearly designed for professional upper-income earners, the group most likely to adopt these household labour saving devices. If that happens, New Calcutta will look like a 'modern' city, what is sometimes called a post-modern city in the U.S. context (Charlotte, NC, for example) – clean, spacious, and free of visible poverty.[21]

A second major development is the growth of heavy industrial investment in Haldia (about 50 straight kms. from Calcutta), and the so-far less successful Falta Export Processing Zone located between the two. As of July 1998, expected capital investments (largely in petrochemicals) in this port city were about $4 billion (my calculations). If expectations are met,

and it seems likely that they will be, Haldia will become a rather large industrial city.[22] This city appears to be modeled after the Fordist growth centres like Durgapur and Bhilai, which, revealingly, are made up of 'colonies' named after specific corporations, e.g., AVB colony, MAMC colony. That is, like most other planned developments in India, the city design will keep the informal sector and the poor spatially separated from the middle- and upper-income formal sector workers. As argued above, keeping the poor out may now be technologically feasible, but separating the dynamic and essential informal sector may be the seed of failure as a growth centre, even if Haldia succeeds as an industrial enclave.

Where Does the Calcutta Story Fit?

Calcutta's spatial structure cannot be separated from its political-economic history. This history has been influenced strongly by global and local events. On the one hand, Calcutta's genesis and early morphology was defined by the global force of colonialism: 'chance selected, chance directed' the city grew as a centre of colonial exchange and administration in inhospitable urban terrain – a silting river, salt marshes all around it, unstable soils unable to carry heavy loads, in a very poor rice-growing hinterland. It never acquired a strong industrial base; its predominant industrial commodity, jute, was made technologically obsolete not long into this century, and the city's global trading links withered with the downfall of its primary product. On the other hand, the more influential events of the 20th century, as far as the city is concerned, have been local or regional in character. While independence may be viewed as a global event (the end of the colonial system), the impact on Calcutta was in its lost hinterland and the flood of refugees. In this, Calcutta is different from even the other comparable Indian colonial cities, Mumbai and Chennai, not to speak of colonial cities worldwide. Thereafter local politics, policies, and events (Freight Equalization, communist infighting, the refugee influx from the independence of Bangladesh) have held centre stage. Now the city has been reintroduced willy-nilly to the global system of production and exchange. The question raised here is what will happen, or is happening, to the internal structure of the city as a result of its *re*integration into the global economy. I believe that the answer will depend substantially on the degree of integration of the local economy in the global market. It appears unlikely that Calcutta will soon become a 'world city' in Hall's (1966) terms, or that it is on the way to becoming a 'global city' in Sassen's (1994) terms; that is, one cannot expect Calcutta to become either a global centre of production (aircraft, ships, military hardware) or services (banking, insurance). The declared goals of the state's leaders are more modest – to become a centre of large-scale production of petrochemicals, leather, pharmaceutical, metallurgical, and engineering items within the Southeast Asia region, and to compete globally in the electronics field (mainly computer software and hardware).

The local state wants to evenly distribute the location of production facilities, but clearly expects such units to converge around the infrastructure advantages in and around Calcutta (in Haldia, Falta EPZ, Kulpi, and the city's industrial suburbs).[23]

There are several possible spatial outcomes. First, the city and state may utterly fail to integrate in the global economy ('a loser city'); this may imply spatial status quo and possibly increasingly miserable conditions for the city's poor. At the moment of writing this appears to be outcome for the foreseeable future. Second, both goals (in the Fordist manufacturing and post-Fordist service arenas) may be successfully realized, leading to a spatial scenario as outlined in Figure 1.6: high-tech, high-income planned enclaves on the eastern edge of the city, and planned industrial enclaves further south, resulting in the creation of a considerably larger agglomerative field, or metro-region. Intermediate outcomes are also possible, where the city succeeds as a centre of Fordist production but fails in post-Fordist terms, or vice versa. (Truth be told, my feeling is that the city would rather be a Fordist success, if it could choose only one area of success.)

And, given the city's history as a refugee haven, one should not rule out the possibility of events beyond the control of the local state (like war,

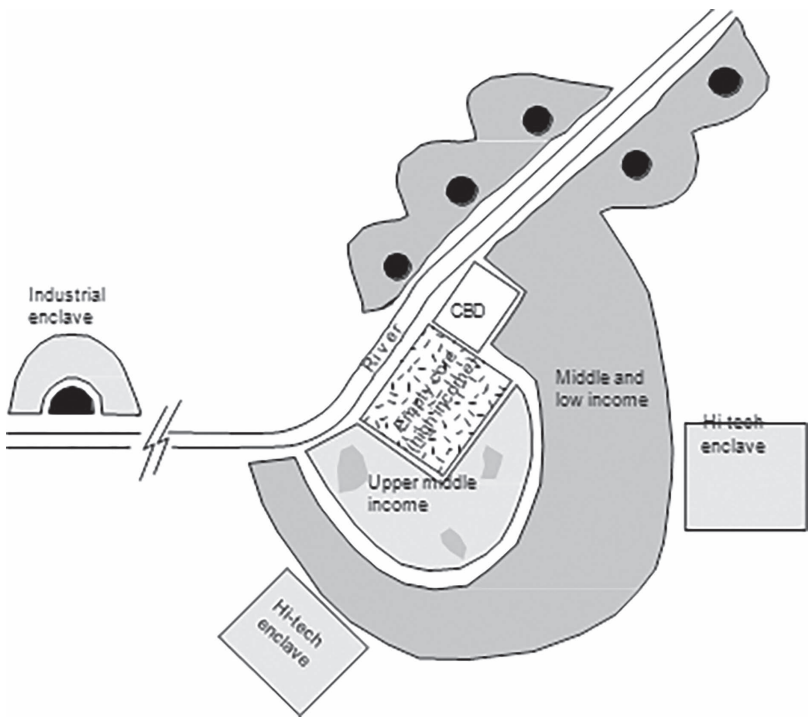

Figure 1.6 The spatial structure of post-reform Calcutta

famine, and natural disaster). Remember that Calcutta is the city of last resort for a largely rural population of over 300 million people (including Bangladesh). Through all these possibilities, except the disaster scenarios, the core city is unlikely to change much in terms of the spatial distribution of wealth and poverty.

Does the Calcutta story fit a model? I am not sure. The city is quite different from its colonial counterparts – the more segregated, hierarchical, monolingual Chennai, or the dynamic, polyglot, recently chauvinistic Mumbai. Calcutta's leftist political leaders do not demolish bustees in high-income areas (though, in a desperate move to clean up the city's image, they have started conducting street sweeps to round up pavement hawkers – a fascinating story in itself).[24] The city has the reputation of being more hospitable to refugees and migrants than any other in India. The Hindu-Sikh and Hindu-Muslim riots of the 1980s and early 1990s barely touched the city. Perhaps globalization will change all that, with increased hardening of spatial boundaries between income, language, caste, and religious groups. Certainly, the bourgeois planning apparatus has worked and continues to work for the benefit of the upper classes. If the liberalisation process continues and is accompanied by a larger role for urban planning (as in planned developments in New Calcutta and Haldia), and the adoption of labour-saving household devices, one could see increased spatial separation between rich and poor in the new enclaves. Barring a dramatic economic turnaround, however, the city proper is likely to retain much of its present structure – perhaps not quite unique, but certainly one that cannot easily be fit into a model.

*

25 Years Later

Much has changed in 25 years. The Left Front (led by the CPM), which was in power for 34 consecutive years from 1977, was defeated by the Trinamool Congress (TMC) in 2011 and then was effectively wiped out in subsequent elections (in 2016 and 2021). TMC is a leftist-populist party which came to power riding an anti-land acquisition movement. The centrality of land issues (land use and land use change) is a new feature in the political economy of the country (unlike land reform, which had been very important in the first three decades after independence). Land issues have always figured prominently in urban morphology, and given the unprecedented urban (and rural) land markets and land prices that have come about after 2000 and the intensity of conflict over land, these issues have become the singular challenge of urban growth and management in India. My own work in *The Price of Land: Acquisition, Conflict, Consequence* has extensive discussions on these challenges (Chakravorty, 2013). This new land market, with arguably the highest prices in the world, will continue to shape Indian cities for

the foreseeable future. I did not anticipate this extraordinary land market in the mid-1990s; neither, as far as I can tell, did any other observer.

As was widely anticipated, the economic reforms initiated in 1991 were deepened. All significant political parties were more or less in support of the new liberalised economic regime, and there appeared to be no near-term possibility of a return to the dirigisme structure of the pre-reform era. The Left Front, after much hesitation, had begun to align itself with this reality; it is possible to argue that its ham-handed approach to land acquisition (which led its electoral defeat) was precisely an attempt to industrialise in the liberal model. The TMC was more pragmatic about these matters, and like all other relevant political actors in India, it attempted to attract new private investment to the state.

But these efforts at attracting private capital for job creation and economic development by the Left Front (till 2011) and TMC (post-2011) were not particularly successful, especially in comparison to states in west and south India. Manufacturing industry, in particular, received little new capital. The big hope for heavy industrialisation in Haldia and its petrochemical complex was not realized. Since Bengal and east India sold little on the global market (no textiles, no footwear, no cars, no machinery), the ports at Haldia and Calcutta saw slow growth. As a result, the suburban and peri-urban industrial enclaves imagined around Calcutta by political leaders in the mid-1990s failed to materialize. The Calcutta metropolitan region continued to have a robust share of the micro, small, and medium enterprises (MSMEs) in India (with low wages and low value addition), but there was almost no new large-scale industry in the Fordist model. This was also anticipated.

What materialized instead is a high-tech enclave to the east of the city. The New Town discussed in the original paper became widely known as Rajarhat New Town. It sat adjacent to Sector 5 in Salt Lake, on the way to the modernized international airport in Dum Dum. Rajarhat and Sector 5 together became a distinct IT hub. It was not large compared to the IT sectors in Bangalore, Hyderabad, Pune, Gurgaon, etc. – employing at most 3 percent of the country's 4.5 million-strong IT workforce – but it was visible and growing. Salt Lake and Rajarhat represented a new model of urban formation in India, based on high-skill, white-collar, private sector work in suburban and peri-urban settings, set amidst clusters of high-rise, high-end housing estates. Gurgaon was the prototype of this model, and it was being widely replicated in the cities listed (and elsewhere). The emergence of this new urban model had not been anticipated 25 years ago (at a time when Gurgaon was merely a curiosity on the road between Delhi and Jaipur, known for not much other than being the location of the Maruti-Suzuki factory).

The other major and visible changes were along the Eastern Metropolitan Bypass, especially the section from Salt Lake in the north to Rajpur-Sonarpur in the south. Both sides of this highway were now dotted with medium- to high-end residential complexes, each typically consisting of hundreds of

flats, and new service sector hubs of health care, education, hospitality, and shopping. These developments could scarcely have been imagined 25 years ago and were part of perhaps the most notable and generalizable change in the metropolis – the proliferation of medium- to high-end housing and service hubs (especially hospitals and shopping malls) – not only around the Bypass, but in south Calcutta and along the Hughli river north of the city where the industrial base of the city (jute and engineering mills) had once been located.

These changes were physical manifestations of two key structural changes in the city. First was the growth of the service sector in IT, health care, shopping, hospitality, and telecom. The decline of manufacturing industry had not been arrested after this chapter was initially written, but had surely been more than matched by the growth of the service sector. Second, as remarked upon earlier, was the booming land market that coincided with a rising demand for new housing. Part of the rising demand came from a steady attrition of the traditional joint family and a preference for nuclear families in the middle class. Added to this were the very high incomes in the upper end of the service sector and the tendency of this class to invest its savings in real estate. Sometimes it seemed that every conversation among this class in its social gatherings and watering holes veered around to real estate.

It was more difficult to be sure of what, if anything, had changed with the distribution of the low-income and poor populations. According to official statistics, poverty declined in Calcutta (and the rest of India) during this period. At the same time, there was net out-migration from the city (continuing the trend of earlier decades) and slow but crucial physical improvements in many authorized slums. Taken together, these facts suggested that the low-income and poor population of the city and metropolis were not very different in size from earlier decades and had perhaps marginally improved consumption levels and access to amenities. It is doubtful that the residential location of the low-income and poor population had changed in meaningful ways during the period under consideration.

Did the changes noted make Calcutta more of a global city than it had been more than two decades ago? It was possible to make a limited case in support of the proposition. The city's IT sector was certainly part of a global value chain of ICT services; most of the work in this sector was connected to multinational corporations or international projects. The health care, hospitality, education, and shopping sectors too served a clientele that was at least partly international (especially from close neighbors such as Bangladesh and Nepal). The high-end residential sector was certainly much upgraded, with construction, amenities, and consumption of international quality. In short, many more people now worked and/or lived in settings marked by international connections and quality. These places, sectors, and people of the city and metropolis were indeed modified to mimic global city standards and aspirations. There was more affluence, less poverty, and more inequality – a combination also associated with globalising cities. The

liberalising reforms initiated three decades ago were indeed finally transforming the city, slowly but visibly. Calcutta as a whole was still far from a global city, but some parts of it appeared to be closer to that status in 2021 than it had been after the end of colonisation.

Notes

1 This chapter was previously published as Sanjoy Chakravorty, 'From Colonial City to Globalizing City? The Far-from-complete Spatial Transformation of Calcutta', in P. Marcuse and R. van Kempen (eds), *Globalizing Cities: A New Spatial Order?* (Oxford: Blackwell, 2000), pp. 56–77. Used with permission. It has been updated with the inclusion of a brief introductory and concluding section.
2 Calcutta's metropolitan population of about 11 million (it varies with the definition used) is almost ten times higher than that of the second largest urban agglomeration in eastern India – Patna, in Bihar, with a population of about 1.1 million. This is by far the highest primacy ratio of any Indian region. To put it in context, it would be similar to a situation in the US where after New York with 18 million people, if the second largest metropolis (Los Angeles) had a population of 1.8 million.
3 Before the 1985 civic elections the municipality of Calcutta was expanded to include the units of Jadabpur, South Suburban, and Garden Reach (shown in Figure 1). The number of wards in the city increased from 100 to 144, and the population increased by about 1 million.
4 Estimates of Calcutta's population during this period are available in Mitra (1990): 10,000 in 1701; 140,000 in 1801; and 950,000 in 1901.
5 It is interesting to note that Calcutta was not the first colonial establishment in the region. Some municipalities which are currently in the suburbs actually predated the establishment of Calcutta. For instance, Chinsurah, Hughli, and Chandannagore were outposts of Portuguese, Dutch, and French traders respectively, established before Job Charnok's Calcutta lease, but were eventually brought under British authority.
6 These industries often had Indian nationals in senior management positions, but capital ownership was almost exclusively in the hands of British nationals or Anglo-Indians. Mitra (1990: 114) argues that 'this exclusive monopoly of European capital in Calcutta continued till 1947'.
7 There were two primary reasons for this spatial pattern of investments. One, regional inequality was perceived as a serious threat to the Indian multi-language and multi-religion polity; decentralizing industry out of the core metropolitan regions into growth centres near raw material sources was argued to be efficient and equitable. Two, the core metropolitan regions were already perceived to be congested and unmanageable; any more investment in these regions would exacerbate the problems of visible concentrated poverty and congestion-created inefficiency.
8 The centrist force was the Congress Party, the leader of India's freedom struggle, and the party in power at the State and Central government. The leftist force, the Communist Party of India (Marxist) or CPM, has been the party in power in the State since 1977. The radical force, the Naxalites, were exterminated in urban areas, but sporadically resurface with actions in rural areas.
9 In August 1998 $1 = Rs. 42 (approximately).
10 The leftist government in West Bengal was initially skeptical and resistant to liberalisation. However, since mid-1994, it has revamped its industrial policy, brought in a high-profile Member of Parliament to head its Industrial

Development Corporation, sent the Chief Minister on investment-seeking visits to Europe and North America, and helped repeal the Freight Equalization Policy.

11 These data have been taken from my ongoing research into the spatial distribution of new investment in India. The preliminary findings are in a working paper (Chakravorty, 1998). The source of the raw data is the Center for Monitoring the Indian Economy.

12 Slum (or Bustee) improvement had been a significant success story of the CMDA (Pugh, 1989). In earlier development plans, it had spent up to 25% of its budget on slum improvement, with less than 14% spent on housing etc. Under the Mega City Programme, slum improvement is budgeted at about 1.7%, while housing, new area development, and commercial facilities are budgeted over 46%.

13 Another new town, this one named Second Calcutta, on the south-eastern border of the city, is being shepherded by the minister for Urban Development. This project appears to be a non-starter: the area chosen is too large, and the environmental problems are more serious than in New Calcutta.

14 It is interesting to note that high-level recommendations to formally recognize this three-fold division of the city were made twice: by the Chief Magistrate in 1833, and later by Baron Dowlean in 1860 (Munshi, 1986; Banerjee, 1986).

15 The term 'bustee' is often used interchangeably with 'slum'. Bandyopadhyay (1990: 86) points out that there are legal differences between the terms. A slum is an area with 'conditions injurious to public health or safety . . .'; a bustee, on the other hand, is defined by the physical nature and dimensions of contiguous dwelling structures. Generally, a bustee is an inferior slum. There are at least 2,000 bustees in Calcutta city, and in the metropolitan area, the total bustee population was estimated to be 3 million.

16 See Figures 1.1 and 1.3 to locate most of the neighborhoods mentioned here. The Lakes in the figure is the upper-income Southern Avenue area. Baligunj is Ballygunje and so on. I have used more current, phonetic spellings for place names throughout this document: Haora instead of Howrah, Hughli instead of Hooghly, etc.

17 North Calcutta does include some impressive mansions: Rabindranath Tagore's house and the Marble Palace, for example. These are remnants of an era when some native elites preferred, for political reasons, not to settle in English town.

18 The pavement dwellers tend to be the most recent migrants (over 65% had moved to the city in the last six years) with the lowest skill levels (about 45% are beggars or casual-day labour). They are not refugees, but tend to be villagers from the agricultural hinterland (see Mukherjee, 1975). These, the truly disadvantaged, lack the resources to even be slum dwellers in Calcutta.

19 There is a longstanding (and some argue, false) dichotomy in India. *Bharat* (which is the native name for the country) is the 'real' country and lives in its villages; India is its 'foreign' element, residing in its cities. This view was/is held by many influential people, including the late Prime Minister Charan Singh.

20 These figures are taken from New Calcutta promotional literature and media.

21 The provision of 7,000 housing units in 'service villages' in New Calcutta raises interesting questions. The Minister of Housing explained to me that these would house the displaced persons; it is possible, though, that some mini-slums are being thoughtfully incorporated to avoid the 'servant problem' of Salt Lake.

22 Here one finds interesting parallels with spatial restructuring in Sao Paulo, Brazil. Diniz (1994) and Storper (1991) have argued that despite 'polarization reversal' within the state of Sao Paulo (using conventional definitions of the metropolis), an 'agglomerative field' of around 150 kms. around the city is the dominant growth region in the country. That is, an expanded definition of the metropolis would show continued polarization of industry and population into it.

23 The information in this paragraph is culled from the state's Industrial Policy Statement of September 1994 and promotional literature published by the West Bengal Industrial Development Corporation. The industrial location incentives offered by the state favor the backward, unindustrialised districts, but the investment response, as shown earlier, is heavily lopsided toward south Bengal.

24 British Prime Minister John Major's January 1997 visit to the city prompted these unexpected street sweeps. The left leaders went against their decades-old reluctance to evict unlicensed hawkers and peddlers so as to show Mr. Major a clean and efficient city worthy of British investment. In a surprising twist, some of the prime movers of the sweeps have suffered embarrassing defeats in local intra-party elections. The story continues.

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2 Envisioning a Sustainable Future for Kolkata

Making a Case for Heritage-led Urban Regeneration

Nilina Deb-Lal

The discussion that unfolds in this chapter is divided into three sections. The first will describe developments in the heritage movement since the 1990s, leading into current attitudes and lacunae in processes and systems. Following from that will be an elucidation of recent and unfolding developments, especially with respect to monetization of heritage status land parcels. The third and last section will expand on prevalent urban stresses juxtaposed against available national and international standards and guidelines, leading to an envisioning of a heritage-led development paradigm of a sustainable future for the city.

Development of the Heritage Listing Process in Kolkata

The initiation of a structured process of identification and listing of heritage buildings and premises in Kolkata can be considered to have been launched with the formation of an Expert Committee on Heritage Buildings, vide a Government of West Bengal notification of 6 October 1997 (ECHB, 1998). The declared remit of the newly-formed Committee was to review the lists of heritage buildings published in the *Land Use and Development Control Plan for the Calcutta Municipal Corporation Area* (LUDCP) prepared by the Calcutta Metropolitan Development Authority (CMDA) (ECHB, 1998). The LUDCP included within it a brief chapter on the *Preservation and Conservation of Areas and Buildings* and a list of 72 buildings requiring preservation and conservation for 'historical, architectural, environmental or ecological' reasons (CMDA, 1996, p. 29). The LUDCP also included additional lists of other premises – such as educational and institutional buildings, and parks and cemeteries – where change of use was prohibited or restricted and therefore might be considered to enjoy a certain level of recognition and protection.

The task before the Expert Committee was, in their own words, 'time consuming . . . and only the initiation of a process' (ECHB, 1998, p. 7). Even so, within a year of being appointed, the Committee completed its heroic task and submitted its report listing more than 1,000 buildings and features, and put forward recommendations for further action.

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The buildings and features were divided into twelve categories, and the criteria applied for selection of premises were historical value, physical or architectural value, and social, cultural, and economic value. Committee recommendations included continued survey and listing of premises, making available in the public domain the final agreed list with annotations as to the justification for inclusion in the list, publication of a manual on relevant conservation techniques, and formation of the West Bengal State Heritage Commission to continue the work commenced by the Expert Committee.

It was also in 1997 that the Calcutta Municipal Corporation Act of 1980 was amended to incorporate a definition of *heritage buildings* and Chapter XXIIIA on the *Preservation and Conservation of Heritage Buildings* (CMC Act 1980, 2000). The new chapter allowed for the constitution of a Heritage Conservation Committee to adjudicate on heritage buildings within the jurisdiction of the Corporation; it also empowered the Calcutta Municipal Corporation (CMC) to declare buildings as heritage, and prescribed strictures for owners of heritage buildings.

A parallel process which was already underway was the documentation of the 72 buildings featured on the LUDCP list. The work was undertaken by the CMC, intended as a test case in documentation. The aim was to generate a dossier for each of the 72 buildings and the precinct of Binay Badal Dinesh Bag, then Dalhousie Square. The dossier was to contain map references, ownership details, historical research, basic architectural plans where feasible, photographs, and explanation of significance. The dossier was also expected to briefly describe the physical condition of the buildings and indicate the urgency of intervention. Although they varied in the quality and quantity of information collated and interpretation of the same, the documents thus produced were a commendable beginning to what was expected to be an extensive ongoing exercise.[1]

The efforts of the 1990s and the early 2000s finally bore fruit in 2009 with the publication of the Kolkata Municipal Corporation's (KMC) Graded List of Heritage Buildings (KMC, 2009). Based on the Expert Committee's recommended list, which was subsequently modified, supplemented, and chiselled to achieve greater accuracy, the published book contained 917 'heritage buildings, monuments, precincts, and/or sites' that were graded into categories I, IIA, and IIB (KMC, 2009, pp. 3–4). However, the publication lacked map references, justification for inclusion in the list, and photographs, which remain lacunae till today.

It is worth making reference to the gazetteer published by the Indian National Trust for Art and Cultural Heritage (INTACH) in 2006. As the official process of listing and documentation was relatively slow, in 2003 INTACH decided to publish its own gazetteer of heritage buildings and precincts. Eventually published in 2006, *Calcutta: Built Heritage Today* included approximately 450 buildings and precincts and represented the first attempt to grade the buildings according to significance (Deb Lal, 2006). Although it did not enjoy any statutory status, the book constituted a significant step

forward in raising awareness about the city's heritage, incorporating landmark and public buildings alongside modest residential buildings determining streetscapes and presented by way of coloured photographs, map references, date of construction, and brief history (where available).

The Alipore Green City Project

As the listing and grading of heritage buildings in Kolkata has progressed, it is relevant to examine the emerging attitudes about listed premises or groups of listed buildings. A case in point would be recent developments in Alipore, a locality originally on the outskirts of the city but, with continued southern growth of the urban agglomeration, now more centrally placed. In November 2019, the KMC floated a *Request for Proposal (RFP)* to engage a consultant for infrastructure development for the *Alipore Green City Project* (KMC, 2019). Along with an announcement by the Kolkata Metropolitan Development Authority (KMDA) in the preceding month vis-à-vis proposed changes in building regulations as applicable to Alipore (KMDA, 2019), the document clearly indicated the possibility of high-density construction in the designated area spanning parts of Alipore and the adjacent locality of Chetla. The RFP for the Alipore Green City delineates an area of 103.3 acres stretching from the Alipore Bridge in the north to Bengal Government Press, located south of the Kalighat Bridge, and from Tolly's Nullah in the east to Belvedere Road in the west. The extant green areas have been presented as being parcelled into eight 'plots' with areas ranging from one acre to upwards of two acres each. New internal roads, also cutting through the green areas, connect the plots to the existing peripheral traffic arteries. The services being contracted included design of utilities, roads and pavements, solid-waste management, and implementation plans for movement of traffic. The notification of the KMDA, which preceded the RFP, proposed building regulation changes for this same 103.3 acres, which would permit significantly increased density of construction compared to the rest of the city.

The key to the genesis of the proposed development is to be found within the RFP document itself. As stated in the Introduction:

> It was decided by the Government of West Bengal to shift the Administrative Offices and the Correctional Homes to Baruipur. These include the residence and Office of the District Magistrate, all the Courts, Presidency and Alipore Correctional Home, the treasury, the Zilla Parisad and all other related establishment, their supporting services along with staff residences.
>
> Once the shifting is completed, about 100 acres of land and a number of buildings at the Alipore site will be available for re-development. The area stretches from the Presidency Correctional Home in the North to the BG Press in South.
>
> (KMC, 2019, p. 3)

The document also lists the ten Grade I heritage premises falling within the demarcated zone, which include the Presidency and Alipore Central Jails, the Bengal Government Press, and the District Magistrate's Residence. The premises of the two jails, or Correctional Homes, taken together exceed 36 acres, more than one-third the area demarcated for development.

Other similar recent developments in Alipore include three large public facilities constructed within a radius of two kilometres. In the front lawn of Hastings' House, a Grade I heritage building, is Soujanya, the State Banquet Hall, and on either side of Alipore Bridge are Uttirna, an open-air amphitheatre with a capacity of 2000, and the Dhana Dhanya Cultural Complex, which seats 3000. The ground area occupied by each ranges between one to three acres, and all were open green spaces with mature standing trees prior to the construction of these facilities.[2]

At this juncture, it becomes necessary to briefly explain the evolution of Alipore. As an erstwhile suburb of Calcutta, it was set apart from the rest of the city by the Tolly's Nullah, also known as the Adi Ganga. The area of Alipore was closely associated with Warren Hastings, who was allegedly gifted the area by Mir Jaffer after the Battle of Plassey. Whether or not this is true, Hastings was certainly a significant landowner in the area; in 1763, he requested permission to construct a bridge over the Nullah to connect the city to his suburban home (Cotton, 1909). In the 1880s, long after Hastings' departure from India, the European residents of the city sought to merge the suburbs with the city proper in order to take advantage of rapidly evolving municipal services, such as water supply and drainage (Deb Lal, 2018). The 1889 amalgamation saw Alipore, along with the contiguous areas of Gopalnagar, Chetla, and New Alipore, merge with the city to form the new Ward no. 23. In 1909, Cotton wrote of Alipore as being a 'fashionable European suburb' (1909, p. 709), while in 1914 the Bengal District Gazetteer described Alipore as a popular place of residence for Europeans, and as the 'most thinly populated ward in Calcutta, there being only 16 persons per acre' (O'Malley, 1914, p. 266).

Today, Alipore retains an aura of greenery with large numbers of mature trees. Aerial views of the city suggest that Alipore, with its ample greenery distributed across the Zoological Gardens, National Library, Alipore and Presidency Jails, and the Agri-Horticultural Gardens, may be considered a southward extension of the central green belt of the city comprising the Maidan, Fort William, and the Race Course.

Kolkata, A City in Crisis

The Alipore Green City Project comes at a time when Kolkata appears to be in crisis. 2017 saw the publication of a report titled *Roadmap for Low Carbon and Climate Resilient Kolkata*. It was a joint exercise between the UK Government and the Kolkata Municipal Corporation launched in 2013. This was a multi-sectoral programme covering three broad areas – preparation of the roadmap for low-carbon and climate-resilient Kolkata,

strengthening institutional capacity of the KMC, and sensitizing key stakeholders within the KMC (PwC, 2017).

The report painted a dire picture of a city in need of urgent corrective measures and positive intervention if it was to mitigate the impact of climate change. Ranked in the top 20 most populous cities of the world and third most populous in India, Kolkata has a population density of 24,250/sq km, making it one of the densest urban agglomerations in the world.[3] Open space has declined in the city from 25% in the early 1990s to approximately 10% in the second decade of the 21st century,[4] with the decrease in open space and filling of water bodies largely attributed to the drastic increase in the city's built-up area – from 67% in 2004 to 78% in 2012. On the other hand, road area in the city stands at an abysmal low of 6%, compared to the national standard of 15%, resulting in traffic congestion. In terms of Greenhouse Gas emissions (GHG) and pollution, Kolkata is the fifth highest emitter of GHG in India, with the building sector being the greatest contributor, totalling some 6.3 million tonnes or 43.8% of total emissions; and the city is the second highest contributor of CO_2 per capita emissions at 3.29 tonnes per person. Summarising the words of the report:

> Today, Kolkata is considered to be third on the list of the world's most flood-prone coastal cities, according to a recent World Bank report on South Asia. This also indicates that the city is at risk from regional earthquakes, as well as suffering from a number of anthropogenic contributors to climate change, including increasing levels of air pollution and increases in localised urban heat island effects; the latter due to the loss of natural vegetation and traditional water bodies from the urban area to be used to cater to the increased demand for housing and infrastructure and supporting social and employment facilities.
>
> (PwC, 2017, p. 18)[5]

The Open Space Conundrum

Insufficiency of open space in Kolkata is not a new problem. Every era makes its own assessment based on prevailing perceptions. A century ago, the Calcutta Improvement Trust (CIT) arrived at a similar conclusion regarding the expectations of the times. In 1914, Edwin Percy Richards, erstwhile Chief Engineer to the CIT, submitted his voluminous study of Calcutta, *Report on the Condition, Improvement, and Town Planning of the City of Calcutta and Contiguous Areas*. Addressing the open space problem in Calcutta, Richards observed:

> The Maidan, forming a great park of 800 acres, occupies a south-west central position in relation to the city whole. It is a little larger than Hyde Park, London, and is perhaps the finest possession of Calcutta, and is so placed as to be fairly close and accessible to about one quarter

> of the inhabitants of the city. It is unhappily too far south to be of any daily use to the dense population of North Calcutta – nevertheless, it is a most valuable large city reservoir of open space and decently fresh air, and without the Maidan and the zone of modern buildings that bound it on north and east, Calcutta would be something of a hell.
>
> With the exception of the Maidan, Calcutta is very badly off for Parks and open spaces. In the mass of built-up Calcutta there are but six open spaces worthy of much notice. The largest is Dalhousie Square, which measures between the building lines about 1000 ft. by 1000 ft. but the actual square is only about 800 ft. by 800 ft., and out of this the best and most central part is occupied by a very plain tank, almost certainly breeding mosquitos and serving no very definite purpose, but confining the public to the narrow strips that lie between the tank and the traffic-filled roads.
>
> (Richards, 1914, pp. 22–23)[6]

The mandate for the CIT allowed for the creation of new open spaces under Section 42 of the Calcutta Improvement Act, and according to the minutes of a meeting in 1919–20, the Chairman's *Note on the Acquisition of Land for Open Spaces in the Suburbs of Calcutta* was put to consideration. C. H. Bompass, the Chairman, seems to have been acutely aware, not only of the need for open space within the city, but also of the Trust's responsibility to the future:

> There is no doubt that looking to the future; it is desirable to secure open spaces in the suburbs of Calcutta, while land is still reasonably cheap. It is generally recognised that this is a policy which should be adopted by all growing towns and great attention is now paid to it, especially in America. If adequate open spaces are not provided posterity will certainly blame the Trust for short-sightedness.
>
> (CIT, 1919, Meeting no. 331)

Although the early interest in the Garden City model of development never fully came to fruition,[7] the Trust was able to add a number of relatively smaller and larger open spaces and parks – Park Circus Maidan, Lansdowne (Deshapriya) Park, Manicktolla Open Space, and Shambazar Park, to name a few. The jewel in the crown was the Dhakuria Lakes. The dual purpose of the development is revealed in *Note. 897 [on] Tank Filling and Land Raising*, included in the Minutes of the Meeting of 6 July 1914:

> It has, I think been more or less agreed that the lowlying, practically uninhabited area at the extreme south end of Ballygunge should be acquired for the purposes of a park scheme, and it is with this end

> in view that I propose that the necessary tank, or tanks required for the procuration of filling material, should be excavated within the area demarcated as a park in the plan submitted with the Joint Report. This area is sufficiently large to accommodate a tank of the size proposed without its value being in any way decreased as a park . . . A park scheme embracing a lake of this magnitude, which would allow of sailing and rowing, etc., would undoubtedly become one of the chief attractions of the City.
>
> (CIT, 1914, Meeting no. 102)

Standing at 192 acres with a water area of 73 acres (Mistry and Basu, 2014), the Dhakuria Lake area has been the last major addition of recreational open space to the city since the early years of the 20th century, though the area within the Municipal limits has steadily increased and has almost tripled from 83 sq. km (20,547 acres) in 1901 to 206 sq. km today (BG, 1905; KMC Basic Statistics, n.d. b).

Enhancement of open space inside a historic city with established street patterns and land uses is a perennial challenge. Rapid urbanisation in the 20th century has exacerbated the problem, not only in Kolkata, but in several historic cities across the globe. Some, like Barcelona, have taken affirmative action.

Barcelona was experiencing what was for them an acute crisis. In 2013, the *Barcelona Green Infrastructure and Biodiversity Plan 2020* was made public. Quoting from the Foreword:

> It is vital to strive towards a city where nature and urbanity converge and enhance one another, where green infrastructure attains connectivity and where green heritage achieves continuity with the natural area surrounding it. Our aim is not for nature in the city to form a map of isolated spots; rather, we seek to forge a genuine network of green spaces. This greenery must by conceived as green infrastructure forming part and parcel of the city, serving an environmental and a social function.
>
> (AB, 2013, p. 5)

The issues confronting the city may be gleaned from a 2016 report: 3 million inhabitants; density of 15,802 inhabitants/sq km; 6.64 sq m of green space per inhabitant, going down to 1.85 in some districts; high levels of air pollution and noise pollution; high rate of road accidents; sedentary lifestyle; heat-island effect (AB, 2016). The programme of action proposed by the City Council was manifested in ten strategic lines of action, ranging from carefully nurturing existing green spaces to creating new ones. The options for creating new public green spaces included revitalizing natural areas, utilizing urban transformation opportunities, creating green spaces in unused plots, and opening private green spaces for public use (AB, 2013).

Every city identifies and plays to its strengths. For Kolkata it should be no different. National greening guidelines have been formulated by the Town and Country Planning Organisation, Government of India (TCPO, 2014), but the implementation necessarily has to be site-specific and city-specific. Barcelona has identified the Superblock model as one manifestation of their green infrastructure and biodiversity goals, based on the premise that Barcelona is founded on a rational structure that makes various new interpretations possible (AB, 2016). For Kolkata, lacking a rational structure, the solution resides elsewhere. Is it conceivable that the very heritage premises currently being opened up for development could provide the key to the open space conundrum?

Heritage and Sustainability

Heritage listing in Kolkata has been strangely silent on the matter of settings and open space contiguous to heritage premises or within the curtilage of heritage premises, other than explicitly permitting construction with a reference to 'surplus buildable land' and the procedure to be followed to obtain permission for such constructions (KMC Heritage Buildings, n.d. b). From early in the programme of identifying heritage premises, the listing process placed great emphasis on architecture and buildings. The definition in the KMC Act expressly refers to buildings and only as much land as may be required for fencing or covering such buildings (CMC Act 1980, 2000). The Expert Committee's advertisement inviting nominations to the list being prepared by them sought information on date of construction and architectural type among other details, but no information on land, trees, greenery, etc., although parks and water bodies as discrete entities had their own lists – both in the LUDCP and the Expert Committee's report.

The omission of open space, settings, gardens and landscape elements, contiguous to or appurtenant to heritage buildings, was further manifested in the documentation undertaken by the KMC at the turn of the century. The documentation report for Hastings' House authored by the INTACH team describes the architecture of the building in considerable detail, but makes no mention of the grounds, other than the observation that the courtyard (sic) and the grounds are used by children from the surrounding areas (INTACH, c. 2000).

The photographs barely show any of the greenery, and the plan doesn't indicate the curtilage of the plot. In a similar vein, the KMC Graded List of Heritage Buildings provides the premises number but no indication as to the extent.[8] Yet there is no denying the significance of the open space contiguous to the building. Writing of his purchase of Hastings' House on behalf of the Government of India in 1901, Lord Curzon says:

> I therefore decided to purchase Hastings House as a Guest House for the Indian Princes, or visitors of great distinction. I took immense amount

> of trouble about the place, laying out and planting the gardens, weeding and mowing the lawns, cleaning the tank, and entirely refurnishing the house. I converted one wing into a fine durbar room for the exchange of the obligatory visits with the Princes, I provided a billiard room for those who have modern tastes (a not inconsiderable number), and I arranged the bedrooms and bathrooms in suitable manner upstairs.
>
> (Curzon, 1925, p. 144)

The omission of reference to the open space surrounding the house, or delineation of the same, disenfranchises the green areas, removes this component from the public consciousness, diminishes its importance, and denies it the cultural significance due to it. With such prevailing attitudes, it is therefore no surprise when the very same front lawn which played host to distinguished visitors is today denuded of its trees and constructed upon, ironically to accommodate a new 21st-century State Guest House, Soujanya.

But in today's context of the impending climate change crisis, the obscuring of the presence and value of these open spaces takes on new meaning. As with the construction of Soujanya, the inhabitants of the city are not only denied the cultural asset; they are also deprived of an irreplaceable environmental asset. Should one then adopt the view that open spaces, gardens, trees, and greenery associated with our heritage premises are not only an integral part of our cultural heritage, but are also our environmental heritage? Catharina Nolin rightly observes that planning decisions regarding open spaces are rarely underpinned with the knowledge of the heritage dimension, and 'green spaces in the designated development areas are [simply] regarded as open spaces or, even as empty spaces, aimed to be filled in with buildings and new (smaller) parks as compensation for the removed green areas' (Nolin, 2019, p. 215).

It is evident from the introduction to the Alipore Green City Project that the development is to happen on lands which largely lay within listed building premises. Applying the Brundtland Commission definition of Sustainability, wherein '[s]ustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987, p. 37), should not the vacated buildings and lands in Alipore be deployed as a public resource to combat climate change, thereby contributing to a sustainable future for the city? Instead of plots and internal roads, would the resource not be better utilised as a new potentially expansive green space in the heart of a city palpably in distress?

There is mounting global awareness of the possible role of heritage in mitigating the impact of climate change and assuring sustainability in the urban environment. Advocating a holistic view of heritage – built and natural – UNESCO adopted the *Recommendation on the Historic Urban Landscape* in 2011. The Recommendation reinforces the need to establish the link between heritage and sustainability, and is predicated on 'a balanced

and sustainable relationship between the urban and natural environment, between the needs of present and future generations and the legacy from the past' (UNESCO, 2011, item 11). The Recommendation further elaborates:

> Human settlements have constantly adapted to climatic and environmental changes, including those resulting from disasters. However, the intensity and speed of present changes are challenging our complex urban environments. Concern for the environment, in particular for water and energy consumption, calls for approaches and new models for urban living, based on ecologically sensitive policies and practices aimed at strengthening sustainability and quality of urban life. Many of these initiatives, however, should integrate natural and cultural heritage as resources for sustainable development.
>
> (UNESCO, 2011, item 19)

The *Roadmap for Low Carbon and Climate Resilient Kolkata* made a case for saving heritage assets and their wider settings for future generations, and advocated promoting design and conservation strategies that are climate change-compliant (PwC, 2017). More recently, a committee appointed by the Supreme Court of India carried out the unusual task of attempting an assessment of the value of heritage trees. The 306 trees in question were scheduled to be axed as a consequence of an infrastructure project on the outskirts of Kolkata. The committee arrived at the conclusion that the life-giving properties of a tree are infinite and invaluable. However, as their terms of reference required them to assign a monetary value to a mature tree, their estimate yielded a figure of Rs. 74,500/- per tree per year of remaining life, thus far outstripping the perceived value of the project in question (SC, 2020). And Catharina Nolin asks whether it is a mistake to view urban green areas only as empty land ideal for further construction, and rather should be seen 'as the "driver" and "representation" of sustainability . . . from which new cities can learn" (Nolin, 2019, p. 211).

It is urgent that we review our attitudes towards urban heritage and green spaces. As demonstrated above, Kolkata is in dire need of relief and a plan of action assuring the city and its inhabitants of a sustainable future, and one of the essential prerequisites is sufficiency of open space and green cover. Creative deployment of our heritage buildings and their settings is a readily available tool to battle the adverse impacts of climate change. A coming-together of specialties and agencies is required to realise such a programme. Other cities are showing the way. Barcelona is making heroic efforts to make fundamental changes in the way the city is used and viewed, and the Yangon Heritage Trust has incorporated the intention in the name of their strategy document – *Yangon Heritage Strategy: Combining Conservation and Development to Create Asia's Most Liveable City* (Rooney, 2018). Perhaps the Historic Urban Landscape approach could provide the starting point for Kolkata.

It would be apposite to conclude with the words of the late Professor Barun De, Chairperson of the Expert Committee on Heritage Buildings, as written in the *Foreword* of *Calcutta: Built Heritage Today*:

> I cannot refrain from pleading a special point germane to broadening our existing concept of urban heritage. The term should apply to the environment that is fresh air, green grass, unrestricted view of heritage buildings, lack of the smoke pall that cloaks our viral infections in winter, clear aquifers . . . in short, space to breathe and to relax.
>
> (De, 2006, p. 5)

Notes

1 Refer to Heritage Building Directories compiled by the Calcutta Municipal Corporation, containing documentation reports prepared by consultant architects over the approximate time period of 1998 to 2001.
2 Capacities and sizes of these public facilities are approximate, deduced from newspaper reportage, aerial views, and the minimal information available in the public domain. Attempts to elicit details from the authorities have been mostly futile.
3 As per the KMC portal, the city has a resident population of 4.5 million and a floating population of 6 million persons per day (KMC Basic Statistics, n.d. a).
4 The *Asian Green City Index* recorded open space in the Kolkata Metropolitan Area (KMA) as being 2 sq. metres per person (EIU, 2011). The urban agglomeration of Kolkata and its surrounding areas is referred to as the Kolkata Metropolitan Area. The Kolkata Municipal Corporation is the single largest constituent of the KMA, standing at approximately 10% of the area of the KMA (KMDA, n.d.).
5 The World Bank report referred to is *Leveraging Urbanization in South Asia: Managing Spatial Transformation for Prosperity and Liveability*. According to the report, 'With 20 centimetres of sea-level rise by 2050 . . . Mumbai, Kolkata, Chennai, and Surat will become the top 2nd, 3rd, 13th, and 14th most exposed cities to flooding in the world' (Ellis and Roberts, 2016, pp. 174–175).
6 The Calcutta District Gazetteer Statistics, Table II, gives the area of the Fort William and Maidan together as 1,283 acres, area inside the Fort 170 acres, and outside the Fort 1,113 acres (BG, 1905).
7 Early in their proceedings the Calcutta Improvement Trust decided to become a subscribing member of the Garden Cities and Town Planning Association, and in 1914 the Chairman put up for consideration a proposal to carry out a trial Garden City development in the suburb of Cossipore-Chitpore (CIT, 1914).
8 The fields of information in the list are minimal: premises number, street name, assessed number (for the purpose of property tax), grade, 2–3 word criteria for listing, location, 2–3 word description.

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3 Urban Displacement in Kolkata

A Historical Appraisal

Binay Krishna Pal[1]

Displacement in India and other developing nations has emerged as a crucial developmental challenge. Although 'displacement' is a highly debated topic in the discourse of development, urban displacement has emerged as a fresh domain of investigation since neoliberal urban planning has caught the attention of researchers (Pantuliano et al., 2012). India is one of the emerging economies of the global South, and its cities are experiencing trajectories of development that aim at achieving global status while remaining largely disconnected with welfare of the poor in terms of use of space and amenities.

As the colonial capital of India, Calcutta has experienced multiple episodes of urban growth and expansion, following many trails in different regimes (Sengupta, 2013). Like other colonial cities of the world, Calcutta started to grow depending upon the surplus capital from the hinterland accumulated through technological and entrepreneurial impetus from countries like Britain, France, and Portugal (Ghosh et al., 1972). The present form of Calcutta (now Kolkata) has its roots in the 19th century when trading activities constituted the key strategic domain, thereby attracting investments, people, and goods. The British East India Company created its base here and expanded its domain in the Indian sub-continent and gradually conquered the entire country after 1857 (Sinha, 1978). The process of exploitation was sustained with the help of feudal proprietors as the local comprador, theoretically well established by the dependency debates. Historically, the urban nuclei of Calcutta comprised three villages: Kolikata, Sutanuti, and Gobindapur in the 1690s (Ghosh et al., 1972). The exploitative land revenue policy for accumulation from the agricultural sector led many rural people to migrate from their traditional livelihood, which was no longer feasible. The then-diminishing countryside stimulated the growth of the city and provided the impetus to fortune-seekers both inside and outside the city (Ghosh et al., 1972).

The growth of Calcutta as a trading centre primarily played the role of accumulating resources during the colonial regime (Sinha, 1978; Sengupta, 2013). It functioned as a point to accumulate the resources from peripheral locations. At the same time, many agricultural and natural lands were

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converted to built-up areas to fulfil the demand of the growing city for expansion of services of a trading centre with an extensive hinterland and European-style settlements, resulting in expansion of infrastructure (though concentrated mostly in the white or European part of the city). Following the change in land use, the livelihoods of the people also changed. Many people chose to shift from agriculture to industrial and service-based occupations. It gradually attracted rural-urban migrants from eastern India and East Pakistan (now Bangladesh). With time, Calcutta's urban transition went through sporadic episodes of forceful land acquisition and redistribution. Space emerged as a key concern wherein the displaces were sent to the periphery as the displacement occurred through an assertive role played by the core (Mishra, 2019). With the onset of the neoliberal period, forceful acquisition of land has incrementally become rampant routed through the binary of 'legal and illegal', where the registered owner of the land or property is considered legal and those who possessed urban land without an official document or consent were treated as illegal. Hence, displacement became a regular and officially endorsed phenomenon to initiate the dispossession of the *illegal*.

After independence, the task of nation-building became a top priority in the Indian policy arena. Post-globalisation urban displacement has taken a new turn towards making the city space more productive as well as competitive. The urban development paradigm has shifted from the core to the fringe since the 1970s. The city authority, in trying to create its own global identity, is bypassing the colonial imprints and instead focusing on urban redevelopment through emulation of global protocols as well as the expansion of the city peripheries (Mitra, 2016; Rumbach, 2017; Mishra, 2019). The present chapter aims to discuss the phases of urban displacement in Kolkata (erstwhile Calcutta) in different historical conjunctures and the contestations that ensued among different actors.

Objectives and Methods

This chapter has three major objectives: *Firstly*, identifying narratives of displacements in Kolkata, reported and documented by several authors; *Secondly*, to find out the roots of urban displacement and whether these are deeply influenced by the colonial trajectory of the city; *Thirdly*, identifying various factors of displacements in different sociopolitical regimes and how they continue to influence urban politics.

This analysis is constructed upon archival data with the help of published and unpublished literature and documents from various secondary sources. Content analysis of the displacement events remains an important basis to assess the displacement narratives and trajectories. The chapter is organized into five sections: the immediate section contextualizes urban displacement in India and its significance of the study, the second section deals with the objectives of the study. The next section charts the chronological narratives

of urban displacement and resultant phenomena in three major times, viz. British colonial period, post-independence to liberalisation period, and neoliberal period.

Theorising Displacement

Involuntary migration has emerged as a complex and day-to-day phenomenon in today's world (Basu, 2014). Migration, especially forced migration, is not new, but the phenomenal incidents of migration in the feudal regime and later stages (Ghosh et al., 1972) tell a different story. Cernea (2005) has conceptualised it as '. . . those situations when people lose, through imposed expropriation, either their house or the land they own, or both. They are compelled the yield the "right of way" to the project'. Besides, the relationship between displacement and vulnerability of women in urban settings is very intricate, as shown by Anita Spring in her work (Spring, 1979; Pantuliano et al., 2012). Being at the edge of urban space, they often have to do away with their dignity to resist the push to relocate (Pal, 2014).

Forced displacements in the urban space start with removal or relocation of people to the periphery of the city while reclaiming the public spaces, renovating and beautifying the city tracks, canals, or pedestrian walkways. Tibaijuka (2010) has found that displacement leads to competition between the displaced people and the host community over utilisation of land and resources (Pantuliano et al., 2012). In most cases, displaced people are prone to various socioeconomic and psychological problems as theorised by Cernea (1997) in his forced displacement theory. His model identifies the eight most important dimensions of impoverishment and vulnerabilities resulting out of displacement:

1. Landlessness: the expropriation of land assets which displaced people previously possessed.
2. Joblessness: even when development projects ostensibly create some temporary jobs.
3. Homelessness: not merely a loss of physical house, but also the family home and the cultural space, with resulting alienation and 'placelessness'.
4. Marginalization: 'downward mobility'- socially and psychologically, as well as economically.
5. Increased morbidity and mortality: especially among the weaker section of the population,
6. Food insecurity: low daily calorie intake, malnourishment.
7. Loss of access to common property resources: such as forests, water bodies, and wastelands, which had substantially supplemented the food and income of the marginalised.
8. Social disarticulation: loss of social, economic, and moral support among relatives and members of community networks, leading to social anomie.

The Historical Account of Urban Displacement of Kolkata

Displacements in Kolkata's urban space have been occurring in many forms since the historic period (approximately 1880s) to the present time (Furedy, 1982). The pressure of the population was not much at the beginning of the 18th century (Sinha, 1978). There was some urgent need for workers for the economic growth of the city. As a result, there was large-scale migration from rural areas and small towns. Displacement was a simultaneous incident that occurred along with the city growth (Furedy, 1984). We should look into three phases of urban displacement i.e., i) in the British colonial period (1690 to 1947); ii) in post-independence to pre-globalisation period (1947 to 1990s), and iii) the neoliberal period (1990 onwards).

British colonial period (1690–1947)

The British colonial period started with the establishment of Calcutta (1690) and extended till independence, i.e., 1947. However, the British started to expand their territory in 1757 after winning the Battle of Plassey (1757) and ruled the entire country for 90 years, from 1857 to 1947 (Dhar, 1994). Since the beginning of the British Empire, Kolkata (then Calcutta) became the centre of British colonial power in East India. The British executed slum demolitions and slum improvements for self-interests and to set up exploitative urban colonies (Calcutta Tramways Inquiry Commission Report, 1967). The first-ever displacement was instigated by the British when they constructed Fort William in Kolkata in the eastern bank of river Hooghly. The erstwhile settlers, the majority of them farmers and fishermen, were bound to migrate to the Sutanuti and Gobindapur village (Calcutta Tramways Inquiry Commission Report, 1967; Ghosh et al., 1972). Since the British colony was located at the heart of the city, they chose to be surrounded by the people who provided their daily-required services.

There was a demand for workers in the jute industry and other small industries in the vicinity of Calcutta, apart from the requisition of maids and servants by the European masters. Migrant labourers were keen to save as much as possible from their wages to send as remittance back to their homes. They were less concerned about their housing, which resulted in the formation of slums near their workplace in the second half of the nineteenth century (Chaudhuri, 2005). The initial government documents and archives termed slums as 'block of huts' or 'native village' (Dutta, 2012). The residential locality surrounded by the slums was seen as prestigious, because the rich and white people's houses were seen as symbols of elitism (Dutta, 2012). The colonial government refused to take financial responsibility for improving slums because the slums were built upon private lands (Furedy, 1982). The Calcutta Municipal Corporation (formed in 1876) acted occasionally when public health and fire hazard led to unavoidable situations (Sur, 2015). Many incidences of fire compelled the authorities to execute

Table 3.1 Displacement trajectories of Kolkata

Years	*Localities Affected*	*Type of Displacement*	*Social/Political Movements/Repercussion*	*Sources of incidences/ References*
1690 Onwards (Early British Period)	Central and South Central, Maidan Area	Political/Colonial	No Movements	Ghosh et al., 1972
1850s	Chowrangee & Park Street	Social & Environmental (Dirty, Water supply issues)	No Movements	General Report of the Commissioners, 1858 in Sur, 2015;
1870	Alipore, Koreya, Chitpur, Khiddorepur	Alipore Zoo, Cementary in Lower Circular road, Tram Depot, Cleaning of Old Ganga Channel	No Movements	Lt. General of Bengal, 1877 in Sur, 2015; Furedy, 1982
1897	Congested Localities	Expansion of Roads and Streets	No Movements	Furedy, 1982.
1943	Streets of Kolkata	Political-Economic/Colonial	Bengal Famine led political uprising	Mukerjee, 2011
1946/1947 & 1971	Muslim-Dominated Neighbourhoods	Communal (To Muslims)	Sanyal, 2014	Sanyal, 2014
1970	City Peripheries	Hukumdakhal	The influx of refugee from Bangladesh made chaos	Bandhopadyay (1970)
1996	Streets of Kolkata	Operation Sunshine (Removal of Hawkers from streets)	Radical Left and Opposition's Movements	Mishra, 2019
1970	South City/Jodhpur Kark	USHA Company	Opposition's protest diluted	Bose, 2013
2010	Rajarhat	Villagers of existing locality	Radical Left and Opposition movements	Sengupta, 2013
2012	South-Eastern Periphery	Displacing Illegal Occupants	Radical Left Movements; Slow down by the state	Times News Network, 2012; Banerjee-Guha, 2012
2013 to Present	North Eastern Part of City, Dattabad; Salt Lake	Slum and Squatter due to East-West Metro Corridor; eviction due to Under 17 FIFA World Cup	Protest by People; Resettlement	Das, 2020

Source: compiled by author from various sources

laws to ban such kutcha houses (made of mud and straw). In this regard, to protect neighbouring European houses from fires, the corporation prohibited thatched huts in 1837 and converted the roofs to tile in the 1850s. In the 1880s, the municipal corporation began to focus on provisions of water and sanitation to improve slum conditions (Sur, 2015).

Slum removal and urban displacement were necessary not only to provide ample lands to the colonisers, but also to restrict the spread of tropical diseases like malaria. However, proprietors simultaneously evicted slum-dwellers as property values rose and the Corporation removed slums to build more streets. Prioritization of street construction over slum improvement grew during the 1890s and early 20th century as power was allotted to the Calcutta Building Commission and the Calcutta Improvement Trust (established in 1912), respectively. Slums were also cleared in the early twentieth century to make room for British settlers who came in as a new migrant group in Kolkata. At no historical point were the authorities concerned with the welfare of displaced slum-dwellers. Rather, the influx of refugees, relocation, or obstruction by the state was one of the major concerns. In the mid-1880s, concern about the differences between the town proper and the underdeveloped suburban areas reinforced the divided-city theme. Many taxpayers resisted the proposal to amalgamate the most urbanised portions of the suburbs with the old town, because this would entail an increase in public responsibilities and thus in municipal taxes (Furedy, 1982).

In the 1870s, at least five slums were removed from Kolkata (Sur, 2015). The reason is not only the facilitation of the Europeans, but also the necessity of land by various government and non-government organisations (Sur, 2015). South Bustee (a slum in the southern part of the city) was another concerning area for the municipal commissioners as well as Europeans due to its congested and filthy characteristics. The slum also propelled the commissioners to look for land to meet the housing needs of the Europeans. The commissioners commented on the cause of slum removal with the following potentialities: a) Slums can be removed sans appropriate value of lands; b) The lands could be utilised for housing with limitless demands (Sur, 2015).

In 1942–1943, undivided Bengal faced huge food shortages, which led to disaster and the deaths of nearly four million people. Some argued that the famine was the reason for the reduction of food production in 1942 due to a catastrophic (Mukerjee, 2011) cyclone. However, in a recent finding reported in a new book, 'Churchill's Secret War', journalist Madhusree Mukerjee (2011) blames Churchill's (then-prime minister of Britain) policies for being largely responsible for one of the worst famines in India's history. Mukerjee goes one step further in questioning whether Churchill (and his associates) at all counted the lives of Indians, whom he declaredly hated as 'a beastly people with a beastly religion' (Churchill, cited in Mukerjee, 2011). Such incidents led to large rural-to-urban Calcutta-centric migration and countless vagrants on the streets of Calcutta hoping to buy rice at a controlled/rationed price of food in May 1943. The upper-middle

and middle class expressed their dissatisfaction with the influx of vagrants and put pressure on the British Government to relocate the poor from the urban space. As a result, the Bengal Vagrancy Act was brought into effect from 31 July 1943. This Act 'for dealing with vagrancy in Bengal' defines a 'vagrant' as:

> '. . . a person found asking for alms in any public place, or wandering about or remaining in any public place in such condition or manner as makes it likely that such person exists by asking for alms but does not include a person collecting money or asking for food or gifts for a proscribed purpose. (p. 3) . . . and requires him/her to accompany 'any police officer authorized in this behalf by the Commissioner of Police in Calcutta and by the District Magistrate elsewhere and appear before, a Special Magistrate' who: . . . shall make a summary inquiry in the prescribed manner into the circumstances and character of such person, and if, after hearing anything which such person may wish to say he is satisfied that such a person is a vagrant, he shall record a declaration to this effect and the provisions of this Act relating to vagrants shall thereupon apply to such person.'
>
> (Bengal Vagrancy Act, 1943, p. 5)

As a result, the colonial government kept away the people from the countryside to prevent the spread of the plague in the city. They were criminalised for occupying city space, resulting in detention and deportation outside the city boundaries.

Post-independence to Liberalisation: Migration and Displacement in Kolkata

After independence, Kolkata experienced two large refugee streams: first in 1947, when partition made a new country of Pakistan (East), and second in 1971, after the formation of Bangladesh. Migrated people settled indiscriminately in various parts of the city from north to south. Initially, refugees settled along the railway tracks, but later they searched for open land to settle down. They found suitable locations in the Dum Dum municipality near the Kolkata International Airport, inside metropolitan Kolkata, and along an arc on the city's southern outskirts. The demand for partition first resulted in violence leading to destitution of many citizens in Kolkata when the Muslim League called for 'Direct Action Day' to make the Government accept a two-nation solution in August 1946 (Haque, 1995, Sanyal, 2014).

The southern outskirts of Kolkata were initially slum-free, but after the influx of refugees from Bangladesh (after 1971), these localities became the popular location of refugee colonies as there were plenty of open lands. By 1971, six million people had entered West Bengal alone (Chaudhuri, 1976). The first wave of migrants was predominantly the upper/middle-class and

educated *bhadralok* (genteel-class people), with varying degrees of exposure to urban life and professions, who came mostly to Calcutta because it was the largest city in the region (Ray, 2013), but also moved to other urban centres. Many agricultural families, who continued to come into the state over the decades, settled largely in the villages in West Bengal (Bandhopadyay 1970). In Calcutta, the pressure of refugees was immense, and it was a burden that became difficult to carry for the nascent state that had just recently dealt with a massive influx of people caused by the devastating famine of 1943. With thousands of refugees arriving at the city every day, the strain on housing and infrastructure became even more intense.

Pre-reform antecedents of urban development were carried out by setting two planned cities near and outside the Kolkata metropolitan area, the Salt Lake City and Kalyani Township (in the 1950s). In both cases, the level of displacement was very minimal as the programme was executed by 'command and control'-style (state-controlled well-calculated moves), with considerations of negative implications (Sengupta, 2013).

Refugees and Displacement in Kolkata

Bandhopadyay (1970) notices that the government tried to rehabilitate many refugees, both farm and non-farm families, in areas in and around Calcutta in a process known as 'hukumdakhal' (Govt. of West Bengal, 1948; Bandyopadhyay, 1970; Sanyal, 2014) and government takeover/appropriation of property. Some refugees were placed temporarily in camps and others, mainly the old, infirm, disabled, or unattached women, were placed in Permanent Liability Camps in areas such as Titagarh. However, many others refused to live in camps. These were mainly educated and middle-class refugees. Many others were among those left destitute on the railway platforms. Being reduced to a state of poverty, homelessness, and worse, pariah status came as a shock to them and their *bhadralok* (gentleman) sensibilities (Chatterjee, 1997). Thus, the government in one way considered the need of the refugees, but failed to convince everyone with the resettlement and housing provision.

Globalisation and Displacement (The Neoliberal Period)

At the current juncture, Kolkata is still expanding with the influx of people that hail from different socioeconomic strata. Unskilled poor people who come to the city with little or no information about shelter go to slums or shanties using their social networks. According to the latest census (2011), the population of Kolkata is 14,112,536, which has increased from 13,205,697 in 2001. Between 1991 and 2011, migrants added around 6 percent to the total population of Kolkata.

Post-liberalisation, Indian cities are experiencing the large-scale policy-induced displacement masquerading as urban redevelopment and renewal

Table 3.2 Growth of Kolkata's population

Census Years	*Urban Population (Million; Parenthesis represent the percentage to total population)*		
	India	*West Bengal*	*Kolkata Urban Agglomeration*
1961	78.16	8.54 (10.93)	5.98 (70.02)
1971	107.82	10.97(10.17)	7.42 (67.64)
1981	159.46	14.45(9.06)	9.19 (63.60)
1991	217.61	18.71 (8.60)	11.03(58.95)
2001	285.36	22.43 (7.86)	13.21(58.89)
2011	377.11	29.09 (7.71)	14.03 (48.23)

Source: Census of India, 1961, 71, 81, 91, 2001, 2011, Urban Statistics, TCPO, September 2005

measures (Coelho et al., 2012). 'Manthan Samoyiki' (a magazine) and 'Shalti Research Group' found difficulty in their livelihoods (Mukhopadhyay, 2011) and ways of living in different seasons in various neighbourhoods (Mukerjee, 2011), thus resulting in transition to different parts of the city.

Kolkata's slum-dwellers also face some unique problems, like slum-fire during the winter and summer seasons and waterlogging in the rainy season, as the houses are mostly located in low-lying areas and canal sides. Halder (2013) reported one such case at Maheshtala Shanty (southwestern part of Kolkata); more than 200 shelters were charred. A similar incident happened in November 2012. The local residents claimed: 'The authority itself is behind such act and conspiracy with political support to promote real estate development on this land' (Halder, 2013). Space is spread over six acres of government land and nearly 5000 families have lived there for years. However, the present state government announced its policy not to displace people who are occupying or farming in a land for a time. The state authority termed this as a 'small incident'. The comment was demeaning, both ethically and in terms of the government's policy of not tolerating such things. Residents guarded their homes at night but all in vain. They had occupied six acres of land for 25 years, which is owned by Kolkata Metropolitan Development Authority (KMDA). The government once took initiative to resettle 1184 families in an acre of land there, but the protest demanded resettlement for all 5000 families. They also claimed that the government planned to resettle only those 1184 families who supported the ruling party in the state.

The case of the Beleghata Canal side is another one where settlers stayed for years before eviction by the state. On the next day of World Human Rights Day in 2010, thousands of state police forces and Rapid Action Force (RAF) cleared 'illegally' occupied land. The dwellers knew the land

they occupied was not owned by them, but by the government. However, it was beyond their thought that the government could evict them suddenly. They attended political meetings and possession of the then-ruling party, CPI(M) to abstain from displacement. Thousands of shanty-dwellers were displaced, ignoring their rights and livelihood, and without resettlement. There were two different parties in power at different levels. The state government stopped this eviction process due to widespread protests of other alliance parties, radical leftists, and civil society groups. The Mayor of Kolkata was visibly upset when he heard of the government's decision (Times News Network, 2002).

In March 2012, Kolkata saw another large-scale eviction drive from its public lands in Nonadanga, South Eastern Part of the city Kolkata. This is the area chosen by the KMDA and the Kolkata Improvement Trust (KIT) to provide Basic Service for the Urban Poor (BSUP), a project by the central government under the JNNURM. For the implementation of the JNNURM programme, all 'illegal' slum and shanty-dwellers who were driven out form the core of the city for renovation and beautification and the development of urban infrastructure (Pal, 2014). Those people gathered and stayed there on the allotted land by the government to live. There were 'environmental refugees' from the 'Aila' cyclone disaster of 2009 in the North and South 24 Parganas and people from Maoist-affected Jangalmahal (a forest-covered area consisting of three districts of south West Bengal). According to the Times of India report (Times News Network, 2012), more than 400 shanties came up in a few years at Nonadanga. However, on 29 March 2012, state government razed around 200 'illegal' shanties. The settlers ran their livelihoods from various informal sources like domestic jobs, labourers, scavenging, hawkers, etc., which were lost, too.

By way of State-sponsored planned urban development, the Rajarhat-New Town area was focused to develop as a model town in Public-Private Partnership (PPP) approach of urban development. The state here played a facilitator's role towards the growth and development of housing and infrastructure by the multinational private sector. The notion of a welfare goal of the fulfilment of the city's 15% housing shortfall was combined with the capitalist interest by allowing them to develop on land acquired by the state primarily from the inhabitants (Sengupta, 2013). The academic community and rights activists have raised the question of forceful acquisition of land by uprooting them from the lands they possessed, cultivated for a long time, and pushing them out to choose uncertain jobs like suppliers and construction materials syndicate merely to fulfil the urban development agenda. For the last few years, the news of Syndicate Raj in Rajarhat new town came in, which is a mere transformation of erstwhile agrarian people's lack of skill who are bound to choose a profession for easy earning, resulting in a big debate in political circles (Singh, 2016; Chakrabarty et al., 2014).

The Park Circus-Tapsia displacement was another incident in 2012, due to the construction of a fly-over (called Maa) under the state-funded

JNNURM project. Around 2,000 people were evicted with little compensation. They allege that a few of them got only 10,000 to 12,000 rupees, while many got nothing. Families expressed their fear of losing their children and pain of losing shelter and livelihood (The Hindu, 2015).

Discussion

In the development rhetoric of West Bengal, displacement has emerged as one of the major issues, which led to the change in Indian colonial draconian law (1894) of land acquisition in 2012. Displacement phenomena cannot be termed as a linear and single-factor process driven by accumulation by dispossession, but rather it remains in the centrality along with other factors. Urban development both exclusively and inclusively remains the force behind displacement. The state provides exorbitant land to the capitalists to sustain the flow of global capital.

The resultant policy of such a collaborative nexus came as Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in 2005, and later Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015, which aggressively focused on smart city and urban renewal by making cities efficient, slum-free, and with consumer-paid services. The megacity programmes of the union government are aimed at revamping timeworn infrastructure and beautifying the city for large-scale productions and real-estate development. In the last few decades, Kolkata is experiencing a large-scale transformation in the city space, particularly along the Eastern Metropolitan Bypass (Bose, 2013).

Major factors of displacement in Kolkata range from economic, political, to social factors, putting paybacks sometimes to the advantage of specific groups of people or authorities. In history, major displacement and resettlement phenomena over the Kolkata urban space were caused by partition and independence. The major causes of present displacement are development projects, beautification projects, housing enclaves, multiplexes, trade centres, and shopping complexes (Dasgupta, 2007). The displacement results from various factors like:

a. Providing space to accommodate the British in the white town (Dasgupta, 2007; Sur, 2015) (historical/colonial factors)
b. Implementation of infrastructure and public properties through urban development (Sur, 2015) (post-independence developmental factors)
c. Eradicating the risk of tropical disease from congested native town (Sur, 2015) (historical factors related to British colonial rule)
d. Beautification projects by the municipality and government (Banerjee-Guha, 2012; Mishra, 2019) (post-independence developmental factors)
e. Providing space for multinational corporations' (MNCs) projects like the business centre, shopping malls, housing projects, amusement parks, etc. (Banerjee-Guha, 2012) (neoliberal developmental factors)

f. Restricting fires by banning the straw-made kutcha houses (Sur, 2015). (Historical/colonial factors)

Modern initiatives like 'non-invasive technology' are prone to reduce the rate of displacement in upcoming infrastructural projects like Kolkata Metro railways, thus providing rays of hope for implementing infrastructural projects (Bandyopadhyay, 2017). Since the beginning of the neoliberal era, the major focus of urban planning has centred upon underutilised spaces in developing nations. The people who migrated and settled illegitimately over the city space were seen as 'illegal', and the state used revanchist policies to send them or wipe out from the space they were accustomed to and earning their bread. Indian urbanisation has often been found to be following these revanchist paths. Policies and relevant measures are often supported by international agencies (Banerjee-Guha, 2012). Along with investment, the city experienced widespread protests and uprisings with the passage of time. The process of neoliberal urban transformation had two major negative impacts – one, eroding natural habitats and two, the large-scale displacement of the people. Activism and media coverage take up the role of exposing such transformations (Dasgupta, 2007).

Urban development, slum removal, and displacement are often simultaneous processes. With the new areas falling under high-density modern build-up, the chances of displacement in the surrounding are higher due to new demands for housing lands and market. Although the municipality later understood that, the slum development or slum redevelopment was a much more humane task than slum removal for attaining cohesive urban growth (Sur, 2015). Most debated cases show how the state, through the municipality implemented 'development projects', displaced the poor from the land or place they occupied. In these cases, the state legitimised the unjust, but the displacement was in a lawful garb. Slum removal programs get citizens' support, as it is the effort to make cities aesthetic and beautiful and make space free and available for commuting. The state may easily implement displacements to effectively secure the 'right to the cit' for its citizens. The visible aim is making the city environmentally less polluted. However, the fundamental basis of such projects relies on allowing big-business and international financial corporations to control the city space by acquiring lands for business hubs, multiplexes, IT parks, etc. The 'public space' is continuously reduced by the intervention of international finance, where the state ought to play the role of facilitator instead of a regulator, thus giving valuable urban lands at cheaper prices, acting as a bribe to keep capital investment in particular urban localities. Harvey defines this act as a 'geo-bribe', where space is gifted for explicit gains (Harvey, 1989; Roy, 2009). The action termed as 'public purpose' is actually publicly subsidised land gifted to the corporates without the promise of employment and better civic amenities (Roy, 2009).

In developing countries, as in Kolkata, the land in the urban space has been at the centre of many contestations. The contradiction of slum and looking into the slum as land is one of the major reasons behind the displacement (Mishra, 2019; Rao, 2006). Remaining absent in public policymaking and being unimportant as a force in the electoral decision, the spatial vulnerability remains central for the people who aren't given legitimate rights over the land (Pal, 2014).

The dichotomy of use of public space surfaces in the academic and political arena, as the informal settlements obstruct the image of Kolkata as a global and modern city; alternatively, the urban poor provide cheap services to the citizens. Hence, slum removal has been a sensitive issue of Kolkata's urban politics due to the leftist politico environment and the role of a sensitive middle class towards protecting vulnerable groups of people (Pal, 2014). Slum development was not only beneficial to municipality revenue by water and lighting tax; it was important for improving public health (Sur, 2015).

In critical urban theories, Harvey describes primitive accumulation by Marx through the notion of accumulation by dispossession (Glassman, 2006; Harvey, 1985). To Harvey, capitalism and neoliberal imperialism need 'profitable terrains for capital surplus production and absorption' by the inevitable action of displacement of property and people from the prime and emerging space in the city. The right to city space is hardly recognised and decisions are left without the participation of citizens (Harvey, 2008). Therefore, the following questions remain valid as:

> 'The very purpose of the brazen neo-liberal doctrine of JNNURM is promotion of exclusionary urban development, to make cities "world class" and habitable for the rich. In addition, this brings us to the issue of the basic right of the people to their cities. Who will decide that right? Who will define it, grant it or deny it? Who will exercise it?'
>
> (Banerjee-Guha, 2012)

The existence of low-rise temporary houses pose opportunities to the municipal authority and corporates as potential land for redevelopment (Mishra, 2019) and generating revenue through taxing. The dearth in understanding the concepts of rights, awareness, and legitimate agency push dwellers to shift from the possessed land to the periphery of the city quite easily (Steel et al., 2017; Mishra, 2019).

Conclusion

The chapter aimed to discuss the incidences of displacements in the city-space in a chronological manner, while exploring the various political-economic factors impacting them. If the non-natural incidents are considered, the state

or its various machinery is found to be causal in the matter of displacement. Naturally, the histories of such records are very difficult to access. The state has always been the strongest stakeholder in land distribution, redistribution, and therefore displacement. In the colonial period, the municipal authorities safeguarded the prime lands for the white people by marginalising the native workers. Displacement in the post-independence period can be summarised as occurring mainly due to conflict by different communities and migrants. The process then took a perilous turn during the post-reform era, when the state initiated an active role in catering to corporate interests while aiming to achieve welfare goals. The urban politics have thence been promoted by radical urbanism to occupy and utilise the urban lands, which is supported by the vast political spectrum. However, sometimes it failed to understand the gradual losses of city space for the common citizen to occupy and engage as public space. On the other hand, the displacement process relocates the poor without proper compensation or rehabilitation. This chapter further raises questions on the comparative politics of land possession and displacement and subsequently attempts to understand how the displaced people negotiate with the challenges thrown upon them from time to time.

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4 Restructuring Urban Space

How Inclusive are Neighbourhood Transformations?

Bikramjit Roy and Sumana Bandyopadhyay[1]

The neoliberal environment has brought about rapid changes in the pattern of investment in most Indian metropolises. In an attempt to view urban restructuring in developing economies, one finds that both the philosophical ground and economic logic are aptly directed towards empowering cities so that they 'come up to the standards' of global cities (essentially of the developed world). Much of the debate in the critical geography perspective therefore deals with the modalities of institutional capture of developing economies through the well-established goals of globalisation.

Like the broader patterns of change in capitalist society itself, urban restructuring tends to be a cyclical process. There is no clear historical break between different kinds of processes, since to a considerable extent, they occur simultaneously. While such changes in urban form and structure are always taking place, they do not occur at a constant pace or proceed in a uniform direction. The period from 1945 to 1973, in most advanced capitalist societies, was evidently the period of profound transformation in urban structure. A similar trend occurred in Indian cities after the liberalisation policies were adopted in 1991. It implied the advent of the market-driven approach which has a strong impact, especially upon those that attempt to be part of the global network of cities. The neoliberal city stresses the efficiency of private enterprise, liberalised trade, and relatively open market, and therefore seeks to maximize the role of the private sector, which leads to commodification of basic services.

According to Martinez and Garcia (1997), '*Neoliberalism is a set of economic policies that have become widespread during the last 25 years or so. Although the word is rarely heard in the United States, you can clearly see the effects of neoliberalism here as the rich grow richer and the poor grow poorer*'. Neoliberalism has been chartered by powerful global institutions like the International Monetary Fund (IMF), the World Bank, and the Inter-American Development Bank. They go on to state that '*the capitalist crisis over the last 25 years, with its shrinking profit rates, inspired the corporate elite to revive economic liberalism. That's what makes it 'neo' or new*.'

While Mumbai, Delhi, and Bengaluru have taken major strides in transformation through restructuring, Kolkata has been a slow follower,

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but the changes are evident. While the goals of a welfare nation are to build inclusive spaces, urban planners have more often created exclusive spaces. The planners' intentions are often linked with economic growth, attracting capital, and creating a world-class city, which are all very clear objectives. However, the poor and the middle-class residents of the city and their socio-psychological relationships as seen in older neighbourhoods have built enduring and cohesive spaces that are inclusive, though not always world-class, in their look and feel. This chapter attempts to take a closer look at neighbourhoods of Kolkata, where urban space is gradually being restructured. Spearheaded by the real estate boom of the present decade, older well-knit neighbourhoods of the city are getting rapid makeovers, replaced by gated communities and commercial spaces of the all-in-one shopping-leisure-entertainment building formats. Simple local markets and daily markets operated by street vendors have been replaced by highly sophisticated upmarket locales where exclusive spaces are created by enclosed air-conditioned buildings with closed-circuit television monitoring and constant frisking by security personnel. High-end shopping experiences, focused on brand visibility and targeting the price-conscious consumers, have ensured that such places are well out of reach of the poor, while a substantial upwardly-mobile section of the population find such shopping zones extremely attractive – where one gets easy access to popular Indian and international brands of consumer goods of all kinds, whether household accessories, fashion accessories, or personal accessories. Residential spaces have been transforming as well, gated living has become more common, and standalone buildings have almost faded away from the housing construction scenario. Even small plots are now converted into single-tower apartments with a gym, community hall, and secured gates. Gated living has its benefits, but the losses in terms of breaking the bonds in the neighbourhoods can hardly be ignored. The city is home to many and yet some remain homeless, moving from one place to the other, sometimes in search of work, at other times forced out because of development projects like road widening, construction of buildings, flyovers, or even simple makeovers like beautification and landscaping. The lives of the homeless are threatened. Every day, lives are further affected by 'planning' pursuits. This chapter thus questions the regimes of inclusive planning and seeks to understand the nuances – of whether, under extremely challenging conditions, the planning and development mechanism can prioritise the needs of the poor, or if the city will keep on creating exclusive spaces in its pursuit of showcasing planning excellence.

The study uses citizens' perceptions in addition to mapping select neighbourhoods in transitional stages in order to understand these changes and how they have impacted the local communities, and the neighbourhood fabric in terms of socio-psychological experiences of citizens in localities where they have lived for three or four generations.

Contextualising Urban Restructuring

The term 'restructuring' has been used widely since late 1960s and early 1970s in Europe. Economists use this term to define a process closely associated with the transition from one regime of accumulation to the speed of circulation of capital and the increasing globalisation of the world. Streeten (1987) used the term 'restructuring' as synonymous with 'development' or certain forms of development. According to Harris (1999), restructuring involves not only quantitative change but includes qualitative transformations in how consumption, production, and exchange take place and relate to each other. Due to qualitative transformation, reproduction of social space is evident.

Urban space is dynamic in nature. Transition in the built environment is evident in planned transformation; on the other hand, organic transformations occur when the character of the neighbourhood is altered by new residents, new commercial ventures, or even something as simple as street art or graffiti. The magnitude of urban transformation may vary from a single building to a city square, an entire neighbourhood, or even a larger part of the city. Though it has a lot of variations, one commonality of urban transformation is that it creates strife in society, because some citizens are in favour of it whereas some are against the idea. Urban restructuring is a complex process which involves numerous stakeholders (city development authorities, urban planners, residents, and business owners) who have various opinions and interests. Such changes can be planned, in cases of large-scale redevelopment projects, and can also be unplanned and scattered, in cases of initial stages of gentrification or organic changes in response to needs of local neighbourhoods.

According to Smith (1982), the most salient processes responsible for the origins and shaping of urban restructuring are as follows:

a) Suburbanisation and the advent of the rent gap;
b) Deindustrialisation and the growth of tertiary sector;
c) Spatial centralisation and simultaneous decentralisation of capital;
d) Recurring movement of capital;
e) Consumption pattern changes.

These factors have been found to occur in most Indian cities in their transformative journeys. The words of caution are, however, quite clear – in the spirit of 'creative' or 'entrepreneurial' city planning, planners often choose to create places of leisure and consumption at the expense of other forms of development. These leisure and consumption amenities are mainly used by affluent members of the society where surveillance and security is very high (Dear, 2000). As a result, Kipfer and Keil (2002) argued that this entrepreneurial planning gives rise to 'militarisation' of public space. Aranya (2003) studies the impacts of *Globalization and*

Urban Restructuring upon the city of Bangalore and finds the following to be of prime importance:

- Physical representation of a growing economic disparity;
- Peripheralisation and formation of enclaves;
- Real estate market dynamics;
- Local autonomy in spatial decision-making;
- Privatisation of infrastructure and networks.

The Neighbourhood as a Unit of Planning

Restructuring of urban space includes, among other factors, an inevitable change in the character of the neighbourhood in its purview. According to Galster (2001), 'neighbourhood is the bundle of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses'.

Causes of Neighbourhood Change

It is not easy to describe neighbourhood change in a single sentence. Assessing change is also complex and challenging, to say the least. While the young college students with a fair share of disposable pocket money may enjoy the presence of a flashy mall with all major shopping brands and food from McDonalds, Haagen Dazs and KFC, an octogenarian may view the same commercial space as 'wasteful' and 'creating greater divides between the rich and the poor' or 'unnecessarily strenuous consumerism that compel parents to allow peer pressure to affect their children' – while they in turn are compelled by the peer-parent pressures to spend more on pocket monies and changes in lifestyle.

Grigsby et al. (1987) argued: 'Neighbourhood change is caused by the natural operation of housing markets under conditions of residential segregation and socioeconomic change'.

According to Lupton and Power (2004), neighbourhood change can be viewed in two ways: firstly, within-neighbourhood casual links, where neighbourhood change is explained as an extensive social and economic change; and secondly, inter-neighbourhood linkages, where associated components with urban and regional systems across neighborhoods are studied.

Restructuring Urban Space: Glimpses from Indian Cities

In recent times, various Indian cities are being remodelled as 'world-class cities' to operate as a node of the International Financial Institutions (IFS) and high-tech giants. The main objectives are to make those cities investment-friendly and suitable to credit rating agencies in the neoliberal urban regime. Homogenised visions of planning have been taken, such as gentrification and reshaping the urban governance system. This vision has aggravated

the contradiction of 'concentration' and 'dispersal' in the existing institutional landscape and reformulated the relational character of specific locations for new users, for whom a process of space specific valorisation and de-valorisation (Banerjee-Guha, 2009) is found to set in. Public-private partnerships have increasingly emerged as the way forward – according to Harvey (2001), 'Private-public partnerships means that the public takes the risk and the private takes the profit'.

Of the policies and programmes aimed at large-scale restructuring of urban space, three deserve special mention: the JNNURM, the Slum Free City, and the Smart Cities Programme. Of these, the JNNURM has been seen as the most transformative in terms of investment in PPP mode with an institutionalisation of the pathways to achieve neoliberal goals in urban planning. Much literature has evolved around the practice and implementation of JNNURM, but certain points impacted structural changes in the way urban planning was viewed to date, like the pre-condition of cities for availing funds was to form para-statal, non-elected nodal agencies for evaluating and monitoring projects, releasing, and managing funds to ULBS/para-statal units. It was said that priorities were to be given to those projects which were participated in by private sector more than by ULBS/para-statal units by themselves. Due to inability of the public sector to improve infrastructure, 100% FDI was permitted.

It's noticeable that JNNURM programmes focus upon reform by investment of private capital:

a Privatisation/commercialisation of basic services through PPPs with the introduction of user fees
b Liberalisation of land and real estate sector
c Development of a stronger mortgage market alongside 100% FDI in land, housing sector, and real estate sector
d Easier rules and regulations for land use conversion
e Reform in property tax and reduction in stamp duties
f E-governance

Indian cities can cite various examples of public-private partnerships. Consider the case of Mumbai, which initiated its global-city status by 'flexibilisation' of labour (Sassen, 1991 and Banerjee-Guha, 2002). In 1993, McKinsey, a consultancy firm, better known as a universal catalyst for private capital in urban projects, suggested that to make Mumbai a global financial centre, two things had to be done: a) relaxation of land acquisition rules, and b) strict control of labour. For Mumbai, implementation of anti-poor projects and appropriation of public land for private use is not a new phenomenon (Banerjee-Guha, 2002), but after NEP, such practices were found excessive. The plan document prepared for Mumbai by McKinsey, in 'active collaboration' with state government organisations like Mumbai Metropolitan Region Development Authority (MMRDA) and the Municipal Corporation of Greater Mumbai (MCGM), compared Mumbai with 10 other cities, namely: London, New York, Singapore, Hong Kong, Sao Paulo, Sydney, Bangkok, Rio de Janeiro, Toronto, and Shanghai.

Four 'high-end services' for the city were targeted: financial, healthcare, IT-enabled, and media/entertainment/telecom services for the future. The plan was based on either full privatisation or public-private partnership projects for these services. JNNURM mostly gave priority to privatisation of basic services. Potential job growth was envisaged in the construction sector, hotel/tourism/recreation sector, and retail that would create 500,000 jobs in 10 years in upgraded museum, stadiums, and convention and business centres, in cafes, clubs, and restaurants on the waterfronts, and restaurants and bars in supermarkets and hypermarkets throughout the city. The transformation of Mumbai was started by the process of gentrification in mill lands of Dadar-Parel, Port-Trust land in the Dock area, Bandra-Kurla Complex, BDD Chawls in Worli, and increased floor spacing index in already built-up areas as the source of land for redevelopment. The contemporary urban restructuring in Mumbai is visibly becoming a part of the neoliberal reconstruction of the urban area at different layers of society.

The conceptualisation by Banerjee-Guha (2009) is an attempt to draw attention to the commonalities between the three hierarchies of policy formulation that reveal the similarities in the objective perpetuation of the neoliberal objectives in using the governmental agencies in legitimising its goals. In the case of Kolkata, some of the JNNURM benefits in transportation and road widening have been beneficial indeed, but the objectives of urban renewal can never be similar across cities (Figure 4.1).

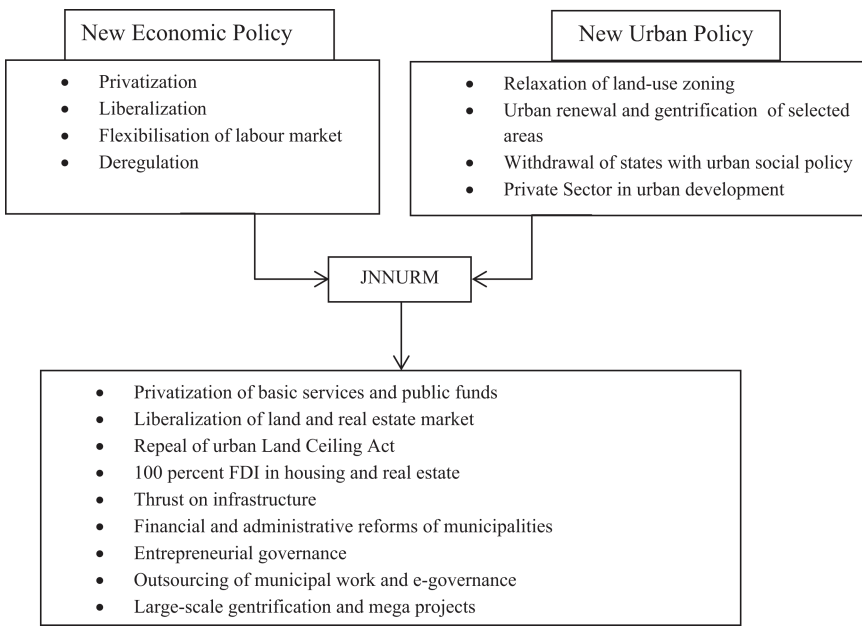


Figure 4.1 Relationship between National Economic Policy (NEP), National Urban Policy (NUP), and JNNURM

Source: Banerjee-Guha (2009) Developed from Swynegedouw et al. (2002)

Transforming Kolkata: Skylines to Pavements

Kolkata has evolved over 400 years from meagre beginnings as a tiny village, *Kalikata*, under Mughal rule and owned by the zamindar, Sabarna Raychaudhuri, through its establishment as the British seat of power, *Calcutta*, to being the commercial capital of the eastern region of independent India, to its present-day struggles of trying to achieve a world-class stature (renamed *Kolkata*, after its Bengali pronunciation, in 2001), given its mind-boggling densities of 24,760 per sq kms, large informal economy, thousands of homeless people, and a slum population of around 1.5 million living in its 2011 registered and 3500 unregistered slums. Steeped in history, its rich colonial past when the British named it '*Jewel of the East*' to its journey as the British capital when the city became '*A city of palaces*', its stagnation and chequered history of post-partition trauma, influx of refugee populations, and multiple planning challenges have all been recorded by historians, political scientists, and sociologists alike. The spatial transformation has been captured in the best possible way by an eminent geographer in this volume (Chakravorty, 2021). This chapter dwells upon some of the trends of transformation in the post-liberalisation era that have altered the socio-cultural character of the city from its roots, especially driven by the changing aspirations of the middle class and their views of the city and its future. Gone are the conservative views of being fiercely protective about the city's identity sans corporatisation, which remained unaffected by the streams of migration as diaspora blended to create the multicultural ethos of the city, as the Armenians and Anglo-Indian population, Chinese business families, and the business clans from Gujarat and Rajasthan all became part of the melting pot called Calcutta, perhaps the most inclusive of Indian cities.

Changes of a very different magnitude began to creep into the city post-liberalisation, after the New Economic Policy of 1991 brought in major lifts to the trade barriers, making way for free flow of capital. Global capital impacted cities like Mumbai, Delhi, and Bangalore to a much greater extent as the Left Front Government of the times was largely conservative about allowing corporatisation and privatisation to the degree that was accommodated by other megacities of India. This, and the fiercely protective middle-class ideology, went a long way in slowing down the city's leap towards achieving the so-called 'global' status. The drive to attaining world-class stature in a rather competitive manner was an outcome of several processes that went hand in hand. The opening up of the investment opportunities implied a diverse economic expansion that captured the imagination of the young who were attracted to a creative opening of opportunities, wider access to the global corporate world offering lucrative careers, and a rise in the unprecedented growth of the service sector, along with opportunities to develop skills to engage with such sectors – banking and finance, real estate

and infrastructure development, and capturing the consumer market by global entities – together formed a complex and overbearing impact upon the urban dwellers. Urban planners could not ignore the rising demand for restructured spaces, beautification, and cleaning up the city (from its garbage as well as its slums). The programmes that came in quick succession go a long way to prove this urge to compete for global capital. Kolkata, though slow and steady, could no longer keep looking away. The demand for urban renewal was in the air and the long-ignored urban vote bank now mattered, as the city demanded new employment sectors, new standards of living, more opportunities, better healthcare, better education, better living spaces, high-end luxury homes, more choices for consumption, and more options for leisure and entertainment. The responses began to follow: new opportunities came in the form of software and IT careers, multinationals and corporates opened their offices, new townships developed to engage them in the playing field of investments in Sector V, new urban living spaces in the form of townships from East Kolkata Township to a more expansive Rajarhat New Town, new housing projects that were mostly gated communities, new market complexes came in the form of malls, new luxury hotels to cater to the globetrotters, theme parks and multiplexes for entertainment and leisure. The initial target locations were the near-peripheral locales, mostly in three directions – along the Eastern Metropolitan Bypass and the Gariahat-Ruby-Science City stretches. The Rajarhat New Township area was a well-planned satellite township, several times the size of Salt Lake Township. This was primarily planned in low-density spaces, agricultural land, bare and/or vegetated land, and wetlands and water bodies that were easy to engage with urban sprawl. The other, more acute changes began to happen in the older residential areas – and this is more crucial in terms of the transformation of old neighbourhoods.

The myriad planning challenges of Kolkata were taken up under collaborative efforts of the Asian Development Bank and DFID, UK. Since 1998, ADB has continued its efforts in taking up complex planning issues, first with the Kolkata Environmental Improvement Plan with a loan of 250 million USD in 2000, supported by 43 million GBP from DFID, UK (Figure 4.2). Further, the Comprehensive Master Plan for Sewerage and Drainage was adopted in 2007 to bring 1.5 million people improved drainage facilities. Also, the KEIIP Programme invested to create 400 kms of additional sewerage and drainage networks, 46000 sewer connections, and completed 20 new pumping stations. This prolonged investment in the city's infrastructure building will perhaps go a long way in facing the challenges of floodwater intrusion and save millions of people in low-lying parts of the city. The larger share of investments, however, is in the form of loans, while grants form a tiny proportion of the investment – over 500 million USD in loans and around 5 million USD in grants.

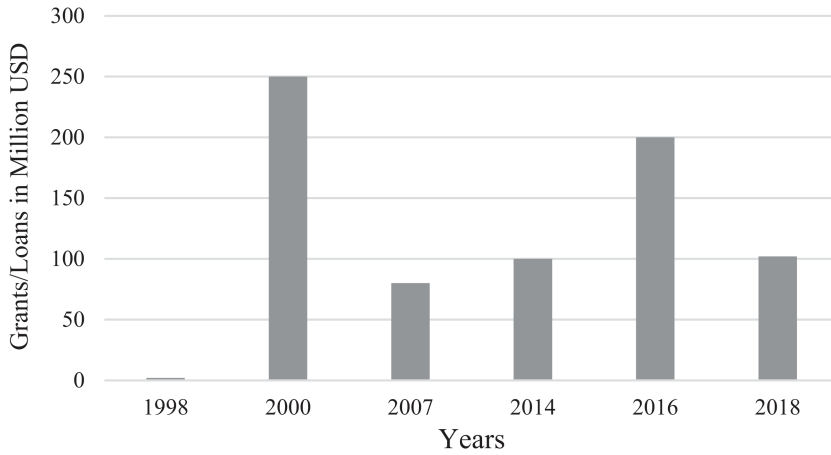


Figure 4.2 Grants and Loans by ADB 1998–2020 for funding key infrastructural projects

Glimpses of Neighbourhood Changes in Kolkata

In Kolkata, the repeal of the Urban Land Ceiling Regulation Act (ULCRA) started creating opportunities for large-scale restructuring of urban space. Industrial areas were chosen for redevelopment projects in the mill lands of Mumbai. One of the best examples is the Calcutta Riverside Project in Batanagar, to the south of Kolkata, over 262 acres of land covering 80% of the area of the former Bata India and Batanagar industrial township. Due to outsourcing of production, numbers of workers decreased from 15000 to 1600 in recent times. The Calcutta Riverside is a mixed-use development project that includes a nine-hole golf course, a sport and recreation club, high-end residential villas, condominiums, hotels (like Crowne Plaza), IT parks (within 25-acre SEZ), hospitals, schools, and a shopping mall. The 1.2-km riverside is being developed for recreational purposes. For fulfilment of this project, the Bata company has formed River Bank Holdings, a joint venture with Calcutta Metropolitan Group. Numerous other developmental projects have introduced gated living for an elite section, often by removing and displacing the poor factory workers, either directly causing their displacement or indirectly forcing them to relocate, given the beautification of the premises and their surroundings: the 400-acre Hindustan Motors at Uttarpara located in the north of Kolkata; the Annapurna Glass Factory of Jadavpur has been transformed into Ekta Heights, an immense gated residential complex of 288 units. Joy Engineering Works of Lake Gardens has

also been transformed to a modern gated complex with 35-storey residential towers and a mall occupying 1,000,000 sq ft. 4.5 acres of land where the old offices of Amrita Bazar Patrika and Jugantar once stood is now a retail-cum-office space commercial tower. Due to lack of maintenance, a market complex of Kolkata Municipal Corporation covering an area of 3–4 acres was handed over to the private sector.

The common features of these projects are that urban regeneration is taking place in locations of industrial closure along the lines of promoting a post-industrial global city with job creation in dynamic sectors like cultural, hospitality, and leisure.

Along the lines of Harvey's '*conceptual apparatus*' that is developed to capture the imagination through 'active collaboration of government institutions' (Banerjee-Guha, 2009), the Kolkata Metropolitan Development Authority (KMDA) has acted as the agent of change.

One may reflect upon the words of Banerjee-Guha (2002): 'The exact mix of private market, monopolistic control and state intervention, however varies from city to city that serves the purpose of social reproduction of a specific region and goes to make a series of sub systems, separated from each other by regional competitive barriers and concurrently connected through a wider neoliberal ideology'.

Implementation of anti-poor projects by way of cleaning up and redesigning the city, removing squalor, and converting pavements into bright, wide pedestrian walkways, may make them look cleaner, designed, and more attractive, but have in effect removed numerous pavement vendors all across the city. The selective reorganisation of space is hard to ignore. While vendors have been cleaned up, every crossing (the roundabouts) in the Salt Lake township has 2–3 small eateries that have been granted permissions; all are fast-food joints, but there are no guidelines for cleanliness in food handling. These are small enterprises, run on low budgets, that use a single bucket of water to wash all utensils, and they even switch off the refrigerators before closing shop! The motivation did not extend to provision of toilets. One could walk kilometres in Salt Lake without finding a public toilet or a place providing clean drinking water – two of the most essential human needs – not even in the modern Satellite township of Salt Lake, much less in the more recent New Town, Rajarhat, Sector V – the emblems of modern spaces created to compete with the top-ranking cities. There are 10 public toilets in 20 sq. kms area of Bidhannagar (Salt Lake). The Kolkata Municipal Corporation area has 383 'pay and use' public toilets by KMC to cover an area of 187 sq. kms and an approximate commuter population of 7 lakhs! Preventing people from access to toilets and eating at the unclean fast-food shacks are both health hazards! The lopsided model or vision of development is resplendent in the visible landscaping with streetlights and copies of iconic buildings, where a person may have to knock on the doors of kind local residents to use their private toilets!

Spatial Reorganisation at the Neighbourhood Level: A Case Study

Several case studies have been conducted at neighbourhood level to assess citizens' perceptions of the changes that have occurred in their neighbourhoods. In-depth interviews and focus group discussions have been conducted to assess their views and emotions about the transformations, not only in physical attributes of the built-up space, but also the socioeconomic character and their feelings and emotions surrounding the losses and gains from their perspectives as individuals, as communities, and as people who feel rooted to the city or otherwise. It captures their 'everyday lives'. The case of Kankurgachi-Phulbagan neighbourhood is discussed here.

The Kankurgachi Phulbagan neighbourhood is selected for very specific reasons:

- Firstly, the ward represents a part of the city proper. It was part of *Dihi Panchannagram* included under the 33 villages purchased by the British from the Mughal Nawab in 1758. One of the oldest parts of the city and initially a periphery of Kolkata, in the early 19th century, some elite Bengali families had built large garden homes. Industries also started here, initiated by Bengal Chemicals and Pharmaceuticals, shifted here in 1901 from its original location at Maniktala, where Acharya Prafulla Chandra Ray had established it in 1892. There are also a Jewish cemetery dating back to the 1800s and a Muslim burial ground.
- The rate of structural change has been found to be much higher than the neighbouring areas.
- This area may be identified as a 'transitional area' lying between the Central Business District and the new township outliers. Small industries like jute and machinery factories dotted the region that closed down in the 1970s and 80s.

Subsequently, urban expansion has engulfed the area and land uses have been replaced by more commercial and economic activities, bringing about a complex urban fabric where the rundown factory land parcels and dilapidated housing areas were later developed into a series of gated communities. Kankurgachi at present is a thriving upper-middle class mixed neighbourhood consisting of both Bengali and non-Bengali populations, where upscaling markets and residential complexes has been a continuous process. The shift of residents of older market centres of Burrabazar and Armenian Street in the predominantly wholesale district of Kolkata, who spent generations in cramped spaces where the ground floors of their homes doubled as their business centres, have been an important trend of this neighbourhood. The younger generations of the thriving business class of Kolkata now choose to build impressive bungalows at Salt Lake and luxury apartments around Phulbagan Kankurgachi neighbourhoods.

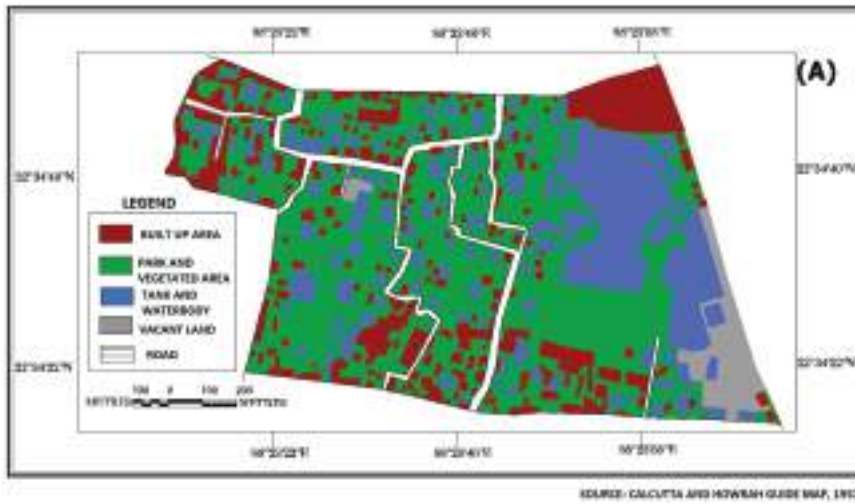
To the urban geographer, the map is a powerful tool and is used here to first visualise the physical transformation – the temporal changes in land use and landcover for the neighbourhood has been studied for 1957, 1995, 2002 and 2012, but for the purpose of quick assessment, just two maps have been presented here to see how the entire ward dominated by open and greenspace has been completely built-up over the decades (Figure 4.3 A and B). The changes have been most drastic between 1995–2002; the maps of 2002 and 2012 show very little changes in some of the vacant land transforming into built-up.

Maps based on satellite images have one major drawback in understanding the micro-level details of land uses within the arena of built-up space, unless plot-by-plot verification is done, which is a complex task in the urban setting – as all spaces having commercial, residential, leisure/entertainment/office space etc. are within a single component of 'built-up' spaces.

The classified map for 2002 is not shown here, but the representations made in Figure 4.4 reveal the increase in residential space from 43% to 57%, an increase in commercial retail and office areas as well as service industry from 4% to 8%, and a decline in green space from 14% to 10%.

The microcosm of socialisation of space is etched out with the help of conversations with citizens. For this case study, interviews of 65 residents living in older buildings adjacent to the newly created gated residences and commercial complexes were conducted. Another group of key informants were the elderly residents of the locality. The researcher intentionally organised the older residents into groups for FGDs, as the aim was to understand the tales of losses and gains as perceived by the local community that has spent years in this neighbourhood.

The key findings were a little disturbing in terms of socio-psychological perspectives. The older residents were distraught with a sense of alienation and disturbed by the wave of changes around them. It was the attitude of the people living in gated complexes and their complete lack of interaction with the neighbourhoods. The sense of alienation that comes from the CCTVs monitoring and recording all movements, not only those who enter the complex but also upon people hovering around the pavement outside the gates, that comprised a 'public space' of sorts for people sitting around a tea stall, vendors gathering or laying down their wares, known faces walking up and down, some to their schools and others to their workplaces as they yelled out to one another on their way back home. This noise and colour had disappeared in the stretch which now housed one gated residence after another, where the grim-faced security personnel peer at every face with questioning eyes that seem to say 'here's another nuisance' (could be a petty thief or a criminal of sorts). It was disturbing to accept that free movement, free access of the pavement, roundabouts, sitting beneath the trees to rest or chat was now almost like 'trespassing', as the outsiders (to the gates) are perceived threats to security of the walled insiders. It was also disturbing to the identities of the inmates – the outsiders to the old



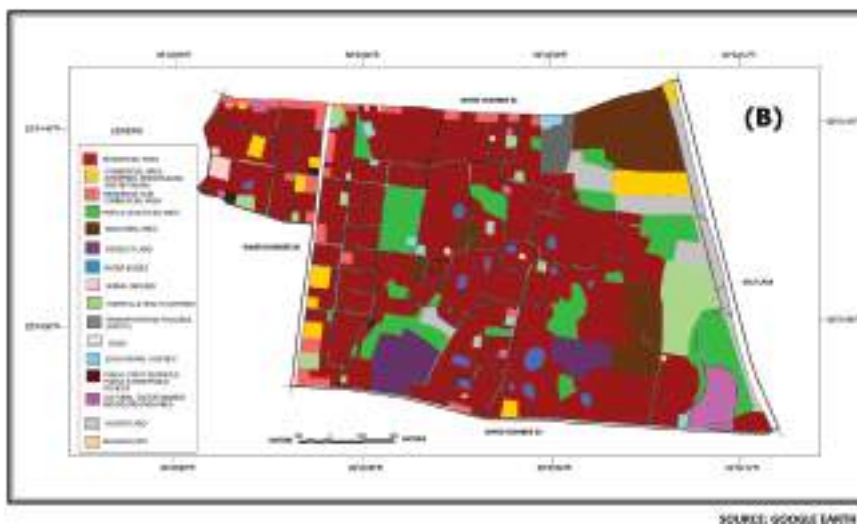


Figure 4.3 Land Use and Land Cover of Ward 31 consisting of Kankurgachi-Phulbagan Neighbourhood, (A) 1957 and (B) 2012

Source: Prepared by Maji and Bandyopadhyay (2015) from sources mentioned

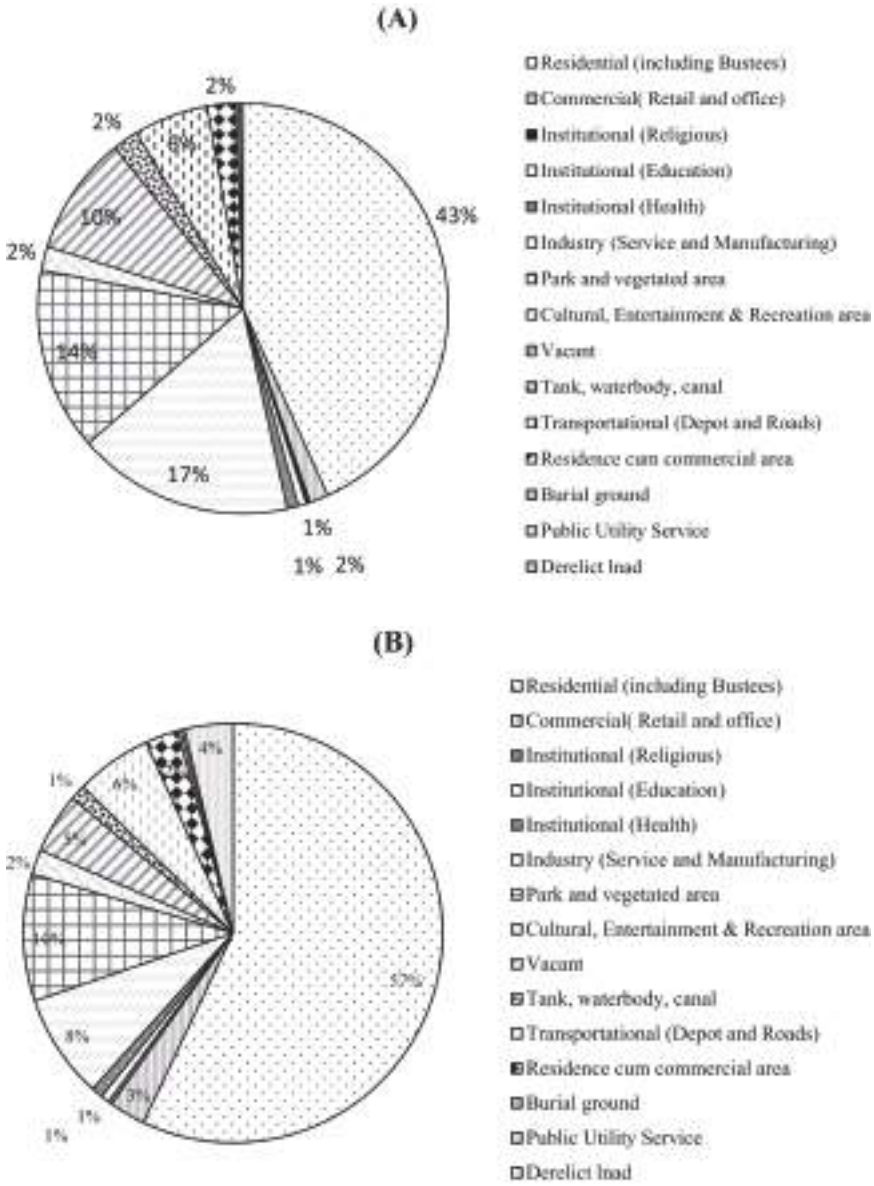


Figure 4.4 Landuse transformations between 2002 and 2012 (A): 2002, (B): 2012.
Source: Calculated from classified image of (2002 not shown, and 2012 as in Figure 4.3)

neighbourhood, a considerable number of whom are service holders or transient residents on the move with a few years posting allotted a residential accommodation by the office, those without a sense of belonging to the space itself.

Alongside the narratives of elderly residents, we collected data on how local residents perceived the amenities of the neighbourhood. These were listed and scored to find that they found the amenities had been positive to a large extent, particularly the development of commercial spaces, entertainment, beautification, and widening and lighting of roads, well-appointed parks, and cleaning up and lighting up of the lake area. The neighbourhood amenities score was + 27.56 (Table 4.1).

The neighbourhood in question is in close proximity to Salt Lake Township, with easy access to the airport and Rajarhat Newtown to its east and equally close to the CBD and older quarters of Kolkata and traditional market centres, and is likely to be progressively in demand as far as real estate development is concerned.

In general, some of the positive and negative impacts of neighbourhood transformations caused by various levels of restructuring may be summarised as follows:

Opportunities created by transformation:

a. *New investment* opportunities
b. *New types of employment options* generated – factory workers, security guards, fishermen, and shopping mall recruits

Table 4.1 Perceptional scores on neighbourhood amenities

Changes in Amenities and Infrastructure	*YES*	*NO*	*SCORE (+ve responses)*	*SCORE (-ve responses)*	*TOTAL SCORE*
Road Construction	60.38%	39.62%	+6.04	– 3.96	+2.08
Road Widened	75.47%	24.53%	+7.55	– 2.45	+5.1
Flyover Constructed	0	100%	0	–10	–10
Landscaping	52.83%	47.17%	+5.28	– 4.71	+0.57
More Trees Planted					
Parks and Gardens Added	60.38%	39.62%	+6.04	– 3.96	+2.08
Malls/Departmental Stores Added	75.47%	24.53%	+7.55	– 2.45	+5.1
Theatres and Restaurants Added	79.25%	20.75%	+7.92	–2.08	+5.84
Retail Houses Increased	58.49%	41.51%	+5.85	– 4.15	+1.7
Sewerage/Drainage Improved	83.02%	16.98%	+8.30	– 1.70	+6.6
Garbage Disposal Improved	92.45%	7.55%	+9.25	– 0.76	+8.49
TOTAL SCORE					**+27.56**

Source: Primary data from neighbourhood respondents

c. *Improvement in the housing stock*
d. *Improvement in certain types of infrastructure* like roads, transport options, etc. that serve the entire population
e. *Diversity* in activities
f. *Choices and Options* for the consumer in diversified markets

The negative impacts of transformation upon neighbourhoods:

a. *Displacing low-income residents* with new gated residences, commercial developments, landscaping, and beautification
b. *Loss of community ties* due to relocation or migration of the part of the community in search of jobs, housing, and cheaper lands, etc.
c. Segregation *reduces community activities* that were prevalent. Gating does not allow people to perform activities together
d. *Multicultural identity disappears* with only closely associated income groups and economic status, similarity in standard of living and choices remain within the gates
e. *Alienation* amongst the older residents living outside walls and gates; not necessarily the poor and underprivileged, but the traditional affluent residents as well

The increasing amenities, plush malls, and multiplexes catering to the elite and upwardly-mobile population that changes consumer behaviour in neighbourhoods are likely to overshadow the sentiments of the non-consumer, non-materialist older inhabitants of the locality, create more disparities as income gaps increase between the nouveau rich and the slum dwellers, where the low-income residents perhaps have more claim to their neighbourhood spaces but are powerless in the claim-making game.

The story of urban restructuring of Kolkata's neighbourhoods bears millions of such narratives, but little does the planner care, in their race to make and remake the urban spaces that they now visualise as 'markets' and not 'inhabited spaces'. Across the developed world, however, neighbourhood planning is a participatory process and careful guidelines are drawn up to enable minimal disruptions in the lives of the older local inhabitants. Such sensitisation has a long way to go. If at all at some point of time in future, a much-sensitised government and planning body wish to take up the job of humanistic neighbourhood planning, the dust would have settled over the old and primitive spaces of belonging.

Conclusion

Urban restructuration is now more common in the global south as well as Indian cities as it is transforming the traditional cityscapes into new social and cultural spaces. These spaces are dynamic entities that represent cultural plurality, while at the same time the transformations in the same neighbourhoods often leaves behind the urban poor and the older residents. Urban

restructuring is best perceivable at the neighbourhood level and is therefore studied here with reference to the citizens' everyday lives in different forms as found from the in-depth interviews and narratives shared by them. The major concerns of the feelings of alienation among older residents revolves not around planning perspectives, but in the socio-psychological well-being of the older vis-a-vis the newer residents. The other major concern is the encroachment of the 'public spaces' used earlier by older residents and informal workers, like vendors, which needs to be addressed in a planned manner by the authorities. The driving away of the urban poor due to new investments, new spaces, beautification, and landscaping brings forth the crucial matter of social justice and welfare issues – posing uncomfortable questions around planning and governance. The aspirations of the new generation are accomplished with the same new urban spaces that provide organised jobs and 'econo-tech'-centric consumerism.

The question posed in the title of this chapter remains blurred as welfare issues are rarely addressed in the neighbourhood planning for our cities; ideally, community participation should be made at the neighbourhood level to make the cities more inclusive. Inclusivity demands the involvement of all stakeholders across income levels and economic status. There is no doubt that the decisive role of private players in neighbourhood transformations of Indian cities can be assimilated with stakeholder interests to enable social justice to prevail in any city.

Note

1 This chapter is dedicated to the memory of Ms. Sima Maji, who left us behind to complete her academic journey in the limited manner that we can.

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5 Gray Spacing and Quiet Encroachment of the Street Vendors in Kolkata

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A street is a space with myriad characteristics that engage multiple ways across time and people. It materially shapes the subaltern subjects while itself being shaped by them (Arnold, 2019). In that regard, apart from being a 'heuristic device' to recognize subalternity, a street also has subaltern properties. In addition, it juxtaposes 'mobile, unpredictable, and dangerous' attributes that remain far from being essentialised into a comprehensible concept/matter. Therefore, the subalterns whose livelihood and everyday life are conditioned by street could be simultaneously political, social, economic, and cultural. Thus, reading street subalternity only as a structured combination of characteristics hides more than it reveals. Besides, this juxtaposition of attributes, often contrasting and contingent, informs the street as a subaltern not only in terms of material conditions (Guha, 1982) but also in its indeterminacy (Spivak, 1994).

While stressing the materiality of a street, it is imperative to underline its role in suturing relationships and instigating conflict between the elite and the subaltern of a city. The elitist materiality sees the street as a mode of circulation and as an entrepot for projecting the smartness of a city (Lindell, 2019; Tafti, 2018) that ought to be kept free of encroachments and ocular filth. The subalternist materiality sees a street as a space for livelihood and habitation (Arnold, 2019), and a place where relationships and cultural transactions are experienced (P, Kamath, and Paul, 2019). In practice, the subalterns on the street are legally considered encroachers who ostensibly subsume the characteristics ascribed by the elites. A mode of governance mediates through this duality by gray spacing the *illegal* occupation, by suspending it between the ' "whiteness" of legality/approval/safety, and the "blackness" of eviction/destruction/death' (Yiftachel, 2009b). This 'chromatic centre' (Mishra, 2016) is fluid, accommodating, and contingent upon the prevailing governing and regulatory regime.

In keeping with the complex, liminal, and contingent nature of a subaltern street (Arnold, 2019), the chapter discusses the street vending in Kolkata from a perspective of gray spacing (Yiftachel, 2009a, 2009b) and how it is subverted through their 'quiet encroachment' (Bayat, 2000). In looking at this mode of existence, the chapter does not subscribe to the political

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economy perspective that sees the shrinking of urban space for the poor as emanating from the logic of capitalism and neoliberalism (Roever and Skinner, 2016). Neither does it view everything as the heroic entrepreneurship of the subaltern and its extraordinary zeal to recuperate (de Soto, 2001). Instead, the chapter chooses a position that experiences the divide between formality and informality as relational, contingent, fluid, and contested (Schindler, 2013, 2014, 2016). Such a position helps to clarify the totality of the context, rather than being restricted to one or other of the ontological perspectives that emphatically tethers to a theoretically informed structure.

The study aims at reflecting on the historical processes of gray spacing the street vendors in the Global South, especially India and Kolkata, and to show how gray spacing is subverted through quiet encroachment as a mode of 'silent, protracted but pervasive advancement of the ordinary' (Bayat, 1997). Such an endeavour is realized through three concepts. First, agonistic and legalized resistance that *reverses the gray spacing* by continuously shifting and charting the formal and informal ways of being and reciprocating through modalities of which the street vendors were once a victim. Secondly, *habituated spatiality and social capital*, where there is an entwining of everyday life and spatial consciousness that ascribes a routinized legitimacy and how it informs social capital at one place and its absence in the other place. The third mode of being goes beyond the quiet encroachment into the realm of *bold encroachment* (Gillespie, 2017), which is neither sporadic nor individualistic; rather, it is what Scott calls the 'real resistance' (Scott, 1986). It is collaborative, organized, and politically exerting.

The chapter then charts in the marginal space to question the politics of inclusion based on The Street Vendors Act of 2014 and practices of Hawker Sangram Committee. It views the practice as a form of civic governmentality that assimilates into the system that it was once agonistic towards. Second, it documents how Hawker Sangram Committee brings about differentiated politics regarding those who lay claim to the street space, but have differences in identity and utilization of the space.

Hawkers in Kolkata

Ritajyoti Bandyopadhyay (2016) traces the origin of the word 'hawker' to the post-partition (1947) rehabilitation of refugees into several hawker corners in the city of Calcutta. Even though the word is seldom referred to in global discussions and dissemination, Bandopadhyay asserts its protracted presence in the political geography of the city. The vernacularised meaning of the word is derived from an Arabic word, *haq*, meaning a 'due status' or a 'just, correct and ethical stake' (Bandyopadhyay, 2011). This gives the hawker's movement due credence of being a struggle in its true essence. Street vending in Kolkata became conspicuous and a 'contamination' to 'order of the things' after the refugees from erstwhile East Pakistan practised their livelihood on the streets of a hitherto *bhadralok*[1] city (Roy,

2008). In the present, street vending is found in every major corner of the city or roaming around in the narrowest of the streets, specialising in one or another commodity. However, the problem with street hawking is not related to the mobile hawking carts, but with the sedentary ones that occupy the street space.

The existence of hawkers in Kolkata as early as 1855 is found in a Bengali journal called *Somprakash* (Biswas, 1992). Referring to them as 'Calcuttans of the soil', Biswas underlines the poverty-stricken nature of their existence on the streets of Calcutta along with other marginal groups. However, the street vendors were encouraged to do their business in several bazaars in Calcutta in colonial times. According to one estimate, there were over twenty such bazaars in Calcutta around 1785 (Sreemani, 1994). The land, therefore, was privately owned where the landlords rent out a space for vending, thus accumulating huge profits from the process. Such was the proliferation of the bazaar economy throughout the city that it concretised a new identity for the locality that extends to the present times. However, there were many other public-owned lands for plying businesses.

The street vending exercise became a menace when the hitherto privately owned land came under the control of a newly independent state with heightened internal sovereignty that precipitated to the individual level. However, as Anjaria says, street vending started to become a major concern of policing after the passing of municipal laws in the 1880s (2011), which empowered the state to cleanse the streets. In addition, the division between the private and public realms became more pronounced after independence. The private use of public space made the gentrified middle-class skeptical about their consumption of the street for circulation and gratification. As said earlier, the influx of refugees and their economic rehabilitation was a major challenge for the state after 1947 (Bandyopadhyay, 2016). Accommodating them in street corner hawking zones was not sufficient because of the space crunch. Thus, the workable self-perpetuating livelihood option was to occupy and lay claim to the street space for plying business. The gentrified middle-class rose to action for the first time in 1952 when the Chief Minister of West Bengal, Bidhan Chandra Roy, wanted to clear College Street of the book vendors so that 'the magnificent colonial architecture of Presidency College and the University of Calcutta could be visible from a distance'[2] (Bandyopadhyay, 2009). Since the market supplied cheap books to the city and beyond, the idea was finally laid to rest.

Since then, Calcutta/Kolkata has experienced regular evictions of street hawkers for one reason or another; however, two such eviction drives must be taken into account for a perspective. In the first half of the 1970s, the Calcutta Municipal Corporation markets could not buy much for the government; the profit gradually declined because of capturing of a trade by the hawkers. In 1975, Calcutta Metropolitan Development Authority, Public Works Department, and Calcutta Municipal Corporation evicted the hawkers from the streets through *Operation Hawker*. The first phase in March

covered most of the city's Central Business District, with the second phase and third phase earmarked for northern and southern areas of the city. Since that was the period of national emergency, the hawkers reacted to the eviction by gathering under the banner of the Indian National Congress as a sign of loyalty. However, 1977 was a turning point in the history of West Bengal, when the hawkers' union started switching to Left parties (Bandyopadhyay, 2016).

The Left (under the Communist Party of India (Marxist)) that had vehemently opposed Operation Hawker in 1975 ironically initiated Operation Sunshine in 1996–1997. The New Communism (Mishra, 2019; Roy, 2004) in the second half of the 20th century emulated, though with caution and criticism, the reformed economy of the federal government. When the Confederation of Indian Industry invited British Prime Minister John Major to Calcutta, the Left government felt the utmost need to showcase the investment potential of the city (Sen, 1998). Therefore, *Operation Sunshine* was carried out in the winters of 1996 and 1997 along 21 streets between the northern Shyambazar and southern Gariahat.[3] In this operation, thousands of hawkers were evicted, resulting in mass suicides (Bandyopadhyay, 2016). Since Operation Sunshine was the brainchild of the most powerful party in the Left coalition – CPI(M) – the worker's wing of the party, the Centre of Indian Trade Unions (CITU) kept itself separate from the eventual protest by the hawkers. A hawker's rights organization of 32 non-CITU hawker unions, Hawker Sangram Committee (HSC), formed just before the operation, took over the movement on behalf of the hawkers.

In the present times, Kolkata has around 3.25 vending units spread all over the city that generate INR 100 crore per day through sales (Javed and Ray, 2019). And, it is estimated that 2.75 lakh hawkers in 2005–2006 had given INR 265 crore in a year as a bribe to different agencies (Ganguly, 2006). Hawker Sangram Committee is the largest union of hawkers and has proved its credibility in securing the right to trade for them.

Since then, there have been intermittent evictions in Kolkata. However, their intensity and dimension have been reduced. The subsequent governments have trod the path carefully and attempted co-optation in place of confrontation. The street space that bustles with commodities for every section of the society in this global south city has proliferated in contemporary times, but always through rectification of practices and policies. As a matter of such endeavors, the gastronomic city now serves the best and most affordable street food in India (Gupta, 2018).

Street Vending and Gray Spacing

Gray space is an idea developed by Oren Yiftachel (2009a, 2009b) in his study of the struggles of Bedouin Arabs in the Beersheba region of Israel/Palestine in the moment of new colonial relations that brings into light a new subjectivity. This space moves beyond the dichotomized perception of

modernist thought into a chromatic boundary that is 'positioned between the 'whiteness' of legality/approval/safety, and the 'blackness' of eviction/destruction/death' (Yiftachel, 2009b). Here the acceptance/rejection is a slippery and contingent mode of being that is always shifting (Yiftachel, 2009a) and keeps informality ' "in the shadow" of the formal, planned city, polity and economy' (Yiftachel, 2009b). He finds that while tethered to the discourse of criminality and contamination to the 'order of things' on one hand, the informality in question is not only tolerated but also encouraged to prosper on the other hand. This dual mode of existence as simultaneously legal and illegal defines the boundary of a gray space, concretized through what Yiftachel calls 'politics of un-recognition' (Yiftachel, 2009b). With the dawn of new colonial relations, the gray spacing in contemporary urbanism has radicalized the Bedouin Arabs into articulation of practices, movements, and discourses, and their disengagement from the state.

This study discusses the street vendor's everyday life in the city of Kolkata through the optic of gray space. However, I wish to stretch the idea further to accommodate the situation where there is a strong state presence in the everyday functioning of the unionized street vendors in Kolkata, unlike that of Bedouin Arabs. It replaces the practice of disengagement with the experience of co-optation, where the subalterns are inducted not only into the neoliberal modes of being but myriad ways of the contemporary urban regime (Roy, 2009). Drawing from the first point of departure, the second point highlights the absence of subverting urban governance, as in Beersheba, in the urban political geography of Kolkata. Instead, something diagonally opposite happens when the street vendor's autonomy intimidates the state.

Street vendors in places of disengagement with the state engage with the lower state functionaries and political parties in ways that secure their position. As a matter of fact, the state does not want to get rid of the informal economy that generates 100 crores of sales every day. But at the same time, their presence on street space nudges the aesthetics of a middle-class that forms the main consumer of the city. In light of such a double-bind, gray spacing is the only way forward.

The form of existence that remains in 'permanent temporariness' is what I call the gray spacing of street vendors. The transitional line that separates legal from illegal and situates gray spaces is always in flux. They change with modes of government. In some of the street corners, their presence is enjoyed and seen as a part of mutual considerations (Bandyopadhyay, 2009), while in other places the conflict is considerably higher. In tune with these solidarities and conflicts, urban governance takes differentiated initiatives and interventions regarding street vending. Therefore, when a massive fire broke out in a large south Kolkata hawking zone, it was decided by the municipal authorities that vendors would not be tolerated within 50 feet of main traffic intersections (Roy, 2019). Terming it as 'Problem Number One in Kolkata', that sees neighborhoods turning ugly and house-fronts as urinals, the middle-class in the otherwise posh locality of the city looked upon

the municipal corporation for any 'support from the system' (Bandyopadhyay and Javed, 2019). In another instance, since the fire broke out due to the use of plastic sheets as roofs and walls, its use was banned by the municipal corporation. Thus, while disposing of plastic, the vending units replaced them with temporary structures like steel bars and tin sheets. The structure which was till then temporary was made permanent. Thus, an emergency that broke out in the heart of the city was an opportunity for both the contesting parties. The informality became restricted but simultaneously firmer and more permanent.

In a judgement[4] regarding street vendors, the Supreme Court of India reflected upon how the 'comfort and convenience of the general public' is maintained by street vendors through the provision of consumption goods at a cheaper price (Roever and Skinner, 2016). In another judgement,[5] the court raised an aesthetic concern about the nuisance slums create in 'the capital of the country', thus maligning its *showpiece*-ness (Ghertner, 2011). The difference in perspective about two different modes of informality hints at their differing nature. While street vending 'considerably add[s] to the comfort and convenience of the general public', slums, on the other hand, 'give[s] rise to domestic waste being strewn of open land in and around' them.[6] A politically assertive middle-class that depends upon the incessant flow of cheaper goods (Schindler, 2016) does not wish to do away with them; rather they 'seek to regulate the poor's access to space and circulation' (Schindler, 2014). This is what characterizes a gray space.

Quiet Encroachment of the Ordinary

Asef Bayat's (1997, 2000) work on not-so-democratic sites of the Middle East hinges on the idea of poverty and the poor's agency to resist the naturalized hegemony. His idea of Quiet Encroachment is an adjustment between the essentialist, reductionist, and perplexing ideas of the poor and their resistance. It is a form of existence that engenders the ways that the subalterns expand their life and livelihood options without getting in a confrontation with the state or any other hegemonic being. It is 'the silent, protracted but pervasive advancement of the ordinary people on the propertied and powerful in order to survive and improve their lives' (Bayat, 1997). Such social non-movements, as 'collective action of non-collective actors', are more concerned with the practice of securing sustenance than with full-on protest (Bayat 2010, 2012).

The encroachment in its quiet form resonates with the idea of 'token resistance' (Scott, 1986). While the idea originally germinated for the peasant class, its epistemic breadth is wide enough to accommodate the urban classes. As distinct from 'real resistance', the token resistance is an act of atomistic, unorganized, and opportunistic self-indulgence with no 'revolutionary consequences' that proceeds through 'an accommodation with the system of domination'. In urban settings, it reflects the everyday

accommodations and contestations that somehow resist the rationality of the state without being explicit. For Bayat, even the acceptance of state rationality often manifests itself as a resistance that restricts us from demarcating only a handful of practices as essentially resistive. Such practices must not be characterised as non-violent only, in a simultaneity, it is also non-antagonistic (Roskamm, 2014). The non-antagonistic relationality sees the other as an adversary rather than an enemy. The conflicting partners engage in what Mouffe calls *agonism* that tames antagonism into a softer adversary (Roskamm, 2014).

Such spaces abound in the Indian case. Spaces of informality prosper through negations of and negotiations with different hierarchies of power through vote banks (Benjamin, 2008), partisan politics (Doshi, 2013), and 'escaping, bribing, negotiating, complying and mobility' (Tafti, 2018). This 'ordinary space of negotiation'(Anjaria, 2011) renders street space into subaltern politics, which is amplified between the attempts to displace informality and the protracted negations and negotiations to emplace them.

The chapter endeavors to discuss the quiet encroachment of the street vendors in the city of Kolkata. In that regard, the study focuses on only three such practices out of many latent ones – *reversal of gray spacing, habituated spatiality and social capital, and bold encroachment*. The study uses ethnographic tools like participant observation and archival analysis to document the observations. The participant observation took place sporadically for 10 months in the busiest of the hawker zones, and the archival exploration lasted around six months. The ethnography involved attending the hawkers during their leisure time, especially in Gariahat and Esplanade, and informal observation during the remaining period. The formal interviews could not be conducted as hawkers seldom have time during the day and more importantly, bodies like HSC have a very tight grip over their members and patrons. In such circumstances, conducting a formal interview is taxing on both mind and body.

Reversing gray spacing

Hawker Sangram Committee is the largest platform for the hawkers in Kolkata to register the atrocities meted out by the state and related grievances. This organization gained prominence after Operation Sunshine in 1996–97 and formed by clubbing around 32 different types of vendor unions. Over the years, HSC has successfully convinced the state that any form of vendor-related information cannot be procured without their intervention (Bandyopadhyay, 2009). In December 2005, the municipal corporation decided to identify the hawkers who were involved in trade before 1977 so that those involved after the period could be evicted (Bandyopadhyay, 2016). During that exercise, the HSC members accompanied the surveyors as they visited every stall. Oftentimes, the members would challenge the surveyors whenever any confusion arose regarding the occupancy status of

any vacant stall. Since vacancy implicates an absence of any form of rights on the part of a hawker, its security became a major concern for the committee members. Thus, while challenging the surveyor's de facto perspective, the members would produce suitable information regarding the owner and identified the date since he/she is doing trade. The local knowledge, which is of utmost importance for a state to function, was capitalized by HSC to its advantage.

A counter-survey by HSC followed the official survey along 21 intersections of the city, comprising 2350 hawkers. The plethora of observations and information in the report became a benchmark and a milestone for all other future surveys and policy considerations. On top of that, the document became an instrument through which the street vendors exerted their significant role in benefiting the low-circuit economy by providing an accessible outlet for their products. The information that is collected by the state and a counter-survey reflect the politicized role of both the process and the information produced through it. Banking on the Foucauldian analogy of statistics (from census and surveys) as instruments of governmentality (Appadurai, 2001; Foucault, 1991) through which the contemporary mode of state governance disciplines the masses, the counter-survey in this case documented the moment of role-reversal. The state through its official machinery not only depends upon the class that it wishes to discipline, but also learns from the same exercise conducted by them. The survey as an instrument of governmentality is from top-down, while from the bottom it is reversing the governmentality by being counter-political.

Besides, the information produced by the state is the validity of its control over the classes. However, more often this marker of governance is used against the government to produce a 'counter-argument'. When street vendors are evicted from their place and their wares are confiscated, a foil of confiscation is issued in return. On said date, the hawker is asked to visit the concerned police department with the foil to get back their goods. A counterfoil is given to the vendor with the returned goods that carries all the related information about the vendor's trade. On a future date, when the police raid the same vendor for being out of place, he/she can show the counterfoil of the past confiscations to prove his legitimacy to trade. The police department that destroys records over five years old could not either re-validate the claim or refute it. The document bearing government insignia is valid even if it cannot be re-validated. This provides the second trope to substantiate the reversal of gray spacing by the hawkers in Kolkata. The hawkers utilize the markers of government hegemony over the space and its use in the later date to substantiate a claim of being an occupant. Therefore, the quiet encroachment in this particular situation never challenges the ascription of informality by the state; instead, it challenges the modes through which the state uproots them from the streets. The records counter the jurisdiction of the state in limiting those who were not there before some temporal threshold.

The gray spacing exercises are countered and reversed through radicalization and quiet encroachment that is anti-hegemonic and not counter-hegemonic (Yiftachel, 2009a). As quintessentially anti-hegemonic, it is a productive exercise for the street vendors because it lets them put their right-based needs by reciprocating in the same terms as those of the state.

Habituated spatiality and social capital

Habituated spatiality is 'any spatial formation that a populace is habituated with' (Mishra, 2016). It is a part of geography's long-cherished idea of *place* and *place-making* that when expanded has the potential to suture political and social ideas in an assemblage. While raising the point squarely regarding the red-light district in Kolkata, I reflected on its social implication that tolerates the 'immoral spaces' as a routinized space that forms an arena of everyday circulation in the city's streets (Mishra, 2016). Since it forms a part of everyday life that a citizen is habituated with, it seldom provokes his thoughts into action to discipline the immorality. The indifference to and toleration of the space hints at its platitudinous nature that may provide 'ocular gratification' but remain short of provoking any de trop action. In the present chapter, I redraw the idea by first moving beyond ocular gratification and incorporating the consumption need of a neoliberal subject, and second, by highlighting its political undertones that capitalize on these consumption needs.

In contemporary times, motion pictures being a matter of consumption also generate consumption patterns at large. In one such film, the leading actor wore a necklace around her neck that instantly became a much-sought-after item in the city's markets. While the upscale shops and malls started publicizing the availability of the necklace and its prototypes through news and print media, the street vendors started to call the female passerby. During participant observation, I realized the potency of such calls and the attention they draw. Even though fashion and consumption needs are volatile, the street vendors keep themselves abreast of the latest requisitions of the customers in conjunction with the trend in the country, if not globally.

I realized the political implications in securing the street vendors in their place. The successful provision of the latest consumer goods at a cheaper price, that which the Supreme Court of India[7] also acknowledges (Roever and Skinner, 2016), is the reason the large swath of the population in Kolkata (both middle- and lower-class) clings to street vendors located throughout the city. In the process, the quotidian transactional relationship that street vendors have with consumers helps generate a common consensus that any eviction by the state will ruin the relationship that meets the corporeal gratification of the city population. Here, I would like to expand on Bass Loretta's (2000) idea of 'commerce of circumstance' by circumnavigating the conditions of gratification, doubled by cheap prices, that help prosper the commerce of the street vendors. Meeting these gratifications

plays an overarching role to secure their stable position vis-à-vis the state policy. Popular vending zones like Esplanade, Gariahat, Hatibagan, and Sealdah in Kolkata are quintessentially such types of zones with a historical legacy of serving a huge population both within and outside the limits of the city.

The transactional relationship that helps maintain the quiet encroachment of the street vendors is not universal throughout the city. A large gathering of hawkers in places like Esplanade, Gariahat, Hatibagan, and Sealdah are relatively more secure from eviction than hawkers who are more loosely segregated in different locales. These small vending units are more prone to eviction because they have established themselves only recently, so did not develop enough habituated spatiality; and the social capital they've developed is not matured enough to challenge policing through quiet encroachment.

Quiet encroachment, even though atomistic, needs a togetherness among the subalterns where social capital can be harnessed for individual or group gains. Bourdieu's Social Capital implies 'actual or potential resources' possessed by a social group enables its members to have a 'collectively-owned capital' (Bourdieu, 1986). Since Bourdieu's idea hinges around both the materialist and symbolic dimensions, it provides the basis upon which the contingencies of social relationships can be comprehended. Besides, the intensification of the idea of social capital as found in the *social infrastructure* idea of McFarlane and Silver (2017) extends the social relationship into socio-material dimensions. It includes both the practices and the individuals, and the practices being shaped by materiality and how it 'exceeds those conditions'.

In an ethnographic engagement over a longer duration, I realized the conditions and contingencies of social infrastructure and its limits among the street vendors in Kolkata. The social capital among the vendors helps them secure customers, but at the same time, it is limited when the vendors strategize to solicit clients and obstruct them from going to the nearby vendors. The social infrastructure is such that if some item is not available with a vendor, he/she can procure it from other vendors and sell it to the client. The assemblage in its sociomateriality relies on transactions through the use of letterheads and rubber stamps. The use of commercial elements like letterheads and stamps questions the capital's unconditional nature and also establishes the legitimacy and permanence of the street vendors to do trade. Thus, the instrumental nature of social infrastructure is reflected in using materials through which trustworthiness in a commercial setting is maintained. In sites where state policing is regular and confrontation minimal, the social infrastructure in its sociomateriality like mobile phones, whistling techniques, and alert signals is of utmost importance. On the pavement of heritage and a luxurious hotel – The Grand Oberoi – I came across vendors whose items are regularly confiscated by the police. When the police raid one end of the informal market, the vendors communicate about it to other

vendors in myriad ways. It facilitates the least amount of confiscation, thus presents more challenge to the police.

However, there are limits to social infrastructure. For McFarlane and Silver, demolition is the most important limit. But in Kolkata, it is both limited and facilitated by the type of occupational dividend. In the 'largest secondhand book market in the world and largest book market in India' (Chattopadhyay, 2017) – College Street – the social infrastructure is limited by the absence of occupational dividends, whose presence ensures profit for all involved in the selling of any item. For instance, when a bookstall vendor was asked about his tussle with the nearby vendor, he said,

> '*Shankar always calls my customers to his shop by different gestures. I have repeatedly asked him not to do but he would never listen. Today, a customer was solicited by him that first entered my shop. Before I could arrange for the books from other shops and earn something, he called them through gestures*'.

Shankar would not have minded had the other vendor supplied the requisite item through him. Had the customer been in his shop, he would have looked for it with him and shared some profit. Thus, the dividend he was about to receive did not reach him. The occupational solidarity is limited to situations when the probability to earn a profit is negligible for a vendor who in that case refers the customer to another vendor and in situations when the occupational dividend is staying with him.

Thus, the habituated spatiality and the social capital work as an instrument of quiet encroachment, but are limited in some of the scattered and recently established vending units and in instances where there is an absence of occupational dividend.

Bold encroachment

The quiet encroachment which is atomistic, sporadic, and agonistic turns bold with collectivism and legal referencing. In his study of street vendors and squatter settlements in Ghana, Gillespie documents the transition from quiet to bold encroachment through 'collective action' (Gillespie, 2017). Vendor collectivity around the atrocities meted out by the state first started to take shape in Calcutta in the late 1950s when the political Left's worker parties began to form a hawker's union (Bandyopadhyay, 2009). This was a period of intense unemployment, buttressed by migration after the partition of the country. Since then, the hawker unions have shifted allegiance from the Indian National Congress Party to the Left parties. Such was the condition of partisan politics that a hawker union affiliated to a particular party would seldom stand by the side of a union affiliated to some other party. During Operation Sunshine, most of the hawker unions were on one side of the fulcrum while the biggest party of the Left

conglomerate's labour wing CITU was on the other side (Bandyopadhyay, 2009). The allegiance to any of the political parties would save them either from forceful evictions or help channelize collective protest. Slogans like '*Goriber devi Indira Gandhi amar rahe*' (Long live the goddess of poor, Indira Gandhi) in the mid-1970s in Kolkata reflect the contextual commitment to the Prime Minister of a country who embodied the state during the National Emergency (Bandyopadhyay, 2016). The political parties reciprocated, too. In 1969, during the regime of the United Front government in the state of West Bengal, the Workers Party of India leader reminded the government that since the hawkers from Gariahat are loyal to the Left, the Deputy Chief Minister must reconsider the plan to evict them (Bandyopadhyay, 2016).

However, things began to change after the mid-1990s concomitantly in India and West Bengal. The landscape of protest began to be concretized outside the ambit of political parties. Against the adjustment in the economic structure of the country and a gradual rise in communalism reflected quintessentially in the Babri Masjid demolition, the National Alliance of People's Movements (NAPM) was formed.[8] A couple of years later, street vendors all over the country assembled under the banner of the National Association of Street Vendors of India (NASVI) in 1998, which was finally registered as a society in 2003. Meanwhile in Calcutta, Operation Sunshine took place during 1996–97 and assembled over 30 hawker unions under the leadership of the Hawker Sangram Committee (HSC). Since then, the membership of the organization has increased to 65 hawker unions (Bandyopadhyay, 2016). HSC has successfully linked with NAPM and NASVI over the years. The constituent hawker unions in HSC are free to maintain allegiance to their respective parental political parties, but are barred from using their flags or any markers of allegiance when under HSC's banner (Bandyopadhyay, 2016). Thus, over a short period, HSC has successfully converged the conflicting political views into a single commitment that secures the livelihood options of the street vendors. It has collectively raised voices against national and global affairs like Foreign Direct Investment in retail trade (Bandyopadhyay, 2016) and the Anti-Wal-Mart Campaign across Indian cities (Bandyopadhyay, 2011).

HSC has effectively convinced the plethora of policymakers that their intervention is of utmost relevance in any enumeration or regulation regarding street hawkers. Their leader, Shaktiman Ghosh, was included in a committee formed by the mayor of the city corporation in 2005. Since then, HSC has obstructed many evictions through the submission of evidential documents and using bureaucratic and academic languages, often taking help from noted economists (Bandyopadhyay, 2011). HSC now functions as a nodal agency of the hawkers in Kolkata, regulating the number of street vendors in a specific locality, setting norms for occupying the street space, and acting as guarantors for credits from informal bankers (Bandyopadhyay, 2009). Besides, it knows the irrevocability of bribes for survival, thus

resorting to negotiating the amount of weekly bribe money with the grassroots bureaucracy (Bandyopadhyay, 2009).

HSC is highly successful in mutating the party-induced politics to what Bandopadhyay calls 'Judicialization of politics' (Bandyopadhyay, 2016). Referring to Partha Chatterjee's documentation of intense party presence in every affair in rural West Bengal – so much so that there seems no need for police and courts – Bandopadhyay experiences a practice that moves away from party allegiance to the court of justice. With their strong connection with civil society and lawyers' collectives, HSC is taking the cases of eviction to the courts. They are fighting against eviction through sloganeering on streets and judicial jargon in the court. When Shaktiman Ghosh refers to Article 19 (1) (g) of the Constitution of India (Ghosh 2000) that secures the right of an individual to carry on with his/her profession, he is putting his point more boldly with no prejudices or trepidation.

At the Margin

NASVI was formed after the *Bellagio International Declaration of Street Vendors* was adopted and signed in 1995. The agreement signed at the meeting of the International Alliance of Street Vendors in Bellagio, Italy is considered a 'landmark development in the vendors' movement at the global level' (Sinha and Roever, 2011). The protracted bold encroachment and persuasion by bodies like NASVI led to the passing of the Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act in 2014 by the federal government. The law ordained the formation of Town Vending Committees (TVC) with 40% representation of vendors, regular enumeration of the street vendors, and at least a 30-day notice before evicting them. Even if the regulation is implemented in piecemeals and remains tangential to the main ethos behind it, it proliferates the same development rationality that NASVI had vowed to fight against. Ananya Roy in her article on civic governmentality calls this '*politics of inclusion*' (Roy, 2009). It moves through knowledge creation, negotiation, and civility to assimilate with the regime it was agonistic for. The Street Vendors Act in its proactive role has strictly regulated the modes of conduct that will be tolerated and secures that over time through regular enumerations and notices of eviction. What it does is the formalization of informality that now has a limit to operate and a boundary, beyond which the regulation's ethos becomes illegible and informality intolerable. HSC in its avatar of self-enumerations and regularization of bribery and controlling utilization of street space is co-opted by the regime of governance. It has formalized the informality.

HSC's control of the utilization of space has brought uniformity to a street vendor's life. However, on the other hand, it has created differentiated subjectivities (Doshi, 2013). HSC not only consolidates street space for the hawkers, but also does so for the pavement dwellers (Bandyopadhyay, 2009). Thus, in a neoliberal phase of urban governance when street space

is not only regimented but whose dwellers are also kept out of state provisioning, HSC's role is sometimes a double bind vis-à-vis the state's role and at other times an aggravation of hegemony in conjunction with that of the state, thus 'fracturing' subjectivities through 'politicization of difference' (Doshi, 2013). It is tolerated in excess of the vendor's right to street space and discriminated against when it infringes upon the same street space (Bandyopadhyay, 2009). After Operation Sunshine, while the street vendors have intensely consolidated their position, the evicted pavement dwellers could not return to their original locations as the vendors then occupied it. Second, HSC discriminates against the vendors from other unions or an individual vendor who is not its party. Thus, HSC's idea of inclusivity and convergence is defeated in such circumstances.

The current study in its endeavor to understand the modes of gray spacing and quiet encroachment by the vendors in Kolkata is limited by its incomprehensibility of other intense modes of the practices. Nevertheless, it sets the agenda rolling for accommodating the myriad and nuanced modes into further studies. Besides, apart from looking for the nature of those practices, further studies are also expected to document the ways in which these practices engender differentiated subjectivities.

Notes

1 S N Mukherjee (1993), while charting the history of the word *bhadralok* in Bengali language and literature, stressed upon it as an 'analytical category' and a '*de facto* group' and not a caste category. The word means the cultured upper and middle class with good taste, existing in opposition to the uncultured and poor *abhadralok/chotolok*. The reference to bhadralok as men with good taste and gentleness is frequently found in the works of literary giants and scholars like Bankim Chandra Chattopadhyay and Sivanath Shastri. The binary opposition still persists in the society, albeit with different contextual connotations.

2 As I have explained later in the chapter, the governmentality now ensues through politics of cooptation in place of eviction and confrontation. During the 200 years' celebration of the prestigious Presidency University (established as a college in 1817), the book vendors (coincidentally, also completing 200 years) (Chattopadhyay, 2017) that flank the university gates came up as a menace factor. As a hindrance to the aesthetic academics, this time the vendors were provided with aesthetically sound infrastructure to assimilate into a whole.

3 Shyambazar and Gariahat are the two largest retail markets in Kolkata, lying at the northern and the southern parts of the city, respectively. Given the prevalence of hawking in the city, both these retail centres are naturally the focal point for hawkers.

4 Sodan Singh vs New Delhi Municipal Corporation, available at http://indiankanoon.org/doc/1767433/.

5 Almitra H. Patel and Anr. vs Union of India and Ors, available at https://indiankanoon.org/doc/339109/.

6 Almitra H. Patel and Anr. vs Union of India and Ors, available at https://indiankanoon.org/doc/339109/.

7 Sodan Singh vs New Delhi Municipal Corporation, available at http://indiankanoon.org/doc/1767433/.

8 http://napm-india.org/?page_id=4083

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6 Housing Poverty in Kolkata

Can Rental Market Reforms Be the Viable Solution?

Ismail Haque, Dipendra Nath Das and Priyank Pravin Patel

With its messy and hidden urbanisation (Ellis and Roberts, 2016), coupled with rising socioeconomic inequality and concomitant environmental degradation issues, the concerns over equitable access to affordable, adequate, and sustainable housing and habitations have become more intricate in urban India, including in its bustling metropolis of Kolkata. Although since independence a plethora of housing programmes/policies have been implemented by successive governments, these have been largely myopic and have achieved only marginal successes due to their lack of continuity or interconnectedness (Tiwari and Rao, 2016). Continuing with such policies, in line with the United Nation's emphasis on greater tenure security in housing provisions, the incumbent union government also launched its own ambitious housing programme, the *Pradhan Mantri Awas Yojana Housing for All (Urban)* [PMAY-HFA (U)], to cater to the escalating unmet ownership housing needs of the Economically Weaker Sections (EWS) and the Low-Income Groups (LIG), including the Middle-Income Groups (MIG), by 2022. Nonetheless, how far this much-celebrated centrally-funded housing scheme will be effective in solving the housing needs of the urban poor remains questionable (Kundu and Kumar, 2017; Bhan, 2017; D'Souza, 2019). The sheer magnitude of households (18.78 million) which have been left with constrained housing choices (i.e. in relation to house type and tenure) and suffer from a high level of shelter deprivation today across urban India (MoHUPA, 2012) bears out this surmise. The corresponding figures for Kolkata are enormous: about 31% of its residents are struggling at present for a better home or are likely to face a residence-centric crisis shortly.

The economic reforms of the 1990s had caused marked changes in the housing market dynamics of Kolkata with the advent of liberalisation, privatisation, and globalisation, and the consequent stunning economic growth. The housing reform measures implemented therein from the post-reform period onwards have brought about a significant transition in housing financing, its production and delivery mechanisms, with higher stakeholder engagement and, most importantly, a shift in the government's role from provider to facilitator. As a corollary, Kolkata has experienced major housing market reforms manifested by decelerating public spending on social

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welfare, a new real estate culture supported by the state and private players, new township development, deregulation of the housing finance sector, and the privatisation of public rental housing. While it has been recognized that these reform measures were partly successful in revitalizing Kolkata's housing sectors, especially in the context of providing housing for middle- and higher-income populations as well as in attracting investment from national and international private agencies, they have actually failed to achieve their larger social agenda of *'housing the poor'*(Sengupta, 2007). The sheer magnitude of housing poverty has thus remained an enduring concern for Kolkata amidst such *'poor blind'* and *exclusionary* housing policies. Aside from this, the housing market in Kolkata has been plagued by supply-side constraints, especially for EWS, LIG, and MIG groups, in terms of both ownership and rental housing, despite there being effective demand. Thus, there remains a desperate need to ensure greater tenure security, which has otherwise not been addressed adequately in such reform measures. Furthermore, as housing policies across Indian cities have always been more biased towards inculcating ownership-based housing, which is a costly affair, or in providing land and individual property titles to the beneficiary households, the potential of rental housing as a viable alternative for the urban poor has always been undermined or put in the shade.

Given this context, this chapter argues that since urban policymakers possibly misconstrue the intricacies of housing poverty in Kolkata, they seldom formulate schemes that can be a catalyst towards solving this problem. In fact, almost all housing reform measures undertaken for Kolkata have largely been *'poor blind'* and myopic. This chapter demonstrates that such a poor blindness and exclusionary policy climate has been the dominant reason for housing scheme failures in Kolkata. It asks a simple question: given the persistent *structural duality* in its hybrid urban context (in terms of poverty, inequality, and policies), can rental market reforms be a viable solution for Kolkata's endemic housing poverty?

Following this introduction, the next section provides a detailed account of the socio-political trajectories and housing reforms in Kolkata that have occurred over the last few decades.

Socio-political Trajectories and Housing Reforms in Kolkata: A Review

Kolkata's housing problems have been deeply rooted in its history of unequal colonial development and a range of socio-political turmoil issues that arose during the mid-twentieth century. These socio-political and economic environments have set the context within which Kolkata's housing sector reforms were eventually institutionalised. Table 6.1 demonstrates a phase-wise detailed account of the socio-political trajectories and housing market reforms that have taken place in Kolkata from the 20th century to the present.

Table 6.1 Timeline of socio-political trajectories and housing reforms in Kolkata

Trajectories	*Phase I: Pre-independence to 1970*	*Phase II: 1970 to 1990*	*Phase III: 1990 to 2010*	*Phase IV: 2011 onwards*
Political and Institutional	• Capital of British India till 1911 • Transfer of capital to Delhi in 1912 with concomitant shift in major development focus away from Calcutta • Establishment of the Calcutta Improvement Trust in 1912 • Independence in 1947 and ensuing Indo-Pak Partition • Calcutta Thika Tenancy Act, 1949 passed for tenure regularization • To accommodate the escalating housing needs, Kalyani, a planned township, built in the early 1950s near Kolkata • Formation of CMPO in 1962 and KMDA in 1970 • Between 1958–1965, Bidhannagar (Salt Lake), another planned new town adjacent to Kolkata developed to house the ever-growing population	• West Bengal Housing Board (WBHB) established in 1972 • Under Fifth Five-Year Plan (1974–79), construction of formal housing for all groups initiated • Instead of providing complete housing, beneficiary-participation through sites and services and in-situ neighbourhood up-gradation approaches had been encouraging • Urban Land Ceiling and Regulation Act (ULCRA), 1976 passed by national govt. to increase urban land stocks for supplying low-cost housing to all • New political era begins with the coming to power of the Left Front Government in 1977	• Economic reforms of 1991 and adoption of Structural Adjustment Programmes (SAP) • Housing as a symptom of economic growth gets widespread recognition • Economic liberalization lures huge national and international private investments in the housing and real estate sector and for new township development • HIDCO established to plan and execute development projects in the Rajarhat-New Town area • Deregulation of housing finance and privatization of public rental housing sectors • Public spending on the social sector diminishes • Centrally sponsored housing programmes (JnNURM, RAY in 2005 and 2011)	• Political change: Trinamul Congress (TMC) govt. comes into power in 2011 • LIG housing scheme (Urban) for minority population initiated in 2012 • MIG housing scheme on rental basis framed in 2012 • Govt. of WB launches 'Gitanjali' housing scheme for EWS (non-municipal urban area) in 2014 • Centrally sponsored housing scheme PMAY-HFA 2022 launched in July 2015

(*Continued*)

Table 6.1 (Continued)

Trajectories	*Phase I: Pre-independence to 1970*	*Phase II: 1970 to 1990*	*Phase III: 1990 to 2010*	*Phase IV: 2011 onwards*
Economic	• Serves as centre for vital administrative and political functions and an important commercial hub • Decline in investment in housing sector and other infrastructure • Industrial growth slow down	• Economic growth slow down • Urban land prices increase due to under supply	• 2000's SEZ policy • 100% FDI allowed for formation of new townships, housing, and commercial complexes, including urban infrastructure facilities • Huge service sector growth • Economic resurgence evident	• Higher economic growth • Increased public spending on social sectors and populist policies (Kanyashree scheme, Khadya Sathi, Swasthya Sathi, among others)
Social	• First Indian metropolitan city • Slow growth rate of around 1.25% until the 1940s • Bengal Famine in 1943 • Huge cross border migration during the Indo-Pak Partition • Highest population growth rate recorded during the 1940s-1950s: 5.27% [1931–1941] and 2.64% [1941–1951] • Severe shortage of housing/ basic services leads to cholera epidemic in 1958 • Huge proliferation of squatter settlements, refugee colonies/ slums • Govt. recognizes unmet need for 65,000 dwelling units/yr for the city during the period 1966–1985 to house all residents	• Cross border migration during Bangladesh Liberation War (1971) causes huge housing crisis • City growth rate begins to diminish: 2.15% [1971–1981] to 1.85% [1981–1991] • Naxalism/trade unionism creates chaos and deteriorates city infrastructure and overall economic health, perpetuating a negative image of the city	• Internal migration slows down but short distance migration unabated • City core flags significantly low growth rates while peripheral area expands at an accelerated pace • Quality of life of urban poor deteriorates due to inadequacy of housing and basic infrastructure	• City core flags negative growth (-0.18%) and peripheral area grows at much higher rate (0.98%) • Haphazard urban expansion in peri-urban areas as an outcome of faulty spatial planning • Acute shortage of housing and civic services further deteriorates the quality of living for city dwellers • 31% population of the city in urgent need of housing

Source: Prepared by the authors, based on Sengupta and Tipple, 2007 and Haque et al., 2019

Phase I (Pre-independence to 1970): Kolkata is the 14th largest metropolitan city in the world (UNDESA, 2016), having entered the million-plus league in the very first decade of the twentieth century. Once the capital of British India as well as an epicentre of major administrative, socio-cultural, political, and commercial activities for the entire country in general and for eastern India in particular, the city lost its major development focus when the British Government shifted its capital to Delhi in 1912. Nonetheless, despite declining capital investment in the housing and infrastructure sectors, huge numbers of rural migrants from its hinterland, comprised of the rest of West Bengal and its neighboring states (Uttar Pradesh, Bihar, and Orissa) had kept pouring into the city (Sengupta and Tipple, 2007). Kolkata further experienced a bottleneck situation in terms of housing and essential infrastructure provisions when it formed the destination for a very large in-migrant populace during the Bengal Famine of 1943 and again when more than one million refugees crossed West Bengal's international border with erstwhile East Pakistan and settled in Kolkata during the partition following independence in 1947 (CMDA, 1977). As a result, basic infrastructure, civic facilities, and housing conditions deteriorated severely due to the unprecedented population pressure, which turned this city into a *'premature metropolis'* (Bose, 1973). Kolkata had genuinely lacked financial and institutional support to combat such a grave situation and as surmised in Sengupta and Tipple (2007), the magnitude of housing poverty was so acute that a single dwelling per family was a rare privilege for the majority of households. Earlier studies have also substantiated that only a meager proportion of all resident families (7%) had a separate sleeping room with a separate bathroom, toilet, and kitchen facility, and that 88% of families resided in conditions where more than two members occupied a room (Chakrabartty, 1959 in Sengupta and Tipple, 2007). Such derelict housing and sanitary conditions not only impacted personal privacy and the basic wellbeing of individuals, but were also responsible for an overall deterioration in health conditions, leading to a cholera epidemic in 1958. As a corollary, the Government of West Bengal set up the Calcutta Metropolitan Planning Organization (CMPO) in 1962, with an agreement to prepare a master plan for water supply, sewerage, and drainage within its metropolitan jurisdiction, under the aegis of the WHO.

By and large, such incidences of demographic turmoil and the rapid proliferation of slums and squatter settlements, including refugee colonies, across the urbanscape kept posing critical challenges to policymakers in Kolkata (Sengupta and Tipple, 2007) during this time period, and the initiatives taken by the city authorities in this regard were commendable. As such, the *Calcutta Thika Tenancy Act*, *1949*, meant to secure the thika tenants' rights, was enacted with the implicit understanding that secure tenure rights would act as an incentive for the tenant families to upgrade their housing conditions, but this proved to be ineffectual at spurring improvement in slum conditions.

Therefore, during this first phase (pre-independence to the 1970s), key legislative and institutional strategies for housing provisions and urban development in Kolkata were set up, with this period termed the city's '*institutional development phase*'(Sengupta and Tipple, 2007). During this time, government estimates ascertained that, on average, about 65,000 new housing units would be required every year for the next 20 years (1966–1985) to meet the escalating unmet housing needs of Kolkata's residents (Dwyer, 1979). Such a grave discovery pointed towards an urgent need for large-scale government interventions to facilitate housing supply in the next couple of decades.

Phase II (1970 to 1990): A further influx of migrants into the city after the Bhola Cyclone (1970) and during the Bangladesh Liberation War (1971) put sustained and increasing pressure on the already *'gridlocked'* housing sector, leading to a massive residential crisis. During this phase, violent Naxalism/trade unionism-led chaos had resulted in the deterioration of the city's infrastructures, which, coupled with stagnant economic and industrial growth, created an overall negative image of Kolkata, and a substantial proportion of the city's populace sought shelter in dangerously overcrowded and underserviced slum settlements (Munshi, 1975; Sengupta, 2007). In 1972, the West Bengal Housing Board (WBHB) was set up and the city authority was charged with construction of 'formal housing' for all income categories under the flagship programme of the Fifth Five-Year Plan (1974–1979). At the same time, under the influence of international policy trends, the city authority initiated new legislation that primarily focused on a transition from providing complete housing units (through slum clearance and redevelopment) to promoting beneficiary participation through sites and services and *in-situ* up-gradation and improvements (Pugh, 1989). While such improvement schemes resulted in widespread infrastructure betterment in numerous low-income neighborhoods across the city, ameliorating the conditions for more than three million residents (Ramaswamy, 2008; Werlin, 1999), the proliferation of slums along the city's peripheries remained unchecked. Nevertheless, Kolkata undertook to construct fully public funded housing units by commissioning large housing projects to meet the shelter requirements of its burgeoning populace in spite of having financial constraints, with the expectation that public housing construction would provide incentives to private investors in housing production and boost apartment living culture among an otherwise skeptical public (Sengupta and Tipple, 2007). It was also assumed that this would escalate the overall demand for goods and services amidst the significantly poor economic growth during this period. The Kolkata Metropolitan Development Authority (KMDA) estimated that on average, nearly 70,000 new housing units were required to be built every year to keep pace with population growth and a further worsening of the existing housing stock, of which only a fraction was constructed, resulting in the huge market dependence for housing supply (KMDA, 2005). By and large, this phase was marked by

rising constraints placed on the involvement of private actors in housing supply and real estate development, especially as land acquisition had become very difficult after enactment of the *Urban Land Ceiling and Regulation Act (ULCRA), 1976*, which had been expected to boost the urban land stock to be utilised for supplying low-cost housing. Consequently, there was a sharp increase in land prices as an obvious outcome of land undersupply and hindered large-scale developments (Rao, 2000 in Sengupta and Tipple, 2007).

Phase III (1990 to 2010): The economic liberalization policies introduced by the Government of India in 1991 resulted in marked changes in the industry, trade, business, finance, banking, and housing sectors. To do away with the apparent negative image attached to the city over the last two decades as a result of the severe public infrastructure damages arising from political unrest, strikes, the Naxalite Movement, labour/trade unionism, administrative congestion, and corruption, making it unfavorable for investment in the housing and real estate sectors, reform measures were considered inevitable in Kolkata. Therefore, the Government of West Bengal undertook its ambitious four-pronged housing sector reform initiative following the liberalisation, privatisation, and globalisation path by emphasising public-private partnership in housing supply and large-scale real estate development, promoting Foreign Direct Investment (FDI) in new township development for addressing the land and housing supply bottleneck, adopting de-regularisation of the finance sector towards creating an efficient housing finance system, and privatisation of the public rental housing sector (Sengupta, 2007; Sud, 2014, Wang et al., 2010). Through these reforms, there was a significant transition in the government's role from being a housing provider to becoming a facilitator, and the housing sector gradually took central stage in the city's economy. Since then, as an outcome of this transformation from providing subsidies and direct housing construction to becoming an enabler for the same, state-sponsored housing supply has fallen drastically in number (Pandey and Sundaram, 1998; Mukhija, 2004; UN Habitat, 2001). While these reform-based structural adjustments were crucial not only for developing a responsive ambiance for market forces but for also reviving the housing sector in Kolkata, the success story of these much-hyped measures are actually blended (Sengupta, 2007). While it was evident that the new housing reform initiatives were successful in revitalising the housing sector by attracting considerable investment from national and international private players and delivered housing for the MIG and HIG categories, they bypassed the city's gigantic proportion of informal urban dwellers while leading to the loss of their safety nets in this regard (Sengupta, 2007). Consequently, the gains from these housing sector reforms were offset by the failure to address the larger social agenda of *'housing the poor'*. Furthermore, the State also pulled back from constructing and managing public-funded, low-priced housing, which supplied easily affordable residences for the majority of the EWS/LIG families (Sengupta and Tipple, 2007). Given this backdrop, the low-quality informal

settlements became the only viable source of affordable housing for these groups, which together made up over 80% of the city's population.

In 2005, two centrally sponsored urban housing schemes, the Basic Services for the Urban Poor (BSUP) and the Integrated Housing and Slum Development Programme (IHSDP), were launched under the flagship programme of the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) to enhance the condition of slum neighborhoods, ensure universal access to essential amenities and civic services, and to address the housing problems of the urban poor. While considerable transformations have been discernible in the context of housing sector reforms and real estate booms during this phase, people in the lower economic segments have been systemically excluded from imbibing the advantages of this progress.

Phase IV (2011 till present): The most recent phase is characterised by political changes in the state, with the Trinamul Congress (TMC) coming to power in 2011, higher economic growth, higher public spending on social welfare, and the introduction of various populist policies. Like its predecessor, the TMC Government has also taken much interest in developing the housing and real estate sector as a means of achieving economic resurgence by adopting an enabling approach to boost the market-oriented affordable housing production model (Sengupta, 2013). Along with centrally-funded urban housing schemes like the Rajiv Awas Yojana (RAY) or '*Slum Free India*', the State government has launched several housing schemes in the recent years to tackle housing problems within the city, such as the LIG housing (urban) for minority groups, MIG housing scheme on rental basis, and 'Gitanjali' housing scheme for EWS (non-municipal area). Besides this, in 2015, the union government launched the PMAY-HFA (Urban) to address housing shortages in urban India by 2022. This giant affordable housing scheme is being commissioned under four verticals: in-situ slum redevelopment, credit-linked interest subsidy, affordable housing partnership, and beneficiary-led individual house construction or enhancement. However, scholars have argued that these housing schemes are severely myopic and lack adequate understanding of the mechanisms that precipitate and perpetuate housing poverty (D'Souza, 2019), with a more nuanced housing strategy being required: one that is underpinned by a holistic understanding of the intricate dynamics of housing poverty coupled with the causative factors responsible for sustaining and exacerbating such housing problems in urban India.

Housing Poverty in Kolkata: Definition and Scale of Problems

Before getting into the scale of Kolkata's housing poverty, a brief note about what comprises 'poverty' and how housing poverty can be measured is pertinent. For decades, there have been long debates with little consensus on

what constitutes poverty and how it can be measured and mitigated. Poverty may be understood as a condition where people are deprived of general human needs. The idea of 'housing poverty' is similar to this, in that there is a threshold in terms of needs, such as an adequate supply of water and electricity, housing space availability, and minimum standards of sanitation, drainage, and hygiene (D'Souza, 2019) for residences. Housing poverty can also be conceptualized by looking at what comprises 'adequate housing'. This includes certain essential amenities like drinking water, electricity supply, sanitation, and drainage in the dwelling unit. The necessity for sufficient financial wellbeing or income to obtain a home loan or rent a house may also come under this remit. Housing poverty can crucially determine one's physical and mental health, as well as educational and economic productivity. It also impacts the potentiality of getting employment and the societal engagements of individuals through their life (Andersen, 2003). Hence, designing policies/schemes to mitigate housing poverty must prioritize the key dimensions of poverty that affect these aspects and also expand the freedom of choices available to facilitate people to function normally. This covers access to jobs and social security, home loans, greater tenure security, and hygienic and clean housing environment including quality water supply, parks and open spaces, and inclusive social relations.

Kolkata's high-magnitude housing problem has endured for decades. According to recent housing data (Census of India, 2011), about 1.41 million (31% of the city's population) people live in 5,600 slum settlements (GoI, 2015) in derelict dwelling conditions that are highly unhygienic and dangerously overcrowded, with meager access to essential civic services and within a socio-spatially segregated housing environment. Table 6.2 showcases the harsh reality of housing poverty in Kolkata at present. In fact, a colossal number of Households (HHs) require decent housing in terms of durability, livability, and the overall acceptability of the dwelling environment.

Table 6.2 Households experiencing housing poverty in Kolkata (2011)

Aspects of Housing characteristics	*Number (in lakhs)*	*% out of Total HHs*
HHs lacking pucca houses	0.71	6.90
HHs lacking good-conditioned houses	3.56	34.70
HHs lacking concretized roof	4.33	42.20
HHs lacking improved wall materials	0.92	9.00
HHs lacking improved floor materials	0.94	9.20
HHs without an exclusive room	0.44	4.30
HHs having only one room	4.36	42.50
HHs residing in homeless condition	0.42	4.10
HHs living in slums	3.01	29.34

Source: Computed by the authors from Census 2011 data

Rental Housing: A Viable Alternative to Housing Poverty

Until now, Kolkata has implemented several housing reform measures to cater to the huge existing housing demand, but progress has been stymied by several factors. In fact, in many cases, housing units built for the urban poor remain vacant; currently 6.6% (0.86 lakh) of the census houses within the city are empty despite the severe housing shortage, highlighting a disturbing housing paradox. Previous research has surmised that the uptake among slum residents for ownership-based affordable housing seems to be closely linked to the balance of benefits and costs. Costs may include social uprooting, disconnection from familiar job markets/livelihood networks, lack of access to informal credit networks, and decreased collective action stemming from rehabilitation into formal settlements in distant locations (Gandhi and Munshi, 2017; Bhunia, 2017). Overall, the success of these much-hyped housing schemes can be regarded as miniscule if the scale of housing production versus the number of units lying empty is taken into account.

The crucial questions which thus arise from this are: Whether a *one-size-fits-all* model solution through ownership-based housing production and delivery really works for the urban poor who require it urgently. Are existing mission-mode urban housing schemes (PMAY-HFA) really sensitive to all dimensions of housing poverty? Given Kolkata's chronic economic poverty, income inequality, and informality, can existing housing schemes really provide an effective solution to the housing poverty crisis among the city's poor while deliberately ignoring the potentiality of rental housing? The answer seems to be in the negative for all three of these queries and in fact, any mere target-specific or time-bound, single-frame ownership-based affordable housing model is unlikely to solve this puzzle, which instead requires a strategic blueprint sensitive to the key aspects of housing poverty and the factors that aggravate it.

This chapter argues that rental market reforms are one of the key components of a comprehensive housing strategy blueprint that can be a catalyst for solving the housing poverty problem in Kolkata.

Firstly, though ownership housing is deemed to be the ideal housing tenure arrangement in national and global housing policy frameworks, there has been an increasing consensus that forms of housing tenure beyond the ownership model may also be advantageous for a significant section of urban households. Therefore, rental housing can be a viable solution to address the persistent housing poverty in Kolkata, where the biggest proportion of households (basically EWS/LIG, working poor, unemployed, underemployed, including disabled, elderly, students, and women) find ownership-based housing unaffordable due to the higher housing price, construction cost, undersupply of low-cost housing and not being in possession of an adequate regular salaried income, which is otherwise central to the *credit-linked interest subsidy* (CLIS) housing provision.

Secondly, it is argued that while the goal of ownership housing may be 'best', it does not represent a realistic target for numerous low-income

households (Kumar, 2001). For many people, especially those living in informal settlements, rental housing can thus be a pragmatic and deliberate housing option (Kumar, A., 2016) on the grounds that: a) it provides greater mobility, flexibility, and choice to a floating population/seasonal migrant or solely-headed HHs in managing finances and thus enabling them to remit greater amounts to their family (UN Habitat and UNESCAP, 2008; Gilbert, 1999; Kumar, 2001); b) gives shelter to those HHs that are in transitory stages in their life course and do not want to make long-term economic investment towards owning a house, which becomes an immovable and illiquid asset, no matter how cheap or subsidized it may be, and; c) provides shelter proximate to workplace, thereby enhancing productivity and economic growth.

Thirdly, rental housing creates a rise in population density within the city area, checking urban spatial growth and reducing demand for expensive infrastructure along the city's periphery (Kumar, 2016). It also helps drive down the demand of urban land and may even work well in terms of social capital formation (Bhunia, 2017). Some Indian metros (Pune, Bangalore, and Hyderabad) provide low-cost sharing rental accommodation for internal migrants, backed by respective state rental housing policies. For instance, *Aarusha Homes Private Limited* has been working since 2007 to provide transit shelter for temporary or seasonal migrants in urban India (D'Souza, 2019). With effective state intervention, similar efforts can be helpful in accommodating the huge number of migrants in Kolkata.

Fourthly, besides constructing new housing units, a developer/urban policymaker must consider why a large section of landlords/owners of these units in Kolkata do not see an advantage in renting out their empty property. One of the prime reasons has been the very low rental output and rental- or property-related disputes; age-old and stringent rent control acts have had a bearing on this and thus require effective reforms. The greater proportion (80–85%) of Kolkata's rental housing is supplied by the private market, which is largely informal in nature and vulnerable to severe mismanagement and exploitation (Sengupta, 2006b). Is there room for molding behavior to develop a vibrant rental housing market with many more stakeholders? These may consist of incentives or penalties, contingent upon an investigation of what may be helpful.

By and large, rental housing can provide not only a partial solution to the existing housing problems in Kolkata but can also offer a window of opportunity for formulating an additional option of sustainable social housing for those who require it most.

Conclusion and Way Forward

This chapter has studied the problem of housing poverty faced by Kolkata over decades, decoded its socio-political trajectories, examined the context of housing poverty and housing reforms since independence, and showed how framing housing poverty solutions without a holistic and inclusive

strategy has resulted in the overall ineffectiveness of a plethora of housing reform measures implemented over the decades. Prominent reform measures for dealing with Kolkata's housing problems have been the direct supply/construction of affordable housing or enabling private market with some financial incentives or tax benefits to construct new houses. Such efforts have proven to be ineffectual in addressing the housing needs of the urban poor, primarily because the measures being implemented have been largely myopic and incompatible with the nature of urban poverty experienced by the city dwellers. Taking a departure from earlier approaches towards addressing housing poverty in Kolkata, this chapter has suggested that there is a desperate need for a balanced approach to housing issues by strongly considering rental housing market reforms, coupled with fair policies and backed by the robust demand in this sector to spur rental housing. Sustainable social rental housing in partnership with local private and foreign players and the strong engagement of the State and local governments might be the way forward. These are essential for not only catering to the colossal housing demand, but also for ensuring equitable housing outcomes in terms of quantity, usage, quality, and affordability among Kolkata's diverse residents. There is also an emerging need for vacant housing surveys, like those carried out in developed nations, to gain a more nuanced understanding of the sustainable use of existing resources.

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7 The Chequered Journeys of the Traditional Houses of North Kolkata, the Older City

Utpal Roy, Subham Pramanick and Anusua Adhikari

One of the quaint cities of South Asia, Kolkata has its origins in the wrinkled pages of history. Although it was made a presidency city by the British, its genesis may be traced to the Maurya and Gupta dynasty, and it certainly was an established trading riverport long before the Slave Dynasty of the Delhi Sultanate. The Mughals, the Portuguese, the French, and most importantly the British East India Company laid the foundation stone of the modern township there (Gupta, 2003).This implies that the emergence of this settlement dates back further than 1200 BC. After many tussles between the British colonisers and the contemporary Emperors of Bengal, in 1757, Siraj- Ud- Daulah, the Nawab of Bengal was finally defeated, leading to the British subsequently transforming the settlement from the one-time 'Traders Scale' to their 'Ruler's Sceptre', by rebuilding and redeveloping the settlement for their convenience. It served as the British Capital of India from 1772 to 1911. Thus, it can be inferred that the city has a rich history that can be perceived in numerous forms that are visible even today, much of which is borne by the architectural designs of the traditional houses and buildings. Broadly, the city of Kolkata can be categorised into three transitional, if not specific, areal extents, i.e., North, Central, and South Kolkata. Central and South Kolkata represent the business and commercial locale and a generalized upscale neighbourhood contributing a relatively impressive skyline on the macro scale. The northern belt of the city exhibits a dense mesh interwoven interchangeably with semi-straight or sinuous alleys and roads and plenty of ancient-cum-traditional housing architecture, whose skyline is relatively low and is marked by greater homogeneity. The north is also the 'native quarter' predating the development of the fort, and the CBD area created by the British administration. There are a large number of neighbourhoods in north Kolkata, like Sealdah, Sovabazar, Bagbazar, and Shyambazar, where buildings stand witness to Mughal, British, and many other traditions in architecture and design, like windows to its rich past. This chapter delves into its past and hopes to bring out the nature and character of traditional buildings, and glance through the influences in architectural style and design to reveal the intermingling of traditions and

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how they have been woven into the city's history – a heritage, less noticed, half-hidden, but as precious as iconic structures . . . and lamenting their lost glory, struggling to survive.

Out of the four zones in Kolkata which reflect architectural heritage of significant typologies, the *Dalhousie Square* area exhibits European styles of grand colonial architecture erected by the British, and the *Chitpur* area in north Kolkata possesses very unique indigenous styles (though primarily influenced by European styles) of residential architecture established by native Indians. The administrative, public, and commercial buildings established by the colonial British rulers at the *Dalhousie Square* region during the late 18th century to the end of the 19th century shaped the area as the Central Business District (CBD) of Kolkata. Those buildings followed the *Palladian, Baroque, Gothic, Neo-classical,* and *'Indo-Saracenic'* styles (Ghosh, 1996). At *Chitpur* area, palatial and small residential buildings were built throughout the 18th and 19th centuries, on par with European architectural styles, but later modified with motifs and delineations of various art forms emerging from regional traditions and architecture of India as well as the globe, and finally with an expression of indigenous style called *'Bengal Baroque'* by many critics (Bose, 2015).The *Chitpur* area developed quite organically with the *Dalhousie Square* region on its southern side, river Hugli on the western side, a canal flowing from the northern to the eastern side and four almost-parallel major roads running in a north–south direction bisecting the area. The *Chitpur Road* (presently '*Rabindra Sarani*') was the principal spine of the area, bridging the north with the south of Kolkata. The urban space of *Chitpur* exhibits a closely-knit narrow and irregular street arrangement; large and small plots with large palaces having courtyards and small buildings; buildings in a semi-detached system abutting the road, forming a continuous street facade such as those of Europe; symmetrical forms, decorative elements, articulated parapets with statues of fairies or urns; decorative iron grillwork on verandas and projected balconies; embellished entrances, sometimes with statues of lions; and a close relationship between concretized and open spaces (Bose, 2012).This urban morphology is very unique to North Kolkata, and the traditional small-scale industries and commercial activities were set up during the building of this native settlement, giving rise to a very functional and interesting commercial mosaic of the street. The growth of vernacular settlements is influenced by the particular religions, social value, climate, and availability of building materials in the local area. This gives a symbolic identity to the specific region with its unique style. Thus, vernacular architecture is also called 'architecture without an architect'(Ganguly, 2015).The major gap in this topic, however, is the present evaluation in retrospect, along with future prognostication of those houses in a comprehensive mosaic which will ultimately provide the basis of the historic understanding to manage the issues in a perspective context.

Kolkata is one of those cities that holds a variety of diverse urban architectural imprints across a long temporal scale, and thus stands out as an enriched repertoire of old to older but presently existing heritages. North Kolkata is richer in this aspect than any other part of Kolkata. For this study, some randomly selected traditional houses (in Kolkata, houses are called *Barhi* in Bengali language) are selected in North Kolkata in *wards number 25*, *28,* and *39* to investigate them in a retrospective as well as prospective vision from the present-day context. The houses in the proximal locality of North Kolkata were established by the then-Bengali elite, but are influenced by European and other elegant architectures (Ganguly, 2016).The ancient/traditional Bengali families mostly reside in the north part of Kolkata in houses that are centuries old. *Bonedi Barhi* (means Wealthy Houses) is one of these places and is over 150 years old. On the other hand, south Kolkata is mostly targeted to those who prefer living in high-rise building apartments or bungalows (Killa, 2019). If one moves through the roads of both North and South Kolkata, he/she will observe a sharp difference between them. Similarly, North Kolkata recollects the city's glorious past and lost heritage. The northern part of the city is full of traditional buildings that stand as a testimony to the colonial influence. When it comes to the rather more posh South Kolkata, one can observe modernized architecture taking over the city with well-planned complexes and well-maintained localities (Roy Chowdhury, 2020). The *Sutanuti* culture of North Kolkata is composed of the new urban feudal culture of the city. Variations in the culture of the families were unravelled architecturally in the design of the courtyard houses, where the arrogance of wealth is portrayed in the palatial mansions found principally in north Kolkata (Das, 2006).

Database, Methodology, and Objectives

Detailed data were obtained through both primary survey and secondary data collection through traditional house owners' survey of the selected wards (i.e., Wards Number 25, 38, and 39) of North Kolkata and other journals, papers, etc. were consulted as literature which helped to portray the present design of the chapter (Figure 7.1). Research gaps are identified subsequently after a thorough investigation of the existing works in this broad field, which helped to formulate the objectives. Various reports of Kolkata Municipal Corporation regarding the heritage buildings are consulted, as they are the authentic source of secondary data (KMC, 2009). Field surveys were conducted intensively to 50 targeted respondents through purposive sampling with questionnaire surveys and FGDs. The collected data were analysed through the synthesized approach blending quantitative as well as qualitative techniques. The results and subsequent interpretations helped to shape the decision-making and recommendation sections through the insertion of the valuable opinions obtained during FGDs.

This study aims to fulfill the following objectives, which will aid in covering the pros and cons of the old traditional houses which are architecturally significant. They are:

a) To investigate the retrospective pros and cons of the old traditional houses with regard to significant architectural designs.
b) To assess the peoples' perception along with owners' views about the heritage value, the future prospects of its conservation, and the fate of the traditional houses.

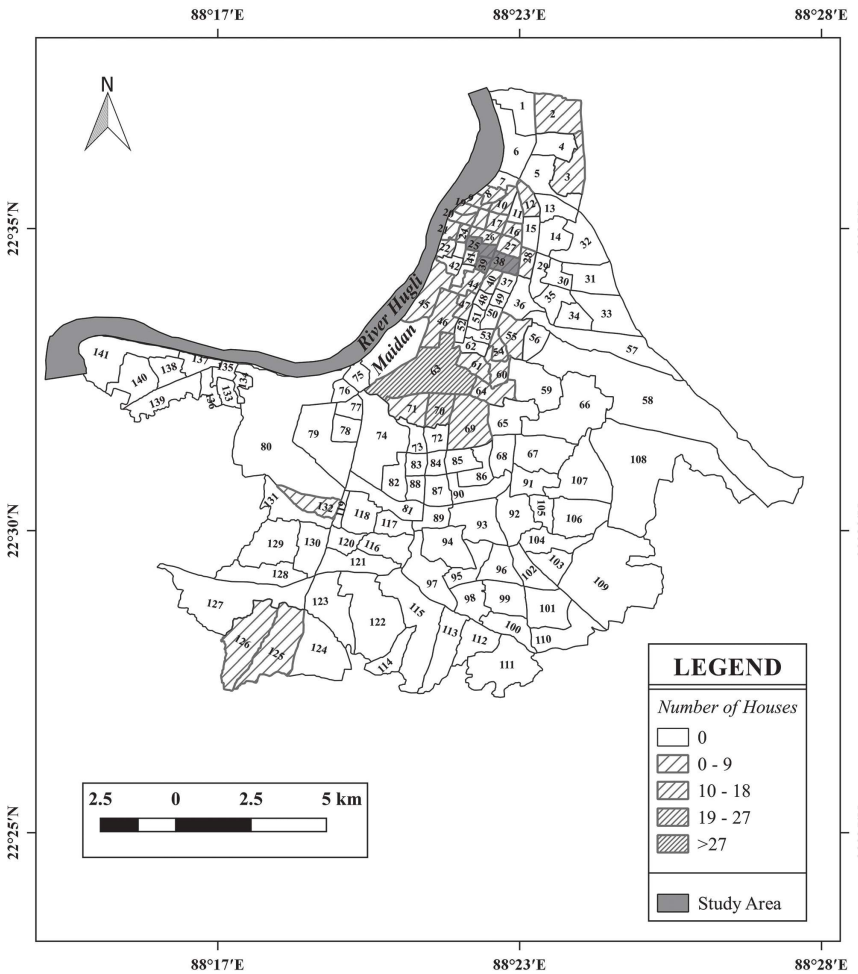

Figure 7.1 (A): Ward-wise concentration of architecturally significant buildings *(Prepared by authors) (B)* Location of selected Heritage Buildings within KMC

Source: Google Earth Pro, 2019

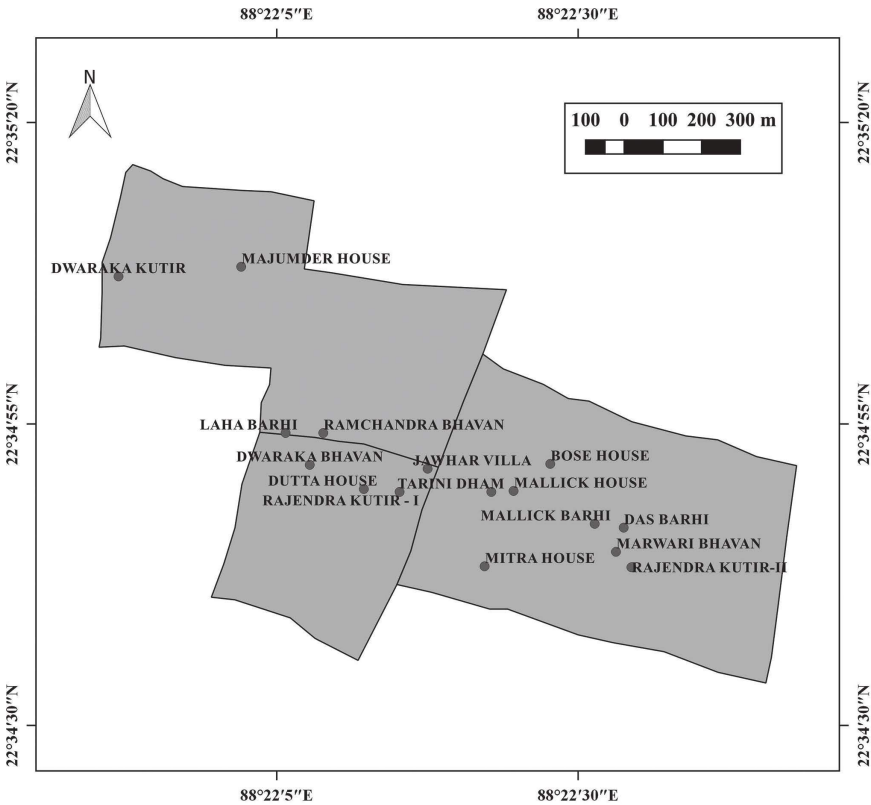

Figure 7.1 (Continued)

Spatial Distribution of Heritage Buildings across Kolkata

As discussed earlier, the region has a glorious trajectory paved by the Maurya Empire (321–185 B.C.), the Gupta Empire (319–467 A.D.), and the Slave Dynasty of Delhi Sultanate (1206–1290 A.D.) on one hand, and also kept the robust evidence of colonialism on the other hand, heralded by the leading colonisers such as British, Portuguese, Danish, etc., who made their distinctive colonies in and around Kolkata. Presently, the architectures that are evidenced in this *'City of Palaces'* as found by the present authors are *Roman architecture, Mughal architecture, Medieval Bengali architecture, colonial architecture,* and obviously the *composite or mixed architecture* (i.e., comprised of more than one dominant architectural style). Many of Kolkata's houses, with red oxide floors with their intricate cornices, elegant wrought-iron grilles, open terraces, and aristocrat interiors gave the city a

charming and temporally diversified mosaic which closely implies the architectural ethos of Kolkata.

By the mid-1850s, Kolkata developed into two separate belts that essentially segregated the inhabitants by skin colour. The British 'White Town' took into account many of the colonial buildings (e.g. *Victoria Memorial Hall,* designed by *William Emerson* following the *Indo-Saracenic revivalist style,* which uses a mixture of *British* and *Mughal* elements with *Venetian, Egyptian, Deccan,* and *Islamic* architectural influences; and *Writer's Building,* designed under the influence of European architecture), and municipal offices that are still in operation, while the 'Black Town' was comprised of a large part of North Kolkata including the old *raj barhis* (Residences of Kings and Emperors) having dominance in the locality. The map (Figure 7.1) also shows that most of the traditional houses are concentrated in North Kolkata, followed by Central Kolkata. Most of the wards of South Kolkata are devoid of such premises, except ward numbers 125, 126, and 132. Ward number 63 contains a number of such architecturally significant buildings, but it is also true that most of them are not residential; they are commercial in nature. This ward covers the Esplanade, Park Street, Chowringhee and its adjacent area, which are purely commercial and act as the heart of the city's economy, as well as that of the state and country to a considerable extent. Most of the premises of this ward were built during the colonial period.

Architectural Layout of the Traditional Houses

Historically, Kolkata's architecture may be divided into two main eras: pre-independence and post-independence. In the abstract of his essay on *The Unintended City*, Joy Sen wrote, 'This vernacular, self-made city is shaped by forces of rejection and affinity, rejection by the urban centre and the affinity of traditions'(Sen, 1975). It is essentially the eternal tension between rejection and affinity that has been explicitly integrated with the urban planning and architecture of the city. From the day of her conception to this day, this dramatic contrast has been expressed visually in the buildings and urban layout of Kolkata (Das, 2006). Since colonial rule, Kolkata has had two unique types of architecture: firstly, the colonial architecture propagated by the British, then an indigenous architectural style initiated by the native Bengali people assimilating European, Persian, and Indian styles of architecture emerged during the late 18th to early 20th centuries, which shaped the architectural heritage in Kolkata (Bose, 2016). Evolving from a small village to one of Asia's largest cities, Kolkata has amalgamated her unique identity from thediverse streams of migrants and ethnic groups who have settled in the city during the course of history (Chatterjee, 1990). Broadly, the architectural layout of the houses can be divided into two different parts in respect to the morphologies of the houses – namely, Internal Structure and External Structure.

Internal House Structure means the internal configurations and interior decors existing in a house, which includes the roof type, floor arrangements, ceilings of rooms, windows, doors, walls, and so on. During the survey, it has been found that the internal structure of most of the ancient buildings belongs to *Mughal* & *Medieval Bengali architecture, Roman architecture, and colonial architecture*.

On the other hand, External House Structure implies the outdoor arrangements and exterior decors present in a house, including the outer wall, verandas, cornices, outer walls, etc. The relationship between life, space, and the external design of the houses is very significant. Traditional Bengali houses commonly comprise *two mahals* i.e. *Andar Mahal (Inner portion of the house or personal space)*, and *Bahir Mahal (Outer Part, which is more accessible to visitors and outsiders)* as the regular features of the traditional Bengali elites. Polygamy, a large number of children, and gender-segregated quarters were necessary in most wealthy Bengali households. The interiors of these houses, however, opted for European furnishing styles and decorative features as early as the mid-18th century, before the exteriors had begun to show indicative signs of British architectural influences (Taylor, 2008). Ceilings of later Great Houses were often very ornate, in pressed metal or timber and painted in geometric designs. *Chunam* (lime) was also used for the exteriors of houses; when polished, it resembled marble and appeared not dissimilar to the stone used on buildings in Europe (Evenson, 1989). Good and cheap local stone was not available for building in Kolkata (Marshall, 2000), so most British buildings were constructed with bricks to which *chunam* was applied. These methods, though visually striking, would also require repair and maintenance, which was inadequate in the British and Indian buildings in colonial Calcutta (Lang, Desai, and Desai, 1997).

The distinctive features which have been observed with respect to each kind of architecture are as follows:

Mughal and Medieval architecture

- The colour of most of the houses is red in the outer part and white on inner walls. It has been found through interviews with the heirs of *Laha barhi* and *Rajbarhi* of *Late Raja Naba Krishna Deb* that the red colour exterior and the white colour interior were a reflection of profound aristocracy in those times.
- The doors and windows are made of very fine quality and expensive Burma (presently Myanmar) Teak (*Segun)* wood, and the colour of the woods is the sleepy green colour which ensures its finest quality as well as durability. The windows of those houses with an open and close system of its middle part are locally called *'Khorkhori'* (like a wooden version of the Venetian Blind). The luxuriously made windows were delicate and allowed free air movement while restricting the solar radiation inside the room during summer.

- Surveyed houses of this style resemble large horizontal extensions. For example, *Sovabazar Rajbarhi (House of Late Raja Naba Krishna Deb)* was constructed mainly with two (2) stories of vertical expansion along with a huge horizontal extension covering an area of more or less 12 kattha (1kattha = 67 square metres), excluding a separate courtyard of 3 kattha. In traditional residences, the courtyard was the focal point of the house. It is often included under both internal and external structures. The entry paths of those houses having courtyards gives the observer a 360° panoramic view of the house interior with spectacular view of the rectangular balcony surrounding the courtyard, although the privacy of the rooms is well maintained. Figure 7.2's schematic diagram is exemplified in the Ramchandra Bhavan. Most if not all rooms of the

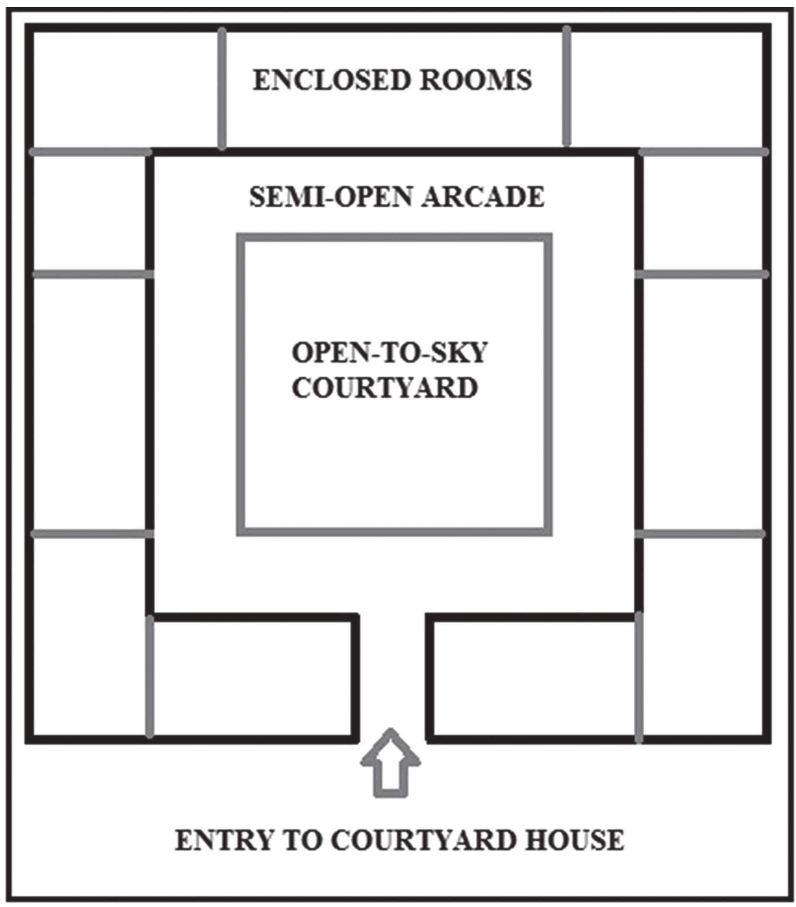

Figure 7.2 Typical Entry path of Courtyard Houses
Source: Das, 2006

Table 7.1 Number of floors

Number of Floors	*Number of Houses*	*Percentage (%)*
2	15	30
3	29	58
4	5	10
6	1	2

Source: Field Survey, 2020

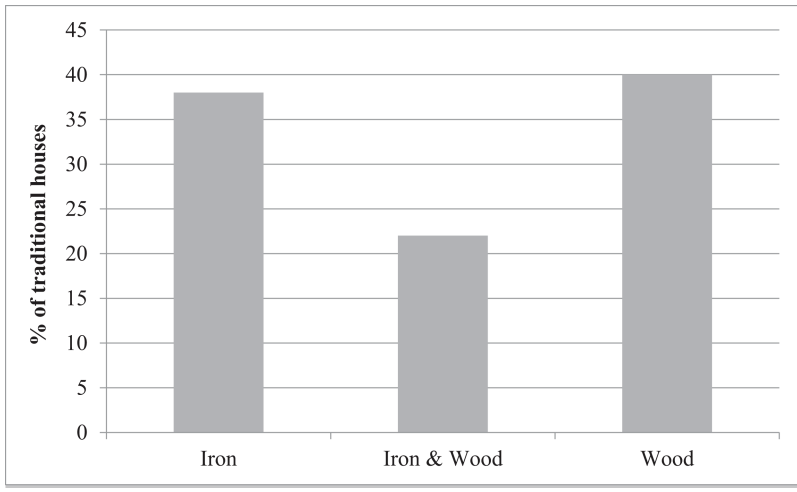

Figure 7.3 Building materials of entrance gates
Source: Field Survey, 2020

house have a direct connection with the courtyard. Courtyards served several social purposes, where they maximized family relationships and openness while keeping the outside distinctly separate. Not only were courtyards used as social family gathering spaces, but they were also a source of airflow and thermal comfort to the residence (Sthapak and Bandyopadhyay, 2014). Table 7.1 shows that 58% of houses have 3 (three) floors and 30% of them have 2 (two) floors. Four (4) storied and six storied buildings amount to 10% and 2% respectively.

- The materials deployed in constructing the entrance gates are usually thick wood *(mainly Teak wood)* with an average height of 12–14 feet. Such doors are locally called *'Singhaduar'*. The frontal uppermost part of the doors is very delicately designed following the *Mughal*and *Medieval*arts with imprints of two (2) lions' faces or snakes. According to the respondents, such expressions exhibit an aristocratic legacy of the house. It has been found from the sample survey that most of the gates are made of fine-quality wood (40%), followed by iron (38%), and iron and wood combined (22%) (Figure 7.3).

- Some portions of the front balconies are separated in a linear or rectangular pattern by large round pillars *(locally known as Tham or Khilan)*, which are occasionally connected to each other with horizontal wooden slats *(locally called Jhilmil)*. Such wooden slats with pillars are of diversified designs which express the sense of architectural aristocracy, as well as the lavish lifestyle of the well-off families and zamindars.
- Shapes of most of the surveyed premises in this category are rectangular (46%), followed by square-shaped (40%). A few of them are circular (6%). The remaining is grouped in amorphous ones (Refer to Table 7.2). The reason behind the shapes is that most of those houses have a big courtyard inside them, mostly rectangular or square-shaped, and the residential blocks make the limbs of those rectangles/squares. According to the present heir of *Ramchandra Bhavan*, this is due to their sense of securing the strict inner privacy of the house, even while entertaining guests and spending leisure hours with friends and compatriots. Privacy was extremely important and prevalent at that time, especially for women, and followed by all, as stated by the family head.

  The numbers of rooms of such houses are substantially high and they are large. Floors are designed by either red oxide coating or marble mosaic. Roof structures are commonly comprised of wooden straight bars known as *'Kori Barga'* (wooden beam).
- In *Mughal* and *Medieval architecture*, the courtyard system is a unique feature in the external structure. They bridge both internal and external layouts. According to Taylor (2008), the Courtyard serves multiple objectives, such as Guest Reception, Family Recreation, Gossip, Entertainment, Daily Household chores that are carried out in groups, space used for the men for drinking and socializing, etc.
- There is the presence of a typical place called *Jalshaghar* (Entertainment Room) which could be found in the *Bahir Mahal* (outer part), symbolising the rich cultural traits during the Medieval period. The aristocracy held regular meetings of artists, dancers, and musicians here and the venue was used for practice and support for classical forms of dance and music.
- Most of the balconies are Maltese in style (*it is a window that allows the person inside the house to look out onto the street without being*

Table 7.2 Shape of buildings

Buildings' Shape	*Number of Houses*	*Percentage (%)*
Rectangular	23	46
Square	20	40
Circular	3	6
Amorphous	4	8

Source: Field Survey, 2020

seen from outside)(34%). But a substantial percentage of houses are devoid of any balcony (32%). Hanging balconies are also present in a few houses (22%). There are also some wooden and metal balconies.

Roman architecture

- The use of iron or wooden beams in the construction of the ceilings is quite common here. The floors are generally composed of marble mosaics of various designs and shades, which represent the robust sense of interior decoration. The use of iron beams in constructing roof structures and artistically designed railings following the Roman tradition for balcony can be witnessed. It has been observed that most of the room ceilings are solidified with the help of wooden *Kori Barga* (70%), followed by iron beams (16%). The rests are composed of either iron *Kori Barga* or other things.
- The colours of most of the houses in this category are yellow, pink and white. There were no particular trends in inner and outer colour, very much unlike the *Mughal* and *Medieval Bengali* architecture. The doors, windows, and main gates are generally composed of iron and glass materials.
- The floors are designed with white/yellow shades and the use of grey marble is prolific.
- The courtyard slopes away towards a portion that is attached to the main drainage system to drain the storm-water as well as the water discharged by domestic usage. The staircases are bounded by iron or wood.
- There are usually a good number of rooms in these houses. The width of most of the walls is more or less 22 inches (44%), followed by 25 inches (20%) and 20 inches (16%). Others range between 9–14 inches. Most of the wall heights are from 12–14 feet (64%), followed by 10–15 feet (18%). Only one (1) house shows a height of 22 feet.

Colonial architecture

- Most of the houses in this category showcase a substantial horizontal expansion, along with the considerable vertical rise of 3- to 7-storied constructions. This kind of design is absent in *Mughal* and *Medieval* architecture. An aged family member of *Chatterjee Barhi* said that this trend of vertical expansion, although very little primarily, was due to the consequence of the Western trend of tall building construction, which is now continuing rather at a more rapid pace than that time.
- Main entrance doors/gates are generally composed of iron and/or wood. Uses of iron beams are also very common here for roof building, and the balconies are covered by artistically designed iron grills and railings with wooden balustrades – which increases the external beauty of the houses.

- Most of the buildings are red with light green windows and doors. Additionally, pink/white buildings with blue doors and windows with coloured glass artwork are found. Most of the glasses were imported Belgian glass. Chorbagan Laha Barhi, Dr. Boria Majumder's house, Swami Vivekananda's Ancestral house (old) etc. are some notable examples of this type of architecture. The well-to-do house owners made special efforts to select and transport building materials that they felt were aristocratic, as adapted from Europeans.
- Does Colonial mean European? Or a new form that merged with the British and Indian (Bengal) styles? This question arises primarily because of the presence of very unique *Thakur Dalan* (Palace for the Gods) which may be found in Sovabazar Raj Barhi. It is a kind of open space where worship is done in a splendid and aristocratic manner. These *Dalans* are surrounded by a long stretch of verandas and are separated by round pillars, the heads of which are designed with medieval Bengali temple art.
- The roofs of the traditional colonial houses are open to the sky and provide a beautiful view to the observer gazing up from ground as well as from the balcony.

Uniqueness in House Structure

It has been found that the *Ramchandra Bhavan*, located in *Chorbagan* (Ward-25), possesses a courtyard whose size nearly matches the size of an international badminton court. Four distinct *mahallahs* are found in *Mitra House*. The present Marwari Relief Society (the house of *Late Baijnath Sobhasaria*) has three distinct buildings which are connected by two uniquely designed *Sky Bridges*. In Kolkata, a 'heritage' building is a landmark that is important as either a significant institutional building, or because a famous person frequented it or lived there. The architectural distinctiveness of the building is a secondary concern or is a pre-ordained, generic feature of the structure, i.e. we already know it qualifies as a heritage structure because it adheres to our idea of what a heritage colonial building looks like. (Chaudhuri, 2015).

Transformation of the Traditional Houses

The colonial history is ingrained in the DNA of Kolkata (Ganguly, 2016). If we follow the trajectory towards the past, basic traditional courtyard architecture can be observed which ultimately was used to address the hot and humid climate of Kolkata. This made a central open place which was bordered by the building structure along with verandas. Thus, it took the form of an arcade to abort the feeling of being suffocated within the house through the free air movement. But the present-day modern trend of skyscrapers or vertically heightened flats and apartments has engulfed the

Table 7.3 Vulnerability of buildings

Vulnerability Scale	*Number of Houses*	*Percentage (%)*
Less	16	40
Medium	6	15
High	5	12.5
Very High	3	7.5

Source: Field Survey, 2020

previous trend. Moreover, most of the existing old structures lack proper maintenance, and they fall on the verge of extinction. Table 7.3 indicates the degree of vulnerability of the surveyed traditional houses. Although most of them are in the *less vulnerable* category (40%), a significant percentage shows at a medium to very high level. Mainly, the cornices, roof structures, pillars, and main entrances are in a vulnerable condition.

The houses are repaired and renovated generally once a year, mostly before Durga Puja or any other significant occasions celebrated by the concerned family. But the maintenance and repairing are not up to the satisfaction level as it was in the past. This is because, in most cases, the availability of the materials that can properly replace the old ones (i.e., window frames, doors, coloured glasses, wooden beams, artistically designed pillars, etc.) and masonry skilled labourers are very poor or even unavailable. Besides, the cost of such materials and labour charges are exceptionally high, so it is very difficult to afford for many of the owners. Moreover, the fragmentation of the joint family structure into single families creates the inheritance-related problems in ownership. This is tantamount to a shortage in supply of money regarding maintenance cost, and the burden falls on the small amount of family present in the house at the time of repairs.

With the effect of globalization of the Indian economy in 1991, an active market force promoted large-scale development of high-rise residential buildings, commercial buildings, shopping centres, multiplexes, etc. in all parts of the city over the past two decades. There is, however, little concern for the old residential buildings. The first legal and administrative support for the conservation of heritage buildings in the city only came into effect in 1999. The State Government restored only a few government-owned buildings, and some owners of private buildings restored their properties with their funds. Hundreds of old important and existing buildings remained neglected, with varying levels of dilapidation. At the same time, many non-listed old buildings with architectural significance are being demolished under the real-estate profit-making regimes. In the new millennium, new fields of concern have emerged; environmental pollution, energy crises, global warming, and climate change became more prominent while the matter of heritage conservation takes a backseat. New commercial structures like malls, multiplexes, and luxury residential buildings have come up in

place of historic buildings, old cinema halls, and other important structures in recent years (Bose, 2016). Moreover, due to improper maintenance, many such houses fall into the category of Vulnerable houses (*Bipadjanak Barhi)*.

During the field survey by the present authors, it was found that most of the respondents are of the view that such integrated and comprehensive legal arrangements of traditional houses is not suitable for nuclear families. As mentioned earlier, these houses have multiple problems with inheritance-related legal disputes which takes years, often the lifetime of an entire generation, to get resolved. Respondents also mentioned that the problem of illegal activities propagated by the tenants caused severe challenges for them. In most cases, tenants are too old and do not tend to agree to increase the rent. For this reason, it can be seen in many houses that the buildings are partially well maintained, and the rest is in a dangerous condition. Besides, unscientific new constructions within the old buildings often lead to the destruction of buildings and create more threatening situations. The problem of water logging makes the matter worse. There are limited conservational attitudes among authorities and even general public. Organising programmes like *'Heritage Walks'* helps spread information about these buildings, but cannot solve the deep-seated legal and conservation problems. The effort for their conservation has been improving slowly but steadily, but this slow information build-up may lead to losses due to pressure from real estate developers. Kolkata's *paras* (local neighbourhoods) are central to the city's social life. They are the fulcrums around which the urban spaces establish their identity and cultural dynamics. Neighbourhood communities must join hands in tackling a combination of legal tangles, economic distress, lack of awareness of the value of the beautiful old structures, and lax municipal regulation. These multiple problems have already pushed residents and owners to part with their amazing bequest and leave the magnificent, architecturally diverse structures (some of them built nearly a century ago) at the mercy of profit-seeking builders who have no respect for history or architectural nuances. The situation has worsened since the turn of the millennium. With land prices skyrocketing and younger generations of Kolkata residents moving out in search of better lives elsewhere, the builders have moved in and promptly demolished some unique structures that defined the traditions of older architecture and designs in Kolkata (Chatterjee, 2020).

A paradoxical picture has been pointed out by Amit Chaudhuri. He stated that it is very blunt logic to state that heritage residential house conservation is anti-developmental. He questions the lackadaisical approach. *'If it can be done in Mumbai, why not in Kolkata? If Kolkata fails to preserve its past, it can only mean that the city has lost all sense of its history and civil society. In Istanbul, London, and New York, neighbourhoods have been developed without destroying their intrinsic character. They have not been turned into Dallas or Gurgaon*,' he points out. '*People will have to look at their habitats with a sense of distance. Only then will they understand that the spaces*

they live in have emerged from a particular kind of culture and history and therefore need to be conserved', he asserts (Chaudhuri, 2015)

At present, although many traditional houses have been demolished already, a few exist in a variety of conditions such as abandoned, rented to multiple tenants, partial/full acquisition by the real estate developers, sold or donated to Kolkata Municipal Corporation, partition within a home, etc.

Owners' Perspectives

It has been rather painful to discover that a significant percentage (16%) of respondents are willing to demolish the existing structure and replace it with a new one, which is mostly an apartment or a gated community-type residential plot. This is mainly due to the profitability vs. conservation costs. Even out of the rest (84%), most of them are strongly attached to the heritage, except a few cases of religious belief that the house deity *(i.e., Kulo Debota/Griha Laxmi,* which means god/goddess residing in houses for a long time as per religious belief) has resided for a long time in the existing plot. Out of the surveyed respondents, a good percentage opined to proceed to sell the houses too.

In respect to maintenance and repairing, related problems generally faced by the owners seem to be varied and diversified. Most of the respondents (54%) have made the extraordinary investments towards maintenance and repair. 28% (12 + 16%) of the respondents prefer the new trend of buildings, which seems less costly than the older ones in respect to maintenance and repair. Other problems are ownership disputes, financial strains, and so on.

Potential Pull Factors

As Kolkata has a strong historical trajectory, there is significant diversity and mixing of old building styles. The then-contemporary constructions were largely influenced by harmonic intermingling and synthesis of Neo-Gothic, Baroque, Neo-Classical, Oriental, etc. designs. Overall it can be inferred that Kolkata possesses a distinctive *Bengali-European* style that cannot be found elsewhere (Chaudhuri, 2015). These unique and marvellous designs attracted many people for tourism, recreation, shooting, rental for different ceremonies, Durga Puja, etc. Specifically, in Durga Puja, some selected houses of North Kolkata regain their traditional charm and are also open to public and heritage experiences for tourists (i.e., Sovabazar Rajbarhi, Chorbagan Chatterjee Barhi, Thanthania Dutta Family, Laha Barhi, etc.).

The survey shows that 42% of the respondents presently open their premises for such purposes. Thus, a significant percentage still holds a conservative view in respect to family privacy and do not want any visitors within their residential space. During the interviews of the tourists who used to visit those places, it has been observed that more than 60% of the respondents have mentioned the main attraction of celebrating Durga Puja

in the aristocratic and traditional ambience of those houses. Most of them shared that the *Thakur Dalan*and *Open Courtyard* concept, along with long stretches of verandas where the people get together to celebrate pujas, is the signature attraction of such houses.

Perceptions on Conservation

Merely putting up a board signifying *'Dangerous House'* speaks of a step motherly treatment from the city administration. The multiple problems are recent splits in the Joint Family of Hindus, asset-related legal tussles, tenancy problems, building developers and estate juggernauts with strong political colour who are creating pressure upon owners to sell their properties, legal complexity of corporations and pressure of local bullies in the form of self-declared local leaders interested in the deployment of masons and raw materials, etc. Although there are several such factors which may be considered family matters, some factors provide enough space to the bullies and miscreants – mostly they have some political colour and the ordinary citizens are bullied by them, without any ability to seek protection from authorities or the police. Such factors create significant problems for the property owners who have neither wealth nor political connections. For example, the respondents of such two notable houses opined that most of the traditional houses adjacent to their existing houses were sold to the real estate developers at marginal prices, as the owners of those houses wanted immediate relief from the liabilities of maintaining those properties. The magnitude of maintenance-related problems is further extended by the present promoting system which has nearly captured the whole sector of building and construction. As they are fully profit-mongers and not bothered about heritage buildings, such a system proves disastrous in the case of heritage conservation. Moreover, they assure the landowners that all the legal and allied problems will be solved by them if they get the scope to develop the concerned land. Thus, in most cases, the house owners and landowners agree with them to avoid any legal harassment for property modification and development.

To draft a mere conservation blueprint, in general, would not be a feasible solution in this regard; rather, there is a requirement for a strongly coordinated programme that will not only financially aid them, but also will protect them from any kind of illegal interference, such as interference from local bullies. A separate department or assignment of any NGOs for the interrogation of these heritage houses can be formed under the umbrella of the corporation, and there should be the proper framework to provide the label of heritage in the old houses. It is very unfortunate to mention that after the publication of a booklet containing information about heritage buildings in 2009, no remarkable steps were taken by the corporation in this regard, and even the booklet has not been updated with time.

Some of the owners have given the ground floor for commercial purposes such as shops, small offices, factory outlets, etc. on a rental basis. But the subsequent upper floors are in the same dilapidated condition. This often leads to fractures and cracks in the structures and subsequent hazards to people in proximity to them. In such houses, a rent scheme can be introduced, a part of which has to be deposited to the corporation or any other NGOs assigned by corporation which they will spend in timely maintenance of those houses. Most of the neighbours (85%) are in favour of those heritages' preservation, although a small percentage (15%) is not agreeing with it. They are rejecting the positive view mainly on three grounds: vulnerability of the houses is the strongest one (10%) among them, followed by promoting scope (2.5%) and Haunted house concepts (2.5%).

Although it is true to mention that every space has identical signage through which it can be recognized, Kolkata is no exception. *City of Palaces* is the signature name of Kolkata which is known globally. But the demolition of these traditional residential houses is hampering that signature to a far-reaching extent. It should be kept in mind that heritage is not a luxury; it is a necessity that predominantly symbolizes the city mosaic and structure. Despite many hurdles and difficulties, it is the opinion of many people that the heritage house should be kept with proper care to uphold the signature of Kolkata. What is lacking, however, is the robust initiative from the community as well as the administrative level to tackle this issue skillfully. There is also a trend among civil architects and engineers to focus more on modern building forms than traditional building conservation techniques, which is not at all a good sign for the civilization.

Conclusion

It has been found that most of the surveyed houses fall into the 'less vulnerable' category, but a significant percentage of the surveyed houses fall into 'medium' and 'high' vulnerability. Mainly, the cornices, roof structures, pillars, and main entrances are in most vulnerable condition due to lack of maintenance, and they often collapse like a '*bolt from the blue*' upon the pedestrians and vehicles passing through the adjacent roads, causing fatal accidents. Some houses are repaired generally once a year, but most are not, and the cost of maintenance is high. The fission of the joint family structure into single families created the inheritance-related problems in ownership, resulting in maintenance issues, and the burden falls on the family presently residing in the house.

Conservation of historic buildings used by people for residential purposes is not of any concern to the government, which only looks after public buildings. They merely tag buildings as risky and leave the matter there. Some of the positive approaches that can make a difference are rethinking conservation of traditional houses and holding them up as emblems of the history of

the city. The Corporation should publish properly updated information in this regard to increase the knowledge base in the public domain.

Some well-designed promotional incentives should be enunciated for these houses so the owners can benefit from them and spend the funds on maintenance and repair. This will help to preserve the heritage, and in return, the government can arrange a portion of their building to be accessible for tourists. The ticketing system can be imposed, the share of which should be divided between the government and the owners of the houses. *Heritage Walks* usually practice this and take participants into heritage houses to showcase the architectural legacies and talk about local histories associated with them.

Knowledge and information on traditional architecture and design should be incorporated into academic courses like history, geography, archaeology, anthropology, and sociology. It should also be widely publicized. The lucid history of each such house should be easily available in both online and offline publications. This will help tourists and other interested persons to learn more and want to visit them.

If mass awareness at the community level, public debates, and public lectures are organized by local administrations, the residents may indirectly protect themselves from goons and profit-mongering real estate developers. The administration should realize that protecting the goons and leaving the ordinary citizens in a vulnerable position will lead to the destruction of all the shreds of evidence of historical milestones of our civilization, and ultimately the history of our city.

Kolkata, once proudly called the '*city of palaces*', is experiencing an alteration in its skyline, lifestyle, and type of real estate development. Once upon a time, the large palatial homes of the *zamindars* were aristocratic symbols of the city's history and heritage, but they are now like the pages of an old album, in which Kolkata's history is scripted. At present, a handful of tourists and conservationists are concerned with the beauty of these structures, but there is no provision for their upkeep, except for those buildings that have been taken over by private agencies. Ordinary houses that are residential properties are the bones of contention as land sharks are awaiting their demise and an opportunity to speculate and grab them at the lowest possible price. It's true that such structures have only heritage value, but isn't it crucial to conserve heritage with due honour and due dignity?

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8 Evolution of a Political Landscape

Revolution to Consolidation and Beyond

Aritra Chakraborty

Introduction: Pre-Independence Scenario

The socio-political landscape of Kolkata evolved in a volatile complexity. The city emerged as a site of royal governance in the colonial period. This initial advantage of the city made its incipient populace much more educated and exposed to the outside world. It thus became the central location of the Bengali Renaissance in the nineteenth century, which was supposed to be the first tenure of enlightenment in colonial India. Western education propagated by the British institutions created a space for such a Bengali intelligentsia. Institutions like Presidency College and Calcutta University emerged as the focal space of intense intellectual mooring. Thus, the city tuned itself to become a revolutionary town in its true spirit. This was evident from the continuous striving of its people to become anti-imperialistic. The partition of Bengal in 1905 fuelled Bengali sentiments to such an extent that it erupted into massive anti-British movement in the city. This political move eventually prompted the British to shift the capital from Kolkata to Delhi in 1911 to reduce Kolkata's importance. Still, after losing its former glory, Kolkata was a crown jewel as far as political importance is concerned. Turmoil of this time period has been reflected in various scholarly texts as well as events.

Kolkata's political landmark achieved a substantial new tag after the famine of 1942, which was a manmade disaster in tandem with the Second World War. This led towards the first influx of poor people from the rural countryside into the urban core areas of the city. The eminent cry of the poverty-stricken people in the cityscape asking for rice and starch was a reality in those days. Thus, Kolkata got its first slum dwellers in the city region in the 1940s. One such important location of the slums was the region in and around the railway lines of Golpark and Dhakuria. Partha Chatterjee (1997) has vividly described the formation of such slums in the vicinity of the said region in Govindapur Rail Colony. However, this influx of the poor people from the rural countryside was, until then, restricted to several pockets.

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Kolkata after Independence and Partition

The real blow to the city was the partition of the country. This not only devastated the economic importance of the city by dividing its chief jute-producing areas into newly-created East Pakistan, which dealt a severe blow to the industry; it also changed the entire demography of the city. Due to partition of the country, people, especially Hindu refugees, started to come into the city in large numbers. In United Bengal, the Hindu population constituted about one-third of modern Bangladesh (then East Pakistan after partition). This entire mass of people came into the city starting at the end of the 1940s. They started to build colonies in the suburbs and rural hinterland by forcefully capturing the land, as well as the landed property of the rich in the outskirts. The entire areas in the northern, eastern, and southern fringes were full of such colonies. They named their localities Bijoygarh, Azadgarh, Gandhi Colony, Nehru Colony, Chittaranjan Colony, and Niswa Colony either in the name of eminent icons or the names that reflected their strife and passion to get a new land by continuous struggles in the city. This created a newer dimension in the political sphere. The people's struggle became a romantic new phase in the political landscape. Films like Rittik Ghatak's 'Subarnarekha' and 'Meghe Dhaka Tara' truly reflected the scale of devastation of these East Bengali refugees, or 'Bangal' in colloquial terms.

It is important to note that from the 1950s onward, the city became a place for strong partisan and electoral battles. Various groups supported different parties. It is thus important to understand the party system, as well as to identify distinct social groups in the city.

Political Party System in Kolkata

1. Indian National Congress (INC): The party ruled the state from independence up to 1967, then again from 1972–1977. This large political party of India became the permanent opposition in West Bengal after the assembly election of 1977. Within the first 14 years of the Left Front's regime, as many as seven times the president of Pradesh Congress Committee was changed, without achieving much electoral success. It revived to a certain extent in the time of Somen Mitra. In his presidency from 1992 to 1997, the situation of the Congress improved a lot. However, in his regime the decimation of Congress started to happen faster as the main mass leader Miss Mamata Banerjee had a bitter relationship with Mitra, leading to the creation of Trinamool Congress. From then onwards, Congress permanently lost its position as the principal opposition, and never regained its former prominence.
2. All India Trinamool Congress: The party was created from Indian National Congress in December 1997 under the leadership of Mamata Banerjee. She still holds her position in the party, and the party thrives solely because of her strength and image. From the very beginning, she was able to displace her mother party in Congress from the opposition

position by garnering enough support from the masses, and substantial leaders also joined the party from Congress. Her main strength was in South Bengal, especially in and around Kolkata. However, at the beginning, she had to establish alliances with either BJP or Congress but was unable to throw the ruling Left Front from power for more than ten years. But due to her constant anti-left movements, especially in the times of the Singur and Nandigram crisis, she was able to garner enough support to throw the Left from Bengal after 34 years in power.

3. Bharatiya Janata Party: In West Bengal, BJP was never a force at all. Since its inception in 1980, the party had a miniscule presence in the state. Its support base was only confined to a certain section of non-Bengali voters in Kolkata and Howrah. However, the situation changed after 1991, when BJP got more than ten percent of the total vote polled on its own. It made a coalition with Trinamool chief Mamata Banerjee in 1998 and is presently considered the chief opposition to TMC in Bengal.
4. Communist Party of India (Marxist): One of the main political parties in the state, CPI(M) formed in 1964 from the erstwhile Communist Party of India. From its inception, the party was extremely strong in West Bengal and was the main opposition party of the state. After the first election they contested in 1967, the party got a taste of power by forming a coalition government. Both in the 1969 and in 1971 Assembly elections, the party was the single largest party in West Bengal. However, in 1972 they faced a total rout in the hands of Congress. They achieved ultimate electoral success in the state in 1977 Assembly election, when they got absolute majority. It was one of the political miracles that a Communist party was able to hold on to the power in an Indian state for 34 years. This was mainly due to the fact that the whole socio-political scenario of the state was politicised under the formidable cadre-based orientation of the CPI(M). The party's first secretary after the left's coming to power was Comrade Pramod Dasgupta. He was the chief architect of politicisation of each and every aspect of social life in the state. This led the foundation of the strong CPI(M) cadre base in the state. He, along with Jyoti Basu, developed the ingenious method of Operation Barga or the land reform. This party was also able to form a strong coalition with other likeminded parties, like CPI, RSP (Revolutionary Socialist Party), and FB (Forward Block) to hold onto their power. The party's decline came at the hands of Mamata Banerjee. In the case pertaining to forceful land acquisition in Singur and Nandigram, the party was severely challenged and was ousted from power in 2011.

The Geography of Vote Banks in Kolkata

As far as politics are concerned, different groups supported separate political parties in the city. Refugees were supported in their effort by the Communist Party of India, and thus they became a solid vote bank of the Communist

Party. Most of the Communist leaders, who ruled the state for 34 years, came from this group of erstwhile East Bengali refugees. Their main citadels were Dum Dum in the north, Beliaghata in the east, and a vast area in the southern fringes in Tollygunge, Behala, Jadavpur, Kasba. This huge spurt in population, induced by the refugee colonies and shanties in Kolkata, also triggered the large-scale unemployment and struggle for existence. These unauthorized refugee colonies fuelled the anarchistic struggle in the city.

Large chunks of Marwari and other non-Bengali speaking populations lived in the city long before the partition. They captured the wholesale trading in the city and thus were living in the major marketplaces in Barabazar in the west central part of the city. They emerged as a solid vote bank of the right wing Bharatiya Janata Party in the 1980s. They are probably the only group that has supported BJP since its inception.

There are certain pockets of Muslim dominance in the city. Many Muslim rulers of the erstwhile pre-British India were shifted in Kolkata, like Wazed Ali Shah of Lucknow, and the descendants of Tipu Sultan of Mysore. Therefore, in certain pockets, like Metiaburuj and Khidirpur in the west, Tollygunge in the south, Park Circus, Entally, Taltola, Bowbazar, Kolutola and Rajabajar in Central, Topseah and Tiljala in the east, and Belgachhia in North Kolkata, Muslims were in large numbers. Their voting pattern was quite distinct. They lived in earmarked regions and favoured both Congress and the Communists.

Large parts of North and western Kolkata, inside the circular road and just outside of it, were the localities of the Bhadralok Bengalis or the original Bengali population of the city. The areas such as Cossipur, Tala, Bagbazar, Shyambazar, Shobhabazar in the north, Manicktola in the east, Jorasanko, College Street, Sealdah, Bowbazar in Central Kolkata, and Kabitirtha in the southwest were where original Bengali 'Bhadraloks' lived in large numbers. Their votes were also divided between both Congress and the Communists. Communists also got plenty of votes from the poor people, slum dwellers, and people from the lower ranks in the areas of Tangra and Beliaghata in East Kolkata, and in all other such pockets of low-income group residences. The only region where Congress and later on TMC (Trinamool Congress) won outright were the mixed localities of Northwest Kolkata in Chowringhy, Janbazar, Jorasanko, Jorabagan etc. Another important region was the posh Bengali upper-class cityscapes in South Kolkata in Alipore, Ballygunge, Bhawanipore, and Rashbehari areas. These were the areas where the left intellectuals emerged in the 1950s and 1960s, when the Left was in opposition, but the people who were in the majority became decidedly tilted towards Congress and TMC in the Left Front's 34 years of rule in Bengal; this is the only group that is constantly anti-incumbent. When Congress was in power, they voted Left; in the Left's 34 years of rule, they were tilted decidedly towards the opposition, and after TMC achieved the throne in Bengal, these are probably the only group (apart from the Marwaris) who voted BJP (Bharatiya Janata Party) in large numbers.

Congress Period in Kolkata: Fifties, Sixties, and Early Seventies

In the 1950s and 1960s, Kolkata became a city of turbulence. The city was unable to accommodate so much of the population burden emerging from partition. Moreover, the city's economic backbone was completely destroyed due to loss of the hinterlands. This situation was ripe for adventurist politics, and thus full-fledged leftist politics started to flourish in the city. Incidents like Tebhaga and the food crisis in rural Bengal, price rise in fares on trams and buses, as well as chronic unemployment led towards a situation of intense Left political movement. This force was initially supported completely by the Bengali middle-class people, who blamed the ruling Congress for all of their misfortunes. Therefore, from the very beginning, though the state of West Bengal was ruled by Congress, the city of Kolkata was captured by the communists from as early as the 1950s. The Left got further support when areas of Tollygunge, a Left citadel, were added into the boundary of Kolkata, thus increasing its wards up to one hundred.

The Left's space was, however, not enjoyed by the Communists for many days. Due to internal feuds within the Left pertaining to various political issues, a hard-line section of the Communists formed a new party known as Communist Party of India Marxist (CPIM). Thus, this division of the Left created a new space for the Congress, which went into political oblivion because of Communist pressure. Both Communist parties were so antagonistic to each other that to tackle CPI(M), the erstwhile CPI joined forces with Congress during the 1972 assembly election. However, this struggle between the Communists was not only limited to these factions. By the end of the 1960s, a new arena opened up in the politics of the city. The entire mass of the Communist cadre started an anarchistic movement, known as the Naxalite movement, which not only started to question the prevailing capitalistic norms existing in the erstwhile Indian political landscape, but also broke away from the Communist party again and denounced all forms of parliamentary democracy by taking a hard-line view towards revolutionary socialism based upon the principles of Chinese Chairman Mao Tse Dong. This particular hard-line group engulfed the entire city space, especially the young generation of comrades, which created an atmosphere of terror in the city. The killing and counter-killing of each of the political parties in Bengal became routine in the city, which completely destroyed the city's economic and educational backbone. The city of Kolkata thus started to see an unprecedented surge of political violence in its streets. Youths, goons, state machinery like police, common citizens, party leaders, etc. were all involved in these red-letter days of turmoil in the city. From the mid-1960s to the first half of the 1970s, this was the case in Kolkata.

In the beginning of the 1970s, Congress regained some of its lost prestige by defeating Pakistan and giving independence to Bangladesh, which went well with the Bengalis living in the city. However, their image was soon

tarnished by the unprecedented terror that they created in the 1972 election and the subsequent emergency and reign of terror in the 70s, which completely destroyed their credibility in the state. In the 1972 assembly election, the Indian National Congress, under the leadership of Siddhartha Shankar Ray, won a thumping majority by winning 25 seats in alliance with the Communist Party of India (CPI) in Kolkata. The main opposition Communist Party of India Marxist (CPI M) got only two seats. The Left was completely decimated. Countless incidents of poll violence made this election a farce and thus the opposition cried foul. After being routed, the entire CPI(M) bench boycotted the election results and overall, they boycotted the whole assembly in this entire five-year tenure.

After coming to power, the ruling congress unleashed another strategy of terror in the name of destroying the Naxalite threat from the state. They unleashed many terror tactics, especially through the infamous polling officer Runu Guha Niyogi. They captured young students and Naxal leaders and killed them in broad daylight. In this way, the government was able to reduce the Naxal problem from the state to a greater extent. This political unrest and oppression of the opposition got a boost when Prime Minister Indira Gandhi declared emergency in the centre. In this case, many leaders of the opposition party were arrested, including the state leaders of the CPI(M), and fundamental rights were curtailed. Freedom of the press was reduced, and again there was a reign of terror in the air. This had a huge impact in the state as well. Since most of the opposition leaders were jailed, it was a kind of free pass given to the government to do whatever they wanted, and they did.

After the emergency was lifted, the Janata Party was formed and West Bengal, along with the rest of the nation, went to the polls. The anti-emergency sentiment, which swept the electoral scenario in all of Northern India, was also very active in West Bengal and Kolkata as well. Congress lost the election. After this parliamentary election, all the imprisoned political leaders were released. After six months, when the time came for the West Bengal Assembly election, the Left Front won a comfortable majority on its own, and Jyoti Basu became the Chief Minister of West Bengal. Thus began a powerful reign that continued for 34 years, as the Left enjoyed the popular support base of the Left liberal electorate in the city.

Left Consolidation in Bengal

After the Left's ascent to the power throne of the state, the city politically became completely bipolar in nature. The entire population of the city was arranged in two camps through the 80s and 90s. All communistic designs were now thrust upon a single party, i.e., the CPI(M), which successfully created a coalition government that stayed in power for 34 years. In all of rural Bengal, this front enjoyed the unparalleled support of the people. However, in Kolkata city itself, the case was not easy for the Left. This was

the only region in the state where the Left faced real challenges from the principal opposition, Congress, and later on TMC, and often were defeated in most of the constituencies of Kolkata. There was a seesaw battle in the city to capture the political power. The Left won overwhelmingly in the refugee areas, slums, poor localities, and in some minority pockets, while Congress won in the Bengali upper- and middle-class localities, as well as other Muslim areas. Barring these two, only BJP was a third alternative in the Marwari belt of Barabazar.

In the making of the political space of the city by the Left Front, several aspects were noted. For the consolidation of their vote bank as well to get the support of the poor people and slum dwellers, they created Nagarik committees (committee of the people, like a colony committee) and Bustee federations (federation of slum dwellers). The Left was also able to manage a section of the opposition, which indirectly helped them in certain key constituencies in elections. The opposition's failure was an important issue that helped the Left immensely. Fractioning and weak leadership were two reasons that INC lost so many elections. There were individuals in INC, and not any collective effort like that of the Left. Their power struggle became easier due to the absence of any visible opposition in the electoral arena. All the leaders of the Congress Party were involved in the internal mudslinging and bickering with each other, and often quit the party on the basis of internal differences. This was conspicuously absent from the Left's scenario, which was highly organised and cadre-based in nature. Their internal differences were all sorted out in the internal party forum and platform and therefore never made public, while Congress leaders were often characterised as backstabbers or 'Tarmuj'. (Watermelon, which was green outside and red inside, thus helping the Left in reality.)

Due to the Left's huge impact on the political arena, the whole political spectrum in the state became highly polarised among the Left and anti-Left. Throughout the Left regime this was the story – they had a strong cadre-based organisation dedicated to electioneering. They had certain ideological bases to their credit. The party became an institution. The Left was very disciplined in terms of governance as well as development. They consolidated many tools of the society under their own union. This unionisation under the leadership of the ruling party, especially unions of the teachers, health workers, and police as well as industrial labourers at the grassroots level, gave the Left Front an immense power in the electoral scenario. The Left politicised all spheres of life in the state, which also helped them. Their whole policy was election-oriented, and they were mechanising these electoral procedures throughout the year. Their whole timer system also generated a lot of workers for the party.

In urban areas, the Left was supported immensely by the voters from the refugee colonies. These were the people who came to West Bengal after the partition, and the Left Front, from the very beginning when they were in opposition, supported their cause. Similarly, the urban working class also

historically supported the Left. Moreover, they freed all the political prisoners from the jail. They also had the support of the middle-class government employees, who were getting some peace after the 'Reign of Terror' of the Congress period, and the Left also took special care of these government employees by giving them allowances and other benefits. This in turn made the elections easier for the Left because these government employees were responsible for managing the booths as presiding or polling officers during elections. Another section that majorly backed the Left were the slum dwellers. It was seen that Left was credited as the party of the poor, and this image helped them gain the support of the slum population, for whose rights the Left Front realistically fought over and again. However, since the slum population was heterogeneous and did not consist of a single social group, in many pockets there was the presence of opposition voters. For example, Muslims in slum areas often voted for INC, while the non-Bengali population of Bihar and Eastern Uttar Pradesh living in the slums voted BJP. Opposition's vote split due to sabotage and dummy candidates, as well as a low index of opposition unity, also helped the Left. After the formation of TMC, this factionalism became more evident. Though BJP had a miniscule presence in Bengal, it still had enough support bases to cut through the opposition votes in some of these elections. The Opposition, however, mentioned that the Left's win was solely due to rigging and electoral malpractice. In many constituencies, the Left's huge winning margin also pointed to that trend. Sometimes terror was used to coerce people when they switched their party allegiance from the Left to any other party. However, it is untrue to mention that rigging was the sole responsible factor of the Left's success in the state.

Downfall of the Left

The Left was doing pretty well until Mamata Banerjee emerged as a true opposition leader relentlessly fighting against the Left in Bengal. She was attacked by the goons on 21 July 1991, when she was heading a protest against the Left government. A sustained attack was launched against the youth Congress president, and many youth Congress workers were killed. This made her the strongest opposition icon in the state. This day is still marked as 'Shahid Diwas' (Martyr Day) by the current ruling party of West Bengal Trinamool Congress. She started a continuous anti-Left agitation and thus became a credible opposition leader, especially in Kolkata. Thus, when she formed her new party Trinamool Congress in 1998, she received overwhelming support from most opposition voters, who rejected Congress and accepted her as the chief anti-Left face. Thus from 2000 onward, it was Mamata Banerjee and the Left locking horns with each other for the control of power in Kolkata. Mamata allied with BJP from 1998 to 2001 and became the central minister in the Vajpayee government. Then she switched her sides with Congress in 2001, then back to the BJP in

2006 and INC in 2009. Moreover, the Left was at the receiving end in the 1990s, especially in the urban segments, mostly because of reasons such as closure of industries, abolition of English, lack of private sector enterprises coming to the state and therefore brain drain of the students, lack of proper civic amenities, etc. In the local-level elections, the Left proved themselves to be formidable, but anti-incumbency against them was quite perceptible.

The Left's losses in the elections were due to many reasons. One of their major weaknesses was that in their rule, the party became overwhelmingly powerful. Instead of class solidarity, it was party solidarity. Even the Left's blue-eyed policy of 'Operation Barga' was a gift guided by party elites and bureaucrats. CPI(M) penetrated all social institutions through party machinery and did not allow growing any alternative institutions of their own. Even individual family problems and travelling were controlled by party. In general, CPI(M) created a party society in Bengal. Due to unhindered incumbency, the political voices of certain classes went unrepresented, and their concerns were unattended and disarticulated. These created a huge anti-incumbency against the party from these sections of the society. The hegemonisation of the Left was perceived in the Anadamarga issue. Anadamargees were a religious and social group who performed their own rites and rituals. They had certain contradictions against the Left on issues of religion, and in 1982, fourteen Anadamargees were burned alive in Kolkata's Kasba region. This caused a deep scar to some of the rightist groups in the state, who eventually became anti-Left.

The image of the Left becoming anti-poor was evident from a couple of issues when hawkers and minority sections moved away from the Left. The issues were Operation Sunshine and the death of Rizwanur Rehman. Operation Sunshine affected the hawkers and street vendors of the city. In 1996, the state government started a campaign of eradicating street vendors from the streets of Kolkata, which was known as Operation Sunshine. This issue alienated the hawkers, who were solid vote bank for the Left front. Another case that affected the voting pattern of the minority population in the city was a case of death of a Muslim boy, Rizwanur Rahaman, as a punishment with the active help of police in the city of Kolkata. This angered the Muslim community greatly. This issue was important for the minority population in the city of Kolkata.

Opposition always mentioned that Left leaders were corrupt at the grassroots level. By virtue of 34 years of incumbency, many local leaders indeed became corrupt. Performance of the local leadership in party functions as well as in governance became one of the major factors that determined the people's perception of the Left. From the mid-1980s onward, the party became omnipresent in all the regular activities of the people in general, and the government was replaced by the institution called the party. Therefore, the behaviour of the local leadership became immensely important in shaping popular perception. Generally, local leaders were people of respectable

origin – in many cases schoolteachers, who were regarded highly by the people. People became overtly dependent on the party for all their activities. Moreover, due to the absence of any alternatives in most cases, there was only a one-party rule, that of the CPI(M). Left local leaders in many cases became complacent as well as arrogant in their behaviour. The party society often created an environment where popular freedoms started to be curtailed. The party of the poor often became the party of the riches. This attitude proved to be costly for the party after 2006, when in general there was strong anti-incumbency in the state. Opposition parties often claimed that the Left won the elections due to the high level of electoral malpractice. Their demand for stricter security and concerns of free and fair polls were addressed by the election commission, who became very proactive, thus disallowing any chance for the Left to create the slightest pretext of rigging the election.

Another problem the Left faced in the penultimate years of their power in Bengal was the disarticulation of their cultural voice, especially in the urban areas. The urban middle class, which was the main backbone of the Left's ideology, was de-radicalised. Thus, a huge group of urban intellectuals were there who wanted to change the government. Congress in Bengal lacked the vision to capture the imagination of the people. They were an amalgamation of discredited individuals. Thus, when opposition became really united, then it became difficult for the Left to sustain their rule. Therefore, disillusionment of the educated middle class, along with opposition unity, paved the way for the Left's defeat. One of the major issues that went against the Left Front, especially in the urban areas, was irresponsible comments made by some of its leaders, including the Chief Minister. It completely demolished the base of the Left in urban middle-class intelligentsia, who were as a whole happy with the Left for their changed stand regarding industrialisation. Buddhadeb Bhattacharya, Binoy Konar, Biman Bose, Anil Bose, and Gautam Deb all commented against the opposition, as well as Mamata Banerjee on several occasions. These comments backfired. In Bengal, which has a strong history of cultural heritage, the population is highly influenced by the political stands of the intellectuals. Before the assembly election of 2011, many of the city intellectuals started opposing the Left for their atrocities and misrule. In fact, the scenarios of intellectuals were divided into two camps: Left supporters and those who opposed Left. The latter group became much stronger in nature because many of the former sympathisers of the Left cause left them and joined to oppose them. The list was huge, and most of them directly started supporting the opposition TMC and INC. The lists of intellectuals included actors, writers, journalists, painters, musicians, academicians, and many more. Their processions and agitations were covered extensively by the media. Many urban intellectuals took up rallies for the ouster of the Left Government, citing 'We Want Change' as a slogan.

Political Geography of the Electorate

As far as the electoral history of the city is concerned, it is evident that the city voters were generally anti-incumbent in nature. Unlike the rest of the state, where incumbency factor is a rule of thumb, the city elections were generally closely fought ones. In West Bengal from 1947 to 1977, barring a five-year gap from 1967 to 1972, INC ruled the state. However, in Kolkata, opposition parties won as many as 20 out of 28 seats in the city in the 1957 assembly election. At that time, barring a small pocket of Northwest Kolkata due to the presence of a large chunk of non-Bengali voters, the entire city electorate voted in favour of CPI and its allies. Even Chief Minister Bidhan Chandra Roy had to win his constituency of Bowbazar by a slender margin. This was the time of food revolutions ('Khadyo Andolan') in Bengal, spearheaded by the Communists. Mass Bengali intelligentsia supported the move. The price rise was another issue that affected the INC. However, in the next election, Congress improved their position. Still, the Left had considerable presence everywhere. In 1967 and 1969, again Congress got a severe jolt by both the Left alliances as well as other opposition parties. This made the Congress sit in the opposition chair. In this entire phase of time, it was seen that Congress was garnering the support of the non-Bengalis, old Kolkata Bengalis (or the Bengalis of North Kolkata) in the constituencies of Jorabagan, Jorasanko, Barabazar, Bowbazar, Chowringhy, etc. while the Left was very strong in the refugee areas (Jadavpur, Tollygunge, Behala), poor parts of the city (Beliaghata, Entally, Manicktola), as well as in the areas where urban middle-class Bengalis were dwelling in South Kolkata (Alipur, Rashbehari). The remaining mixed parts of the city were noncommittal (Belgachhia, Sealdah, Vidyasagar, Ballygunge, etc). In 1969, there was a complete rout of the Congress in the state. Barring five seats in Northwest Kolkata, everywhere else they were defeated. Thereafter, in the time of turmoil, political instability helped Congress in the election of 1971 when people were generally fed up with so many governments in such a short time, as well as tired of the constant feud between the two principal communist forces, CPI and CPM. This splitting of votes between these two communist groups, as well as disturbances created by the Naxalite movement in the state, made people tilt towards the Congress again. Thus in 1971, people of the city, in hopes of getting a stable government in the state, voted for Congress in large numbers. Indira Gandhi achieved the liberation of Bangladesh that turned Bengali voters in favour of Congress. This background eventually led to the election of 1972. This was an unprecedented election in the history of the city. For the first time, the city witnessed a large-scale terror in an election. Many of the booths were captured by hooligans. There was large-scale rigging. The entire opposition, headed by CPIM, boycotted the poll as well as the results. They lost almost all the seats in the city. CPI had an alliance with INC, and together they captured all the seats in the core of Kolkata.

However, CPIM was still able to win the refugee strongholds of Jadavpur and minority-dominated Garden Reach. This entire phase of electoral cycle can be called the phase of Congress rule.

There were 26 assembly segments in the Kolkata district in the Left regime, before the delimitation in 2009. All of these were essentially urban constituencies, and all but one (Taltola) were general seats. In this region in the tenure of the Left Front in West Bengal, opposition was stronger throughout the entire span of time. Only in 1977, in the first election when the Left Front came to power in West Bengal and the anti-Left vote was split between INC and JP (Janata Party), was the Left Fronts able to win 21 out of these 26 seats. In 1977, it was a complete reversal for the ruling Congress, who were wiped out from the city's electoral scenario. The Janata Party became the principal opposition of the Left in the city, capturing Congress's non-Bengali votes in Northwest Kolkata to win five seats. The entire remaining portion of the city was won by the Left. The Left also performed well in 1991, when BJP captured a substantial amount of anti-Left vote that harmed Congress. Still in 1991, the Left Front was able to win only 16 seats of these 26; while Congress won the remaining ten. In the parliament election of 2004, when the Left was strongest in the state and the opposition was completely decimated, then opposition TMC established a lead in nine assemblies here. The Left was really in a sticky spot in this region in the 1982, 1987, and 2006 assembly elections, when the Left Front got historic mandates and secured nearly 80% of the seats in West Bengal; but still in Kolkata, opposition got more or less same number of seats as the front achieved. TMC-BJP combined swept the poll in 1999, when the Left had a lead only in three segments. This was the region of TMC's best showing. After the formation of the party, they completely captured the vote bank of the Congress and became the main powerhouse of this region. In the 2006 assembly election, when there was a Left wave throughout the state, TMC was still able to manage 10 seats in this region, despite having no alliance with Congress, who won four seats.

Kolkata Corporation was enlarged in 1985 by the inclusion of the Jadavpur, Garden Reach, and South Suburban municipalities. In the core

Table 8.1 Municipal election results in Kolkata

YEAR	*LEFT*	*INC*	*TMC*	*BJP*	*OTHERS*
1985	68	67	–	2	4
1990	100	37	–	2	2
1995	70	66	–	2	3
2000	61	16	57	4	3
2005	75	19	42	3	2
2010	33	10	95	3	0
2015	15	5	114	7	3

Source: Compiled by author from the data of the West Bengal State Election Commission

Table 8.2 Electoral Results in Kolkata (Assembly Segment wise)

YEAR	*TOTAL*	*LEFT*	*INC*	*TMC*	*OTHERS*
1957	28	20 (12 CPI, 4 PSP, 3 IND, 1 FBM)	8		
1962	28	13 (9 CPI, 2 IND, 1 RSP, 1 FB)	15		
1967*	27	15 (8 CPM, 4 CPI, 3 IND)	12		
1969*	27	22 (11 CPM, 5 CPI, 2 RSP, 2 FB, 1 WPI, 1 IND)	5		
1971*	26	9 (8 CPM, 1 CPI)	17		
1972**	27	2 (CPM)	25 (21 INC, 4 CPI)		
1977	26	21 (17 CPM, 2 RSP, 2 FB)	0		5 (JNP)
1982	26	14 (12 CPM, 1 RSP, 1 FB)	12		
1987	26	13 (12 CPM, 1 RSP)	13		
1991	26	16 (13 CPM, 2 FB, 1 RSP)	10		
1996	26	11 (9 CPM, 1 RSP, 1 FB)	15		
1999 ***@	26	3	2	21(TMC+ BJP)	
2001****	26	11 (9 CPM, 2 FB)	2	13	
2004 ***@	26	17	0	9 (TMC + BJP)	
2006 ***	26	12 (9 CPM, 1 FB, 1 RSP, 1 RJD)	4	10	
2009 ****@	18	2	---	16(TMC + INC)	
2011****	18		---	18	
2014 @	18	1	1	13	3 (BJP)
2016 *****	18	1 (CPM)		17	

Source: Compiled by the author from the data of Election Commission of India

@ 1999, 2004, 2009, and 2014 results are Parliamentary election results, where these results have been projected in each of the assembly segments.

* In 1967, 1969, and 1971 elections, both CPI and CPM fought against each other by forming two separate fronts.
** In 1972 INC had an alliance with CPI
*** In 1999, 2004, and 2006 TMC had alliance with BJP
**** In 2001, 2009, and 2011 TMC had alliance with INC

of Kolkata, since Congress was much more powerful than the Left, to gain control of the corporation, the Left Front included these added areas in the boundary. By winning in these added areas, Left was able to wrest control of the corporation from 1985 to 2000 and then again between 2005 and 2010. They were eventually defeated by TMC-BJP in 2000 and 2010. In this entire period, municipal elections also reflected a stiff neck and neck contest in the city. Unlike the rest of the state, in almost every election, the fight between the Left and the opposition to capture the municipality was extremely stiff. Only in the 1990 municipal election, when there was a rampant complaint of large-scale electoral malpractice and rigging by the Left, did the entire opposition get decimated. In this particular election, there was a huge outcry of the Left's muscle flexing in the booth level to defeat the opposition candidates. Thus, the Left won handsomely. In every other election, in 1985, 1995, 2000, and 2005, the elections were even. In 2005, the Left achieved a wafer-thin majority. The Left did consistently well in Jadavpur refugee areas, Beliaghata, and Entally regions that are poor parts of the city while opposition did extremely well in upper middle-class belts of South Kolkata, where the educated Bengalis thrived for a political change in the city. Both in 2010 and 2015, TMC swept Kolkata, while all other parties were decimated in these elections.

Kolkata in Present Scenario

After the 2009 election, the entire city went into the grip of a completely different sort of political field. As mentioned, instead of becoming a keenly contested space, the city tilted completely towards a single party (the TMC). Both municipal elections were won by TMC, and in assembly and the 2014 parliament elections, they were invincible. After 2011, the electoral scenario of the city changed completely. A new player in the form of the Bharatiya Janata Party emerged in the political landscape of the city. After capturing the power at the centre, the party became one of the major players. In the elections thereafter, it became a major force around which the Bengali middle and upper-middle class, along with the non-Bengali population, started to make new arrangements. Congress has emerged as to some extent insignificant in Kolkata's electoral politics. The Left remained a party of the refugee areas. BJP emerged as the party of the upper middle class and the trading community. However, as far as Kolkata's city politics is concerned, this has become the most prolonged pro incumbent phase since Independence, where the ruling TMC is enjoying unprecedented electoral support in the city through the process of social engineering, accelerated intelligently by Chief Minister Mamata Banerjee with the backing of minority votes, as well as through overwhelming support of the poor, slum dwellers, and the lower middle-class Bengali population, who are beneficiaries of the populist policies. In every level of elections, they are emerging victorious without any doubt. Their strong anti-centre stand, anti-price rise posture, giving doles to

the clubs and Puja committees, development schemes like Kanyashree for the girl child and other social programmes, and strong secular stand have a huge appeal to the minority, poor people, slum dwellers, middle and lower middle-class Bengali voters. Moreover, the party was able to carry out *poll management* and use organisational strength by learning and successfully copying the poll machinery of the Left when they were in power. They also consolidated their cultural front. Their mode of continuous festivity goes well with the older generation voters, who are generally retired and have plenty of spare time. The film industry has been completely captured by the ruling party, thus consolidating their appeal to the middle-class voters. They also have started to give many awards to eminent personalities, which made the intelligentsia pro-Mamata. The city since its independence has never witnessed such strong pro-incumbency for almost ten years in continuity. Even the Left Front in their heydays of 34 years faced strong anti-incumbency in the city itself in every election. This is indeed an achievement. The opposition voters in the city are now in complete disarray and fragmented, which has helped the ruling TMC immensely to nurture their support base and become stronger. In the future, the political landscape for the opposition parties seems bleak, because organisationally they are completely unmatched and the leadership crisis that the opposition is facing is also striking. There is no viable leader in the entire opposition camp – at least, not to be seen in the immediate future. Except for a small minority section of old-age refugee voters who still preferred the Left and the upper middle-class Bengali, TMC won almost all other groups. Division of votes between Left and BJP also helps them. Several new groups are being included in the fold of TMC, especially poor people, by TMC's tough stand against centre's demonetization and implementation of GST. TMC also is dead against price rise, which is also a fact of their support base among the downtrodden section of the society. They also have taken a position of resistance to the Central Government's anti-Bengal stand, which helps to garner sympathy votes as well as a complete grip on minority votes. They were so strong that even major scams had little effect in loosening their grip on electoral outcome. However, some of their leaders, especially at the grassroots level, have become corrupt and extortionist, which may in the long run spoil the sentiments of the common people towards the party. The upper middle-class Bengali voters in Bhawanipore, Alipore, Rashbehari, Ballygunge, and Bidhannagar, along with the trading belt voters in Barabazar and Jorasanko support the BJP. The Left has lost significant force even in the Jadavpur–Tollygunge refugee belt, which was their stronghold.

Concluding Remarks

The political future of the city seems bleak. The politics of dole, continuous brain drain, economic and industrial retardation, bitter hatred among political parties, and a huge influx of the rural poor into the city have

contributed a lot to the slow progress of the city, which is being reflected in its demographic shift caused by the flight of the younger generations in the middle-class areas because of large unemployment in the state and city itself. Politicising of institutions and intense political rivalry in the city tarnished the image of the city. Kolkata often makes news for all the wrong reasons, among which high levels of politicization are one. It is unknown whether the city will evolve to be a more politically mature one in the future. Kolkata's reputation of being a city of politics has rightly been given to it, where every individual has a political opinion and thrives in its jargon. Citizens are found discussing politics and political manoeuvring in informal social gatherings and generally dislike being apolitical. For the citizen, the drive to maturity in political life has yet to be attained, but one can be hopeful that awareness may lead to maturity, and that in turn may lead to good governance.

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Part II

Ekistics of a Deltaic City

9 The Built-up Horizon

Urban Sprawl and Emerging Core – Periphery Dynamics

Sk. Mafizul Haque

Urbanisation is a result of a complex interaction between nature and anthropocentric changes that occur. The cultural landscape is thereby superimposed upon the natural environment (Doygun et al., 2008). Urban expansion is also a continuous and dynamic system. The urban dynamism is reflected in multiple dimensions, including the functional, morphological, and structural identities of the urban area.

The context of post-modernism in urban studies has flagged the contextual colonial and post-colonial urban conflicts and its 'north-south' optic. Rapid urban expansion has gradually impacted every aspect of the world economy at multiple magnitudes, along with the vivid gaps reflected in unbalanced urbanisation (Pacione, 2005). Lawhon and Roux (2019) stated that the study of urbanisation of the global south is less in the arena of the 'World of Cities', whereas a wide range of views from the Global North has been established as the global episteme of urban advancement. In recent times, the colonial cities of South Asia are considered urban centres on the 'back foot' with their conspicuous absence in any discussion on contemporary global urbanity (Short, 2004). Till the 1950s, the colonial urban centres were important examples of world cities, essentially for their linkages with economic systems of Western cities. The decline of colonial power isolated these cities without any developmental and strategic planning (Pal, 2006). Consequently, most of the colonial cities in the global south were reduced to urban centres with 'loose connections' with their coloniser countries and were excluded from the list of contemporary world cities (Short, 2004). Based on these arguments put forward by Schindler (2017) and Lawhon and Roux (2019), this chapter focuses on the expansion of Kolkata's (Kolkata Municipal Corporation), urban environment, using substantial empirical evidence. It also explores the declining importance of the city in the era of rapid urbanisation. In the post-independence era, despite the country's high urbanisation rate and the growing importance of metropolitan cities, the city of Kolkata has been rather slow when it comes to urban expansion in general and urbanism in particular.

The recent rapid urbanisation process in developing countries is dominated by the growth and spatial expansion of big cities creating primacy of

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selected urban centres. The urbanisation process in India is influenced by two main processes: (i) urban centres that experience *urban-industrialisation* where large employment is generated, and/or (ii) *urbanisation* through the movement of people from the vast rural hinterland to seek myriad services in the city. Kolkata has expanded by both processes. The colonial period of Kolkata was characterised by industrialisation-led urbanisation, while in the post-independence period, its position as the capital of West Bengal was nurtured by its administrative function, trade, and service functions. The city evolved as a primate city and its history reveals its strong colonial links that were disrupted upon Independence, leaving the city behind as Delhi, the latter capital of British India, and many other large cities, strode forward in the saga of development.

Planning for Indian Urbanisation in the Post-liberalisation Period

During the last two decades, India has experienced two fundamental influences that had strategic impacts on its urban system and planning. One is associated with the local governance, i.e., the 73rd and 74th Constitutional Amendment Act of 1992, and the other was the impact of globalisation or liberalisation of the economy. The first one advocated a 'bottom-up' approach replacing the 'top-down' system (Halder, 2014), whereas the process of globalisation incorporated a new dimension in the city's functional attributes and modes of urban management (Newman and Thornley, 2000). The combined feedback of these two strategic liaises created a considerable impact on India's urban system. The Special Action Plan (SAP) was formulated for the basic development of urban infrastructures in selected leading metropolises of India. But at the very beginning of the 21st century, the Jawaharlal Nehru National Urban Renewal Mission scheme boosted the basic urban amenities along with the infrastructural advancement in almost all the leading urban centres of India. After this initial attempt, several reforms on inclusive urban planning were introduced to strengthen the governance and spatial data infrastructure. For instance, National Heritage City Development and Augmentation Yojana (HRIDAY) was launched for the conservation and capitalisation of urban arts, cultural, and aesthetic identities. On the other hand, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was initiated alongside the Smart City programme, planned in 2015 for meeting instant and user-defined service demand by local people. Apart from these, different regional-scale plans have been adopted for case-specific urban development strategies, i.e., Transit-Oriented Development (TOD) for comprehensive and multi-modal mobility improvement, mixed land utilisation practices, and integration of weaker sections and affordable housing in the influence zone. Recently, to create resilient cities, the Ministry of Housing and Urban Affairs, Govt. of India has initiated short-,

medium-, and long-term action plans under the various agenda of sustainable development.

According to Pathak (2004, 2014) the uniqueness of urbanisation in India is structurally and spatially imbalanced in terms of its domination by large cities and metropolises. The functional importance of these urban centres has been influenced by numerous programmes adopted during previous plan periods. The leading metro cities are the centres of functional innovation and employment generation in India and drive a large share of goods and services disbursement. Owing to the presence of employment opportunities, metropolitan cities of India have experienced greater inflow of population during the last few decades. As a result, maximum metropolises evolved into what may be called 'under-bounded cities' at the end of the 20th century, due to uncontrolled extension of their built-up horizon leading to haphazard urban expansion. Subsequently, partial revitalizations of the civic bodies, ad hoc reforms impacting the local economy, the incomplete efforts in slum improvement, and the large share of informal labour force, all contribute to the creation of a spatial imbalance in urban functions, mostly due to ad hocism. At the same time, post-liberalisation influenced cities in a big way, transforming their commercial base and giving them large-scale makeovers that led to the gradual disconnect of the channels of modernization on the one hand and the status of the urban poor on the other.

In the context of greater Kolkata, the concept of Master Plans does not exist; instead, there are Development Plans, and the Kolkata Municipal Development Authority (KMDA) is the overall authority for planning and executing of the development plans. Several experts opine that the KMDA has failed to operationalise holistic sustainable development (Pal, 2006; Halder, 2014). On the other hand, small urban centres within Kolkata's urban agglomeration have played a vital role in establishing linkages with the existing global economic systems and have been responsible for expansion of the metropolitan area, primarily through the large-scale growth of the real estate sector. However, the horizontal expansion, which far exceeds the vertical expansion, has impacted and reduced the natural resource base of the region (Haque, 2013). With the wave of spatial segmentation, new prosperities were predicted to arrive alongside the process of urban expansion and sprawling (Shaw, 2015; Bhatta, 2010).

Materials and Methods

This study is primarily based upon critical analysis of land-use and landcover data extracted from satellite images and supported by intensive Ground Truth verification with the help of geospatial tools. Historical information was extracted from the various existing literature, reports, and maps. The administrative, demographic, and amenities data was extracted from the Census of India from 1961 to 2011. The Survey of India Topographical

Map (1973) and the Howrah-Calcutta Guide map (1957) were used as the base maps for assessing the previous, historical land use dynamics. These maps were processed through the geographic information system (GIS) platform for assessing the spatial concentration of various variables using simple overlay and clustering methods. Different bands of remotely sensed data of the Multi-spectral Scanner (MSS), Thematic Mapper (TM), Enhanced Thematic Mapper Plus (ETM+) and Operational Land Imager (OLI) sensors were used for expansion analysis. After necessary correction of the satellite data, the following exercises were performed:

a) Image classification for the extraction of built-up area, LULC preparation,
b) band ratio-ing for the identification of functional nodes and urban core
c) pixel clustering for assessment of urban morphological units

Ward-wise intensity of built-up extension is estimated by the Reynolds method (1993) using the following formula:

$$U = UL_2 \sim UL_1/P_2 \sim P_{1,}$$

Where UL_2 = area of built-up cover in succeeding year, UL_1 = built-up area in preceding year, P_2 = population in succeeding year, and P_1 = population in preceding year

The final output of all these techniques was reexamined and verified by primary data considering the first law of geography as stated by Waldo R. Tobler in 1970 that 'everything is related to everything else . . . but nearest things are more related than distance things'.

Urban Dynamics and the Development Scenario

The Kolkata Municipality was set up in 1876 (Chaudhuri and Mukhopadhyay, 1975). During that time, Kolkata Municipal Corporation (KMC) had only 18 wards covering 15.20 sq. km. (3754 acres). After a series of amalgamations, the total area of KMC became 187.33 sq. km., and finally with the incorporation of three more wards in 2012 (from 141 to 144 wards), the area presently stands at 206.08 sq. km (Figure 9.1d).

Demographically, Kolkata enjoys primacy over a vast hinterland. Due to its economic and cultural dominance over a large area in eastern India, Kolkata is at the centre of influence. The resultant functional diversity and intensity created a huge population influx into the city, which continued to be the largest city in India till 1981. But its physical configuration and urban services were not sufficient to support the burgeoning population. According to the 2011 Census, it is the third largest urban agglomeration in India next to Mumbai and Delhi. The decadal growth rate of Kolkata does not show a uniform trend. During the period from 1831 to 1840, the

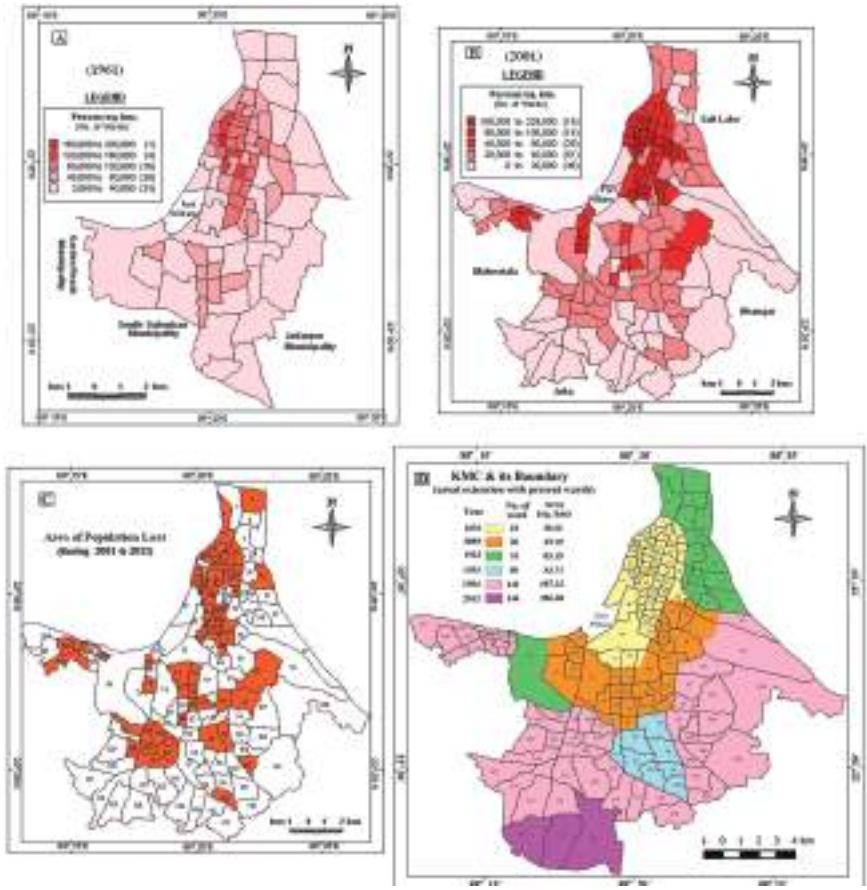

Figure 9.1 Spatial concentration of population in KMC [a] 1961 and [b] 2001; [c] areas of population loss during 2001 to 2011, [d] extension of the municipal boundary with time.

population increased remarkably, with the growth rate estimated at more than 93%, whereas the period between 1850 and 1866 shows a decline in population growth at -14.11 %.n From 1872 to 1881, the growth rate is negative. In the last millennium, the maximum decadal population growth occurred from 1931 to 1941, reaching 76.22%. In the last decade of the last millennium, it was calculated at 3.933% and it has become negative (-1.88 %) in the first decade of this century (Figure. 9.1c). Gross population density, defined as the number of persons per unit of an urban area, has increased gradually in the study area throughout the last century. The present population (Census 2011) density in the study area is more than 23951/

sq. km., a substantial rise from 10196 persons/sq. km. in 1901, but not as high as that of comparable Indian megacities. It may be concluded from the data that Kolkata's growth has been slower than comparable cities of India.

Urban Expansion and the Process of Spatial Transformation

Initially, the combined interaction of agricultural surplus and development of the manufacturing sector led to the urban expansion trajectory in Kolkata. It is argued that in growing metropolitan areas, peripheral zone changes more rapidly vis-à-vis the centre. As a result, a new form of urban development begins to take place (Pickett, 2001; Garreau, 1991). The shopping malls, residential enclaves, large departmental complexes, luxurious hotels, and transportation nodes are built on this urban frontier, interspersed with scattered and newly formed business centres. With time, this frontier becomes a prominent economic, cultural, and political place adorning the characteristics of a small urban core of considerable importance. Kolkata has experienced such a process and has seen gradual changes in social organisation.

Spatial transformation of urban space during the Independence period

Based on Burgess's model, Berry and Rees (1969) had first analysed the factorial ecology of Calcutta and formulated the social layout of the growing metropolis of India (Figure 9.2). Based on the 1901 and 1961 census data and the '1964: A Social Survey' report by N. K. Bose, Berry and Rees assessed the social areas of Kolkata in the first half of the 20th century and emphasised that the city was in a transitional developmental stage then. During that time, most of the buildings situated in central Kolkata were utilised for running businesses, offices, and other commercial establishments. Consequently, these wards had a conspicuous mixture of the homeless male population and those residing in institutional domains. Besides, the dominance of traditional communities involved in trade and commerce, like the Marwaris, was found in the immediate surroundings of this core. The concentration of non-Bengali business families was especially remarkable in the areas close to the north of the city core, as well as east of Maidan. Similarly, the Bengali upper caste communities had their traditional residences in the northern part of the city, i.e., the old native quarters.

Within the Bengali community, there existed distinct differences in terms of architecture of dwelling units, i.e., upper-class Bengalis had both large palatial bungalows with unique architectural designs as well as moderate-sized bungalows, whereas poorer families lived in mud-walled single-room tenements. The peripheral areas were occupied by a mixture of Oriya and Bihari in-migrants. In those times, there was a distinct division of the city space. It was deeply divided into two categories: *the area of colonisers:* a

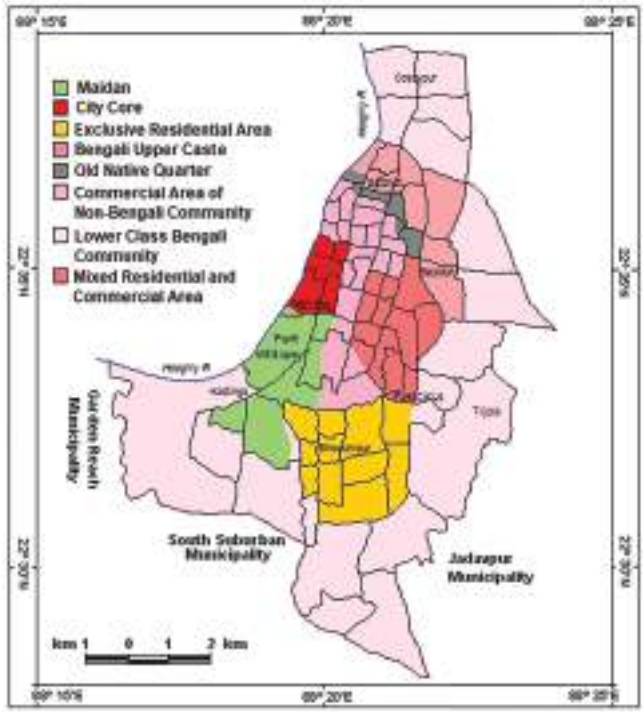

Figure 9.2 Conceptual framework of predominant social areas in Kolkata during the first half of the 20th century (modified after Berry and Rees, 1969).

well-serviced area where people lived in spacious bungalows with adequate amenities, popularly marked as the 'white town'; and *the area of natives:* a poor, unplanned, and un-serviced area with congested neighborhoods, known as the 'black town'. For availability of services, slums of the poor natives developed within the proximity of the white residences. Railway connections between Kolkata and the rest of the country turned this urban centre into the second largest city of the British Empire, and it became a popular colonial trading centre along with Mumbai (Munsi, 1975).

Spatial transformation of urban space during the post-independence period

Chakravorty (2005) studied the temporal transformation of Kolkata's urban space since the colonial period and came out with three important conceptual models. In his spatial structure of the colonial Kolkata model, he also asserted a big open space encircled by the native, middle-income, and British town, along with the service centre of the port and primary function area.

During the post-independence period, the city structure mostly remained unchanged, although the spatial divide was now transformed into that between the upper-class natives: owners of capital, landowners, political leaders, and apex government officials who occupied privileged spaces that was once reserved for the British officers posted to India, and the poorer natives, like refugees from East Pakistan (now Bangladesh) (Goswami, 1990). Gradually, the surrounding villages including their paddy fields and tanks got incorporated within the city's limit of Kolkata (Mitra, 1990). As the land habitation of Kolkata during the post-colonial urbanisation was highly characterised by social division rather than class division, spatial segregation spread to the farthest areas. It is observed that the income of people declined with distance from the city centre, and the previous native town has suffered from infrastructural deficiencies over time. Besides, with the lack of proper planning and investment, the congested central area gradually fell behind. The primary core area of Kolkata had a limited capacity to assimilate the influx of migrants; as a result, the city experienced rapid outward extension of housing infrastructures and consequential structural modification (Pathak, 2011). On the other hand, north Kolkata was surrounded by an old urban area on the north and the eastern sides. With time, it struggled to absorb the distressed migrant population from its vast rural hinterland. But there was also the need to absorb the waves of refugees who were compelled to settle down south of the city limits. The combined effect of all these scenarios depicted another story of the urban poor, manifested by the development of slums on the southern periphery and homeless population in central Kolkata (it's CBD) as pavement dwellers. The spatial separation of the entire urban environment was not confined to the poor, but is also deeply differentiated by occupational, religious, caste, and ethnic grounds. Apart from the geographical limitations, problems like congestion, urban blight, and socio-environmental problems also developed due to the counter-effect of this mass migration (Bardhan et al., 2011). Planning policy since the 1960s has tried to form multiple nuclei through development of new urban nodes within the immediate surroundings of KMC (Bardhan et al., 2011). But the factorial ecology reveals that the city defied the policy and followed a strong mono-centric trend of functional assimilation (Dutt et al., 1989) up until the initiation of reform activities in Kolkata.

Spatial transformation of urban space during post-reform period

The pushing of the population from the core to the fringes has been precipitated in the form of increasing population densities in peripheries (Pathak, 2011; Shaw, 2015) In this context, different types of reforms, as well as city-improvement activities, led by Government intervention have taken place in and around the Kolkata urban area. After the failure of the Kolkata Port and the jute industry, these areas emerged as the zones of new development. Kolkata gradually inducted some spatial changes in sync with globalisation, the market economy, and associated policy reforms. But the reform process

in Kolkata was dissected, short-term, and slow. In its first report in 1962, Calcutta Metropolitan Planning Organization (CMPO) (1963) planned to set up satellite towns like Bidhan Nagar (popularly known as Salt Lake), and the counter-magnets like Kalyani (CMPO, 1966). Satellite towns would function under the influence of the central city, whereas the uncontrolled expansion of urbanised areas was to be managed by counter-magnets to complement the central city in terms of livelihood options, services, and cultural amenities. Although the first attempt was a grand success and the marshy swamp was transformed into a planned satellite township, the second one (Kalyani, the counter-magnet) was a planning disaster.

Like the other planned development scenarios in India, city planning in post-reform Kolkata kept the urban poor away from the development perspective. 'Operation Sunshine' in 1996–97 is a clear reminder of such instances. During the last few years of the 20th century, areas in and around Kolkata began to develop through the advancement of post-Fordist techno-centrism, and the urban reconstruction that was required to accommodate its materiality became the priority of the policymakers irrespective of the deteriorating environment (Figure 9.3). As a result, natural resources like

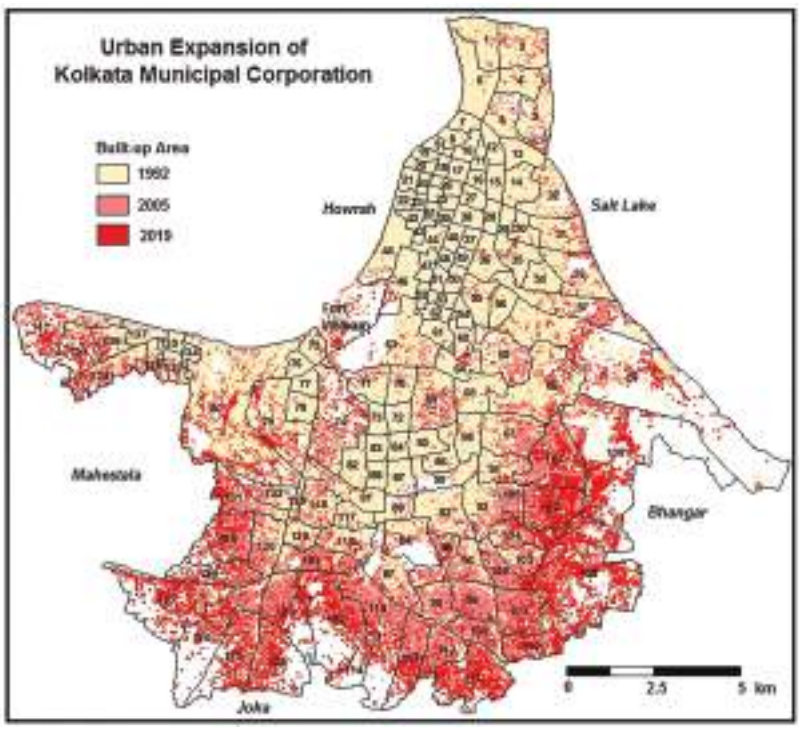

Figure 9.3 Expansion of built-up area in KMC from 1992 to 2019 [post reform period].

water bodies, open spaces, and the extensive fragile eastern wetlands waned in the wake of futuristic development. In the last two decades, expansion of the service sector was concentrated along the newly constructed Eastern Metropolitan Bypass towards the southern extension of the city. Along this thoroughfare, the high-end residential enclaves along with commerce, leisure, and hospitality, as well as services like health facilities, have been reflected by the booming real estate activities. Presently, Kolkata's land utilization patterns are incoherent with the previous functional cores but are controlled by several discrete functional nodes. Different types of redevelopment processes are going on under both the central and the state-funded programmes. Agglomeration of these functions has rapidly increased the land values in and around these nodes, accompanied by vertical space utilization. At the same time, this development is often not in clear response to existing demand, and non-performing infrastructural assets and vacant high-rises are often seen in most of these projects, revealing a lack of acceptance and affordability. On the other hand, a number of slum pockets have evolved in the immediate surroundings of the same nodes that are trying to cope with endless conflicts.

Urban Expansion as a Process of Functional Agglomeration

In this section, the concept of 'urban core' is considered as an intensively utilised spatial unit that evolves as a continuous built-up. It differs from the Central Business District (CBD), which is a morphological segment of an urban area dotted with only urban functional entities. Thus, the urban core is an important areal segment that is developed through the successive processes of invasion and succession of an urban phenomenon. Bryant (2004) has highlighted that the urban landscape surrounding the city core has developed with a greater level of heterogeneity. From the light of urban ecology, various urban habitat niches in the core include the existence of 'semi-natural habitats' like parks, cemeteries, railway tracks, derelict lands (James et al., 2009; Grant et al., 2003), etc. In the consideration of complex land utilisation of any metropolitan centre, the core is essentially characterised by intensive urban functions and a well-defined skyline, signifying strong functional diversity dynamics.

In Kolkata, the area of the previous 'city-core' has remained unaltered (Figure 9.4), and the continuous formation of the built-up structure indicates the intense development of urban functions. The high compactness is synonymous with the metropolitan core. In 1973, compact built-up was confined to the central area and surroundings like BBD Bag, Esplanade, Chowringhee, Barabazar, Bowbazar, and Central Avenue. Beyond this, it was eastward to Park Street, Park Circus, and southwards to Bhowanipur-Ballygunge, Rashbehari, Khidderpur. With time, this continuous built-up area has become more compact. In 1990, a large area of the metropolitan core was co-terminous with the '*bazar areas*' (marketplace) of KMC (Haque,

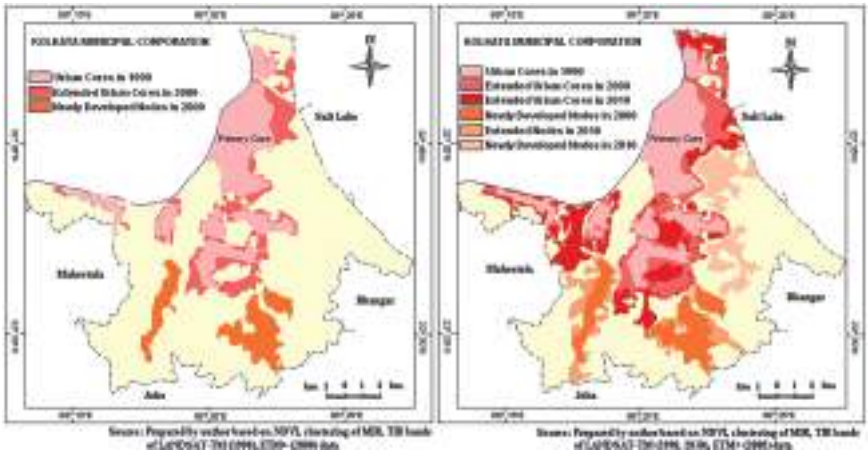

Figure 9.4 Location and extension of core areas in KMC (1990 to 2010) (A: 1990 & B: 2010)

2013) that has its origins in the colonial past and is considered here as the '*primary core*'. Kolkata has retained its primary functional core for decades, which is considerably more continuous than the relatively smaller disjointed nodes. With time, this primary core has developed a strong association with the extended *'bazar area'*, pockets of central administration and judiciary functions, financial hub, wholesale areas, oldest academic institutions, oldest corporate offices, logistics, storage, and warehousing facilities, etc. distinctly marked by its colonial past as the administrative centre (Haque and Bandyopadhyay, 2012). The unique colonial architecture of this core area is a strong identifier of its history. By 2010, the primary metropolitan core of Kolkata had expanded only slightly, and spatial restructuring and renewal had occurred around this central location. The process of using derelict land left behind by de-industrialisation over the years and the conversion of the unregistered slum areas into gated enclaves had clearly indicated the onset of the neoliberal changes in urban space.

Beyond the primary core, relatively smaller functional units are found to have evolved. These subsequent functional units are considered as *secondary cores*. Between 1990 and 2000, an increase in area and compactness was found at three stretches of Behala-Taratala, Jadavpur-Garia, and Baghajatin-Mukundapur. Also, older nodes were expanding, as seen in the following stretches: Park Street-Park Circus, Rashbehari-Gariahat, Port Area-Khidderpur, and Metiabruz. During this time, the primary core had extended in the easterly and southeasterly direction (Figure 9.4).

By 2018, it extended to Cossipur-Sinthee in the north; Kankurgachi-Phoolbagan-Belaghata area in the northeastern direction; Tangra-Topsia

to Picnic Garden and onwards up to Garia in the east and southeastern direction; Tollygunge-Jadavpur area in the southwards; Taratala-Behala and Hastings-dock area in the southwest stretch. In this regard, an elongated stretch of built-up area has also developed along the E. M. Bypass, which creates two separate nodes of development foci, i.e., Science City and its surroundings and Ruby Crossing and its surroundings. This area is gradually becoming one of the most advancing nodes of KMC in recent decades.

By 2010, there is compactness and outward extension of the built-up environment towards this direction. These ancillary urban functional units (*secondary core)* were much smaller in their spatial extension, but grew at a faster pace than the older nodes. Over time, with urban expansion, new urban functional units have evolved that reflect the intensity of urban land use, but are located in considerably lower densities of built-up space, as either substitutes of the main core functions or extensions of the same. Newly developed nodes are characterized by the mixed-use of residential and commercial with its supporting functions in the form of services and have been classified as '*Newly Developed Urban Nodes*' (Haque and Bandyopadhyay, 2012). The newly emerging nodes are characterized as expansions of road networks and flyovers for increasing connectivity. Baghajatin-Mukundapur node has developed as a health hub with the proliferation of five hospitals, medicine shops, two malls, several elite gated residential communities, and a handful of institutions. It is also linked well with the road-rail-metro network with facilitated transport services. Development of international education institutes, large multi-speciality hospitals, international stadium, several corporate offices and multinational financial hubs, numerous residential enclaves, and numerous regional offices of the government have marked these nodes. On the other hand, the Tangra-EM Bypass area has mainly developed due to the continuous formation of high-rises, corporate complex residential enclaves, international hotels, and commercial activities. It could have been better planned in a framework of land use controls and related policy initiation, as it is dotted with wetlands and water bodies. This only indicates the immense need for the proper assessment and constant review of land use characteristics and imposing strict regulations while land-use changes occur in newly developing fringes of the city.

The land use map of 2010 shows that these newly developed nodes appear largely in the southeastern area. By this time, the primary core had almost stagnated while all the secondary nodes revealed rather dramatic expansion in its areal extent due to the coalescence of adjacent densely built-up spaces. This is largely attributed to the expansion of real estate and infrastructure and a consequent reduction of open spaces. Apart from these, the combined output of the 2010 classified image depicts the formation of two strong functional nodes at a) Ruby-Mukundapur and its surrounding area; and b) the Tangra-Eastern Metropolitan Bypass neighbourhood.

The extension of older core and development of new nodes along with the decadal changes in the areal coverage are shown in Table 9.1.

Table 9.1 Spatio-temporal changes of functional nodes, 1990–2010

Type of Functional Centre	*Area (in '0000 sq. metres)*		
	1990	*2000*	*2010*
Primary Core	1519	2309	2407
Secondary Cores	1349.9	2586.3	4411.51
Newly Developed Nodes	-	1328	2502.4

Source: Haque and Bandyopadhyay 2012; Haque 2013

Figure 9.4 depicts the evolution of the functional nodes, clarifying that the pace of growth between 2000–2010 is much greater than 1990–2000. Also, while the primary core is a continuous built-up area, the secondary and newly emerging functional units are found to have initially emerged in a discontinuous manner because of the presence of vegetation, grass patches, open spaces, and less built-up areas in between. It is essential here to note the expansion of the primary core that increased from 15.19 sq. km in 1990 to 24.07 sq. kms in 2010. The newly developed functional nodes are found to have emerged along the Eastern Metropolitan Bypass by assimilation of important functions. These functional hubs catered to sprawling gated communities, supporting commercial activities like retail and entertainment, and institutional expansion, and have evolved during the last two decades. Figure 9.4 uses two maps to give clarity to the evolution of the urban landscape between 1990–2000 (9.4 A) and 2000–2010 (9.4 B).

The Kolkata Municipal Corporation area is structured by both local economic forces and broader regional development policies. It is striving, like most metropolitan cities of the global south under the neo-liberal influences, to be a part of the global market network, albeit at a very slow pace. Thus, a gradual increase in the proportion of capital investment, largely focused upon the real estate sector, has characterised the transformation during the last three decades. Major findings from this exercise regarding the temporal variation and extension of urban nodal sites include:

I. The city has a traditional and primary core that spills over the CBD, and it was built and executed by the British government. Under the influence of colonial power, this area had international importance between 1765 and 1911 and attained a unique identity. But the shifting of capital from Kolkata to New Delhi led to an abrupt halt in its prowess and viability.
II. That the city did not continue with a single-core. Due to the influence of the market economy and their variegated forms, Kolkata has developed multiple functional nodes.
III. Several secondary cores, developed over time to support the expanding functions of the city, are experiencing large-scale economic alteration through land-use restructuring. Population loss, dominance of

non-native citizens, concentration of modern economic activities, and the development of high-rises, along with the proliferation of old slums, etc. are the main characteristics of these core areas.

IV. That between 1990 and 2000, ***five*** new functional nodes emerged in the south, east, and southeastern fringes, and between 2000 and 2010, ***two*** nodes formed in the eastern sides of the municipal corporation. The three newly developed urban nodes of 2000 have formed in the same direction, (i.e., south, southeast) which implies that this region now needs to be the focus for planners. That the newly emerged nodes developed between 2000 and 2010 mainly developed in and around the ecologically sensitive zone, i.e., the East Kolkata Wetlands (a Ramsar site), making it a critical issue. Rapid infrastructural encroachment towards this site is attributed to the newly developed urban nodes.

V. That expansion of new built-up spaces around the nodes are replacing the natural land cover like open land, grassland, and wetland, thus causing environmental degradation.

VI. That there is no planned selection of the direction and magnitude of nodes and eventually no plan for its sustenance either. Land markets, proximity to arterial roads like the E. M (Eastern Metropolitan) Bypass, or the VIP road, and availability of space have guided almost all the conversions in a random and ad hoc manner.

Expansion and the LULC Corroboration

The expansion of the built-up area from 1973 to 2018 has created some major impacts:

- Firstly, horizontal expansion has ensured the *spatial transformation* of other land use and land cover classes.
- The compactness of built-up has undergone changes with years. During recent years, highly compact built-up areas characterise localities of Cossipur-Sinthee in the north; Kankurgachi-Phoolbagan-Belaghata area in the northeastern direction; Tangra-Topsia to Picnic Garden and extends onwards up to Garia in the east and southeastern direction; Tollygunge-Jadavpur area in the southwards; Taratala-Behala and Hastings-dock area in the south-west stretch. In this regard, an elongated stretch of built-up area has also developed along the E. M. Bypass which also creates two separate nodes of development foci, i.e., Science City and its surroundings and Ruby Crossing and its surroundings. This area has gradually become one of the most advancing nodes of KMC in recent decades (Figure 9.5, E)

  Thirdly, new nodes or subsidiary cores of metro functions that have emerged also experienced expansion in built-up areas This scenario is widely noticeable in Kadapara, Science City, Ruby-Kasba, Baghajatin, Anandapur, Mukundapur, Golpark, etc. The Behala, Barisha, Putiary,

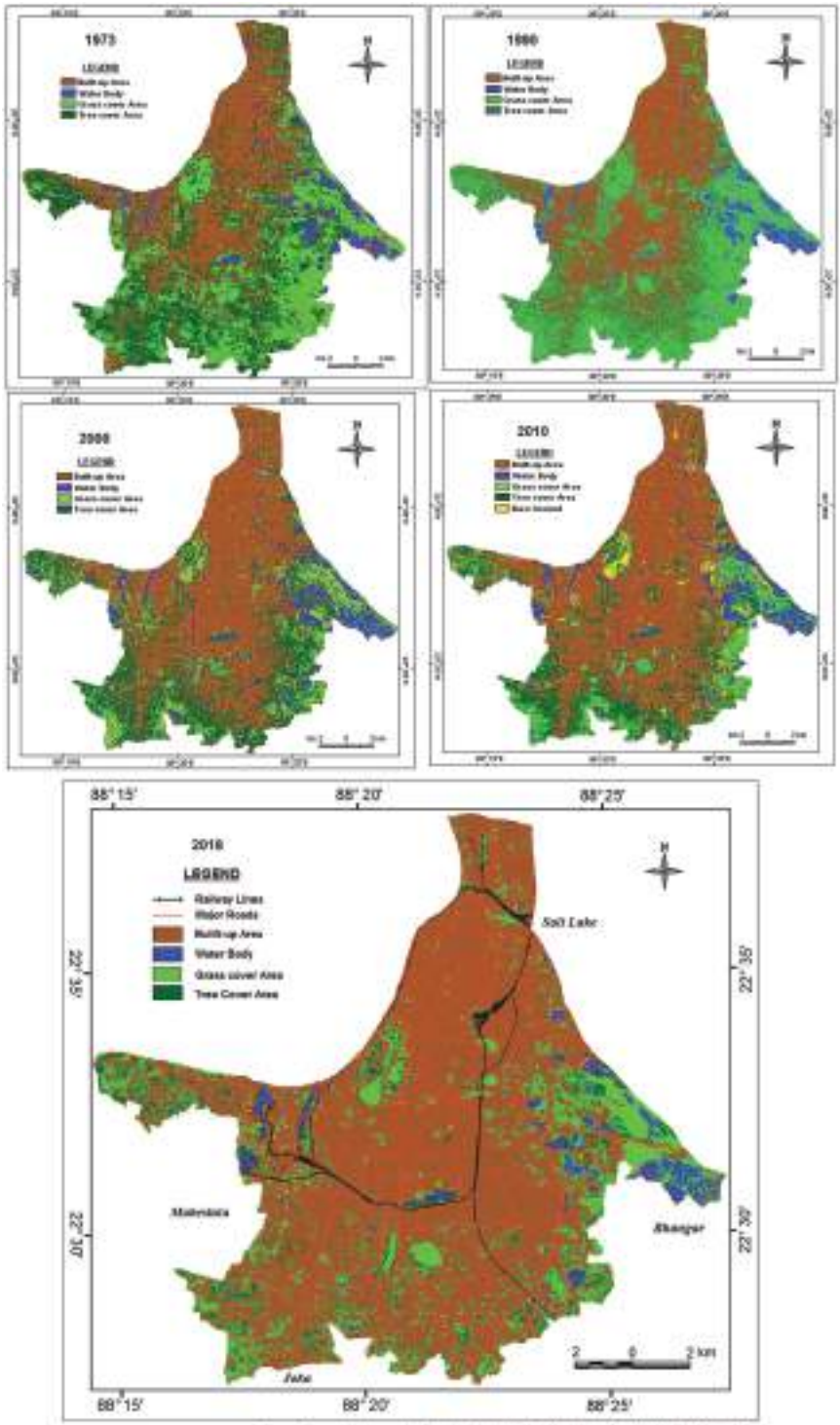

Figure 9.5 Temporal changes of LULC in KMC, 1973 to 2018

Source: Prepared by author using LANDSAT-MSS (1973), TM (1990, 2010), ETM+(2000), OLI (2019) data

Mominpur, Paharpur, and Metiabruz areas have become denser due to the proliferation of housing units and commerce.

The classification of images has revealed the declining natural spaces alongside the progressive rise in the built-up environment. As a result – a) *Water bodies* have a negative relation with the development of built-up features. But the maximum alteration of the water body to other land-use features was found during 1973 and 1990. Within the KMC limit, although it is noticed that some areas of water bodies were dug for the fishery development (like Nature Park, Rabindra Sarovar, etc.), agriculture, brick kilns, and roof tiles manufacturing purposes, a large number of water bodies and ponds were also converted to other land utilization schemes. Many of them have disappeared with the introduction of new developmental activities, and this continues in the peripheral Kolkata, for instance, the Thakurpukur, Bansdroni, Putiary, Garia, Patuli, Mukundapur, Ajaynagar, Anandapur, Narkeldanga, and Sorsuna areas. Wetlands in some places like Bikramgarh Jheel and ponds in Mukundapur Mouza are facing rapid deterioration. b) *Grass cover* area of KMC has also declined with the extension of the built-up environ. In 1973 satellite data, there was 30.19% grass cover, whereas the first decade of this century has shown this figure at merely 7.78%. The maximum area in eastern, southeastern, and a few patches in the southern and southwestern part of KMC was under the grass cover category, but at present it is compressed in specific areas in the eastern, southern, and southwestern fringe of the city. A substantial change in this type of land cover was found in the last period of the 20th century, when it declined at an alarming rate. This situation is also observed in 2010 and 2018, but the rate has decreased slightly. Grass-covered land disappeared due to the continuous built-up area in the central part of KMC. Here some open spaces show the presence of grass patches. Owing to regulated prohibition, an extensive grass-covered area is present at the Maidan area, located at the southwestern portion of the Esplanade (meaning the end margin of a big open area), Race Course, Golf field of Royal Calcutta Golf Club, Tolly Club, Haridevpur area, and Sarsuna. The Eastern portion of E. M. Bypass also has an extensive grass-covered area, but for most of the year it is used for cultivation purposes. In 2018, these areas were converted into a built-up environment. c) Extensive presence of *tree cover area* was found in the peripheral environment in 2000. Large patches of wooded settlement in Ballygunge, Tangra, New Alipur, Behala, Garden Reach, Jadavpur, Garia, etc. are replaced by enclaves. Newly developed built-up structures are mainly used for residential, institutional, or retail purposes. The built-up environ replaced the peripheral tree cover patches in the outward direction. A large number of uprooted trees were found along the E. M. Bypass as a result of the devastation caused by the Aila Cyclone in 2009, and during the Amphan in 2020, the situation became more critical. Beautification programmes by the Urban Forestry Department and NGOs have ensured

plantation of new trees at open public spaces, park areas, children's playgrounds, or street sides, which are mainly found in the older built-up environment. Stepwise regeneration of green spaces along with few attempts to develop the urban forestry has dramatically increased the green vegetation area from 2010 to 2018. South Kolkata has seen a major improvement in vegetation development in comparison to north Kolkata. Tree-covered areas in some pockets at the southern part of KMC are in good condition because of the beautification programme of urban forestry schemes and plantation activities in the restricted areas. But in most of the places, the dominance of foreign species is prevailing along the roadside areas. Ballygunge, Maidan area, areas under Fort William, Princep Ghat area, defense area at Hastings, Nature Park, etc. have shown increased tree-covered conditions. This scenario is confined only to South KMC. But in consideration of the total KMC area, it has registered a decline. Because of the advancement of the built-up environment, tree-covered areas are shrinking with varying rates.

Changes in the built-up area

The temporal changes in the built-up area are discussed in two aspects:

a) Expansion of the overall built-up horizon

In 1973, the total built-up area was found to be 71.86 sq. km concentrated in the primary core, i.e., Bhowanipur, Port area, and Khidderpur area. Over three decades, the built-up area has expanded in the southeasterly direction. In 2010, the total calculated built-up area was 136.53 sq. km. The gradual and slow temporal changes of the built-up area, as computed from the consecutive classified outputs, are shown in Figure 9.5. Till 2018, the extension of the built-up horizon was towards the south and southeast. This outward expansion resulted in the demarcation of areas of specific land utilization like housing complexes, educational hubs, market complexes, and theme parks, along with the residential buildings.

b) Expansion of the continuous built-up horizon

The presence of a continuously built-up area is a characteristic of metropolitan morphology, which indicates compactness with the process of expansion. In KMC, this process developed a few specific spaces uses like *new area of market economy:* through the process of urban renewal, restructuring and initiation of modern business activity; *area of hotspots:* developed for the preservation of environmental sites and identification of prohibited pockets; *site of heritages:* area of unique identity, art, and culture which has a range of specific historical, socio-cultural, and socioeconomic values; *locality of conflict:* indicates the undecided area of occupancy right and

Table 9.2 Changing Rate of LULC Alteration from 1973 to 2018 in KMC

LULC Category	*1973 (MSS)*	*1990 (TM)*	*2000 (ETM)*	*2010 (TM)*	*2018 (OLI)*
	Area in sq. metres ('0000)	*Area in sq. metres ('0000)*	*Area in sq. metres ('0000)*	*Area in sq. metres ('0000)*	*Area in sq. metres ('0000)*
Built-up Area	7186.45	9385.89	12854.63	13653.48	14924.27
Water Body	1729.49	1393.84	1266.66	1197.66	517.38
Grass Covered Area	5670.42	4787.24	2185.59	1461.47	1069.09
Tree Covered Area	4190.86	3210.25	2470.34	2070.34	2266.48
Bare Ground	-	-	-	394.27	-
Total	**18777.22**	**18777.22**	**18777.22**	**18777.22**	**18777.22**

Source: Haque 2013 and calculated from the satellite data

Table 9.3 Remarkable areas of high-intensity expansion in KMC, 1991–2019

Period	*Area having high intensity* of built-up expansion (ward no.)*	*Nature of Changes*
1991 to 2001	Port area, Park Circus and Jadavpur *(59, 66, 67, 92, 96, 99, 98, 107, 130, and 80)*	• in and around the secondary cores, but high centrality, • limited access to transport facilities, • wooded settlement to built-up pockets with extensive open space,
2001 to 2011	Port Area, Tollygunge, Garia, Mukundapur, Science City *(80, 106, 107, 108, 109, 111 and 122)*	• associated with newly developed nodes with growing cluster, • infilling dominated land-use transformation, • deep interaction with natural resources like – water bodies, grass covered area etc.
2011 to 2019	Tangra, Behala, Putiary-Kudghat *(58, 114, 122, 125, 126, 128 and 129)*	• service area depended on extension, low centrality and high continuity with the local area, • para-transit dominated commuting system, • high fractal dimension of land cover

* intensity of built-up extension has been calculated by the Reynolds method (1993).

policy implementation; *locality of dispute:* caused by development paucity. It is also closely associated with the definition of the *core* urban area.

Conclusion

KMC has experienced a unique expansion nature. As the wards in central Kolkata have lost population at a rate of 1.08% between 2001 to 2011, it is

deduced that people migrated towards the periphery and created a new built-up area resulting in the *segmentation* of urban space. Geographically, KMC is almost bounded on the west and north sides, so the growth is directed towards the east, southeast, south, and southwest directions. Based on the spatial transformation, KMC has experienced – a) contact expansion: found in its northeastern periphery which is amalgamated with other old municipal areas; b) conversional expansion: alteration of land cover (i.e., natural resource) into the built-up environment by the rapid changes, which is mainly practiced in the eastern periphery of the study area, which squeezed out natural resources, i.e., East Kolkata Wetlands; c) transform expansion: experienced in the south and southwestern periphery through a direct transformation of rural and settlements to urban status. As a result, the natural landscape is fragmented vigorously; it has also replaced the patches of wooded settlement during the last two decades. Similarly, KMC has experienced leapfrog and filling processes (Haque et al., 2019) of urban expansion in the inner-city portion. In KMC, spatial integration was mainly confined in and around the areas of the inner core in association with older functional hubs (Figure 9.4).

While there has been substantial transition in the nature and magnitude of functional agglomeration in response to expansion, the city has remained characterised by limited vertical development and alteration of open space along with the segmentation of urban space. Although it is very slow, the landscape identity and skyline of the city has been changing conspicuously. For example, the steady increase in high-rise constructions was confined mainly to the primary core between 1991 to 2001, but it extended up to Jadavpur in 2019 in a linear corridor connected with Park Street, Park Circus, Ballygunge, Gariahat, and Golpark areas. Concerning this, Dasgupta and Sivaramakrishnan (2013) have observed the imprints of neighbourhood changes and social transformation as emanating from an increasing number of high-rise residential apartments in the KMC area. At present, the process of expansion is most rapid along the E. M. Bypass especially in the east of Tangra area, owing to the development of numerous high rises, international hotels, schools, superspeciality hospitals, and other institutional enclaves due to the instigation of the market economy. Behala and its surroundings are also experiencing booming micro-markets with several real estate projects. The ongoing metro project has also triggered the effects at an alarming rate and Putiary to Kudghat area has witnessed this because of the metro rail route extension from Tollygunge to New Garia during the last decade. On the other hand, due to the shifting of development activities to Kamalgaji the landscape changing scenario has slowed down in the Garia area. But all the infrastructural advancement in KMC is controlled by state-driven policies and guided by local agendas emanating from local demand. From this discussion, it is also concluded that Kolkata's urban agenda ought to be considered for getting cognizance of the variegated urbanity in the global south. It forms one of the regions from which a new urban theory can be generated in times to come focus on its urban development, expansion, and overall resilience.

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10 Differential Transformation of the Eastern and Southern Peri-Urban Interface

Sayantani Sarkar

The growth of Kolkata has been described by Rudyard Kipling (1922) as 'chance directed and chance erected'. In 1757, amalgamation of the outer towns was initiated by the Company, which, according to Howell, was 'a considerable tract of land taken from the 24 Paraganas adjoining to Calcutta in order to extend its bound'. This tract, comprised of 55 mouzas or grams, was called Panchannagram. The boundary of the town was fixed to be the inner side of the Maharatta ditch (Proclamation of 1794), and with Act XXI of 1857, the suburbs were defined to include all lands with the general limits of Panchannagarm. The city further grew organically in different time periods, amalgamating the adjoining rural areas. The following table highlights the spatial growth of Kolkata city in different time periods (Table 10.1).

Kolkata grew as and still remains the major economic and political centre of eastern India. Its cultural and educational contributions to the eastern region and the country as a whole are unfathomable. It remained the favorite administrative location for the British to rule the country till 1911, when the British capital was shifted to the more central location of Delhi. Kolkata also encountered twin waves of migration- one during the time of Partition in 1947 when East Pakistan was formed, and the second after 1971, when Bangladesh was liberated from Pakistan. The enormous influx of population led to a growth process which is often equated with prematurity. Further, the industrial base of the city continued to pull people from neighboring districts of the state of West Bengal and the other states as labour forces. As such, population continued to grow for the next two decades.

Presently, Kolkata Metropolitan Area is the oldest and also the largest urban metropolis in the eastern part of India. KMA has a total area of 1886.67 sq. km. and is composed of three major municipal corporations, 39 municipalities, 75 non-municipal census towns, 16 outgrowths, and 446 rural areas. The three major municipal corporations are Kolkata Municipal Corporation, Howrah Municipal Corporation, and Chandannagore Municipal Corporation, of which KMC is the largest with an area of 200.71 sq. km. KMC forms the very core of the KMA area, comprising 30% of the total population of the entire KMA area (Figure 10.1).

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Table 10.1 Growth of Kolkata

Period	*Area (in sq. km)*	*Remarks*
12th century	5	Kalikshetra
1706	6.8	First survey conducted
1794	20	First official boundary
1850	20	Simm's survey map (18 wards)
1901	53	Census 1901 (25 wards)
1923	78	Census 1931 (32 wards)
1953	104	Census 1961 1961–80 wards 1971–100 wards
1984	187	Census 1981 (141 wards)
2012	205	Census 2011 (144 wards)

Source: Compiled from multiple sources

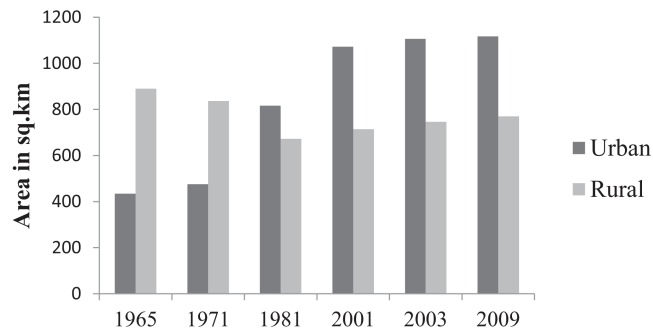

Figure 10.1 Peripheral changes along KMA

Source: Based on perspective plan of KMA-2025 and KMDA

However, due to gradual saturation of the core area, there has been spilling over of the population to the suburbs and the adjoining rural areas. This has triggered the growth and development along the peripheries in the form of construction of new towns and residential areas. The initial attempts to develop a parallel township at Kalyani failed, mainly due to its distance from the main core, lack of adequate transportation, and lack of interest from the people to settle there.

Later, there were successful projects in the form of the Salt Lake satellite township, Baishabghata-Patuli Township, and the Rajarhat Newtown project. These projects played a significant role in transforming the nature at the fringes of the metropolitan area. The following figure depicts the changes evident in the peripheries with the gradual expansion of urban areas and resulting shrinkage of the urban area. As pointed out by Shaw (2015), the

spillover is active along the eastern peripheral areas, where higher growth rates have been evident.

The current demographic growth pattern of the city indicates population growth in the peripheral areas over the city. Several factors have been attributed to this condition. Some of them include inner city saturation, declining economic importance of the city, increased administrative turmoil, and weaker infrastructural health. Also, with the neoliberal advancements, the developmental focus has shifted to peripheries other than the inner areas, making the hinterlands more favorable sites for realtors and developers. The availability of better infrastructures at the fringes and the lowering of taxes have engineered the flow to population towards the peripheries, too. Thus, the peri-urban regions of Kolkata are undergoing massive transformation processes – residential, commercial, and infrastructural.

In spite of accommodating a large-scale urban spillover population, the Kolkata peri-urban areas remained administratively unattained for a long time. As the planning activities were mostly limited to within the administrative boundaries of the municipal towns, the fringe areas were left to the natural processes of growth (Pathak, 2011). Later focus was shifted to the eastern fringes where satellite towns and new towns were planned. There was a hurried approach from the government to develop the fringes, primarily to join the league of other growing Indian cities, like Bangalore, in growing information technology sectors. The Rajarahat new town project along the northeastern fringes follows the trends of new development, with new liberal strands where the state actively participated in preparing grounds for the private actors to developing a world-class city. Compared to this, the peripheral growth along the southern parts has been more natural. Urban imprints grew slowly along the southern margins of the city, but remained unattained by the government for a long time. The recent re-delineation of the administrative boundary of the city has incorporated some major peri-urban areas along the southern boundary, including Joka outgrowth.

The Eastern Fringes – Rajarhat New Township

The significance of the eastern fringes of Kolkata pertains to the existence of the famous East Kolkata Wetlands, one of the major Ramsar sites in India. The vast area thrives with scattered shallow water bodies and marshes making up an area of roughly 12000 hectares. These wetlands have supported numerous fisheries and paddy cultivation areas and have immensely helped in waste recycling for many years. However, the intrusion of urban growth into the area has massively affected and jeopardized the fate of this extraordinary system. The eastern fringes had earlier witnessed the reclamation of marshy land for building the satellite township of Salt Lake, also present at the eastern fringes of the city.

The major New Town project, called Rajarhat New Town, was initiated in 1993. Largely proclaimed as a sparsely-populated and low-lying marshy

area, huge acres of lands were acquired for the new project to develop a world-class city. Initially, the project took over 21 mouzas, which was later extended to a few more. A total of 3075 hectares of agricultural land came under consideration. Presently, the new town is spread over an area of around 3700 hectares. The task of developing the project was handed over to the West Bengal Housing Infrastructure Development Corporation (WBHIDCO), which undertook the land acquisition from the villages (Figure 10.2).

The land acquired was mostly agricultural and water bodies, including wetland areas (as the region forms a part of the East Kolkata Wetlands). The entire project is composed of four action areas and a central business district. As pointed out by Bysack (2004), the share of different income groups in the project has been very uneven. In Rajarhat, 44% belongs to the higher-income group and 35% to the middle-income group, while only 4 and 17% are left for the economically weaker and the lower-income groups. Only 21% of the land has been reserved for the disadvantaged population.

The pattern of growth has not been very continuous; few patches of residential growths have been separated by large tracts of unused barren lands. Large housing complexes have been built and many more are proposed. Along with residential gated communities, malls, hospitals, office complexes, and educational institutes have been built. The region suffered the major challenges of basic services like efficient public transportation, inner

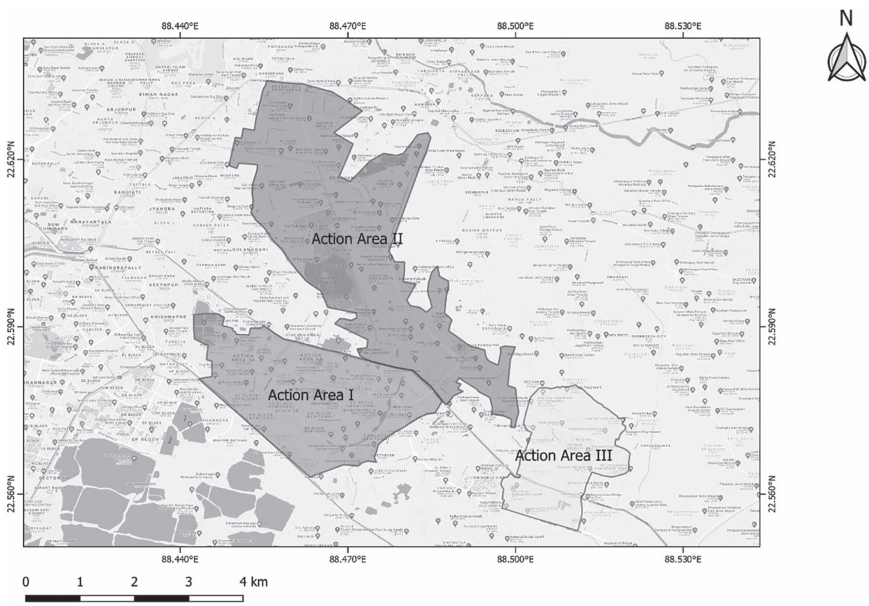

Figure 10.2 Location of Action Areas in Rajarhat

roads, and water supply. Residents often had to rely on private transportation modes and popular para-transit modes for daily commuting and other travel purposes. According to Census 2011, the population of New Town was around 40,000. Since its initiation, Rajarhat has become a popular site to purchase second homes for the inhabitants of Kolkata. But the lack of basic services has prevented most of them from permanently settling here. This resulted in numerous houses still lying vacant and underutilized.

The Southern Fringes – Joka

Located along the southern boundary of the city, Joka is an urbanised neighborhood outside the city limits. It was an outgrowth of Kolkata Municipal Corporation till 2001 and was declared a census town in 2011. The growth of Joka has taken place along the major arterial road, with Diamond Harbour Road connecting the main city with the rural hinterland of the South 24 Paragana District. The region attracted a large-scale outpouring of population, mainly urban middle-class, and has experienced unprecedented population growth in the last two decades (Table 10.2). One of the oldest housing societies of the region, Diamond Park, dates back to 1966. There are other residential areas as well, like Vivekananda Ville and Diamond Plaza.

In spite of its extended history of urban growth, Joka remained under rural administration for a long time. Till very recently, the region was under the administration of Joka Gram Panchayat (rural local body). The outcome was a severe deficiency of basic urban infrastructural services like drinking water, waste management, and street lighting. Its inclusion under the Kolkata Corporation has created the availability of basic urban services. One interesting point, as highlighted by Khatua (2018), is that Joka's urban population growth has already surpassed the threshold population of 30000, and the region is eligible to form its own municipality. In spite of this fact, it was chosen to be a part of the larger Corporation area.

Joka's incorporation in the Kolkata Municipal Corporation area is closely associated with the proposed metro railways extension, the 16.2 km Joka-BBD Bag route (the established central business district of Kolkata). A large part of the residential population of Joka consists of daily commuters. Its nearness to the CBD area and ease of access to major roads and railway

Table 10.2 Population growth of Joka

Census	*Total Population*	*Growth Rate*
1991	4000	
2001	7678	91.95
2011	9302	21.15

Source: Calculated by author from Census

routes has made it a preferred residential location for the working-class population. These factors have paved the way for early urban growth of the region, with gradually expanding built-up areas and diminishing agricultural land. The occupational pattern also changed as non-agricultural activities gained prominence. In spite of these factors, the region continued to be administered by a Gram Panchayat that could not handle the growing demands of basic infrastructural services of an increasing urban area.

The Contrast and Policy Implications

It is ironic that the respective administrations failed to notice these natural changes happening along southern fringes, while they were too engrossed in forcefully developing the eastern fringes of the city. Here we find a dual example of forced peri-urbanisation and neglected peri-urbanisation in different parts of the same city. The eastern fringes were largely influenced by the neo-liberal ideas and approaches of the state government that went too far in showcasing urban growth. The transformation of the fringes was involuntary and invited repulsion and dislike from the common people's end. The villages underwent in situ urbanisation that forcefully destroyed their subsistence structure, and the entire socio-economic structure of the region was jeopardised. An estimated 1,300,000 people lost their land and livelihood due to the large-scale project (Sengupta, 2013). The influx of new population in the region has created a huge rift in the social structure, where the original inhabitants are undergoing a sense of *placelessness*. According to Kundu (2016), 'new arrivals to the gated communities too are dealing with a sense of loss of place as they encounter a city in the making, and have no memories to guide them in their interactions'. Along with that, the excessive impetus on building for the higher-income groups has restricted the growth of public amenities like government hospitals, public schools, and even proper markets. All these factors are preventing the middle-income population from settling in Rajarhat.

As opposed to this, Joka underwent urban growth more naturally, owing to its proximity to the Central Business district, which was the major job centre of old Kolkata. The extension of the tramways also played a significant role. The middle-class population chose to stay in this city locality, paying lower taxes. The significance of the place was increased by the establishment of the Indian Institute of Management, a well-known academic institution, in 1961. The place acquired an urban character much earlier than expected and grew as a full-fledged urban neighbourhood at the urban fringes. This transitional character of Joka was not properly administered due to the lack of an adequate governing system. As pointed out by Shaw (2005), such transitional areas are to be administered by town panchayats (74th Amendment), but West Bengal failed to create such a governing body. As such, it was administered by Gram Panchayat, which did not have the willingness or the resources to cater to the growing urban infrastructural

needs of Joka. This inattention can be attributed to the low interest shown by the private investment groups in this region compared to other fringe areas of the city. It was only after the announcement of the extension of the metro railways route, connecting it to the central business district, that the region gained a significant hike in land prices. The re-delineation of the KMC area was undertaken after 28 years. Khatua (2018) has indicated that, 'Unlike cases of eastern fringes of the city, Joka represented a periphery where discontent originated from being deprived of urban services and amenities despite staying close to a municipal core'. Even when the region attained eligibility to have its own municipality, it was chosen to be added to the Corporation area.

In both cases, the primary concern of the fringe areas is the unavailability of basic infrastructural services. In the case of Rajarhat, the improvement of basic services can be the key factor in attracting more population to settle, especially the middle-income group. The region is in urgent need of good public transportation with better connectivity. The new town needs new people to grow; otherwise, it may fall prey to what is referred to as 'phantom urbanisation' and degenerate into a ghost city. On the other hand, in the case of Joka, the re-delineation process is expected to solve the long-standing problems of basic services. The Cooperatives in Joka have played a significant role in negotiating for basic services like better roads, waste disposal, and water supply (Shaw, 2005; Khatua, 2018).

So far, the state initiatives made Rajarhat a prime investment zone, where large real estate companies poured enormous capital to ensure new development. Big investment houses like Ambuja and DLF invested in building huge complexes mainly catering to the needs of the higher-income section. Though there were initiatives for affordable housing for the economically weaker section, like Sukho Bristi, their impact remains insignificant. This makes the urban splintering effect very visible in the new town, where the socio-cultural rift grows. Compared to this, Joka has so far grown as a middle-class neighbourhood for the white-collar population. People have been living in cooperative housing like the Diamond Park housing cooperative societies, and gated communities are not very popular housing structures. With the initiation of the metro extension project, the land values have started to escalate. and private housing projects have initiated.

Conclusion

The outward migration of the population from the core towards the edges of the cities sets in increased peripheral growth. This growth can be natural or sometimes forced. The abovementioned two cases of peripheral growth in Kolkata represent these two different aspects of peripherization. In one case, Rajarhat, under the neo-liberal influence, the state carries out a forceful transformation, negating the interest of the commoners. In the case of Joka, due to failure on the part of the government to understand the natural

growth and administrative requirement of the region, the peripheral growth remained stagnant for a long time. Both the regions face severe crises of basic amenities that impact each case differently. Kolkata has so far exhibited poor results in fringe management, where it has failed to realise the needs of the peripheries and act accordingly. Rajarhat needs better facilities to demographically grow further, while Joka needs basic facilities for its overgrown urban population. It therefore becomes necessary on the part of the administrative bodies to understand the forces of peripheral growth first and then formulate the suitable policies. Similar policies may not germinate into fruitful results. Proper assessment of the peri-urban forces is a mandatory part of urban planning.

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11 Surface Temperature Mapping to Assess Local Climate Zones

A Study Using WUDAPT

Satyabrata Mandal, Sujoy Sadhu, Joy Rajbanshi, Pradip Patra, Aneswa Halder, Amir Khan and Lakshminarayan Satpati

Rapid urbanisation in the present Anthropocene epoch has significant impacts on the global climate systems, including in the urban areas (Ching et al., 2018). However, lack of appropriate management of the unplanned urbanisation could have several adverse effects on urban climate, which have already been widely noticed in the form of climate extremes and unexpected weather events. It has been projected that more than 75% of the global population will live in urban areas by 2050, compared to its present share of about 50%, resulting in more urban sprawl (Ching et al., 2018; Ochola et al., 2020). Moreover, the urban built-up areas are expected to expand by three times across the cities of the developing countries, while the rate may be restricted to 2.5 times in the developed nations by 2030 (Ching et al., 2018; Ochola et al., 2020). Rapid urbanisation involves transformation of the natural environment by replacing open pervious and vegetated surfaces with concrete surfaces have the outcome of changed urban physical forms of land use and landcover, the building materials and the geometry of buildings, and functions comprising transportation, vegetative areas, bare surfaces, energy usage, and generation of waste products that sustain urban livelihood (Ching et al., 2018; Richard et al., 2018). These issues have raised manifold consequences of climate modifications by incorporating different parameters of surface energy budgets and Urban Heat Island (UHI) effects as influenced by diversified heat-storing capacities across the morphological structures within the urban agglomerations around the globe (Santamouris et al., 2017; Wang et al., 2018; Richard et al., 2018). Such climate modification caused by anthropogenic forcing leads to change in different thermal comfort levels and resultant cooling demands among the city dwellers of the typical morphological structures (Stewart and Oke, 2012; Stone et al., 2010; Oppenheimer, 2016; Vargo et al., 2016). Nonetheless, the Intergovernmental Panel on Climate Change (IPCC) in its Fifth Assessment Report (AR5) projected that the uncorrected heat island effects coupled with land surface changes will contribute more than 10% of the reported increase

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of air temperature in the present century (Stocker, 2014; Mushore et al., 2019). Therefore, it is crucial to identify as best as possible the heat-sensitive urban areas in order to adopt suitable measures to mitigate or at least to manage the thermal issues. However, urban climate research has long been undertaken through various non-standardised methods of quantification of urban climate parameters and characterisation of homogeneous heat load areas. To address these issues in urban climate studies, the concept of 'Local Climate Zones' (LCZs) has emerged as a universal standard method in the present decade (Stewart, 2011;Stewart and Oke, 2012; Geletič et al., 2016). LCZs are considered as the regions of uniform land cover, surface structure, construction materials, and human activities spread across several kilometres in an urban area (Stewart and Oke, 2012; Bechtel et al., 2015). In addition to this, thermal behavior within LCZs have been proposed to be quantified by its surface configuration (building and tree height/density), surface cover (pervious or impervious), fabric (albedo, thermal admittance), and metabolism (waste heat from transportation and space heating/cooling). More importantly, the unique combinations of these surface attributes provide a distinctive thermal regime of each LCZ, particularly the temperature profile at screen height, which can be observed the best in clear weather conditions and over uniform relief (Stewart and Oke, 2012; Bechtel et al., 2015; Geletič et al., 2016;Ren et al., 2016; Wang et al., 2018).

Except some studies– for example, by Thomas et al. (2014), Kotharkar and Bagade (2017)–LCZ-based studies in urban areas of India, especially in the Kolkata Metropolitan Area, are very limited. LCZ maps of New Delhi, Jaipur, and Chandigarh have been completed and uploaded to the website (www.wudapt.org/cities/inafrica/) of World Urban Database and Access Portal Tools (WUDAPT) in the recent past. Though the LCZ map of Kolkata city is available in the WUDAPT, it seems to be incomplete as it mostly covers the Kolkata Municipal Corporation (KMC) area only. The Kolkata Metropolitan Area (KMA) is not completely explored in the context of LCZ-specific analysis; neither have the dimensions of thermal regime along with LCZs been extensively conducted. Except for a few isolated UHI studies (Khan and Chatterjee, 2016; Gazi and Mondal, 2018; Chatterjee et al., 2019), no comprehensive thermal behavior studies linked with urban morphological parameters has been initiated till now. Keeping these in view, the present study is aimed at mapping LCZs covering the whole 1851 km^2 geographical area of the KMA by adopting Level 0 method of WUDAPT. Besides this, the thermal behaviour of LCZs has been quantified and compared using relevant statistical methods.

Materials and Methods

The Kolkata Metropolitan Area (KMA) –The Study Area

The Kolkata Metropolitan Area (KMA) is the 3rd largest urban agglomeration (UA) in India. It is extended from 22°20′ N to 23°00′ N of latitudes and

88°05′ E to 88°34′ E of longitudes by covering an area of about 1851 km^2. Contiguous linear conurbation exists along both banks of the river Hooghly in the north-south direction (Figure 11.1). A large portion of rural areas (of 746.32 km^2) is also located within this agglomeration. The metropolitan area is comprised of four municipal corporations, namely Howrah, Kolkata, Chandernagar, and Bidhannagar, as well as 38 municipalities, 77 non-municipal towns, 16 urban outgrowths, and 445 villages (Census of India, 2011). Nearly 14.72 million populations live here with a density of 7950 persons/km^2, and the total population is projected to be 21.1 million by 2025, with an annual growth rate of 1.8% (Census of India, 2011; KMDA, 2011). The metropolitan area has been experiencing burgeoning population pressure, traffic congestion, poverty, and substantial urban pollution, mainly due to migration-induced rapid urbanisation (Mukherjee, 2012).

As a consequence, wetlands and previously agricultural areas have been converted into built-up areas without giving proper attention to urban planning, as may be particularly observed in the south and eastern parts of the KMA, i.e., in Bidhannagar, Rajarhat, Maheshtala, and Sonarpur areas (Nandy, 2007; Dasgupta et al., 2013). Built-up areas in this UA have been changed drastically since the 1990s. The urban sprawls in Kolkata, Howrah, South Dum Dum, Rishra, Chandernagar, Halisahar, Bidhannagar, Bally, and North Dum Dum have achieved their optimum limits. The impulsive growth is observed in Rajarhat, Bidhannagar, Sonarpur/Rajpur, Barasat, New Barrackpur, and Maheshtala– mostly because of their favourable location and well-connected transport network. With the existing spatial sprawling patterns, it is estimated that the city's burgeoning population will eventually coalesce with its suburban fringes (Sahana et al., 2018).

The Database

The present study employs high-resolution Google Earth (GE) images of the year 2019 to identify the appropriate training sites for LCZ in the KMA. Cloud- and haze-free (<5%) Landsat 8 data (path and row: 138 and 44) for the summer months (MAM) for the period 2015–2019 sourced from the United States Geological Survey's (USGS) earth explorer interface (www.earthexplorer.usgs.gov) have also been used. Thus, a total of 6 images at 30m spatial resolution of different dates within the penultimate timespan have been used for mapping LCZs, and also to retrieve their corresponding LST in the KMA. Acquisition time for all the scenes is 10:00:40.42 IST (4:30:40.42 UTC), as the satellite overpasses the region every 16 days interval on the same time. Therefore, all the thermal images have been recorded in the morning daylight hours and being confirmed of their daytime retrieval for further analysis (Table 11.1). Atmospheric correction was applied to eliminate the noise effects following standard procedure (Cai et al., 2017;Mushore et al., 2019). The multi-spectral and multi-temporal reflective data have been stacked together into a single multi-band file for supervised image classification. In addition to this, the 30m spatial resolution is

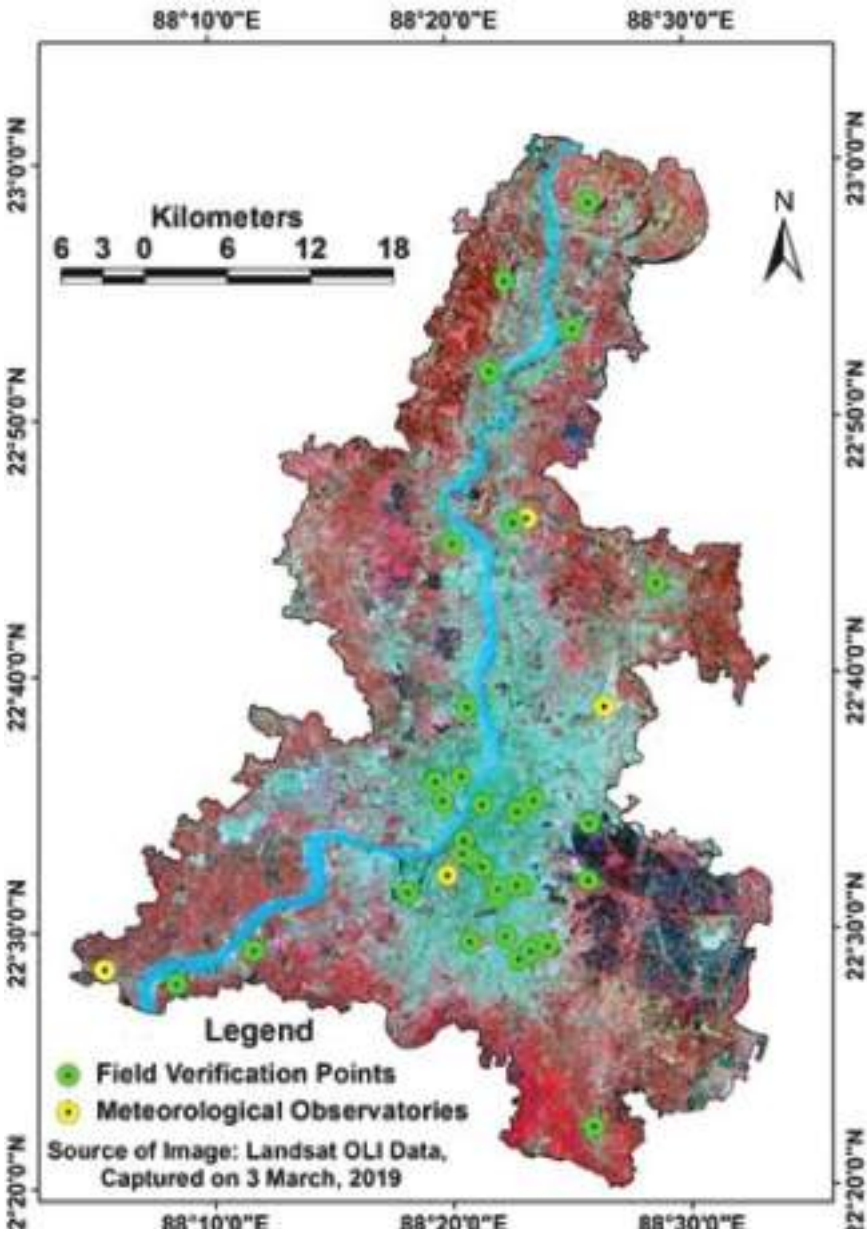

Figure 11.1 Geographical location of the Kolkata Metropolitan Area
Source: Landsat OLI image, 3 March, 2019 obtained from https://earthexplorer.usgs.gov/

Table 11.1 Specification of remotely sensed (RS) data used & observed weather conditions on the days of RS data acquisition over the Kolkata Metropolitan Area.

Landsat8 data specification				*Observed weather condition*			
Scene Id	*Acquisition Date*	*Scene Time (UTC)*	*Mean LST (°C)*	*T max. (°C)*	*T min. (°C)*	*T mean. (°C)*	*Relative humidity (%)*
LC81380442015067LGN01	3/8/2015	4:30:41	28.3	30.0	17.7	23.9	54.8
LC81380442016102LGN01	4/11/2016	4:30:36	33.5	40.1	26.9	33.5	67.3
LC81380442017072LGN00	3/13/2017	4:30:44	25.1	29.9	18.2	24.1	39.7
LC81380442017104LGN00	4/14/2017	4:30:28	30.9	35.8	25.3	30.6	72.3
LC81380442019062LGN00	3/3/2019	4:30:40	23.4	27.2	10.6	18.9	51.0
LC81380442019126LGN00	5/6/2019	4:30:28	30.4	34.8	27.2	31.0	78.8

Source: Landsat 8 images dated 8 August 2015 to 5 June 2019. Sourced from https://earthexplorer.usgs.gov/

re-sampled to 100m for identification of the spectral signals of small-scale urban structures. Naturally, the observed air temperature at 2m average height over 4 meteorological observatories (Alipur, Dumdum, Barrackpur, Uluberia) across the KMA has been measured high (from 18.9 to 33.5°C), while relative humidity varied (from 39.7 to 78.8%) on the dates considered for the analysis (Table 11.1).

Identification and Classification of LCZ

In this study, LCZ mapping follows the level 0 classification scheme proposed by WUDAPT (www.wudapt.org; Stewart and Oke, 2012; Bechtel et al., 2015; Mushore et al., 2019). The procedure begins with defining the influential local scale structural and land cover properties, followed by measurement of surface air temperature at 1–2m height above the ground level across the KMA. As per the universal scheme of WUDAPT, the urban landscape is categorized into 17 standard classes, each of which is unique by their own building types (compact high-rises or open low-rises, etc.), number of stories of the buildings, types of construction materials (concrete, steel, stone and/or glass, etc.), presence or absence of tall vegetation and land cover types, i.e., dense trees, bare rock or paved surface, etc. (Table 11.2).

As a detailed urban morphological dataset of surface characteristics of the city is unavailable due to technological limitations and government policies, the unique surface configuration within individual LCZ is estimated by digitizing training polygons on Google Earth's (GE) pro image as suggested by Stewart and Oke (2012) and Bechtel et al. (2015). By definition, a typical LCZ training sample is a polygon containing specific LCZ information, which is further used as a learning sample for the similar types of LCZ classification. However, there are some difficulties while identifying LCZ 3 (compact low-rise), LCZ 6 (open low-rise) and LCZ 7 (lightweight low-rise), as these are all low-rise buildings and appear more or less homogeneous and mostly inseparable in Google Earth images. However, these have been identified and separated by observing their associations, such as surrounding green space and construction layouts (Cai et al., 2017). Low-rise buildings enclosed with sufficient greenery is selected as LCZ 6. LCZ 3 and LCZ 7 have been distinguished by observing their building types and materials from more detailed and clear images of Google Street View. Likewise, the low-rise buildings constructed with lightweight materials, i.e., wood, bamboo, tin, and metal, are selected as LCZ 7. In addition to this, the spatial information has incorporated GPS reading (survey conducted in December 2019) across the KMA to help in precisely locating the training samples for the study. Nearly 20 training samples from each of the LCZ classes have been digitised and saved in KML format. Thus, a total of 340 training samples are stored for the purpose of the classification. In the next step, LCZ is classified based on the combination of different spectral features of pre-processed Landsat 8 image and training samples using Random Forest (RF) algorithm in

Table 11.2 Classification scheme of 'local climate zone' (LCZ) and its 17 standard classes as modified by the authors (Stewart and Oke, 2012).

Built Types	*Definition*	*Land cover types*	*Definition*
1. Compact high-rise  22°32′28″ N & 88°21′18″ E	Dense mix of tall buildings to tens of stories. Few or no tress. Land cover Mostly paved. Concrete, steel, stone, and glass construction materials.	A. Dense trees  22°33′31″ N & 88°20′33″ E	Heavily wooded landscape of deciduous and/or evergreen trees. Land cover mostly pervious (low plants). Zone function is natural forest, tree cultivation or urban park.
2. Compact mid-rise  22°31′16″ N & 88°21′58″ E	Dense mix of midrise building (3–9 stories). Few or no tress. Land cover mostly paved. Stone, brick, tiles, and concrete construction materials.	B. Scattered trees  22°32′50″ N & 88°20′44″ E	Lightly wooded landscape of deciduous and/or evergreen trees. Land cover mostly previous (low plants). Zone function is natural forest, tree cultivation, or urban park.

(*Continued*)

Table 11.2 (Continued)

Built Types	*Definition*	*Land cover types*	*Definition*
3. Compact low-rise  22°28′51″ N & 88°22′48″ E	Dense mix of low-rise building (1–3 stories). Few or no trees. Land cover mostly paved. Stone brick, tile, and concrete construction materials.	C. Bush scrub  22°22′17″ N & 88°25′55″ E	Open arrangement of bushes, scrubs, and short, woody trees. Land cover mostly pervious (bare soil or sand) zone function is natural scrubland or agriculture.
4. Open high-rise  22°34′11″ N & 88°25′53″ E	Open arrangement of tall building to tens of stories. Abundance of pervious land covers (low plants, scattered trees). Concrete, steel, stone, and glass construction materials.	D. Low Plants  22°32′52″ N & 88°20′46″ E	Featureless landscape of grass or herbaceous plant cover. Few or no trees. Zone function is natural grassland, agriculture, or urban park.

5. Open mid-rise

22°29′25″ N & 88°23′39″ E

Open arrangement of midrise building (3–9 stories). Abundance of pervious land cover (low plants, scattered trees) concrete steel, stone, and glass construction.

6. Open low-rise

22°29′15″ N & 88°11′41″ E

Open arrangement of low-rise building (1–3 stories). Abundance of pervious land cover (low plants, scattered trees). Wood, brick, stone, tile, and concrete construction materials.

E. Bare rock or paved

22°35′06″ N & 88°20′34″ E

Featureless landscape of rock or paved cover, Few or no trees or plants. Zone function is natural desert (rock) or urban transportation.

F. Bare soil or sand

22°31′54″ N & 88°25′46″ E

Featureless landscape of soil or sand cover. Few or no trees or plants. Zone function is natural desert (or agriculture).

(*Continued*)

Table 11.2 (Continued)

Built Types	*Definition*	*Land cover types*	*Definition*
7. Lightweight low-rise  22°34′36″ N & 88°22′48″ E	Dense mix of single-story buildings. Few or no trees. Land cover mostly hard-packed. Lightweight construction materials (e.g., wood, thatch, corrugated metal).	G. Water  22°34′07″ N & 88°25′49″ E	Large, open water bodies such as seas and lakes, or small bodies such as rivers, reservoirs, and lagoons.
8. Large low-rise  22°29′32″ N & 88°20′47″ E	Open arrangement of large low-rise buildings (1–3 stories). Few or no trees. Land cover mostly paved. Steel, concrete, metal, and stone construction materials.	**VARIABLE LAND COVER PROPERTIES** Variable or ephemeral land cover properties that change significantly with synoptic weather patterns, agricultural practices, and/or seasonal cycles.	

9. Sparsely Built  22°29′09″ N & 88°23′19″ E	Sparse arrangement of small or medium-sized buildings in a natural setting. Abundance of pervious land covers (low plants, scattered trees).	*b. bare trees*	Leafless deciduous trees (e.g., winter). Increased sky view factor. Reduced albedo.
10. Heavy Industry  22°27′58″ N & 88°08′25″ E	Low-rise and midrise industrial structures (towers, tanks, stacks). Few or no trees. Land cover mostly paved or hard-packed. Metal, steel, and concrete construction materials.	*d. dry ground* *w. wet ground*	Parched soil. Low admittance. Large Bowen ratio. Increased albedo. Waterlogged soil. High admittance. Small Bowen ratio. Reduced albedo.

SAGA-GIS (v.6.3) software environment at 100m spatial resolution (Kaloustian and Bechtel, 2016; Ren et al., 2016;Ochola et al., 2020). The RF algorithm is chosen because of its high assessment accuracy and computational performance. So, without requiring additional testing data, this provides unbiased error estimation (Bechtel et al., 2015; Cai et al., 2017). Moreover, it is a universally accepted method, as it has been already tested and applied for LCZ classifications around the globe (Bechtel et al., 2015; Bechtel and Daneke, 2012; Geletič and Lehnert, 2016; Ren et al., 2016).

Retrieval of LST for LCZ

The thermal infrared (TIR) band 10 (10.60–11.19μm) has been used to estimate the brightness temperature, while band 4 (red wavelength, 0.64–0.67 μm) and band 5 (near infrared, 0.85–0.88 μm) are used for calculating the Normalized Difference Vegetation Index (NDVI) in this study. The spectral radiance ($L\lambda$) at the top of the atmosphere (TOA) is retrieved from band 10 using split window algorithm (Avdan and Jovanovska, 2016; Richard et al., 2018; Ochola et al., 2020). Converting the digital numbers (DNs) to reflectance, the TIR band is then transformed to brightness temperature (BT) from spectral radiance using the thermal constants provided in the metadata file. Consequently, the BT has been revised by adding the absolute zero (approx. -273.15°C) to obtain the unit of land surface temperature (LST) in degree Celsius (°C). Finally, the BT is converted to LST through emissivity correction, which has been obtained through generating NDVI following standard procedures (Avdan and Jovanovska, 2016). LSTs of six Landsat 8 images are retrieved in order to show their LCZ-dependent sensitivity.

Analysis of LST Sensitivity to LCZ

To examine the spatial characteristics of heating mechanisms across the city, the thermal analysis, especially LST estimation, has been performed by assuming the fact that LST regime is sensitive to each LCZ for their unique attributes. Overlaying the LST layer with LCZs, the zonal LSTs are computed for all LCZs separately. Statistical distribution of LSTs, their variability, and outliers for individual dates in the summer season (MAM) have been examined using box plots. Apart from this, the mean significant difference among zonal mean of all LCZs for the particular dates are estimated by adopting paired t-tests following standard procedure (Ochola et al., 2020). The test results are summarised in Table 11.3.

Results

Classification and Validation of LCZs

The accuracy level of classification procedure of LCZs as per WUDAPT level 0 schemes for the KMA is depicted in Table 11.2. The confusion

Table 11.3 Summary statistics of pair t-test among LSTs of individual LCZs for six different Landsat 8 images dated 8 March 2015 to 6 May 2019.

Image acquisition date	*t-statistics*	*p-value*	*Conf.int*	
			Lower	*Upper*
8 March 2015	–4.571	0.00032	–2.53	–0.93
11 April 2016	–15.041	7.64E-11	–7.45	–5.61
13 March 2017	–5.902	2.36E-05	–2.61	–1.23
14 April 2017	–11.452	4.17E-09	–4.91	–3.38
3 March 2019	11.981	2.29E-09	2.82	4.03
6 May 2019	2.322	0.03418	0.075	1.64

Source: https://earthexplorer.usgs.gov/

matrix shows user and producer accuracy (PA) of each LCZ along with overall accuracy and the Kappa coefficient (*k*). The overall accuracy is found to be 95.9%, which is higher than the recommended lower threshold of 80% (Acharya et al., 2015), while the inter-rater reliability (*k*) is 95.0% (Table 11.4). Zone-wise user accuracy ranges from 71.7% (LCZ 4) to 100% (LCZ 1), while PA is extended from 46.2% (LCZ 7) to 98.9% (LCZ 6). Relatively poor classification results for LCZ 7 with PA below 47% may have resulted from limited building height information stored in Landsat images (Table 11.4). The impecunious performance of RF classifier in producing LCZ E (<58% PA) in particular may be because of its limited performance in distinguishing vegetation with different height and density. However, such inefficiency may be caused by the insufficient height-density information of vegetation captured in Landsat images. Nevertheless, the classification based on multi-dated data of GE and Landsat 8 considerably misled the RF by producing lower PA value for LCZ E in particular (Cai et al., 2017). Except these two LCZs, all others have a high level of satisfaction (78–99% PA). Thus, the higher level of individual as well as overall classification accuracy of LCZs over the KMA are obtained due to the Landsat 8 images with <5% cloud cover which eliminated the solar and atmospheric interferences. Additionally, we have acquired remotely sensed data from three homogeneous climatic months (MAM) of the summer season, which provided a similar physiographic as well as thermal environment for vegetation growth and land surface heating mechanism over the KMA. Our results are corroborated with researchers around the globe who have reported similar ranges of high level accuracy vis-à-vis better performance of RF classifier for comparatively larger urban agglomerations (Cai et al., 2017; Xu et al., 2017;Mushore et al., 2019; Ochola et al., 2020).

Spatial Organization of LCZs in the KMA

Figure 11.2 demonstrates the contemporary spatial organisation of LCZs in KMA, prepared as per WUDAPT level 0 methodology. All 17 LCZs,

Table 11.4 Confusion Matrix for LCZ classification results of the Kolkata Metropolitan Area (KMA)*

Class	*LCZ 1*	*LCZ 2*	*LCZ 3*	*LCZ 4*	*LCZ 5*	*LCZ 6*	*LCZ 7*	*LCZ 8*	*LCZ 9*	*LCZ 10*	*LCZ A*	*LCZ B*	*LCZ C*	*LCZ D*	*LCZ E*	*LCZ F*	*LCZ G*	*Number of Actual pixel*	*Producers Accuracy*
LCZ 1	11	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	14	78.57
LCZ 2	0	206	1	3	0	1	1	1	0	0	0	0	0	0	0	0	0	213	96.71
LCZ 3	0	7	214	0	0	5	0	0	0	0	0	0	0	0	0	0	0	226	94.69
LCZ 4	0	3	0	33	1	0	0	0	1	0	0	0	0	1	0	0	0	39	84.62
LCZ 5	0	2	0	2	84	4	0	0	1	0	0	0	0	1	0	2	0	96	87.50
LCZ 6	0	0	0	0	0	90	0	0	1	0	0	0	0	0	0	0	0	91	98.90
LCZ 7	0	5	0	0	1	1	6	0	0	0	0	0	0	0	0	0	0	13	46.15
LCZ 8	0	4	2	3	0	1	1	386	1	1	0	0	1	2	1		1	404	95.54
LCZ 9	0	0	0	0	0	3	0	0	144	0	0	3	0	0	0	0	0	150	96.00
LCZ 10	0	0	0	0	1	0	0	2	0	22	0	0	0	0	0	0	0	25	88.00
LCZ A	0	0	0	0	0	0	0	0	0	0	53	1	0	4	0	0	0	58	91.38
LCZ B	0	0	0	0	0	1	0	0	2	1	0	110	2	1	0	0	0	117	94.02
LCZ C	0	0	0	0	0	0	0	1	2	0	0	0	140	5	0	0	0	148	94.59
LCZ D	0	0	0	0	0	0	0	0	2	0	1	2	0	418	0	0	0	423	98.82
LCZ E	0	7	0	1	0	1	0	6	0	0	0	0	0	0	20	0	0	35	57.14
LCZ F	0	1	3	0	0	4	0	0	2	0	0	0	0	0	0	139	0	149	93.29
LCZ G	0	0	0	2	0	0	0	0	0	1	0	0	0	9	0	3	1190	1205	98.76
Number of Predicted Pixels	11	236	220	46	87	111	8	396	156	25	54	116	143	441	21	144	1191	3406	
Users Accuracy	100.00	87.29	97.27	71.74	96.55	81.08	75.00	97.47	92.31	88.00	98.15	94.83	97.90	94.78	95.24	96.53	99.92		
Overall Accuracy (%)	95.89																		
Agreement	3266.00																		
Agreement by chance	0.05	14.76	14.60	0.53	2.45	2.97	0.03	46.97	6.87	0.18	0.92	3.98	6.21	54.77	0.22	6.30	421.36		
Sum Agreement by Chance	583.16																		
Kappa Coefficient	95.04045																		

Source: Matrix computed by the authors.

* The evaluation is based on training data produced on overall accuracy (OA), the user accuracy (UA), producer accuracy (PA),& coefficients. Rows refer to classification output, columns to reference data.

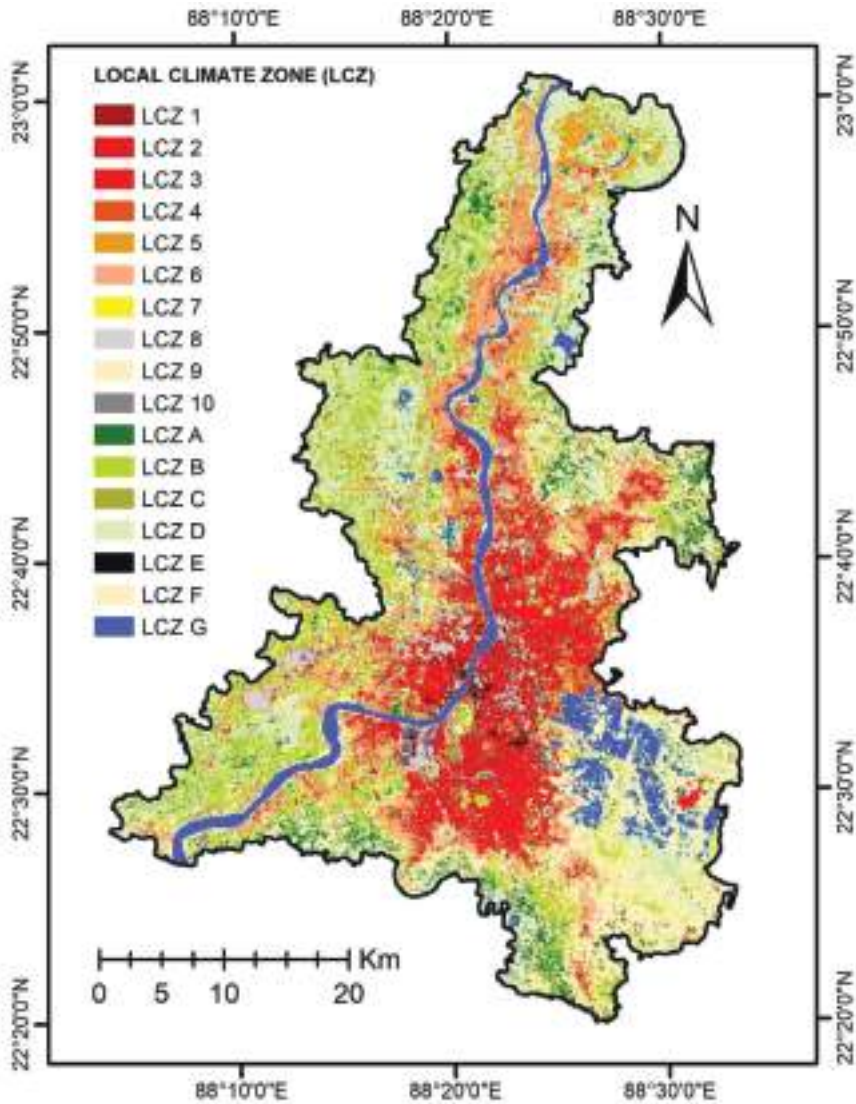

Figure 11.2 Local Climate Zone (LCZ) over Kolkata Metropolitan Area (KMA). Prepared based on level 0 methodology proposed by the World Urban Database & Access Portal Tools (WUDAPT: Stewart and Oke, 2012).

comprising both the building morphology (LCZ1–10) and land cover type classes (LCZ A-G), have been found in this urban agglomeration. Nearly half (51% or 896 km^2) of the metropolitan area is occupied by built-up areas, while the other half (i.e., 862 km^2) is attributed to land covers comprised of vegetation, bare soil, and water bodies (Table 11.5). Sparse arrangement of small- and medium-sized buildings (LCZ 9) in natural settings, along with wide-open pervious land cover with small plants and scattered trees, have occupied major portions (28.2%) of the built-up areas, which is followed by open low-rise (LCZ 6, 23.7%), compact mid-rise (LCZ 2, 13.5%) and compact low-rise (LCZ 3, 11.6%) settlements. Therefore, more than 77% of the built-up area comprises of 'compact mid-rise', 'compact low-rise', 'open low-rise' and 'sparsely arranged small and medium buildings'. On the contrary, 'compact high-rise' (LCZ 1) buildings of about 10 stories and more, generally constructed with concrete, steel, stone, and glass materials along with adjoining impervious paved soil surface cover only 0.2% (2.2 km^2) of the built-up areas of the city. However, the highly potential UHIs of the metropolitan area (LCZ 1–3) is spread in the northward direction along the river Hooghly from the city's central business district (CBD), which consists of BBD Bagh, Esplanade, Free School Street, Park Street, Dalhousie Square, and Burra Bazaar characterise grand colonial architectures of 'compact mid-rise' and 'compact high-rise' buildings. However, such a morphological pattern (LCZ 2–3) is in the present trend of expansion towards the southeast direction from Khidirpur to Garia through Tollygunge and Baghajatin (Figure 11.2). Visual inspection reveals that the 'compact high-rise' buildings are geographically located in the places like Minto Park, in between Kustia and Kata Pukur, near Harakumar Tagore Square, Bandhaghat, Barendrapara, Srirampur, Bara Bazar and its surrounding areas, etc. (Figure 11.2 and Table 11.5). Likewise, detailed inspections of the spatial organization of highly contributing built type LCZs are summarised in Table 11.5.

Among the land cover-type LCZs, the 'low plant' (LCZ-D) areas of grasses, agricultural fields, and urban parks with few or no trees at all occupy >44% (384 km^2) of the land cover area, which is equivalent to 21.8% of the metropolitan area. Similarly, the areas of 'scattered trees' (LCZ-B) of deciduous and/or semi-evergreen constitutes nearly 9% (155.6 km^2), while water bodies (LCZ-G) as a whole contribute only 7.2% (126.9 km^2) of it. Their spatial distributions are not uniform; rather, they are irregularly spaced in different pockets over the city, which has been comprehensively identified and shown in Figure 11.2 and Table 11.5.

Distribution of LST Depending on LCZ

Spatial distribution of LSTs on all the six specific dates during the summer months (March-May) over the KMA reveals that the CBD area is attributed with 'compact high-rise', 'compact mid-rise' and 'compact low-rise' commercial and administrative structures in particular, generating the maximum

Table 11.5 Spatial distributions of Local Climatic Zones (LCZs) over the Kolkata Metropolitan Area (KMA).

Local climate Zone (LCZ)	*Area (Km^2)*	*Geographical distribution and/or locations (area or location name, directions, etc.)*
LCZ 1	2.2	Major dense mix of tall buildings to tens of stories observed in the places like Minto Park, in between Kustia & Kata Pukur, near Harakumar Tagore Square, in between Landsdown & Rowland Road (Fortis Hospital), multi-housing project areas like Greenfield City, Burabazar, Notun Bazar in core KMC area, Bandhaghat area of Howrah, Barendrapara, Srirampur, etc.
LCZ 2	120.8	Dense mix of mid-rise buildings (3–9 stories) located in between Netaji Bhavan & Jatindas Park area, Kalighat, Barisha, Jadavpur, Ballygunge, and New Alipur of Kolkata. Other major areas found in Barrackpur Cantonment, South and North Dumdum, Sector V of Salt Lake, Bally, Kadamtola, Naora, Chakra Beriya, Betor, Baruipara, Santragachi, Howrah, Satpukur, Badha Bartola, etc.
LCZ 3	104.0	Dense mix of low-rise buildings (1–3 stories) mostly found beside LCZ2, Anandapur, Panihati, Tarapukur South, Sinthi east (Purba), Amrapalli, Gaguly Bagan, Vidyasagar Colony, Sree Colony, Bidhanpally, Bijoygarh, Anandapally, Manasatala, Pratapgarh, Naskar Para of Kolkata, Karbala, Ayub Nagar Basti area, Baguihati, Jyangra, Amrapalli, Purba Sinthi, Banhoogly, Paikpara, etc. in the Northern part of KMA, while Pratgarh, Manasatala, Bidhanpally, Anandapally place of Jadavpur, Aswini Nagar and Arabinda Nagar are characterized with 'dense mix of low-rise buildings'.
LCZ 4	39.4	Open arrangement of tall buildings to tens of stories. Abundance of pervious land cover located in Ballygunge place & surrounding areas, Ballygunge Dovar Lane area, Picnic Garden, Tiljala, Minto Park & nearby areas, southern part of Taltala & Santoshpur area, etc.
LCZ 5	75.5	Open arrangement of mid-rise buildings (3–9 stories) with open space. Isolated places in different areas, like CIT area in south Sinthi, Ajoy Nagar, Gopal Nagar, Belur Math & surrounding area, Gariahat Forestation & its surrounding area, Sahanagar, etc.
LCZ 6	212.5	Open arrangement of low-rise buildings (1–3 stories) mostly found in major parts of northern and southern areas of the KMA. Mostly at Chandannagar, Bandal MC, LN colony of Halisahar, Baidyabati MC in the northern part of KMA, and Arabindya Nagar Colony, Ghosh Para, Major part of Budge Budge MC, Pujali MC etc., and east Barisha in the eastern part of KMC.
LCZ 7	3.7	Dense mix of single-story buildings with few or no trees. Land cover mostly hard-packed found near Brace Bridge, Re-mount Road in Khidirpur, B G press colony, Sreema Palli, Panchanan Tala, Naskarpur at Behala, surroundings of Kolkata Metro Railway Yard at Dumdum, different parts of the MC like Naihati, Kankinara, Dakhineswar, Belghoria, Birati, New Barrackpur, Madhyamgram etc.

(*Continued*)

Table 11.5 (Continued)

Local climate Zone (LCZ)	*Area (Km^2)*	*Geographical distribution and/or locations (area or location name, directions, etc.)*
LCZ 8	73.4	Open arrangement of large low-rise buildings (1–3 stories), large cover mostly found in Brace Bridge-Majerhat railway station area, Chitpur in north, Tikiapara railway station in east, Kona railway station, Agarpara, Tala, Military area of Ballygunge, surrounding area of Madox Square, Central Jail and its surrounding area of Alipore and police line area of Alipore. Howrah, Belgachia, Kona High School and surrounding area in south, and Santi Nagar, Preo Nagar in Khardah, & Talapur area in north.
LCZ 9	252.6	Sparsely built-up area of small and medium-sized buildings in natural settings. Mostly found in Hiland Park Area, Santoshpur area, Ajaynagar, Mukundar, beside Adrshanagar, Jamuna Nagar, etc.
LCZ 10	11.8	Low-rise & mid-rise industrial structures (tower, tanks, stacks) with few or no trees. Land cover mostly paved, found in Khidirpur & Gardenreach area, Farirpukur area near shyambazar Seth bagan, Kundu bagan of South Dumdum. Mostly these structure predominateson both sides of the river Hoogly, i.e., Howrah, Shalimar, Howrah Maidan metro area, Tikipara, Liluah-Ballyghat & Ballykhal area etc.
LCZ A	63.0	Heavily wooded landscape of deciduous and/or evergreen trees. Land cover mostly pervious (low plants).Mostly found in different parts of in the western part of Bandel like Kalora, Panchrakhi, Nandipur, Botanical Garden in Howrah Shibpur, scattered dense forest predominant in Bandel, Badu & Kazipara in the east.
LCZ B	155.6	Scattered trees; mainly lightly wooded landscape of deciduous trees mostly found along isolated patches in Alipur, Dhulagori, Panchla. Along the track of eastern railway areas like Khantora, Uttar Jhapardaha, Makardah, Singur, Baruipara, Palta & Barrackpur. Southern part of the Raipur-Sonarpur municipalities like Harinavi, Nearabout Paschim Nischintapur & Maheshtala also.
LCZ C	88.6	Open bushes, scrubs mostly found in city outskirts area. Scattered in the inner part of the city area, near Saha Nagar Park, Kalighat, Ekdalia Park, near Dover Terrace, Beckbagan near PNB bus stand, etc.
LCZ D	384.0	Grasses are mostly found in Majherchar, Birpara, Baliaghata, Basudebpur in eastern part of KMA & Piarapur, Thakurhat, Jharkari etc. Dadpur, Osmanpur etc. in western part of KMA.
LCZ E	9.0	Bare surface or featureless landscape, mostly found in urban transport network & building structure located in BBD Bagh, Fairly Place & surrounding places, Howrah bus terminal to Tikiapara, Sovabazar area, Garden Reach & Khidirpur area, Cossipore area, etc.
LCZ F	35.3	Featureless landscape of soil with agricultural activity or sand cover, mostly found in the southern part of KMA, mostly Panchpota, Bhagabanpur, Ghasi area, Champahati, Kalikapur, Bidhyadharpur etc. In southern part mainly at Joka & surrounding areas of Kalyan Nagar, Kalua, etc. It is also found in other parts of the different MC's mostly city outskirts like Bhatpara, Degachhina, Jadunath bati, Dankuni, Chakpara, Kona, etc.
LCZ G	126.9	Large open water surface like Hugli River, prominent waterbodies like East Kolkata Wetland,& other waterbodies also found near Netaji Dock. Western part of Rishra, Basudevpur, New Town Lake, Natagarh, Gyaspur Jhil, water bodies in the southern part of Pandit Satghora, etc.

Source: Authors identified LCZs based on the classification proposed by Stewart and Oke (2012).

LST (32.9–42.2°C) compared to the peripheral areas (Figure 11.3). Away from the CBD, an elongated pattern of the maximum LST emitting area is spread along the river Hooghly up to the northern tip of the city. Spreads of 'compact, mid-, and low-rise' residential structures emerged soon after the initiation of large-scale industrial growths along the river Hooghly in the colonial period to make the area more prone to generation of higher LST. 'Compact low to high-rise' structures located far apart from the heart of the city, namely in west Howrah township area, Dankuni industrial area, and Kalyani industrial area, have also produced higher LSTs, as revealed by the individual LST map of the metropolitan area.

As expected, the bare soil, water bodies, and vegetation-rich 'open mid-low rise' structures in the periphery, especially the East Kolkata Wetland (EKW), Baruipur and Sonarpur area in the east and southeast, and Uluberia and Pujali in the southwest, are found to be comparatively cooler (16.3–26.5°C) because of their strong heat mitigation capacity compared to the relatively warmer urban core areas (Figure 11.4).

Since all the typical LSTs are sensitive to building densities and heights, land cover types and surface wetness of each LCZ, their close association is observed across LCZs on six different dates of the summer season. LCZ-dependent typical LSTs phenomenon has been further investigated by constructing Box-plots (Figure 11.5), which exhibit relatively consistent results for all six dates considered in this study.

The LCZ 1–3, LCZ 5–8, LCZ 10, and LCZ E have revealed positive temperature anomalies with respect to the average LST of the metropolitan area, while the reverse trend is observed for the built-area type LCZ 4 and 9, land-cover type LCZ A-D and LCZ F-G for all the specific summer dates, as well as for the seasonal LSTs (Figures 11.6a and 11.6b). Among the compact built-type morphological structures (LCZ1–3), the 'compact mid-rise' structure is found to have the maximum LST-(30.8 ± 4.0 ° C) producing zone of the city (LCZ 2).

Higher LSTs are also associated with 'large low-rise' (LCZ8: 30.0 ± 3.9 ° C) and 'bare rock or paved' (LCZ E: 30.0 ± 4.0 ° C) areas compared to other higher LST-producing LCZs (Table 11.6). Thus, the 'compact mid-rise' and 'large low-rise' urban structures along with 'bare rock or paved' (i.e., the zone of urban transportation) land cover type spatially located (Table 11.5) might be considered as serious thermal areas in the metropolitan area. On the contrary, 'dense forest' (i.e., functional zones of forest, tree cultivation, or urban park: LCZ A) and 'water bodies' (consisting of rivers, reservoirs, and lakes: LCZ G) are found to be the coolest zones, which exhibited only 26.7 ± 3.5 °C and 25.2 ± 3.2 °C LST respectively during the summer season (Table 11.6). Thus, the coolest LSTs correspond to the forest areas of Bandel (Kalora), Panchrakhi, Nandipur, Badu and Kazipara etc., while the major water bodies spread across the Hooghly River, EKW, the western part of Rishra, Basudevpur, New Town Lake, Natagarh, Gyaspur Jheel, and southern part of Pandit Satghora etc. (Table 11.5 and Figure 11.4).

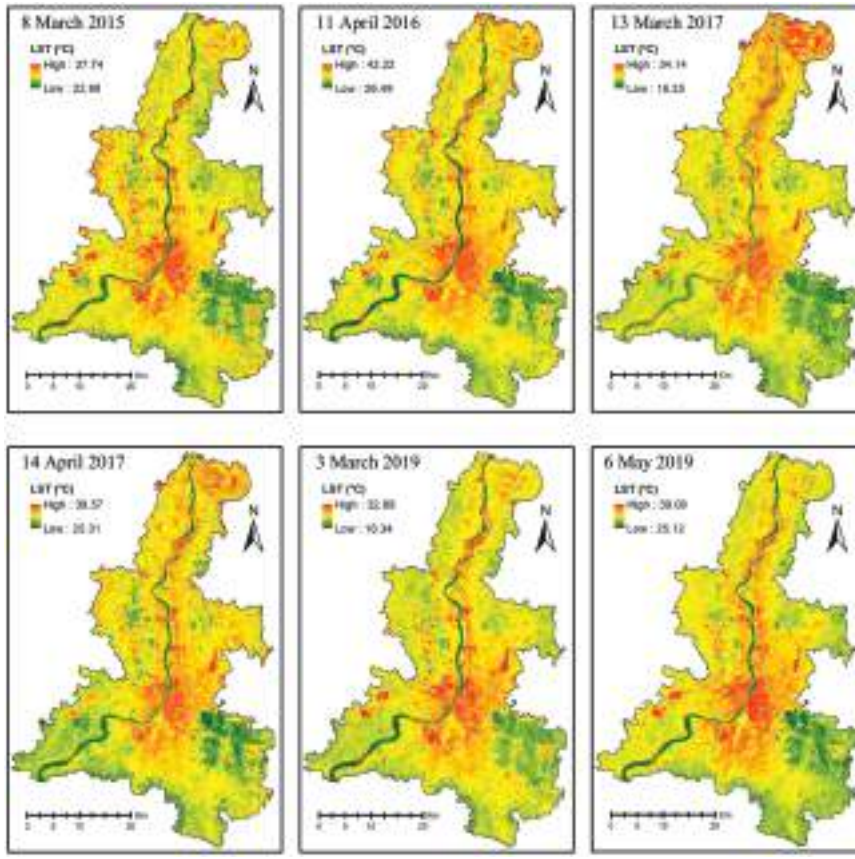

Figure 11.3 Spatial variability of LST over KMA as estimated using Landsat-8 data in summer months (MAM) during 2015–2019

Source: https://earthexplorer.usgs.gov/

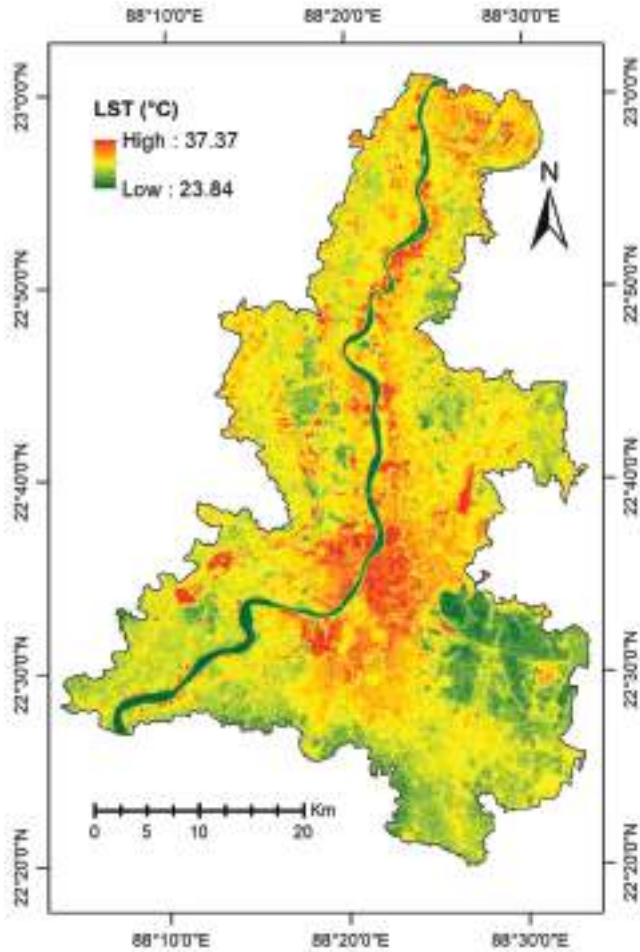

Figure 11.4 Mean Land Surface Temperature (LST) distribution over Kolkata Metropolitan Area (KMA) during summer season (MAM). Mean LST distribution estimated by weighted average of six individual day's LST from the summer months of March to May during 2015–2019

Source: https://earthexplorer.usgs.gov/

In spite of sufficient visual differences among LSTs of typical LCZs on a particular date, it is not possible to compare them directly, since particular LST differences emerge from numerous dynamic factors, like land cover change and the synoptic situation on that particular day (Bechtel et al., 2015; Ochola et al., 2020). Therefore, we have adopted pair t-test

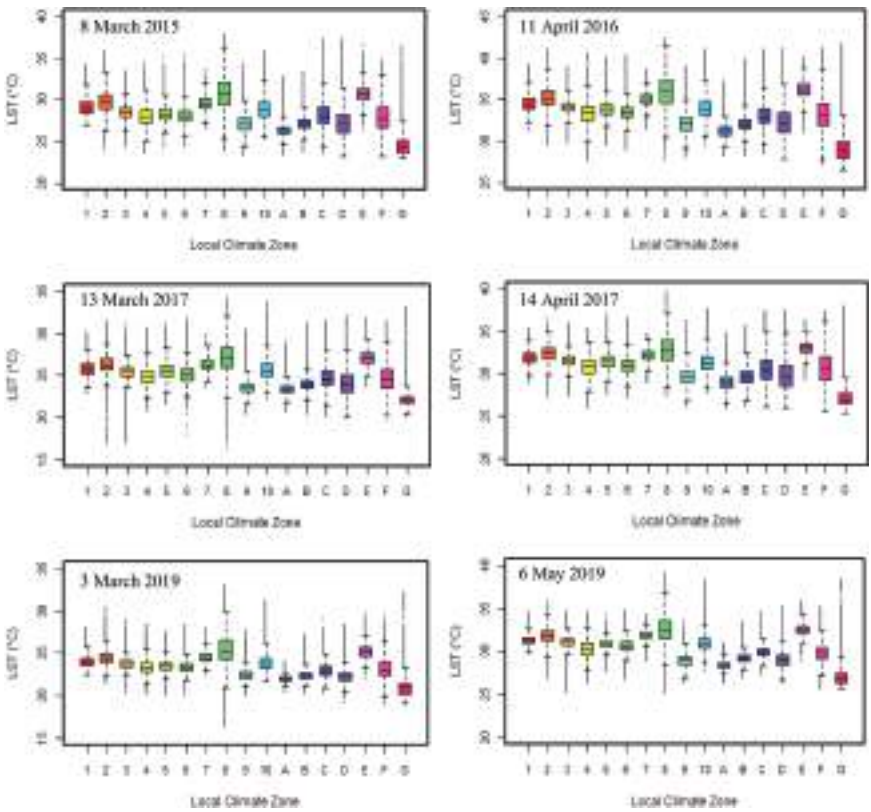

Figure 11.5 Box plots of estimated LSTs using Landsat 8 data show distribution of the value of median (Q_2, mid horizontal line in the box), first quartile (Q_1, bottom of the box), third quartile (Q_3, top of the boxes) and outliers (black vertical lines) across LCZs in the Kolkata Metropolitan Area

Source: https://earthexplorer.usgs.gov/

for inter-comparison of LSTs, and the statistical summary reveals significant (p<0.05) differences among LCZs regarding the mean LSTs of each of the six summer days (Table 11.3). Thus, our study on estimation of LCZ-based LST difference further reaffirms and justifies this approach.

Discussion

The study on classification of LCZ over the KMA offers the scope of understanding the term 'urban' in the true sense by evaluating dynamics of urban morphology, e.g., building layout, pattern, fabrics, land cover, etc., through standardized assessment approach. It has also provided unbridled

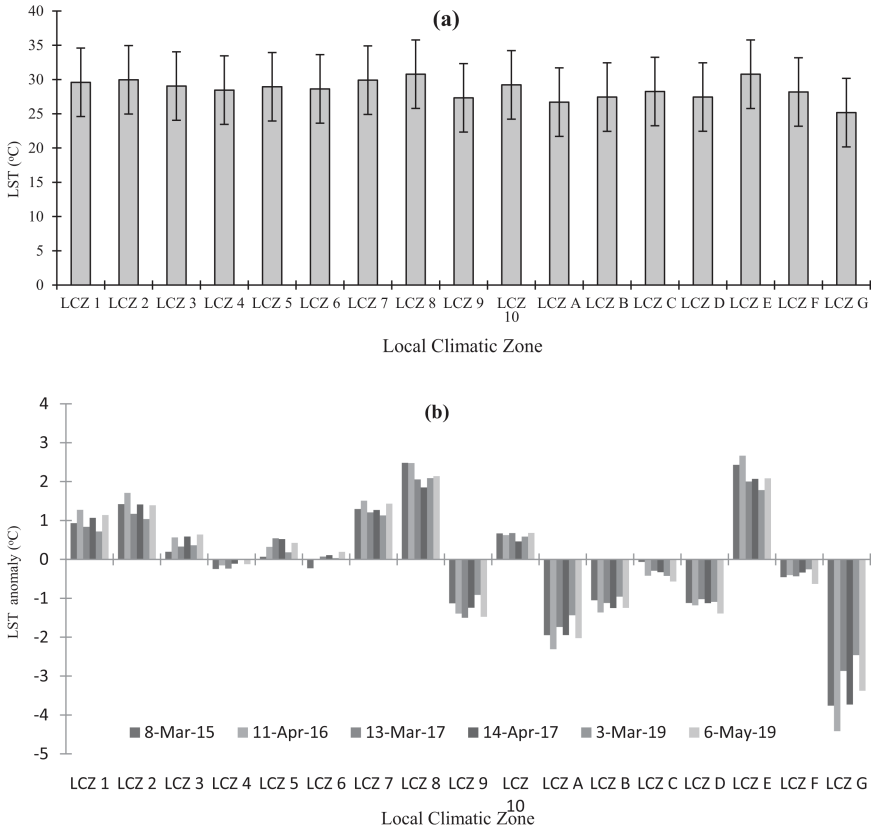

Figure 11.6 (a) Distribution of average LST across different LCZs, (b) anomaly of LST in LCZs from region average in specific dates during summer season (March-May: 2015–2019) over KMA

Source: https://earthexplorer.usgs.gov/

opportunities for inter- and intra-LCZ comparative analysis with respect to national and international cities (Thomas et al., 2014; Kotharkar and Bagade, 2017; Mushore et al., 2017, 2019;Ochola et al., 2020). Large vertically-oriented surfaces across the municipal corporations, municipalities, and non-municipal urban areas cause uneven solar heating more than rural areas that encourage a thermal anisotropy effect over the KMA (Lelovics et al., 2013; Ochola et al., 2020). The 'compact mid-rise' is found to be the warmest (30.8 ± 4.0 °C) in LCZ 2 by 1.2–1.8 °C compared to 'compact high-rise' and 'compact low-rise' in the metropolitan area. Not only that, but it also records higher temperatures than the warmer LCZs of 'lightweight low-rise' (LCZ 7), 'large low-rise' (LCZ 8), and 'heavy industrial'

Table 11.6 Mean Land Surface Temperature (LST) across Local Climate Zones (LCZ) on individual dates as well in the summer season (MAM) over the KMA (2015–2019)

Local Climate Zone	*8-Mar-15*	*11-Apr-16*	*13-Mar-17*	*14-Apr-17*	*3-Mar-19*	*6-May-19*	*Season average (MAM)*
LCZ 1	29.2[#]±1.4[@]	34.8 ± 1.3	25.9 ± 1.1	32.0 ± 1.0	24.1 ± 0.8	31.5 ± 1.0	29.6 ± 4.0
LCZ 2	29.7 ± 1.3	35.2 ± 1.2	26.3 ± 1.0	32.3 ± 1.0	24.4 ± 0.8	31.8 ± 0.9	30.8 ± 4.0
LCZ 3	28.4 ± 0.9	34.1 ± 0.8	25.4 ± 0.8	31.5 ± 0.7	23.8 ± 0.5	31.0 ± 0.6	29.0 ± 3.9
LCZ 4	28.1 ± 1.1	33.3 ± 1.2	24.9 ± 1.0	30.8 ± 1.1	23.4 ± 0.8	30.3 ± 0.9	28.5 ± 3.8
LCZ 5	28.3 ± 0.9	33.8 ± 0.8	25.6 ± 1.0	31.4 ± 0.9	23.6 ± 0.6	30.8 ± 0.5	28.9 ± 3.8
LCZ 6	28.1 ± 0.9	33.5 ± 1.0	25.2 ± 1.0	31.0 ± 1.0	23.4 ± 0.6	30.6 ± 0.7	28.6 ± 3.8
LCZ 7	29.6 ± 1.1	35.0 ± 1.0	26.3 ± 0.9	32.2 ± 0.8	24.5 ± 0.7	31.8 ± 0.6	29.9 ± 3.9
LCZ 8	30.8 ± 1.8	36.0 ± 1.9	27.2 ± 1.7	32.8 ± 1.6	25.5 ± 1.6	32.5 ± 1.5	30.0 ± 3.9
LCZ 9	27.7 ± 1.2	32.1 ± 1.2	23.6 ± 0.9	29.7 ± 1.2	22.5 ± 0.6	28.9 ± 0.7	27.3 ± 3.7
LCZ 10	28.9 ± 1.5	34.1 ± 1.5	25.8 ± 1.3	31.4 ± 1.3	24.0 ± 1.2	31.1 ± 1.1	29.2 ± 3.8
LCZ A	26.6 ± 0.8	31.2 ± 0.8	23.4 ± 0.7	29.0 ± 0.9	22.0 ± 0.3	28.4 ± 0.4	26.7 ± 3.5
LCZ B	27.3 ± 1.0	32.1 ± 1.0	24.0 ± 0.9	29.7 ± 1.1	22.4 ± 0.6	29.2 ± 0.6	27.4 ± 3.7
LCZ C	28.2 ± 1.6	33.1 ± 1.4	24.8 ± 1.4	30.6 ± 1.5	23.0 ± 0.8	29.8 ± 0.7	28.3 ± 3.8
LCZ D	27.2 ± 1.6	32.3 ± 1.8	24.1 ± 1.6	29.8 ± 1.7	22.3 ± 0.7	29.0 ± 0.8	27.4 ± 3.7
LCZ E	30.7 ± 1.1	36.2 ± 1.0	27.1 ± 0.9	33.0 ± 0.8	25.2 ± 0.8	32.5 ± 0.7	30.0 ± 4.0
LCZ F	27.8 ± 2.0	33.1 ± 2.4	24.7 ± 1.8	30.6 ± 2.1	23.1 ± 1.4	29.8 ± 1.6	28.2 ± 3.7
LCZ G	24.5 ± 1.2	29.1 ± 1.6	22.2 ± 0.9	27.2 ± 1.1	20.9 ± 0.8	27.0 ± 0.9	25.2 ± 3.2

Source: https://earthexplorer.usgs.gov/

#: Mean LST °C; @: Standard deviation.

(LCZ 10) by 0.8–0.6 °C during the summer season. This is mostly consistent with the findings of Thomas et al. (2014) and Ochola et al. (2020) who reported 'compact high-rise' as the warmest urban LCZ from Kochi in India and Nairobi in Kenya. Marginally higher (by 0.1–0.8°C) heating property of 'large low-rise' than 'light-weight low-rise' and 'heavy industrial' may result from differential heating of the diversified surface configurations of the typical morphological structures (Akbari and Levinson, 2008; Parlow et al., 2014; Bechtel et al., 2015). Similarly, Mushore et al. (2017, 2019) have observed high LST over the CBD and industrial areas categorized under LCZ of 'compact mid-rise' in Harare metropolitan city, Zimbabwe. The 'light-weight low-rise' structures with no or few trees (LCZ7) are marginally hotter (by 0.9°C) than 'compact low-rise' (LCZ3), mostly because of the closely-spaced high-density buildings with corrugated metal-made structures that facilitate more heat absorption and obstruct winds to transmit it away. However, this is contradicted by Alexander and Mills (2014) and Mushore et al. (2019), who have reported reverse heating processes in the said LCZs from Dublin, Ireland and Harare metropolitan city, Zimbabwe. Higher LSTs along industrial areas (LCZ 10) might have a close connection with the heat from emission sources and the accumulated heat from the building structure itself. Low amounts of water in plants during hot summer periods considerably reduce the heat mitigation capacities of vegetated

layers within the built-up areas, leading to huge heat storage in these LCZs. Besides, dry ground surface and deeper piezometric surface further decrease the chances of surface cooling by evaporation in the hot season. However, the ratio between buildings' height (H) and width (W) of the adjacent street (H/W), orientation, reflectivity, conductivity, plot coverage, balconies, vegetation, and human activities may have an obvious impact on urban heating mechanisms (Taslim et al., 2015; Li et al., 2018; Bechtel et al., 2019; Ochola et al., 2020), which further claims extensive investigation for comprehensive understanding of LCZ-based LST studies over the KMA area. Naturally, the 'dense trees' (LCZ A) consisting of forests, tree cultivations, and urban park and 'water bodies' (LCZ G) remain 4.1–5.6 °C cooler than the hotter zones, even during excessive hot weather in the summer season. This can be explained by their higher heat-mitigating properties through evaporation and greenery effects.

Conclusions

This is the first-ever initiative towards classifying the whole 1851 km^2 geographical area of Kolkata metro city into LCZs following the international standard of protocol of WUDAPT (Level 0 approach) using remotely sensed data. Beyond its original purpose of identifying highly sensitive thermal areas in the metropolis, the classification scheme provides an intellectual procedure of urban landscape segregation based on their canopy layer climate. Thus, the authentic scientific database produced rationally in this study may have immense utility to the scientific community for further research on urban climates at micro-scale. Moreover, the research is able to establish how the zones are unique in terms of surface heat generation through their complex interaction of different surface configurations (building and tree height/density), surface covers (pervious or impervious), fabrics (natural and constructional materials), and metabolism (waste heat from transportation and space heating/cooling). Increasing heat wave occurrences during the summer seasons in the past few years are also in the same line of the IPCC's anticipation. Most of the affected areas are in the LCZs, where vegetation has been cleared-off; or places with dark surfaces like asphalt roads and black roofs, or areas of reduced porous surfaces, tall buildings and narrow streets, or patches of decreased water surface areas, etc. Temperature contrasts of about 4–5 °C between warmer (compact mid-rise: LCZ 2, compact high-rise and compact low-rise: LCZ 1 and 3, lightweight low-rise: LCZ 7, large low-rise: LCZ 8 and heavy industry: LCZ 10) and cooler (dense trees: LCZ A and water bodies: LCZ G) zones in the metropolis are serious issues in sustaining comfortable human health *vis-à-vis* urban life. However, unresolved research questions, such as seasonality of thermal behaviors along with LCZs and thermal anisotropy effects (complete surface temperature differences), remain open for future research. In spite of these, the present research findings should have immense utility in devising urban planning for

minimizing the UHI effect, particularly by identifying those heat-sensitive urban morphological areas and their thermal sensitivities.

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12 Urban Hydrology of Calcutta

Evolution from the Colonial Period

Kalyan Rudra and Nilangshu Bhushan Basu

The city of Kolkata, formerly Calcutta, may be described as a 'hydrologically subsidized city' as its boundary delineated by the Hugli River in the west and a wetland in the east. Further east, a river called Kultigang receives spilloff of the water of the wetland. While the river supplies domestic water to the 4.50 million population of the city, the low-lying swamp popularly known as 'East Kolkata Wetland' serves as a waste-water recycling zone (Ghosh and Sen, 1987). The Bhagirathi-Hugli River, with a length of about 500km., is the most important distributary of the Ganga. The northern 220km. of the river is non-tidal and known as the Bhagirathi. The tide-induced lower part lying south of Nabadwip is known as the Hugli. The fertile soil, bright sunlight, and an interlacing network of rivers made Bengal so productive that it was described as the 'Paradise of India' by the European traders (Campos, 1919). The fame of Bengal lured the European traders during the 16th and 17th centuries, and the Hugli River was the gateway for many European merchants, among whom it was ultimately the British who emerged as the victors in the battle of Plassey. Initially, Calcutta was a small dock that they needed to reach the banks. The colonial rulers felt the urgent need for a riverine port to facilitate the growing trade. The three villages of Sutanuti, Gobindapur, and Kolikata gradually emerged as a port. The small trading centre propelled itself into an international port when the steamships chugged down the river with loads of merchandise. In its wake, during the late 18th century, came the ripples of the Industrial Revolution in England. The face of Bengal changed rapidly. The banks of the Hugli River witnessed the establishment of factories, jute, paper, leather, and engineering, and thus the agrarian landscape quickly changed into an industrial one. The hinterland of the port at Calcutta kept growing to a size that was larger than the combined geographical area of England and France.

In the second half of the 18th century, the situation further changed with the advent of the railways. Industrialisation flourished and Calcutta, the nerve centre of the British Raj, functioned as its capital till 1911. People migrated to Bengal in large numbers from the neighboring states of Bihar and Orissa. The British left India in 1947. A divided Bengal saw an influx of millions of people crossing the border to seek refuge on either side. The

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environmental stress on the riverfront increased, and the hinterland of the port of Calcutta extended from the eastern part of Uttar Pradesh down to western Assam. But the navigation in and out of the port was extremely difficult due to inadequate depth and uninterrupted sedimentation in the river. Since the early 19th century, dredging of the channel was required to render safe passage to the sea-going vessels. The 20th century witnessed a revolution in shipbuilding technology, and ships of much larger size and greater draught started to dominate the maritime trade. Large sea-going vessels requiring a depth of more than eight metres could hardly approach the inland port at Calcutta. It was during the high tide that a ship could move up the Hugli estuary. The evolution of three sleepy villages and adjoining regions into the port-industrial city took more than three centuries starting in the late 17th century. While the population of Calcutta was less than one million in 1901, present Kolkata, covering an area of 205km^2, is home to more than 4.5 million residents (Chakraborty, 2013).

Changing Hydro-Geomorphology

Calcutta (now Kolkata) is located within the largest delta of the world. The Ganga-Brahmaputra-Meghna delta absorbed half a million km^3 sediment load deposited on the relatively shallow basin, and it took more than 20 million years to build that extensive deltaic plain (Rudra, 2018). When James Rennell surveyed Bengal during 1764–1777 and published 'A Bengal Atlas' in 1780, the Sundarban was extended up to the southern fringe of the Calcutta. The mangrove forest was extended further north in the earlier days. The presence of two successive peat layers, 4.50–5.00 and 12–13 m. below the ground level of Calcutta, has been referred to as the evidence that forest cover once extended to the north of present Sundarban (Banerjee and Sen, 1987).

The Hugli River tends to spill over the bank during high tide, especially during the rainy season. The site chosen by the East India Company was initially inhospitable for human settlement as the land was premature, swampy, and tidally inundated twice a day. The terrain had an imperceptible eastward slope from the bank of Hugli towards East Calcutta Wetland. The water spilled off from the Hugli River flowed to the east along some channels or low-lying tracts. A Conjectural Map of Calcutta at the advent of British rule, drawn by an anonymous cartographer, shows three east-flowing channels; the first one had been Chitpur Creek, the second one flowed along the present Ganesh Chandra Avenue-Creek Row, and the third one was the Adiganga. Another such map shows two spill channels taking off from Hugli River near the present Posta area and flowing eastwards like all others into the East Kolkata Wetland. The residence of Rabindranath Tagore at Jorasanko, literally meaning 'twin bamboo bridge', points to its history.

The East Kolkata Wetland was an area where fluvial and marine land-building processes were working together. The occasional storm surge used

to submerge the entire area. The British had a clear vision of the role of the Ganga and other rivers in this country. In Calcutta, they realized that the urban and industrial wastewater should not be allowed to flow into the main river that acted as the lifeline for the entire region. They excavated east-flowing canals to divert the wastewater to the natural wetlands located at the eastern fringe of the city (Ivermee, 2021;Mukherjee, 2020). The East Calcutta Wetlands (ECW) today not only act as a reservoir, but also as the site of resource recovery through a natural process.

The first canal, known as 'Maratha Ditch', was excavated in 1743 by Nawab Alibardi Khan from Bagbazar to Beckbagan along the present APC road to protect the city from the invasion of Marathas. This ditch was filled up between 1799–1893 to construct one of the main arterial roads of Kolkata. This was followed by the excavation of the Tolly's Nala (1777), Beliaghata Canal (1810), Circular Canal (1829), New Cut Canal (1859), Bhangar Canal (1897), and Krishnapur Canal (1910). The canals, which were excavated to create a shorter navigation route between Calcutta and East Bengal or bringing resources from Sundarban into the city, gradually decayed and converted into outlets of wastewater, posing a serious health issue for the dwellers (Inglish, 1909). The canals that carry wastewater of south Kolkata or adjoining areas are TP Canal, Charial Khal, Begore Khal,

Figure 12.1 Calcutta and its Environment (Imperial Gazetteer of India, 1931)
Source: Atlas of the City of Calcutta, NATMO (1990)

and Mani Khal. The Boat Canal was excavated to connect Adiganga with the port of Calcutta. It is important to note that the northern part of the Maratha Ditch was excavated along the old Chitpur Creek; the Circular Canal initially followed the same path and subsequently was aligned in a new direction, lying east of the filled-up Maratha Ditch. It joined the Beliaghata Canal, which was excavated in 1810 near Pamer Bazar. In 1859, the New Cut Canal was excavated, taking off from the Circular Canal near present R. G. Kar Medical College and aligned in a semicircular path along present E.M Bypass between Ultadanga and Chinrighata and thus connected Beliaghata Canal. But this portion of the canal was subsequently filled up to build the road, and waters were given a new outlet through Krishnapur Canal, which was excavated in 1910. Presently, this canal flows along the periphery of the Bidhan Nagar city and joins the Beliaghata Canal near Chingrighata.

The Bagjola Canal also appears to be an old spill channel taking off from the Hugli River near Ariadaha and discharged into the Jatragachi wetland of Rajarhat. It is now completely beheaded from its feeder and carries wastewater of the North and South DumDum Municipality. In the 1930s, a proposal of rejuvenating the Bagjola Canal was under consideration by Calcutta Corporation, with a proposal to rename it as Grand Trunk Canal.

Early Drainage System and the Problem of Waterlogging

The area that is today known as Kolkata used to be a conglomeration of three villages and some fishing hamlets interspersed with forests, creeks, and canals that connected the Hugli River on the west with the Salt Lakes on the east. These creeks and canals served as the natural drainage system and were discharging into the Salt Lakes. The excess rainwater and sewage were then carried away to the sea through the Bidyadhari River, which has decayed. Calcutta had been the city of many ponds which stored the excess rainwater, reducing the magnitude of large-scale waterlogging. Virtually 3/5ths of the present command area of Kolkata was a natural swamp, and the other 2/5thswere habitation during the early 18th century.

The densely populated areas on the riverbank – especially the markets of Barabazar and along the old pilgrims' way in Chitpore – saw occasional flooding. The fledgling English settlement around the 'Lal Dighi' also experienced some inundation, leading to deadly bouts of malaria and cholera. The creeks and canals rendered outlets to rainwater into the Salt Lakes. But due to the rapid expansion of the built-up area in the 18th century, many tanks and creeks were filled in. With the area devoid of natural drainage routes, waterlogging became a major urban problem. This change invited epidemics of waterborne diseases, which especially affected the lower-lying areas of the town in North Kolkata. To address this issue, the small and cash-strapped Calcutta Government excavated some rudimentary narrow sewers to drain sewage and rainwater to the Hugli River. This plan proved

futile, as the natural eastward slope of the city did not allow the reversal of flow towards the Hugli River during the monsoon. The plying of the boat in the Chitpore Road during the rainy season was common. The experts of the East India Company explored the remedial measures and some important reports were put forward (Goode, 1916).

Wellesley's Report and the Improvement Committee

In 1803, Lord Wellesley, then-Governor General of British India, published detailed minutes condemning the sad state of municipal affairs in Calcutta. In the report, Wellesley especially criticised the poor condition of drinking water, extremely unhealthy sanitation, and faulty drainage system in the city. The Committee noted:

> The construction of the Public Drains and the Water-Courses of the Town is extremely defective . . . neither answer the purpose of cleansing the Town, nor of discharging the inundations occasioned by the rise of the river, nor by the excessive fall of rain during the South-West Monsoon . . . Experience has manifested that during the rainy season, when the river has attained its utmost height, the present drains become useless; at that season the rain continues to stagnate for many weeks in many parts of the Town, and the result necessarily endangers the lives of all Europeans residing in the Town and greatly affects our Native Subjects.
>
> (Quoted by Goode, 1916)

A Report on the Municipal Calcutta and its Institutions

In 1809, the appointment of Justices of Peace, municipal officers, and the constitution of the Improvement Committee was based on the submitted report from Lord Wellesley. The Improvement Committee was assigned the task of maintenance of sanitation, to take appropriate measures to prevent waterlogging, waste disposal, and overall health in Calcutta. The records of the Committee's recommendations were never found and assumed lost as reported by the succeeding Lottery Committee in 1817. The excavation of the Circular Canal that bounded the then-northern and eastern boundary of Calcutta is presumed to be the only contribution of the Improvement Committee to the city of Calcutta. This canal, which is operational to this day, extends from the inlet of the erstwhile Maratha Ditch in Bagbazar to connect Beliaghata Canal at Chingrighata. The connection of the existing open drains at Chitpore, Bagbazar, Sobhabazar, and Nimtala with the Beliaghata Canal allowed the high tide on the Hooghly River to eliminate sewage and rainwater to the Salt Lakes. However, this arrangement was not sufficient. The open sewage of North Calcutta was clogged, leading to stagnation. The open sewages and drains were not emptied regularly. This resulted in the

accumulation of waste, human and animal excreta, the putrefaction of the filth, and overflow of dirty water, contributing to deadly outbreaks of disease. This problem increased significantly during the monsoon, when a large volume of tidal water entered the city through the canal (from both the river and the Salt Lakes) and resulted in the overflow of the open drains. Lack of an underground stormwater drainage network aggravated the waterlogging problem in the northern part of the city. Finally, the existing drainage system was not comprehensive; several parts of the city did not have proper outlets for sewage and rainwater. Thus, the Beliaghata Canal could not improve the waterlogging problems of the city.

The Lottery Committee (1817–36) and Fever Hospital Committee (1836–47)

The Lottery Committee and the more effective Fever Hospital Committee were successively appointed to address these shortcomings. Steam-powered lock gates were installed at Bagbazar near the mouth of the Circular Canal by the Lottery Committee to regulate the entry of tidal water. This became a major attraction for the citizens of Calcutta, and people gathered in numbers each day to see the operations of the first steam-powered machine in Calcutta. To overcome the serious issue of waterlogging and sewage problems in Calcutta, the Fever Hospital Committee proposed to construct a comprehensive network of underground tunnels and a large, combined drainage system. Three rival proposals were debated in 1835. Among the three proposals, the first proposal, construction of a masonry aqueduct from Chitpore in the north to South Park Street Cemetery and beyond to the Salt Lake was adopted by the Fever Hospital Committee. This design was proposed by Major General Forbes, the Captain of the Royal Engineers. This canal, parallel to the Circular Canal, would be provided with sluice gates to admit tidal water from Hugli and the Salt Lakes. The design that was proposed by Major General Forbes included the construction of two large, covered drains on each side of the canal. All the open drains of the city would remain connected to these two closed drains. The closed drains would empty their sewage to the constructed masonry canal. All the drains (both closed and open types) would be flushed with tidal water entering through the additional sluice gates constructed at different locations. Similarly, combined drainage would also drain to the canal. The proposed masonry canal could also be utilized for the transportation of goods by small *dingis* (boats) by paying a toll fee. The water in the canal could also be used to clean roads and supply water to extinguish fires.

The second proposal suggested the construction of a large underground brickwork tunnel running from west to east, from the Hugli to the Circular Canal near Beliaghata through Nimtala and Maniktala in North Calcutta. Mr. Blechynden, who was the Superintendent of Roads of Calcutta, proposed that all the smaller drains in the city would deposit the sewage and

excess rainwater to the constructed brickwork tunnel. The tunnel would be eventually flushed by tidal river water.

The third proposal was by an engineer, Captain Thomson, who was Officer-in-Charge of Canals. His ambitious proposal was to construct a large network of underground combined drainage tunnels so that the sewage and excess rainwater might be flushed by tidal river water (entering from the Circular Canal and sluice gates of other canals/inlets) towards Salt Lakes. James Prinsep was a renowned Orientalist scholar and antiquarian. He was a key member of the review committee that debated the proposals, and he rejected all three proposals. He was completely against the idea of an underground drainage system due to the failure of underground drainage scheme at Varanasi. This made him skeptical about its implementation in Calcutta. Even after accepting the proposal by Major General Forbes, the Fever Hospital Committee could not implement the project due to a dearth of sufficient government funds.

Clark's Scheme and the Foundation of Kolkata's Current Sewage System

In 1855, a modified plan based on the concept proposed by Major General Forbes was submitted to the Calcutta Municipality Review Committee. An engineer and inventor named William Clark conceptualized the plan. It would not be out of place to mention that Mr. Clark contributed to this city in other major infrastructure as well, namely making of the then-Central Avenue, and the width of the road was criticized by many at that time. In his plan, Clark proposed the construction of three underground main sewers connecting the Hugli in the west and the Circular Road on the east. These three underground canals extended under Dharmatala Street, Kolutola Street, and NimtalaGhat Street, and were proposed to be connected with a north-south oriented underground sewer extending from Sovabazar to the Upper Circular Road. The north-south extending sewer would further be connected to a sewer from the south and Dharmatala east-west sewer at Lower Circular Road. All open drains in the city were designed to flow into one of these sewers and ultimately into one of four combined overflows, which had larger capacities than all the intercepting sewers combined. Clark proposed this scheme for drainage of excess rainwater during the monsoon. Per the scheme, the sewage and rainwater would drain to the Circular Canal at Beliaghata. The sewage pumping station located at Palmer's Bridge ultimately drained/pumped out to the Tangra Creek, located in the vicinity of the Science City. Calcutta Municipality's review committee sanctioned Clark's proposal in 1857. The mechanism continues to this day.

Before the implementation/construction of the sanctioned scheme, the Government Drainage Committee conducted elaborate measurements of the slopes in different parts of the city from 1858 to 1859. The Committee also recorded the tide levels at Bamungahata, Tangra, and Dhapa on the

Salt Lakes side. Similar readings of tidal levels were recorded at Chitpore, and Chandpalghat on the Hugli River and tidal levels at Tolly's Nullah. To augment the huge requirements of bricks for the underground labyrinth of sewers, modern brick-making technology was obtained from England, and a large brickfield was established for the production of bricks at Palta. However, the project was delayed and had to be halted several times due to a lack of funds. Moreover, the plan had to be modified multiple times with cost revisions along with the tenure of the project. These revisions were necessary because of the rapid expansion of the city's boundaries and population, further delaying the implementation of the proposed scheme. Ultimately, in the late 1890s, Clarke's scheme was fully implemented and laid the structure of the current sewage and combined drainage system in Kolkata.

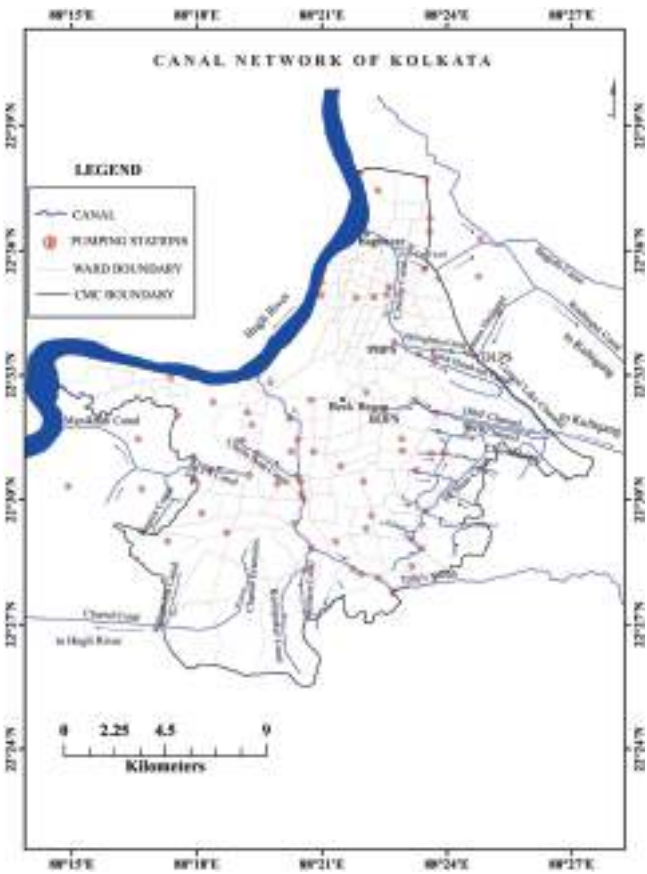

Figure 12.2 Canals and drainage pumping stations of Kolkata
Source: Drawn by the authors

Planning of Urban Hydrology

The history and evolution of Kolkata's drainage system dates back to 1803, when the Governor-General, Lord Wellesley, appointed a committee to ascertain the description of drains and watercourses that would prove most efficient for the drainage of Calcutta. For further improvement of drainage, the Lottery Committee was set up in 1817 and was assigned the construction of the Beliaghata Canal. A major landmark was achieved in 1823, when the construction of Palmer Bazar Pumping Station (PBPS), with a capacity of 18.5cft/sec., was completed. However, the issue of waterlogging and drainage of stormwater still plagued the civic body. The Committee report of 1832 on the Calcutta drainage problem identified that the remedy to the problem was the construction of the Underground Drainage System. The civic body recommended the construction of an underground drainage system for the Town System & Suburban System in 1856. In 1863, the Municipal Government developed the water supply and drainage system and they contributed Municipal Slaughter Houses (1866) and New Market (1874). In 1870, Municipal Sanitation Consciousness emerged with an unprecedented emphasis on sanitation and drainage. This ushered in the golden age of brick sewers in the city. The culture of regular cleansing of municipal sewers in manual mode and flushing of sewers by the high tide of river Hugli also evolved during this period. The evolution of the drainage system during the period from 1839 to 1875 is known as Mr. Clark's period. Mr. Clark, the first Chief Engineer of Calcutta Corporation, designed and executed the 'Town System'.

In 1875, PBPS consumed about 400 Metric Tons (MT) of coal annually to fuel the steam pumps to remove 15 million gallons (MGD) of sewage daily. Soon after, Mr. Kimber succeeded Mr. Clark as Chief Engineer of Corporation from 1875 to 1891. It was during the regime of Mr. Kimber that major extension of the drainage system was undertaken. In 1878, about 38 miles of Man-Entry and 37 miles of Non-Man-Entry brick sewers were completed in the city of Calcutta. Construction of Beliaghata and Circular Canals were accomplished in 1886. From 1891 to 1907, Mr. Kimber, along with Mr. Huges, initiated the construction of the Ballygunge Drainage Pumping Station (BDPS) and further augmentation incapacity of the PBPS. In 1901, an extension of Engine House at PBPS was completed, while BDPS for Suburban Systems was commissioned in 1904. The Chief Engineer duo contributed to the construction of high-level delivery sewers and excavation of stormwater reservoirs leading to Central Lake Channel at Bantala during their tenure. The Bhangore kata khal was completed in 1897, and in 1903, the construction of Mominpur Pumping Station and Suburban High-Level Sewer was completed under the aegis of Mr. Kimber and Mr. Huges. In 1908, construction of Canal Area Drainage, i.e., area between Acharya Prafulla Chandra Road (APC Rd.) and Circular Canal with Shymbazar at its north up to Sealdah at its south, was concluded. The construction

of siphons under Tolly's Nullah at Gopal Nagar was completed in 1909. This connected the Mominpur Pumping Station unit with BDPS. The construction of the Kestopur Canal in the east was completed in the next year (1910). Calcutta Improvement Trust (CIT) was established in 1911 through the Kolkata Improvement Act. The trust was created with the purpose of expansion and improvement of the developing city and its urban surroundings. This was the brainchild of Lord Curzon, with the basic objective of the development of urban infrastructure and its maintenance. Many sewerage and drainage plans were prepared and executed as part of the area development plan. In 1913, it was realized that there was difficulty in the terminal discharge of sewerage of Town System beyond city limits due to serious deterioration of the capacity of Bidyadhari River. The Maniktala Drainage Pumping Station as an intermediary lifting station was commissioned in 1915. By 1928, Ultadanga, Beliaghata, and Narkeldanga Syphon Pumping Stations were completed and commissioned. Pagladanga Pumping Station (1930) and Topsia Pumping Station (1931) were constructed and commissioned. In 1943, Dr. Birendra Nath Dey, the Chief Engineer of Calcutta Corporation, adopted a unique method of city wastewater neutralization by introducing pisciculture and diverting the flow to the Central Lake Channel of Bantala before discharging nutrient-free effluence. The same practice is still active in the East Kolkata Wetland and is the major source of freshwater fish for the city and surrounding areas. In 1943, Nimak Mahal Pumping Station was constructed.

The city witnessed independence in 1947. This came at the cost of the partition of Bengal and a huge refugee influx. The city planners were unable to manage such an imbalance in population growth over such a short period. The city witnessed the damage of natural drainage routes with loss of ponds and exhaustion of current capacities. Thus, the process of nation rebuilding/further augmentation of the existing infrastructure was initiated. Chetla Lock Pumping Station was constructed in 1954, and construction of Dhapa Lock Pumping Station (DLPS) and Birpara Pumping Station was started in 1958. A Master Plan was prepared by CMPO for the period from 1966–2001. In 1966, Chowbhaga Drainage Pumping Station was constructed to drain the flow of the Tollygunge Panchannagram channel, which was further extended to transport the wastewater from intercepting channels in later years. The Jodhpur Park Pumping Station was commissioned in 1967 (Fig.2).

The Indo-Pak War started in 1970. This added to the political turmoil and unprecedented migration to the city from the villages. This led to the further degradation of civic maintenance culture as well as encroachments on canals. From 1987 to 1995, Calcutta Metropolitan Development Authority (CMDA) constructed several Lifting Stations at different fringe areas of Tollygunge, Behala, Jadavpur, and Gardenreach. CMDA had plans to commission a few sewage treatment plants (STP) under Ganga Action Plan (GAP), but these remained incomplete due to various social and infrastructural

issues and was unable to yield the desired result. In 1990, the civic body started rethinking and initiating landmark studies to augment civic infrastructure. Several studies followed, like the Sewerage and Drainage Study by CMDA (1992–1993), the Sewerage and Drainage Study by Calcutta Municipal Corporation (CMC) with a loan from the Asian Development Bank (1998–1999), and the Sewerage and Drainage Study by Kolkata Municipal Corporation (KMC) with World Bank Loan (2000–2001). To alleviate waterlogging in north Kolkata, Thanthania Pumping Station was commissioned in 1999. But the scenario became more difficult for civic managers due to rapid urbanisation and dwindling infrastructure with population explosion, population concentration at high rises, silted-up drains, old and worn-out pumping infrastructure, and narrowed canals with low flow as well as filled up with silt and debris.

Further augmentation and improvement of drainage infrastructure happened during the period from 1999 to 2016. Southern Avenue Drainage Pumping Station was commissioned in 2004. The Kolkata Environment Improvement Project (KEIP) was launched with funds from an ADB loan. The project provided funds for ward nos. 1 to 6 and 101 to 141 for provisioning of underground sewers and restoration of a few waterways with the assistance of the Irrigation Department for effective disposal of wastewater in the project areas. From 2007 to 2015, KMC undertook the ambitious project of thorough cleaning and structural rehabilitation of roughly 140-year-old 27kms of Man-Entry and 15kms Non-Man-Entry brick sewers with funding from Jawaharlal Nehru National Urban Renewal Mission (JnNURM). This ambitious project adopted trenchless technology and lining with structural Glass Reinforced Pipe (Type-II) for Man-Entry and it was deployed for the first time in our country. Non-Man-Entry sewers were rehabilitated by the conventional cut and cover method. This project has been appreciated by the international engineering community. It would not be out of place to mention that the Institution of Civil Engineers (ICE), UK, the oldest professional institution going back to 1818, had recognized this project as a replicable model in their bi-centenary issue of 2018 amongst 200 projects from all over the world. In 2017 and to date, the extension of KEIP is in progress to supplement the gaps left out earlier with the fresh sanction of ADB loans for the added areas of KMC.

Concluding Remarks

Being located in the interfluve between the Hugli in the west and Kultigang in the east, and the terrain having an altitude lower than the highest tide level, the planning of stormwater outlets had been an extremely difficult task. The initial drainage layout executed during the colonial period was modified/upgraded during the post-independence period. As the city sprawled east and southwards at the expanse of low-lying tracts, the task of rendering a free outlet to rainwater became more difficult. The laying

of the foundation stone of the city by the British Colonial engineers and subsequent modification by town planners had been the matter of a continuous engineering experiment. In the period since 1690, the city grew in both bounds and population. Contemporary research and landmark studies recognize that several problems still exist. Age-old sewers are heavily plagued with siltation, reducing capacity. Open drains and canals are more often clogged with solid waste resulting from improper civic habits and neglect. The initial plan of using Ganga water to flush out the sewers in a natural way during high tide is no longer functional. Moreover, the law of the land no longer permits manual cleaning of sewers by civic workers or using child labourers to clean Gully pits (entry points on roads).

To overcome these problems and to maintain adequate flow in the sewage network of the city, experts have suggested several methods, and the mechanical desilting of the existing sewers to augment the hydraulic capacity seems to be the best technical option. This is necessary as the present systems cannot be expanded due to very low road space of 6.25% of the total land area, in contrast to a planned city with 20–25% road space. Fixing proper strainers and regular cleaning of the same to arrest the clogging by solid wastes and deleterious substances that flow along with liquid waste has been adopted by the Kolkata Municipal Corporation. It is essential to perform regular Energy Audits for all electro-mechanical installations for efficient maintenance with timely replacement after the economic life of all the equipment. The lining of the canal bed and bank, prevention, and regulation of encroachments with regular cleaning and dredging are necessary to maintain adequate sewage flow in the canals. These measures can maintain proper health, hygiene, and sanitation of this 'cultural capital of India'.

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13 Transformation of Land Use and Land Cover Dynamics of East Kolkata Wetlands

Prativa Karmakar

Wetlands comprise one of the most productive and diverse ecosystems in the world. The process of urbanisation has led to a progressive loss of the wetland habitats across the world, causing a decline in wetlands globally, both in area and quality (Gardner et al., 2015). While productive capacities of natural resources like wetlands cannot be determined by price or market values, they facilitate environmental conservation by their mere existence and play crucial ecological roles and functions. However, the trade-off has been a neglected perspective in studies on regional and urban planning. Since the Ramsar Convention on Wetlands in 1971, the conservation and restoration of these critical ecosystems have attained due relevance. It is undeniable that wetlands in close proximity to urban regions have been substantially more affected by degradation than those located away from cities. High population densities and the consequently higher demand upon land have been the prime cause of unplanned reclamation of wetlands over time (Panini, 1989). Continuous expansion of impervious concrete surfaces, peat removal, filling, drainage, pollution, transport development, and consequent land conversion are posing a major threat to the wetlands (Goudie, 2006; Hettiarachchi et al., 2015; Ancog and Ruzol, 2015; Torbick et al., 2006). The Ramsar Convention Secretariat (2016) defined wetlands as not only natural water bodies, but also aquaculture ponds, farm ponds, stock ponds, small tanks, irrigated lands, seasonally flooded agricultural land, wastewater treatment areas, and those areas that support the wetlands' ecosystem regime. This implies that it is not enough to conserve the water body itself, but also the adjacent and corresponding land use for land cover. This chapter focusses upon land use dynamics of the East Kolkata Wetlands (henceforth called EKW) that play an important role in the sustenance of Kolkata, one of the largest metropolitan cities in Asia.

Kolkata is naturally endowed with a large expanse of wetlands to its east that has traditionally played the crucial role of waste recycling, apart from delivering other ecosystem services. As an urban wetland, it faces the threats of conversion and degradation to a greater extent. Its inclusion in the Ramsar List and continuous attempts at conservation have not yielded the best results. For the planners, the region has remained a complex challenge, as

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the city is bounded by these wetlands to its east and the Hugli River to its west – and at the same time, the growing need for space has led to an eastward expansion by conversion of these wetlands as the easiest option. The conservation of these wetlands has been an important consideration for planners in Kolkata and time and again, developmental plan documents have cited the need to conserve it. Kolkata is also one of the first cities to have a Wetland Institute dedicated to research and evolution of conservation programmes. In spite of all such factors as well as the Ramsar listing, the planning philosophy of *building around wetlands* could not be followed because the location of the wetlands made it a convenient site for conversion and expansion. Under the given circumstances, it is crucial to study and assess the changes in the land use and land cover of the EKW to place the major issues of conservation in clear perspective. Continuous monitoring of the land use and land cover (LULC) changes over time is extremely significant in analysing and predicting the trends of change. It is likely to inform the scientific decision-making process for sustainable urban planning and wetland management.

Satellite Image Processing and ground truth verification have proved to be robust tools for change detection and facilitate assimilation of important information that help in the more effective management of the wetland area (Ozesmi and Bauer, 2002; Mondal et al., 2017, Chopra et al., 2001). Different change detection techniques such as post classification comparison (Li et al., 2016; Das, 2009; Mas, 1999; Kesgin and Nurlu, 2009; Dewan and Yamaguchi, 2009) image differencing (Parihar et al., 2013), principal component analysis (Fung and LeDrew, 1987), change vector analysis (Baker et al., 2007), direct multi-date classification (Mushtaq and Pandey, 2013), background subtraction (Singh, 1989) and NDVI technique (Gandhi et al., 2015) have been developed to monitor LULC change using satellite imageries.

A substantial volume of literature on EKW has revealed numerous issues. The initial studies of Chattopadhyay (1990); Ghosh and Sen (1987); Furedy and Ghosh (1984) provide detailed history of formation, use, and relevance of the wetlands with reference to a growing urban centre. EKW provides the entire range of ecosystem services that include reserves for flood water, aquifer recharge, biodiversity protection, carbon sequestration, pollution control, and livelihood sustenance (Banerjee and Dey, 2017). It is a great protector of local biodiversity and a habitat of several species of flora and fauna (Sengupta, 2018). But the processes of urbanisation and growing infrastructural facilities have posed great threats to the ecosystem (Haque, 2020). Mondal (2017) and Ghosh et al. (2018) have explained the impact of urbanisation on EKW and identified the most vulnerable areas using remote sensing data, and have defined the reasons behind such vulnerabilities. While using the 'time diary method', Dey and Banerjee (2016) present that the impact of LULC change induced by urbanisation has created different vocational opportunities directly connected with the EKW. Bandyopadhyay

et al. (2004) analysed determinants of valuation of this wetland ecosystem. The traditional knowledge and the sewerage-based aquaculture and agriculture are the soul of EKW. To conserve these wetlands, several public interest litigations have been initiated and as a consequence, the government has drawn up policies against any kind of conversion of land within the boundary of EKW (Nagarik Mancha, 2017). Time and time again, policies have proved futile in the face of the powerful real estate players, as found in many cities across the world.

The present study attempts to prepare a detailed land use and land cover map and explore the zone-wise temporal changes in the LULC for the timespan from 1972 to 2019. This analysis is expected to provide the basis for planning for the region and evolve a proper wetland management strategy. Further, it goes on to explain the nature and magnitude of land conversion that will enable us to prepare mouza-wise zonation maps by rate of change over time. The exercise is likely to enable detection of critical zones that need prioritisation in the process of conservation.

Early History of the EKW

East Kolkata Wetlands is located in the Ganga delta region between 22° 25'N to 22° 40'N and 88° 20'E to 88° 35'E to the east of Kolkata, bordering the Salt Lake township on one side and New Town on another side (Chakraborty and Gupta, 2019) (Figure 13.1). Since its origin, it was an inter-distributary marshy land that was disconnected from the main river and remained deprived of silt deposition; over time it became a low-lying marshy area. Gradually, it became a spill reservoir of the Bidyadhari River, a tidal river (Chattopadhyaya, 1990). The western part of the swampy area was more or less divided by small embankments. The water flowed in to fill these swampy areas during high tide. The earlier accounts depicted the area as a salt marsh area, abounding in numerous species of fish and birds (Ghosh and Sen, 1987). Initially, a portion of the low-lying saltwater marshy area was taken for fish cultivation, but with the decay of the Bidyadhari River, it was gradually converted to a freshwater fishery, recycling the sewerage water with intervention from the farmers and fishermen communities, where small '*bheri*' (fishing ponds) areas produce both fish and paddies alternatively. Earlier, the saline swampy land was chiefly inhabited by the fishermen, who built their thatched huts on the margins of the saltwater lakes, taking the ponds on lease for pisciculture (Biswas, 1927).

But with passing time, sewerage and stormwater from the city discharged into the Bidyadhari River during ebb tide, and by 1904, it was also noticed that the river was silted up by 30ft. Trials to resurrect the riverbed ended in failure. In 1935, it was decided to discharge sewerage and storm water into the Kulti River, using two channels of stormwater and the daily dry weather flow channel (Bose, 1944). After partition, in 1953, a decision was taken to reclaim the saltwater lake area to develop a satellite township called the Salt

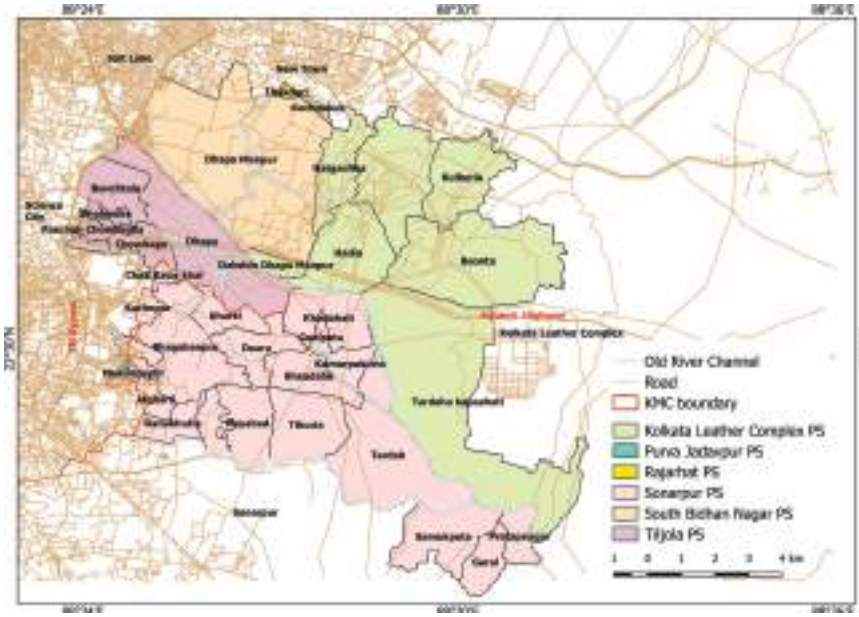


Figure 13.1 The study area: East Kolkata Wetlands

Lake City in accordance with the Salt Water Reclamation Plan formulated by the British Government in India in 1945. After the construction of Salt Lake City around the 1970s, gradual land transformation to agricultural uses were noticed. In 1980, few water bodies were acquired for the construction of the Eastern Metropolitan Bypass. This incident acted as the trigger for subsequent rapid changes. Identified as a threatened entity, in 2002, EKW was recognized as a Ramsar site with great international importance (EKWMA, 2006). Since 2006, East Kolkata Wetlands Management Authority (EKWMA) has been the designated authority of management for this wetland. The entire wetland area has 37 mouzas (Kundu et al., 2008).

At present, the wetland area is surrounded by major townships such as Bidhananagar, Rajarhat New Town, Baishnabghata Patuli Township, and the East Kolkata Township. It has been commonly noticed in different cities around the world that with wealth, power, and tacit support of hierarchies of governance, real estate developers find ways to access land for development, using the logic of public demand for housing. It is an enigma that in and around Kolkata, hundreds of apartments built to fulfill the apparent rising demand today lie vacant, while land sharks continue to encroach land for the cause of development. At present the wetland, therefore, is in a critical situation and needs urgent measures for conservation and protection by the authorities, backed by strong political will.

Materials and Method

Dataset

Remotely sensed dataset, along with survey data for empirical knowledge, collected from vivid field visits is used for drawing the LULC map. To find out changes in LULC, 5 Landsat MSS (1972), TM (1989, 2000, and 2011) and OLI (2019) data set (Table 13.1) are taken for LULC classification using the supervised technique of image classification with the maximum likelihood algorithm. In Table 13.2, details about LULC categories are explained. Figure 13.3 illustrates the detailed workflow of the study. Therefore, signature samples are collected and validated through the feature space plot. Spatially, the supervised LULC classification is compared with the ground truth using topographical map and Google Earth images of the time and place and through field visits. The quantitative measure of accuracy to assess the quality of classification is done using the Kappa Coefficient (Foody, 1992) (Table 13.3). Here, thematic accuracy addresses the correctness of the classified map through its tool of Producer's accuracy and User's accuracy. Producer's accuracy measures how correctly the reference samples are classified and user's accuracy tells about what percentage of the classes has been correctly classified (O'Donoghue, 2005).

Table 13.1 Details of the dataset and its uses

Dataset	*Data Source*	*Year*	*Purpose*
Landsat MSS data	http://earthexplorer.usgs.gov	11/12/1979 (P148/R044)	Image Classification for LCLU
Landsat TM data		30/01/1990, 9/11/2000, 5/11/2010 (P138/R044)	
Landsat OLI-1		02/02/2020 (P138/R044)	
Topographical Sheets	• 79B/6 on 1:50,000 • 79 B/5 on 1:50,000 • Toposheet on inch map	Survey of India - 1973 (Surveyed on 1958–59) Survey of India - 1968 (Surveyed on 1922–24)	For Classification result verification
Google Earth Image	Google Earth	2000, 2010, 2020	
Open Street map	http://openstreetmap.org	2017	For preparing topology of road map
East Kolkata Wetland Administrative Map	EKWMA	-	For boundary of the wetland

Table 13.2 Details about LULC categories

LULC Class	*Description*
Wooded Settlement	Almost single-storied pacca and semi-pacca or hut small settlement either used as residential or temporary workplaces for fishermen or farmers, surrounded by trees/vegetation.
Built-up	Concrete residential building, single- or multi-storied, manmade structures, and/or roads.
Hydrophytes	Hydrophyte-dominated area mostly in swampy, semi-wet areas which seasonally remain dry or wet.
Open land	Filled up and newly filled up land, neither containing water nor any built-up structure.
Vegetation	Urban farms mostly based on solid waste, tree cover.
Agricultural Land	Urban or peri-urban agriculture; here, effluent-based cultivation is distinct from plantations in term of cropping and process of cultivation.
Water body	Perennial water body.

Change Detection

A change matrix (Table 13.4) is generated for the entire EKW for the timespan of 48 years (1972 to 2019). The magnitude or extent of change of a particular type of land class to another type is calculated here based on the LULC classification data (Figure 13.4). In Figure 13.5, yearly changes in LULC area are represented. A change detection map for this time period has also been prepared (Figure 13.6). The transformation matrix is constructed based on the area of 1972 and 2020 to investigate the pattern of interclass mobility of land classes. This helps to explore the process of change in LULC occurring in the EKW area during the specified period of 48 years (Table 13.5).

Major LULC Zonation

A zone can be a region with a particular trait, i.e., homogeneous value, but may also consist of multiple elements, all having the same values. Here, the LULC zonation is defined using the major type of land use or land cover in each mouza of the EKW. Comparing the present land zone with the past may clearly define the transformation of mouza-based land use (Figure 13.7). The major typology of land use-land cover is defined (Figure 13.2) through most frequent occurrence of a particular value that denotes a particular land class (ArcMap, 2016).

Result and Analysis

Accuracy Assessment

The study is based on classification of land use and land cover, and its accuracy assessment is an important aspect in evaluating the output with ground truth.

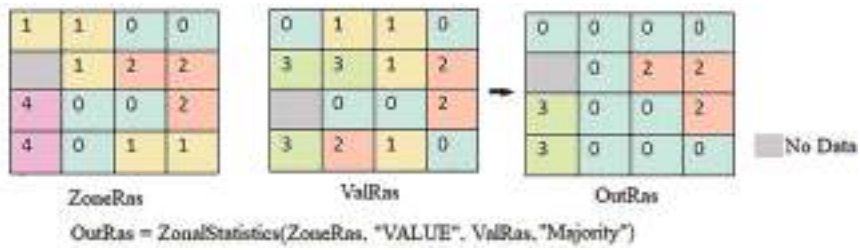


Figure 13.2 Process of generation of output raster value in generation of zonation using 'majority value' ArcMap, 2016

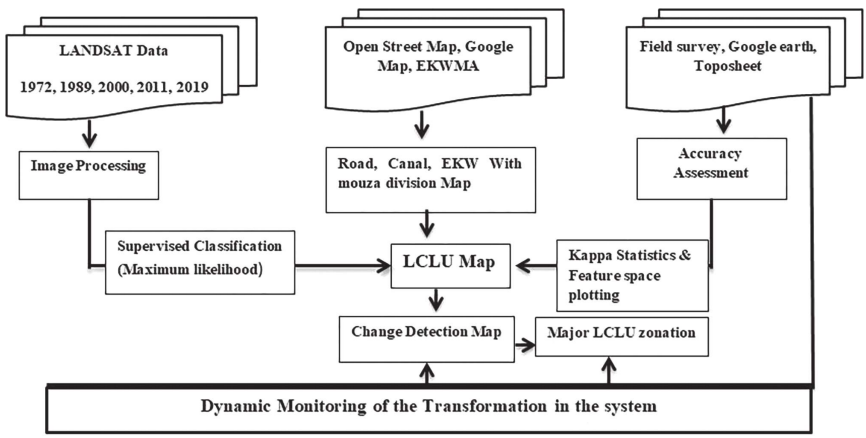


Figure 13.3 Methodological flow chart of the study

The accuracy of five LULC maps covering a timespan of 48 years has been measured in this study. The LULC classifications are verified at two levels of accuracy. Firstly, the signatures are evaluated on feature class images, and secondly, the quality of classification is checked through contingency error matrices. Feature space plot analysis is carried out to identify the extent of separability between signatures of various LULC classes. The feature space plot reveals that most of the classes are distinct from each other, except for a few that have spectral signatures overlapping to an extent. Here, seven objects are defined based on the training input collected from the satellite image to represent water body, agricultural land, open land, vegetation, wooded settlement, built-up, and area dominated with hydrophytes. Ellipses in feature plot represent the pixels assigned to a particular object area with three standard deviations from the mean, and points are collected based on the distribution parameter of equalized random method from every LULC class. Selected signatures for the classification are verified and fixed through ground truth

Table 13.3 Accuracy assessment result for LULC classification of EKW for the year of 1972 to 2020

Land Use and Land Cover Classes	*2019*		*2011*		*2000*		*1989*		*1972*	
	Producer's Accuracy **(%)**	*User's Accuracy (%)*	*Producer's Accuracy* **(%)**	*User's Accuracy (%)*	*Producer's Accuracy* **(%)**	*User's Accuracy (%)*	*Producer's Accuracy* **(%)**	*User's Accuracy (%)*	*Producer's Accuracy* **(%)**	*User's Accuracy (%)*
Built Up	100.00	71.43	85.71	100.00	100.00	100.00	100.00	100.00	100.00	83.33
Area Dominated by Hydrophytes	100.00	83.33	100.00	66.67	83.33	100.00	100.00	100.00	85.71	100.00
Vegetation	100.00	100.00	100.00	83.33	87.50	100.00	100.00	83.33	100.00	100.00
Open Land	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	83.33
Water body	87.50	100.00	85.71	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Agricultural Land	87.50	100.00	100.00	100.00	100.00	90.91	75.00	100.00	85.71	100.00
Wooded Settlement	100.00	100.00	85.71	100.00	100.00	100.00	100.00	83.33	83.33	83.33
Overall Classification Accuracy (%)	**95.83**		**93.75**		**97.32**		**95.83**		**93.75**	
Overall Kappa Statistics	**0.9408**		**0.9286**		**0.9731**		**0.9524**		**0.9286**	

Table 13.4 LULC transformation matrix for 1972 to 2020

Land Class		*2020*							*Grand Total (1972; Area in Hectares)*
		Agricultural Land	*Hydrophytes*	*Built Up*	*Open Land*	*Vegetation*	*Water body*	*Wooded Settlement*	
1972	**Agricultural Land**	1179.39	808.1	1597.45	463.26	216.85	207.95	230.25	4703.25
	Hydrophytes	202.57	264.07	307.89	117.5	99.71	95.1	86.19	1173.03
	Built Up	0.06	0.02	28.12	0.65	0.04	0.01	0.37	29.27
	Open Land	118.56	141.77	368.64	93.44	66.22	31.67	45.59	865.89
	Vegetation	137.62	214.82	315.12	114.82	165.88	63.27	91.61	1103.14
	Water body	309.73	1086.85	609.54	210.73	115.61	1258.14	182.92	3773.52
	Wooded Settlement	62.82	113.02	383.17	117.33	48.03	24.05	103.47	851.89
Grand Total (1972;Area in Ha)		2010.75	2628.65	3609.93	1117.73	712.34	1680.19	740.4	12500

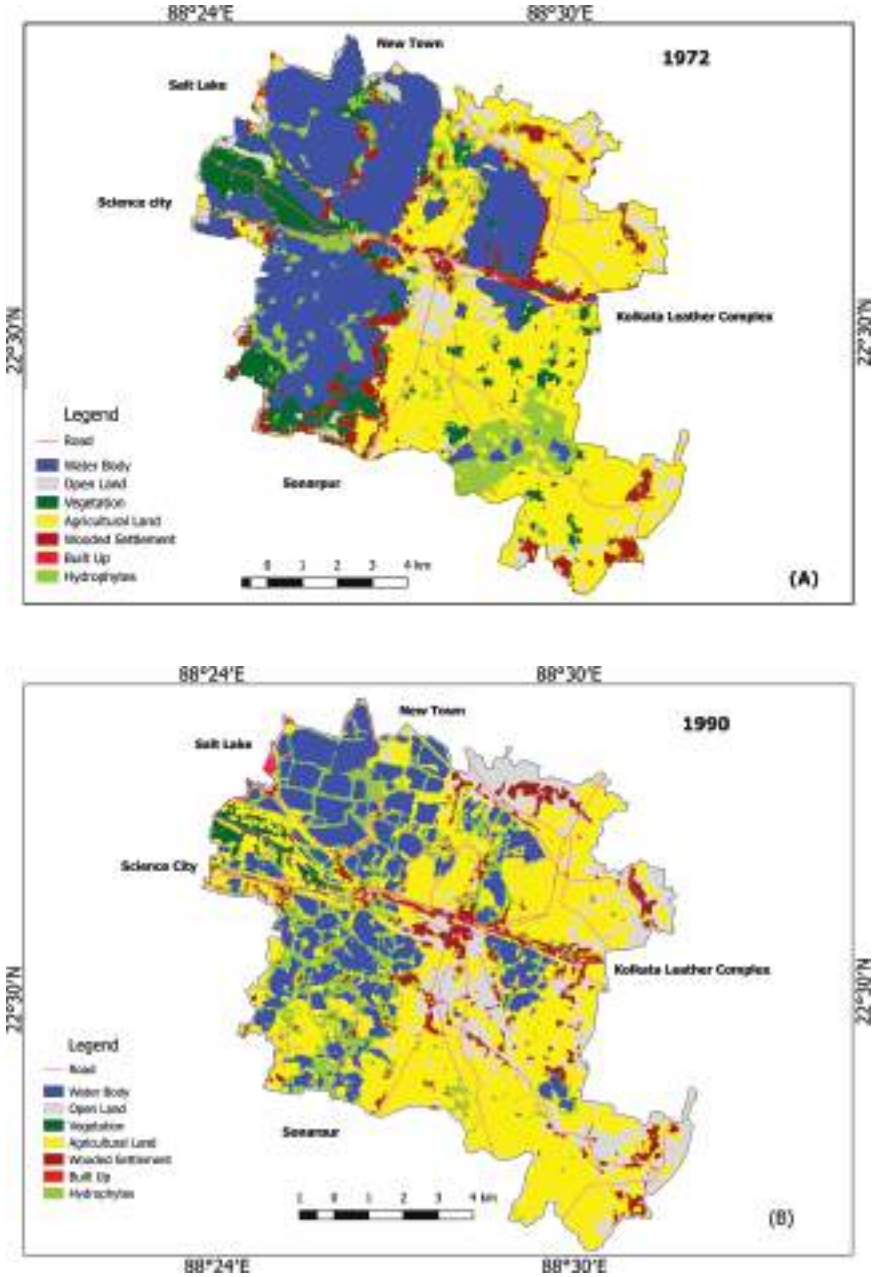


Figure 13.4 Land use and land cover map, A: 1972, B: 1990, C: 2000, D: 2011, E: 2020

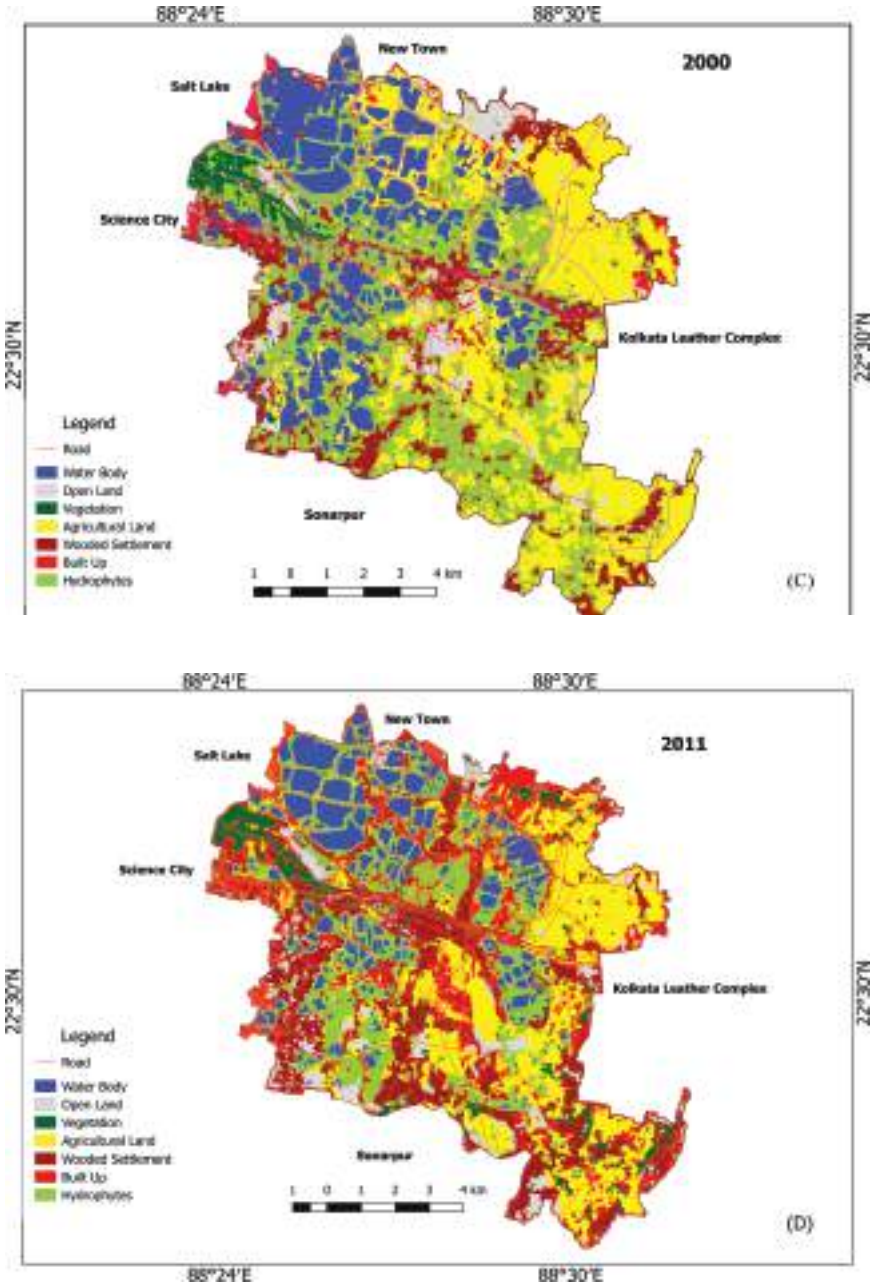
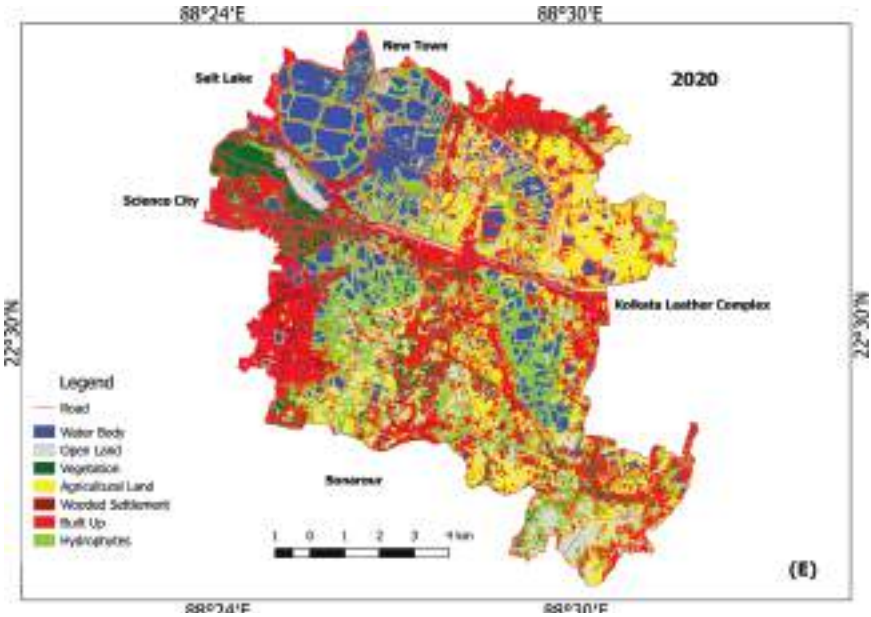


Figure 13.4 (Continued)



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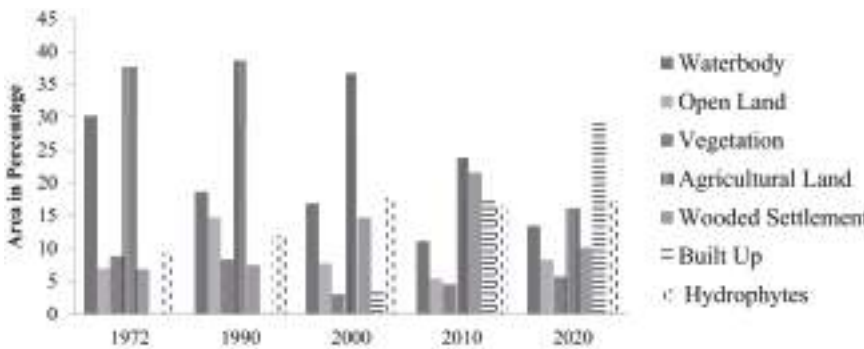

Figure 13.5 Area in percentage of different LULC categories from 1972 to 2020.
Source: Data source LULC map Figure 13.3

GPS survey, topographical map, and Google Earth image, and then used for accuracy assessment. Using the reference data and the classified map, an error matrix was generated which indicates the overall accuracy, producer's accuracy, and user's accuracy of five LANDSAT images (**Table 13.3**). Overall accuracy of the classified map ranges from 93.75% to 97.32%, which is satisfactory to accept them for subsequent change detection and analysis.

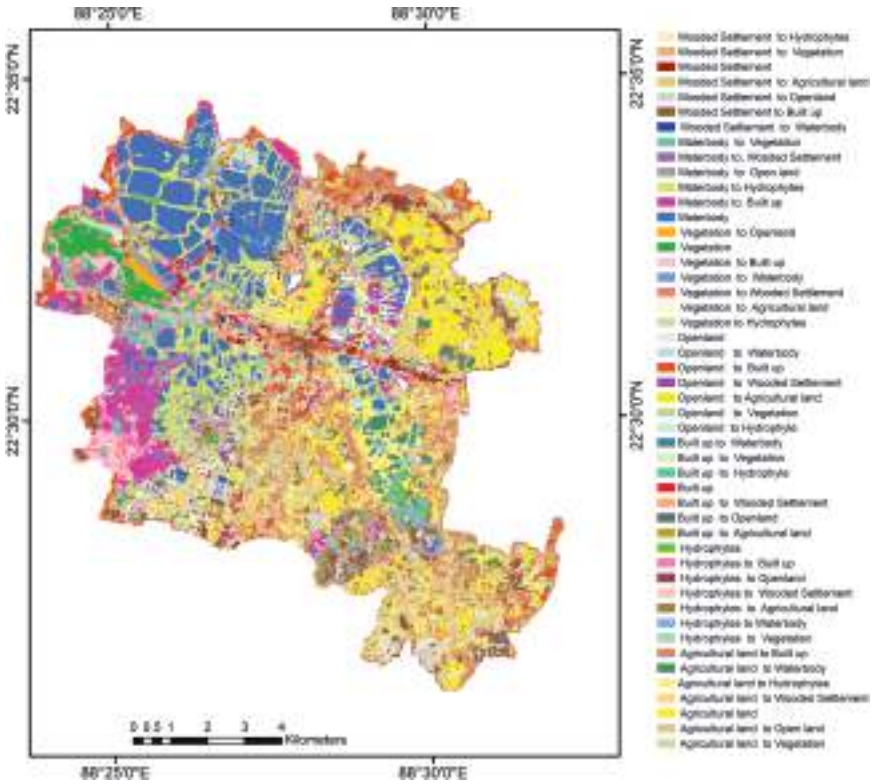

Figure 13.6 The spatial distribution of LULC changes between 1970 and 2020

Table 13.5 Transformation Possibility between 1972 and 2020

Land Class	*Agricultural Land*	*Hydrophytes*	*Built-Up*	*Open Land*	*Vegetation*	*Water body*	*Wooded Settlement*
Agricultural Land	0.25	0.18	0.34	0.1	0.04	0.04	0.05
Hydrophytes	0.17	0.24	0.26	0.1	0.08	0.08	0.07
Built- Up	0	0	0.95	0.02	0.02	0	0.01
Open Land	0.13	0.16	0.42	0.11	0.1	0.03	0.05
Vegetation	0.12	0.19	0.35	0.1	0.1	0.06	0.08
Water body	0.08	0.29	0.15	0.05	0.05	0.33	0.05
Wooded Settlement	0.07	0.13	0.46	0.14	0.05	0.03	0.12

Land Use and Land Cover Transformation Analysis

The EKW is known as a unique ecosystem that provides multiple ecosystem services and multiple uses. Figure 13.4 shows the LULC classification in EKW areas for the time period from 1972 to 2020, and Figure 13.5 shows the percentage of area in each LULC category during that time period. Here, total wetland area is divided into seven categories based on major land use and land cover characteristics, such as water body, hydrophyte dominated area,

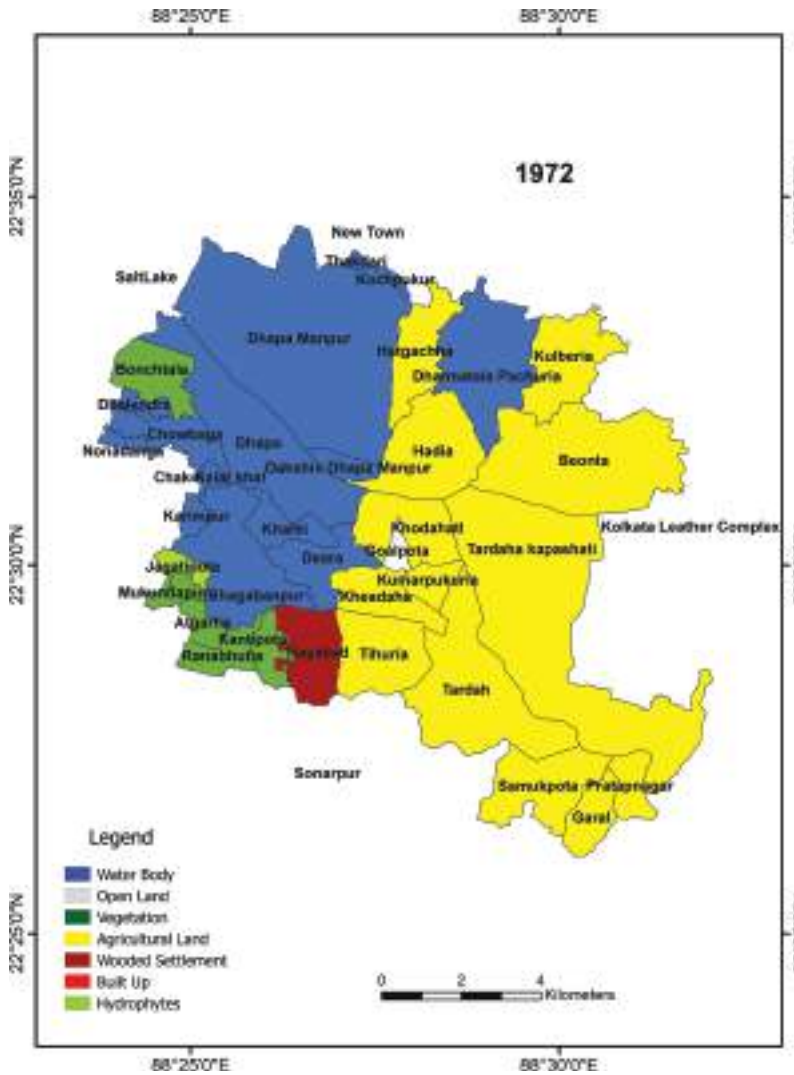

Figure 13.7 Mouza wise major LULC zonation map (A) 1972, (B) 2020

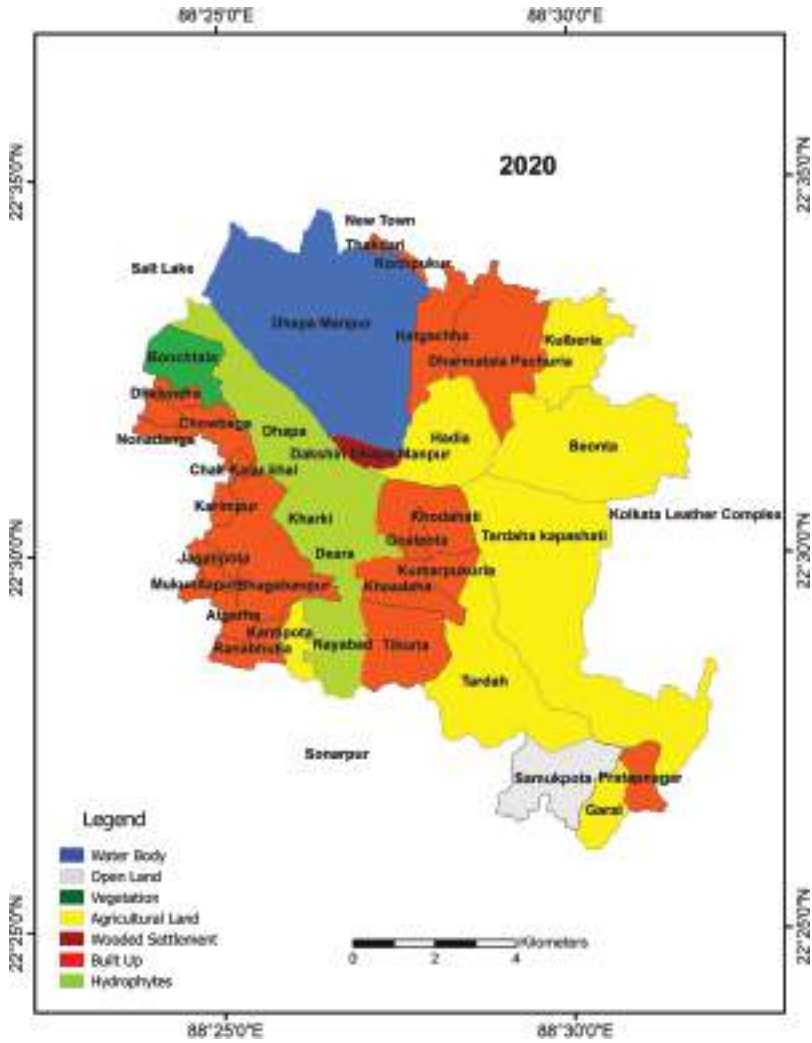

Figure 13.7 (Continued)

vegetation farming on garbage substrate, effluent irrigated agricultural land, open land, rural wooded settlement, and built-up area (Figures 13.4 and 13.5).

Apart from the main perennial water bodies, which accounted for 30.18% in 1972, a significant part of the wetland is seasonally characterized by wet and dry spells and remains dominated by hydrophytes. In 1972,

such hydrophyte-dominated areas accounted for almost 9.4% of land. In the same year, agricultural land covered a greater percentage than other LULC categories, namely, 37.6% of the total area, but in 2020, it covers only 16.06% (Figure 13.4). There are isolated pockets in the wetland that are classified as rural wooded settlement and are primarily settled by fishermen and cultivators who are directly connected with the wetland. In 1972, it accounted for only 6.8% while the built-up area was insignificant, but the whole scenario is different in the present; in 2020, the dominant land use is under wooded settlement and built-up, accounting for 39.23% of total land. Only two decades, from 2000 to 2020, did the percentage of area under built-up increase at an alarming rate. In 2000, this category accounted for 3.32%, while in 1990 it was only 0.29% of total LULC. Figure 13.4 represents that most of the settlement development is along the transport routes towards the western and southwestern directions experiencing urban sprawl, while the northeastern direction experiences the newly developing construction sites under the influence of Newtown, the most recent township to develop.

Nature and Location of Changes in LULC

LULC change pattern and process are presented with the transformation matrix (Table 13.4) and transition possibility (Table 13.5) for the time period of 48 years between 1972 to 2020. The spatial locations of these changes are presented with Figure 13.4.

During the selected time period, the built-up area expanded more at the cost of agricultural land and water body covering an area of 1597.45 hectares and 609.54 hectares respectively (**Table 13.3**). Another remarkable point is found in the growth of the total area under hydrophytes, covering 1086.85 hectares of water bodies and 808.1 Ha. from agricultural land and out of the total area under hydrophytes, 307.89 hectares is converted into built-up and 202.57 Ha is converted into agricultural land. 315.12 hectares are vegetation cover, mostly concentrated at the northwestern part, which is also converted into a built-up area. Wooded settlement of 383.17 hectares land area is upgraded into built-up land in 2020. Among all these categories, area dominated with hydrophytes and open land are the most dynamic.

From 1972 to 2020, built-up area is stable but has an increasing trend, while water bodies are relatively stable, but the trend is decreasing. A transformation possibility table is prepared for the years of 1972 to 2020 (**Table 13.4**). The matrices estimate the self-replacement of the water bodies to be nearly 33% while the rest of the part, almost 67%, has transformed into other land use, while only the built-up area has self-replacement of nearly 95%. From Figure 13.6, it is found that most of the conversion of agricultural land has taken place in the north, northeastern, southeastern, and south-central parts, while conversion of open land into built-up is

taking place in the north, northeastern, and southeastern parts. Another remarkable change from water body into built-up area is recorded in the west and southwestern part.

Major LULC Zones

Based on the most occurring frequency of any land class category in different mouzas of EKW for the years 1972 to 2020, a zonation map is prepared and presented in Figure 13.7. In 1972, in Dhapa Manpur, Dhapa, Dakshin Dhapa Manpur, Chak Kalar Khal, Dhalendra, Paschim Chowbagha, Chowbagha, Nonadanga, Karimpur, Kharki, Deara, Bhagabanpu, Hatgacha, Thakdari, Kochpukur, and Dharmatala Pachuria - in all these 15 mouzas, water body is the dominant land cover. In six mouzas of Kalikapur, Mukundapur, Kantipota, Ranabhutia, Atghara, and Bonchtala, the majority of land class is vegetation, while only the mouzas of Jagatipota and Nayabad are dominated by hydrophytes and wooded settlement, respectively. Only Goalpota has a dominant proportion of open land. The remaining 13 mouzas are dominated by agricultural land. It is already represented in the LULC change map that with the rapid expansion of built-up area, the whole scenario of the EKW area is transformed and the previous land zones are changed. The present distribution can be identified in the zonation map of 2020 (Figure 13.7). In 2020, only one mouza, Dhapa Manpur, is dominated by water body. Open land and wooded settlement are dominant usages in most mouzas, i.e., Samukpota and Dakshin Dhapa, and Manpur, respectively. In 2020, 22 of the total mouzas, namely, Chak Kalar Khal, Dhalendra, Paschim Chowbagha, Chowbagha, Nonadanga, Karimpur, Kharki, Deara, Atghara, Bhagabanpu, Thakdari, Kochpukur, Hatgacha, Dharmatala, Pachuria, Khodahati, Goalpota, Kheyadaha, Kumapukuria, Tihuria, Pratapnagar, and Dharmatala Pachuria are dominated by built-up areas, while six mouzas are dominated by agricultural land, and rest of the five mouzas have hydrophyte-dominated land cover.

Discussion

Between 1972 and 2020, undoubtedly major changes in the land use and land cover pattern have taken place (Figure 13.6) within the boundary of EKW as well as the corresponding Ramsar site. Most of the conversions from water body into built-up is prominent in the northern section and in the west and southwestern parts of the wetland area. Since 1962–67, large-scale conversion of the salt water lakes into built-up area for construction of the Salt Lake Township initiated the process of wetland conversion (Ghosh and Sen, 1987). Further, in the 1980s, the construction of the Eastern Metropolitan Bypass along the northwest has provided ample opportunities for

expansion of built-up regions and infrastructural development in or around the northwestern to the southwestern part of the wetland area.

Mouza-wise Planning Possibilities

The Basanti state highway, another arterial road that directly connects Sundarban with the metropolitan city, runs through the wetland area and divides the total wetland area into two. In the northern part, Newtown township development has been accelerating the conversion process in Hatgacha, Thakdari, Kochpukur, and Dharmatala Pachuria mouzas. In Thakdari, Kochpukur, and Dharmatala Pachuria, mouza land is converted mostly from water bodies into built-up areas while in Hatgacha, the present built-up development is mostly at the cost of agricultural land.

In the southern part, the major arterial road connecting the state highway with Sonarpur, one of the major railway junctions that connects the Sundarbans with the main city, runs through Khodahati, Goalpota, Kumarpukuria, Kheyadaha, and Tihuria mouzas of EKW. In these five mouzas, built-up area has mostly replaced agricultural land. Another noticeable conversion is found in the southeastern part of the wetland, where the built-up area has been on the rise. This development is mainly due to the opportunity of access to the main city. An expanding network of connecting roads characterises this region. Most of the conversion here has affected the fragmented water bodies and agricultural land.

A major change in water bodies is noticed in Nayabad, Deara, Kharki, and Dhapa. This region reveals a major reduction of hydrophyte zonation. Hydrophytes are a significant part of the wetland environment and indicate soil moisture level (Tiner, 1991). As part of the wetland ecosystem, hydrophytes have great environmental significance, but they are redundant in the face of anthropogenic activities. In the four mouzas just mentioned, major land cover is seen as a hydrophyte-dominated area class in 2020. In 1972, these mouzas were dominated by water bodies, but with passing time these water bodies were dissipated and fragmented. There is also a trend of gradual shift towards built-up. Again, many regions, like Tardaha, Khapashati, and Beonta have witnessed the excavation of several new ponds as fisheries. However, the probability of conversion from hydrophyte-dominated land into built-up is mostly pronounced in the surrounding regional unit. Haque (2020) has explained the trend of wetland fragmentation in the entire EKW region as a whole.

Conclusion

Kolkata metropolitan city is an environmentally subsidised city. The deltaic location with suitable climatic conditions and the natural waste recycling and sewerage treatment have provided huge opportunities for sustainable

growth. However, urban sprawl, coupled with a clear reluctance towards conservation, have destroyed the ecological status of the wetlands, and the increasing fragmentation reveals that ultimately, we are moving towards devouring the whole ecosystem. EKW is one the most precious ecological entities that treats tonnes of city sewerage and in turn, produces tonnes of vegetation, paddy, and fish almost free of cost and is one of the sources of fresh food and vegetables for metropolitan Kolkata. The traditional knowledge of the local residents and fishermen has an equally great significance in treating the wastewater and producing fish, vegetables, and crops. As better livelihood opportunities for work are found due to urban development, the bond between the local residents and the wetlands is consistently fading away, partially creating opportunities for real estate developers to degrade the ecosystem. However, the age-old wetland continues to provide the valuable ecosystem services in spite of the present situation that has questioned its existence. Instead of acquiring reverence for being an internationally recognised Ramsar site, several urban development projects are continually being sanctioned that categorically aim at relinquishing the future of the wetland ecosystem as a whole. This study has tried only to depict the details of land transformation from 1972 to the present decade. Through the change detection mapping, the pattern of conversion status has been presented while the zonation map is complementary to representing the mouza-wise changes; together, it holds up the picture of crisis and urges the development authorities to care for the natural ecosystem services that provide contingent values never visible to the human eye because of the non-monetised benefits it provides. If the mouzas, which are critical for status of land transformation, can be taken up under special notification and restriction, the journey towards a sustainable city may take off.

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14 Assessment of Ecosystem Services of Urban Water Bodies

Debarpita Banerjee

Aquatic ecosystems are the lifeline of all communities. These ecosystems, comprised of lakes, marshes, rivers, and coastal regions, deliver a wide range of benefits to people (DEFRA, 2007), mainly in the form of various services categorised as provisioning, regulating, cultural, and supporting (Millennium Ecosystem Assessment, 2005). Urbanisation and related conversion of land use, agricultural and industrial pollution, and rising sea surface temperature all have adversely affected the status of urban water bodies. Urbanisation and related environmental degradation are two coinciding phenomena, and unplanned urban localities have shattered the complex historical nature of ecological interactions. The process of urbanisation has never lowered the dependence on nature. Moreover, recent emphasis is placed on providing a green and clean environment, which can only be accomplished with restocking of the earth's natural capital. Urban areas are also dominated by ecosystems where natural processes interact with ecosystem functions for the provision of ecosystem goods and services. Street trees, lawns/urban parks, urban forests, cultivated land, wetlands, lakes/sea, and streams form these urban ecosystems (Bolund and Hunhammar, 1999). India is privileged with a number of large and small lakes, reservoirs, and wetlands of international importance. The tremendous national urban expansion has raised multiple concerns of air quality degradation, transformation of ecosystems into 'urban concrete jungles', vulnerability of indigenous species, climate change, water scarcity, and the increasing effect of urban heat islands (Nagendra et al., 2013). The city of Kolkata is also endowed with drainage channels, large and small ponds, lakes, and wetlands; thus, the city's evolution can be attributed to 'deltaic-estuarine-marshy-aqueous origins', with River Hooghly shaping the western part and East Kolkata Wetlands flanking to the east (Mukherjee, 2020). During the early years of evolution, urban functions were disrupted with the city being located in a swamp, but the higher ground of the natural levee at the same time facilitated the rapid development of trade and commerce, therefore leading to rapid urbanisation (Murphey, 1964). Though unsuitable for settlement in the early years, the city rapidly encountered an exponential rise in population that affected ecosystem functions and processes at local and

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regional levels. The pattern of urban growth is manifested in the encroachment of natural blue and green areas – more importantly, water bodies, both large and small, are extensive parts of the eastern wetlands. In this backdrop, this work has highlighted the ecological services provided by urban water bodies and focuses upon Kolkata, one of the megacities of India.

The concept of ecosystem services dates back to the early 1980s and focussing on nature's function (Gómez-Baggethun et al., 2010). During the last phase of the 20th century, Costanza et al. (1997) attempted a grouping of 17 ecosystem services into 5 major categories (global non-proximal, local proximal, directional flow related, in situ, and user movement related) highlighting the differentiation between ecosystem services and ecosystem functions. De Groot et al. (2002) constructed a classification of ecological functions into 4 major categories (regulation, habitat, production, and information functions), on the basis of which 39 ecosystem goods and services were identified. Another mode of classifying ecosytem services exists in the literature on the basis of 'excludibility and rivalness', where the former signifies the extent to which producers exclude consumers to use a resource, and the latter points out the degree to which benefits depend on other users (**Table 14.1**).

TEEB (2010) has also put forward a classification of ecosystem services, slightly differing from that of the Millennium Ecosystem Assessment (MEA), that categorises them into four groups: provisioning, regulating, habitat, and cultural. Nevertheless, these services are actually accomplished by ecosystem processes and functions that ultimately lead to human well-being. Thus, ecosystem services and human values are treated in conjunction with each other (EPA, 2009).

The basis of ecosystem services lies in the fact that its major recognition is the direct or indirect contribution to mankind. In this context, Boyd and Banzhaf (2007) have formulated the concept of 'final ecosystem services', which are end products of nature and thus form an integral part of natural resource accounting. This concept sounds similar to that of the relationship between natural capital and ecosystem services, where the continuous

Table 14.1 Classification of ecosystem services based on excludibility and rivalness

	Excludable	*Non-excludabale*
Rrival	Market goods and services (most provisioning services) E.g.: timber, vegetables	Open access resource (some provisioning services) E.g.: fresh water
Nnon-rival	Club goods (some recreation services) E.g.: boating	Public Goods and services (most regulatory and cultural services) E.g.: air quality regulation, spiritual and religious value

Source: Adapted from Costanza, 2008

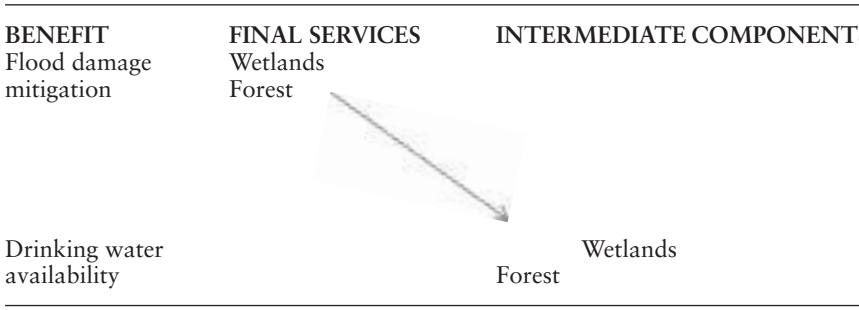

Figure 14.1 Ecosystem services for wetlands
Source: Adapted from Boyd and Banzhaf, 2007

flow of matter, energy, and information rejuvenate the natural stock and facilitate human welfare. Ecosystem processes and functions in the form of biological, chemical, and physical interactions produce ecosystem services, and the main task is the differentiation of intermediate product and the end result.

The benefits provided by the particular services are contingent upon human behaviour. Considering the context of flood control, wetlands are essentially final products, but when provision of drinking water from the wetlands is concerned (Figure 14.1), they are intermediate products, as the value of wetlands is contained in the water quality. Thus, in particular cases, these services are explained in terms of 'benefit in question' (Boyd and Banzhaf, 2007) and they form an integral part of human economy since some of them (provisioning services) are actually traded in the market (Daily, 1997).

Study Area

Presently, Kolkata Municipal Corporation (KMC) is comprised of 4222 water bodies, except canals and port area. Within its jurisdiction, water bodies are classified into three broad categories (Haque, 2013):

I. East Kolkata Wetlands, covering the eastern limit of the territory
II. Major Lakes:
    a. Mudialy Fishermen's Co-operative Society (MFCS) lying to the southwestern part of KMC
    b. Rabindra Sarobar in south Kolkata
    c. Subhash Sarobar towards east Kolkata
III. Ponds scattered all over the territory

The three major lakes of KMC that have a profound regional and local interest and serve as important ecological areas are selected for case study

Mudialy Fishermen Co-operative Society (MFCS; Nature Park)

MFCS is by far one of the most important and largest water bodies of Kolkata. Known as a centre for wastewater fishery, this site involves the treatment of industrial water, purification of the water of the River Ganga, and promotion of pisciculture, horticulture, animal husbandry, and social forestry. Covering a total area of 82.5 hectares, this water body is located in KMC Ward No. 80, which is mainly characterized by industrial units. The site has a long story of evolution. The elderly members of the society stated that this area was totally left over as marshy wasteland during 1950s. Taking this area on a lease from Calcutta Port Trust (CPT), the poor fishermen of Mudialy Jelepara (the locality where a group of fishermen lived; 'Jele' means 'fishermen' in Bengali) came forward to form a co-operative based on fishing activities by clearing away the weeds and reducing the intensity of anti-social activities, which were very frequent in that area. Till now, the legal right to the wetland remains vested in the hands of CPT, and a huge amount of money is given per year to CPT. The Nature Park came into being in 2005, which has been a great venture on the part of the fishermen to develop a park to attract tourists from the southwestern part of Kolkata. Though the development of the park has not been possible at a large scale due to lack of funds, initiatives are continuously being undertaken to improve the ecosystem and its functions.

MFCS supports biodiversity with around 127 species of plants and trees, 141 recorded types of birds (some migratory birds were also noticed during the past years), 30 species of fish; some of these are included in IUCN Red List of Threatened Species (**Table 14.2**). The planting of trees is being done to serve a four-fold purpose: serving food to fish, absorption of dust from adjoining industrial areas, horticultural purpose, and bird attraction (Banerjee and Bandyopadhyay, 2020). Bird-watching is a widely accepted tourist activity, and it has the possibility of generating a huge amount of income (Lee et al., 2009).

The park has a provision of a Mini Zoo, providing separate areas for spotted deer; however, the enclosure for deer is vacant as the deer have recently been taken away elsewhere by some authorities. Against this backdrop, tourist attraction at this site has declined rapidly as reported by some of the officials. A separate enclosure for deer was only available at Nature Park apart from the Zoological Garden, Alipore, and their absence has adversely affected the interest of tourists. Rabbits, peacocks, and tortoises are the other fauna that adorn the park.

Rabindra Sarobar

The site stretching over 73 hectares in south Kolkata and covering parts of Ward Nos. 87 and 90 is a valuable environmental entity that has been

Table 14.2 Status of faunal species found in MFCS

Category	*Trend*	*Fish*	*Birds*
Least Concern	Decreasing	Tangra	Pheasant-tailed Jacana, Little Grebe, Intermediate Egret, Rufous Woodpecker, Tree Pipit, Plum-headed Parakeet, Black-capped Kingfisher, Stork-billed Kingfisher
	Increasing		Great Cormorant, Cattle Egret, Grey Heron, Common Chiffchaff, Greenish warbler, Red-vented Bulbul, House Swift, Spotted Dove, Black-crowned Sparrow Lark
	Stable	Mourola, Singi, Magur, Folui,	Common Hawk Cuckoo, Plaintive Cuckoo, Greater Coucal, Asian palm Swift, Black-rumped Flameback, Blue-throated Barbet, White Wagtail, Scaly-breasted Munia, Black headed Munia, Whiskered Tern, Richard's Pipit, Cotton Pygmy-goose, Fulvous-breasted Woodpecker, Pale-billed Flowerpecker, Purple Sunbird, Purple-rumped Sunbird, Jungle Babbler, Indian Robin, Dark–sided Flycatcher, Black-headed Cuckoo shrike
	Unknown	Rohu, Calbasu, Minor Carp, Bele,	Pintail Snipe, Common Sandpiper, Wood Sandpiper, Green Sandpiper, Bronze-winged Jacana
Vulnerable	Unknown	Common carp	
Near threatened	Decreasing		Pied Cuckoo
Critically Endangered	Decreasing		White Rumped Vulture

Source: Categories of species are based on IUCN Red List of Threatened Species, 2017–3 compiled by the Author

included in National Lake Conservation Plan (NLCP). It was dug strictly for the purpose of acquisition of materials for the construction of roads; later on, the excavated part was razed and extensive planting of trees was undertaken by the Calcutta Horticultural Society; the result of which we now see is 'Rabindra Sarobar'; *sarobar*: meaning lake in Bengali (West Bengal Pollution Control Board, 2017). It is a very well-maintained recreation spot managed by Kolkata Improvement Trust (KIT) and Kolkata Municipal Development Authority (KMDA). West Bengal Pollution Control Board (WBPCB) has taken up frequent initiatives for cleaning the lake and maintaining the water quality. The lake, along with its adjoining park area, has

provisions for a children's park, auditorium, informal playgrounds, joggers' pathways, and the major attraction remains the four artificial islands at the centre of the lake and the hanging bridge connecting a mosque to the main part.

The artificial islands provide the main habitat for important species of birds, many of which are migratory in nature (West Bengal Pollution Control Board, 2017). WBPCB has provided a detailed account of the floral and faunal diversity, which includes 88 algal or phytoplanktons, 29 species of macrophytes, 162 species of trees, 204 species of herbs, shrubs climbers and lianas, 34 species of macrofungi, 51 species of zooplanktons, 34 species of insects, 29 species of ants, 57 species of butterflies, 13 species of dragonfly, 20 freshwater species of molluscs, 40 freshwater fish species, 5 species of amphibians, 11 reptilian species, 107 species of birds, and 10 mammalian species, some of which are categorised as per IUCN Red List of Threatened Species (Table 14.3).

Subhash Sarobar

Subhash Sarobar is another artificial lake located in the northeastern corner of KMC in Ward No. 33, covering a water area of 39.5 acres. Like Rabindra Sarobar, it was also dug as a part of constructional activities. As the 'lung' of East Kolkata, this vast water body has acted as a natural sink for the pollutants accumulating from the surroundings (IWMED, 01.08.1998–31.01.2000). Originally known as 'Beleghata Lake', it underwent expansion during the 1970s, along with the reclamation of Salt Lake. The lake serves as a major recreation spot, and the artificial islands created after accumulation of materials at the centre remain the major habitat for various types of birds used mainly for roosting and feeding (Ghosh, 2010). Apart from providing recreation, local people previously used it for bathing and washing of clothes, both of which have been restricted over the past few years.

The lake supports a wide variety of biodiversity in the form of 22 species of phytoplankton (diatoms being predominant, followed by green algae, blue-green algae, and phytoflagellates), 48 species of zooplanktons (Khan and Sinha, 2002), 218 native and exotic species of flowering plants, 29 species of butterflies, 46 types of birds (Ghosh, 2010), 18 different species of macrophytes thriving in open water or water edge or banks, 20 molluscan species, 2 amphibian species, 10 species of reptiles, 12 species of mammals, and 13 freshwater fish species (IWMED, 01.08.1998–31.01.2000). The importance of the species found in this site has been categorized on the basis of IUCN Red List of Threatened Species (Table 14.4).

The floral diversity of these three areas is very rich, with species richness reaching its maximum at Rabindra Sarobar, followed by Subhash Sarobar (**Table 14.5**). The wide variety of flowering plants and trees mainly falls under the category of 'least concern' as per the IUCN list. Rabindra Sarobar provides a habitat for a near-threatened exotic species, while Subhash

Table 14.3 Status of faunal species found in Rabindra Sarobar

Category	*Trend*	*Mammals*	*Dragonflies & Damselflies*	*Molluscs*	*Fish*	*Birds*	*Amphibians*	*Reptiles*
Least Concern	Decreasing	Common Palm Civet, Bengal Hanuman Langur, Indian Flying Fox			Zebrafish, Striped Dwarf Catfish,	Jungle Myna, Thick-billed Warbler, Purple Heron, Common Pigeon, Brown-breasted Flycatcher		
	Increasing	Lesser Bandicoot Rat, Short-nosed Fruit Bat				Common Myna, Blyth's Reed Warbler, House Swift, Cattle Egret, Eurasian Collared Dove	Common Indian Toad	
	Stable	Indian Grey Mongoos, Brown Rat, House Shrew, Small Indian Civet	Wandering Glider	Geri Googly	Mola Carplet/ Mourola, Climbing Perch, Giant Snakehead, Spotted Snakehead, Stinging Catfish, Flying Barb, Feather Back, Indian Glassy Fish	Shikra, Olive-backed Pipit, Spotted Owlet, Plaintive Cuckoo, Large-tailed Nightjar, Greater Coucal, Whiskered Tern, Purple Sunbird, Oriental Magpie Robin, Large Cuckooshrike, Blue-throated Blue Flycatcher, Verditer Flycatcher, Taiga Flycatcher, Ultramarine Flycatcher, Dark-sided Flycatcher, Asian Brown Flycatcher	Skittering Frog, Cricket Frog, Indian Bull Frog, Common Indian Tree Frog	

(*Continued*)

Table 14.3 (Continued)

Category	*Trend*	*Mammals*	*Dragonflies & Damselflies*	*Molluscs*	*Fish*	*Birds*	*Amphibians*	*Reptiles*
	Unknown	Five-striped Palm Squirrel Indian Pipistrelle Small Indian Mongoose		Jhinuk	Blue Panchax, Catla, African Catfish, Bengal Danio, Bareye Goby, Minor Carp, Orange-fin Labeo, Mud Eel, Ticto Barb, Rohu	Common Kingfisher, White-breasted Waterhen, Asian Openbill, Bronzed Drongo, Hair-crested Drongo, Black Drongo, Lesser Racket-tailed Drongo, White-throated Kingfisher, Indian Pond Heron		Common Grass Skink, Indian Roofed Turtle
Vulnerable	Decreasing				Mozambique Tilapia, Boal			
	Unknown				Wild Common Carp			
Near threatened	Decreasing				Silver Carp	Darter, Painted Stork, Alexandrine Parakeet		
Critically Endangered	Decreasing					White-rumped Vulture		

Source: Categories of species are based on IUCN Red List of Threatened Species, 2017–3, compiled by the Author on the basis of Ghosh (2010) and West Bengal Pollution Control Board, 2017

Table 14.4 Status of faunal species found in Subhash Sarobar

Category	*Trend*	*Fish*	*Birds*	*Amphibians*
Least Concern	Decreasing		Intermediate Egret, Stork-billed Kingfisher, Common Hoopoe, Brown Shrike, House Sparrow, Black-naped Oriole	
	Increasing		Great Cormorant, Little Egret Cattle Egret, Spotted Dove, Eurasian Collared-Dove, Rose-ringed Parakeet, White-breasted Kingfisher, Coppersmith Barbet, Red-vented Bulbul, Asian Pied Starling, Common Myna, Black-headed Oriole	Kunobang
	Stable	Mrigal, Singi, Magur	Asian Palm-Swift, Black Kite, Shikra, Common Moorhen, Blue-throated Barbet, Oriental Magpie Robin, Common Tailorbird, Red-throated Flycatcher, House Crow	
	Unknown	Rohu, Calbasu, Bele	Little Cormorant, Common Kingfisher Indian Pond Heron, White-breasted Waterhen, Black Drongo, Ashy Drongo	
	Unspecified	Shrimp		
Near threatened	Decreasing	Pangus		

Source: Categories of species is based on IUCN Red List of Threatened Species, 2017–3, compiled by the Author on the basis of Ghosh (2010), IWMED (01.08.1998–31.01.2000) and West Bengal Pollution Control Board, 2017

Table 14.5 Floral Diversity of the three major lakes of KMC

Case Study	*Category*	*Trend*	*Plants & Trees*
Mudialy Fishermen's Cooperative Society	**Least Concern**	Increasing	Sessile Joyweed,
		Stable	Water Lettuce, Tavola, Day Flower, Madras carpet, Common Duckweed, Caesarweed, Ear Leaf Acacia, Manila Tamarind, Sand Paper Tree, Indian Beech Tree, Water Pepper
		Unknown	Kapok, Flame Tree, Dense flower Knotweed, Gamar
Rabindra Sarobar	**Least Concern**	Increasing	Sessile Joyweed,
		Stable	Water Lettuce, False Daisy, Chinese Wedelia, Mexican Calabash, Pink Poui, Rosewood, Indian beech, Portia tree, Rain Tree, Red sandalwood, Turkey Tangle Frogfruit
		Unknown	Indian Putat, Colville's Glory, North Indian rosewood, Mexican lilac, Cannon Ball Tree, Siris tree, Bengal kino, Kanak Champa, Adrarezina.
		Unspecified	White Cheesewood.
	Near Threatened	Decreasing	Indian Kino Tree, Cuban mahogany
Subhash Sarobar	**Least Concern**	Decreasing	Phesantwood
		Increasing	Sessile Joyweed, Hydrill, Indian Goosegrass
		Stable	Ear Leaf Acacia, Red Sandalwood, Kachnar, Roktosimul, Turkey Tangle Frogfruit, Guest Tree, Common Duckweed, Majestic Heaven Lotus, Tapegrass, Water Hyssop, Spanish Cherry, Balloon Vine, Gin Berry, Firebush, Indian Coral Tree, Poinsettia, Elephant Apple, Indian Jujube, Wild Sugarcane, Day Flower, Indian Almond, Indian Laburnum, Purple Orchid Tree, Tamarind, Peacock Flower, Scarlet Flame Bean, Hairy Fig, Water Lettuce, Cook's Pine, False Daisy, African Tulip Tree, Yellow Trumpetbush, Manila Tamarind, Annatto, Black Mustard, Common Prickly Pear, Sugar Apple, Sea Mango, Frangipani, Sleeping Hibiscus, Portia Tree, Caesarweed, Rain Tree, Weeping Fig
		Unknown	East Indian Walnut, Indian Oak, Charcoal Tree, Mexican Lilac, North Indian Rosewood, Bastard Teak, Water Morning Glory, Flame Tree, Colville's Glory, Guava, Kapok, Oleander
		Unspecified	Blackboard Tree, Cannonball Tree, White Cheesewood
		Decreasing	Jacaranda
	Vulnerable	Unknown	Sunberry
		Unspecified	Sita Ashok, Big Leaf Mahogany
	Near Threatened	Decreasing	Bael Tree, Indian Kino Tree, Cuban Mahogany

Source: Categories of species is based on IUCN Red List of Threatened Species, 2017–3 compiled by the Author on the basis of Ghosh (2010), IWMED (01.08.1998–31.01.2000) and West Bengal Pollution Control Board, 2017

Sarobar is ecologically more significant as the home of various exotic trees categorised as 'near threatened' and 'vulnerable' of decreasing trend.

Methodology

Introduction to the RAWES approach

The RAWES approach was undertaken under Ramsar Convention XII.17 to assess the benefits accrued from wetlands (Ramsar Convention, 2018), focussing on the resources and data constraints pertaining to wetland utilisation, as well as the major concerns about the level of benefits and types of beneficiaries (McInnes and Everard, 2017). Earlier, there were as many as 40 rapid assessment methods used to monitor the wetland and its condition (Fennessy et al., 2007). However, a comprehensive tool was always a prerequisite. The RAWES approach, although primarily designed to cover wetland areas, is also applicable to other ecosystem types (Ramsar Convention, 2018). This approach is a user-friendly, cost-effective, and quick method that requires the involvement of no more than two people at the survey site to complete the total assessment (data collection and assessment of data analysis) in one full day (Everard et al., 2019). This procedure provides effective integration of the service function with the local population who live in close proximity to the environmental entity and field observations (Mandal et al., 2020).

This chapter has followed the guidelines of the RAWES approach and questionnaire as provided in the RRC-EA, 2020. All ecosystem services within the four broad ecosystem service categories (provisioning, regulating, cultural, and supporting) are assessed on a 5-point semi-quantitative scale (**Table 14.6**) ranging from 'significantly positive' to 'significantly negative' to determine Ecosystem Service Index (ESI). This index provides a comprehensive numerical value for 'observed ecosystem service production against potential maximum service production' (RRC-EA, 2020). ESI value has a range between +1 to -1 and can be calculated separately for each subcategory within the broad one or as a whole for all the service categories using the following equation (i).

$$\mathrm{ESI} = \frac{\sum(n_{+1.0} + n_{+0.5}) + \sum\left(n_{-1.0} + n_{-0.5}\right)}{\sum n_{TOTAL}} \qquad \text{(i)}$$

In this case, the ESI value is derived to be +1; it indicates highest service provision, and the lowest service provision in case ESI comes out to be -1.

Levels of benefits

While the semi-qualitative scores assess the respective contribution from a service category, the level of significance lies in the number of beneficiaries.

Table 14.6 Conversion of qualitative scale to numerical scale

Importance score	++	+	*0*	-	--	*?*
Semi-quantitative contribution	Significant positive contribution	Positive contribution	Negligible contribution	Negative contribution	Significant Negative contribution	Gaps in evidence
Numerical Value	1.0	0.5	0.0	-0.5	-1.0	Remove from analysis

Source: Adapted from RRC-EA, 2020

The RAWES approach has stated that significant positive contribution (++) can be attributed to regions where population is low and number of beneficiaries is 100; whereas, considering a densely populated region, the same score (++) can be applied to as many as 10000 people. (RRC-EA, 2020).

The assessment here actually covers the benefits that are received at the local, regional, national, or global level (Everard et al., 2019); however, this is subject to modifications and alterations locally based on the perception of the direct and indirect stakeholders (Mandal et al., 2020). The benefit in question is whose welfare is going to be accomplished by a particular service? For instance, provision of fresh water by a lake can support the local population in terms of fish production; it may also support a wide range of biodiversity, facilitating recreation that can attract national as well as international tourists. The three large lakes within KMC jurisdiction have attracted local and international tourists in this respect. Considering the case study of MFCS, it has developed an effective strategy to treat waste industrial water, thereby extending the benefits to all city population indirectly. Thus, the scale of benefits can be assessed on a three-point scale covering local, regional, and global benefits, or a five-point scale covering local, city, regional, national, and global context, depending on the type of beneficiaries (McInnes and Everard, 2017).

Data collection

Primary data was collected through field assessment techniques using the questionnaire format provided in Resolution XIII.17 of Ramsar Convention, 2018. For information regarding the ecosystem services, direct stakeholders employed in Rabindra Sarobar and Subhas Sarobar and the fishermen in MFCS were interviewed. The data collected was thereafter transformed to numerical score as stated in Table 14.6. A four-point scale was adopted to assess the level of benefits:

- Local benefits received by individuals or households in close proximity to the water bodies

- City benefits delivered to the individuals or households residing within KMC jurisdiction
- Regional benefits covering individuals or households within a broader jurisdiction – for example, the state of West Bengal
- Global benefits extending beyond the national boundaries

Results and Discussion

Record of the ecosystem services

Out of the 36 total ecosystem services used for the analysis, 24 services were documented in these three sites, accounting for 66.67% of the total concerned; only 2 services (5.55%) were registered in two of the three sites, while another set of 5 services (13.89%) were recorded at only one site. Around 5 ecosystem services, which were assessed on the neutral scale, were not registered in any of the sites. In other words, services with significant positive contribution were more numerous in all the sites.

Considering the four categories of these services, MFCS has encountered the maximum frequency (n=21) with significant positive contribution to the environment and human society, followed by Rabindra Sarobar (Figure 14.2). The lowest significant positive contribution was documented in Subhash Sarobar (n=14), while this site also outnumbers the other two in highest positive contribution (n=12). In the cases of MFCS and Rabindra Sarobar, the number of services with positive contribution are the same

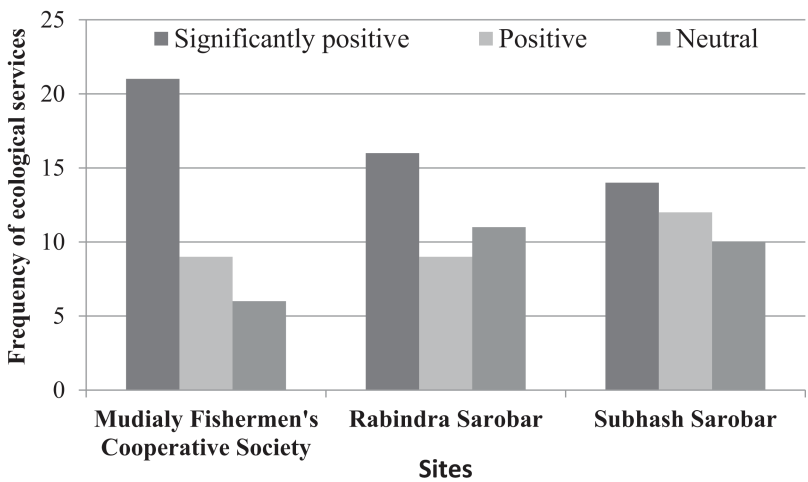

Figure 14.2 Relative significance of ecosystem service function in field assessment sites

Source: Prepared by author

(n= 9). Some ecosystem services were identified as having neutral impact, which constituted nearly 13.89% and constitutes maximum frequency in Rabindra Sarobar (n= 11), followed by Subhash Sarobar (n=10), while in this category the lowest frequency is observed in MFCS (n=6).

If the four categories are separately taken into consideration, provisioning services have not recorded highest frequency of significantly positive or positive contributions in any of the sub-categories (Figure 14.3). Provision of fibre, fuel, natural medicines and pharmaceuticals, ornamental resources, though available in all these sites, are not utilised at a local level except for MFCS. Under the main category of provisioning services, only provision of fresh water registered the highest frequency, being recorded in all the sites. In the particular regulatory service category, a considerable proportion (73.33%) has been found to have either significantly positive or positive contributions on the environment, and beneficiaries are somewhat aware of the perception of these services. In this category, important services having the highest frequency with significantly positive contribution are provided by regulation of air quality, global climate, pollination, and noise and visual buffering. Regulation of local climate, water, and fire has been attributed to the positive contribution category in all the field assessment sites. In case of cultural services, every site has provided these intangible benefits and had either significantly positive or positive contributions. Services accounting for significantly positive contribution with the highest frequency were recreation and tourism, aesthetic value, maintenance of social relations, and encouraging education and research, while the positive contribution with maximum frequency (n=2) is noticeable in the case of prevalence of spiritual, religious, and inspirational values. All the supporting services have been documented in all the sites, where maximum individual highest frequency occurs in case of soil formation that has registered significant positive contribution in all the sites.

The breakdown of separate ESI scores for each of the service categories reflects the highest score for MFCS in provisioning (ESI= 0.667) and regulatory services (ESI= 0.633). The ESI score for provisioning services, except for MFCS, is quite low in comparison to the others (Figure 14.4). Being run as a co-operative, its members are entitled to utilise the direct benefits as well, and these are also marketed. Thus, the individual ESI score for provisioning services in this site is the highest. While Rabindra Sarobar has the highest ESI score for cultural services (ESI= 1.0) with all the sub-categories (n=6) having significantly positive contribution, the score for the same is lowest (ESI= 0.786) in Subhash Sarobar. The score for the supporting services in all the site is, however, the same (ESI= 0.8). Individually, the scenario reflects higher scores for cultural and supporting services.

The overall ESI score for all the sites reflects the highest score for MFCS, followed by Rabindra Sarobar and Subhash Sarobar, indicating that MFCS has provided the greatest benefits to the locals as evident from their

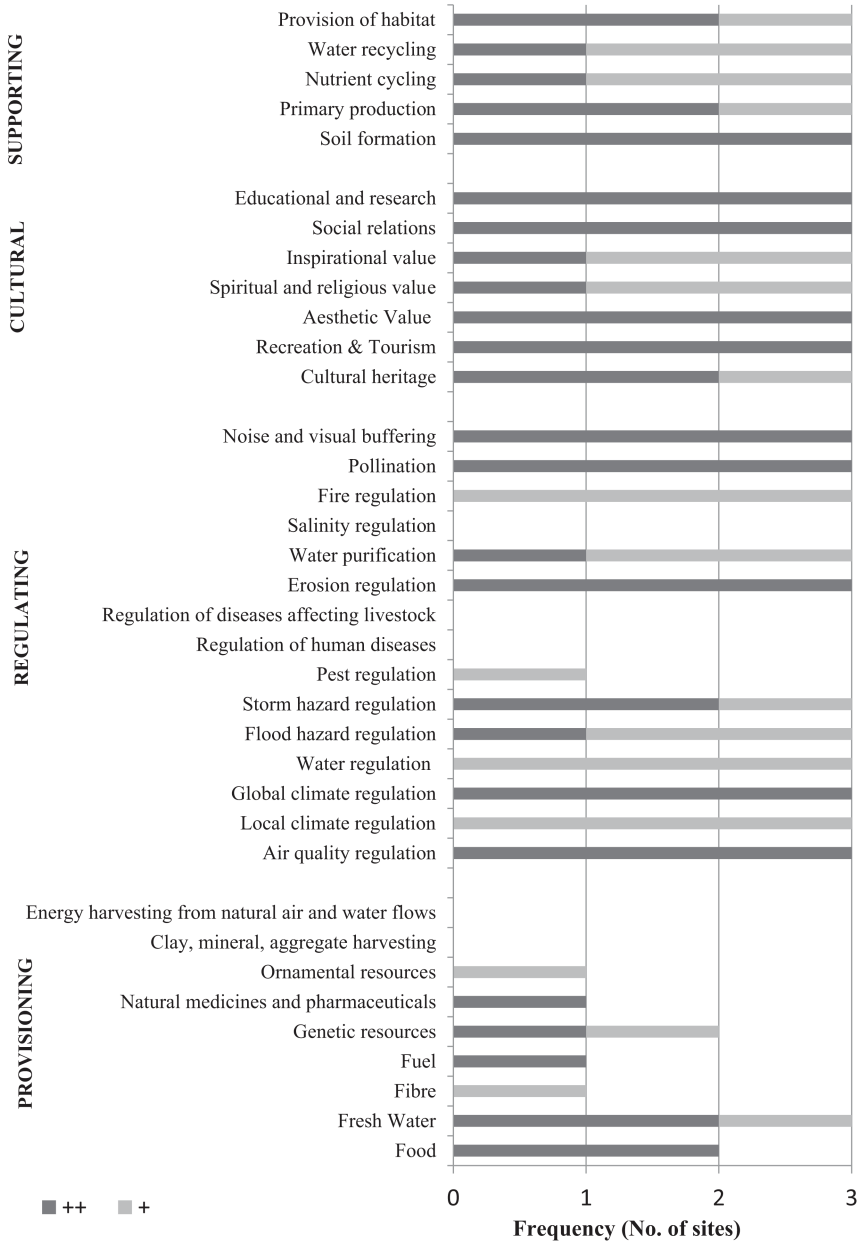

Figure 14.3 Frequency of prevalence of ecosystem services in all field assessment sites

Source: Prepared by author

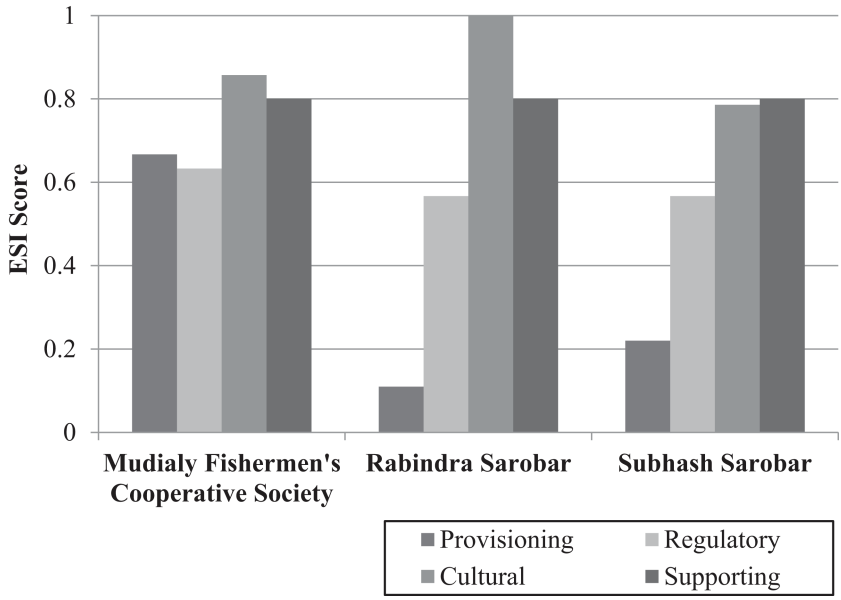

Figure 14.4 ESI Scores for each ecosystem service category in all assessment sites
Source: Prepared by author

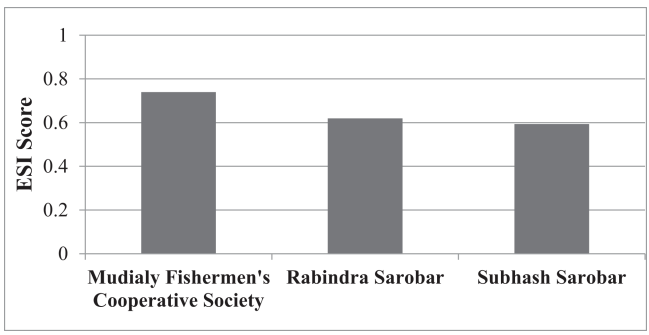

Figure 14.5 Overall ESI score for all field assessment sites
Source: Prepared by author

perception of ecosystem services (Figure 14.5). However, indirect services are provided at the same level by all these sites.

Differences in service production in the assessed sites

A coefficient of variation from the mean score of each sub-category was calculated and presented in Figure 14.6. The results show very low variability

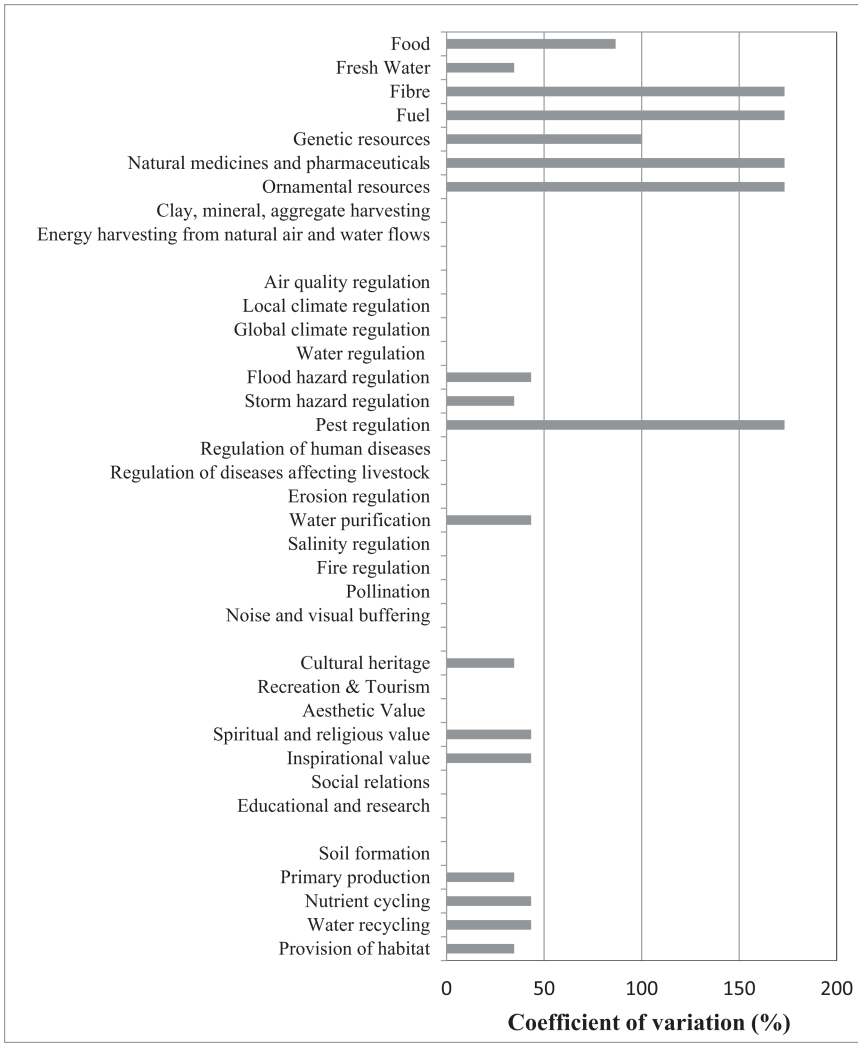

Figure 14.6 Variability of each service category in all field assessment sites
Source: Prepared by author

in cultural, supporting, and regulating function. However, provisioning services have scored very highly and are indicative of high variability across all the sites. Further detailed analysis has pointed out the prevalence of highest variability in the score in case of provision of fibre, fuel, natural medicines and pharmaceuticals, ornamental resources within the provisioning category, and pest regulation in regulatory services. Zero variability is also not uncommon, and it occurs in 50% of the services where, in each site,

the individual breakdown of each category has registered the same level of qualitative contribution. The case of lowest variability is, however, more pronounced in regulatory services. The lower the mean score, the higher the variability; in other words, where a particular service is recorded only at one site, the mean score for that has been lower, hence the prevalence of the inverse relationship.

Spatial differences of benefits accrued from the sites

The spatial distribution of benefits accrued by individuals or households from the three sites was analysed using ESI (Figure 14.7).

Variations in scales of benefits are evident from the following diagrammatic representation (Figure 14.8). In all three cases, local service provision was more dominant, followed by benefits received at city level. However, MFCS has registered the maximum local service provision function (ESI= 0.739), followed by Rabindra Sarobar (ESI= 0.619), and Subhash Sarobar (ESI=0.593). At all levels, MFCS has registered maximum service provision function except for the regional level, where Rabindra Sarobar (ESI=0.389) has produced the slightly highest benefits. Global benefits, however, are low for all sites, with the lowest at Subhash Sarobar (ESI= 0.218). Nevertheless, relatively higher global benefits are noticeable in the case of regulating and cultural services.

If the service provision categories are broken down, it is found that regulating and cultural service provision is the maximum at local and city level

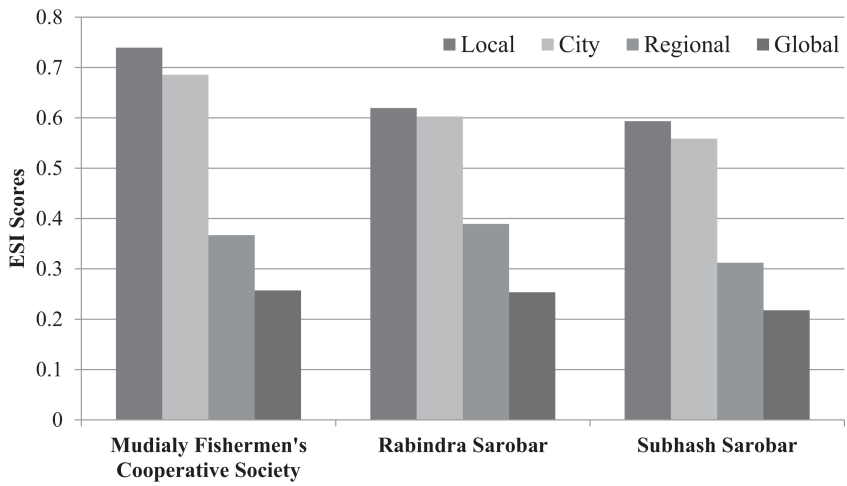

Figure 14.7 Relative importance of spatial benefits accrued from field assessment sites

Source: Prepared by author

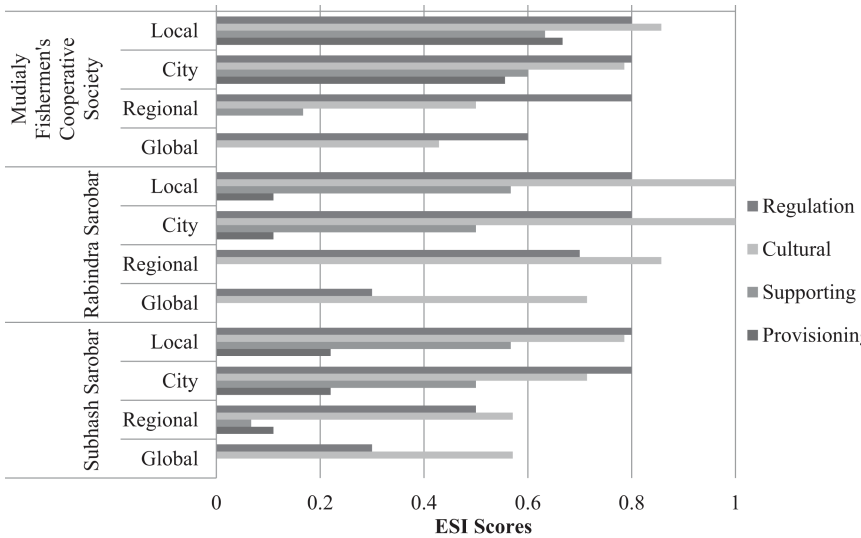

Figure 14.8 ESI Scores for all ecosystem services at various spatial levels
Source: Prepared by author

in all sites, while provisioning service production function has provided least benefit at all levels in Rabindra Sarobar, which is highest for MFCS at the same time.

Conclusion

This study on ecosystem services has provided valuable input to the existing literature on this topic. Ecosystem service function has gained importance in the city with respect to East Kolkata Wetlands. However, this application of the RAWES approach in KMC is the first one that has tried to link ecosystem service function with the areal coverage and scale of benefits concerning one wetland and two important lakes that serve as recreation centres. While residents and the local population view these places mainly for recreation purposes, the areas have effectively benefitted us in all other ways of providing direct benefits of regulating air, water, and climate, buffering noise, supporting biodiversity, nutrient cycling and treating water, and maintaining social relations. A total of 24 service functions were identified from all the sites with a dominance of regulating, supporting, and cultural services. The provisioning service function was lower in Rabindra Sarobar and Subhash Sarobar than in MFCS due to local dependence of the co-operative members on food, fish, sale of fruits and vegetables, and other products. Overall ecosystem service provision function is also noticeable in MFCS. The

services have varied highly depending on scales of benefits, with local and city population benefitting mostly from all categories and global benefits being accrued mostly in cultural services. All the service categories are likely to be affected with deterioration of the water quality of the three areas; the least affected is cultural services. Considering the wide array of benefits, these areas acting as major carbon sinks of the crowded city need to be managed properly, which requires investment from the management authorities and local population. This can be done by the adoption of environmental valuation techniques undertaken by Banerjee and Bandyopadhyay (2018, 2020). The RAWES approach is important in this respect, as it widens the perception of ecosystem service functions; following this, it can be applied to other small and large areas taking into consideration the major ecological principles.

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Part III

Critical Planning Issues of the City

15 Socio-Demographic Peculiarities of COVID-19 Patients

Experiences of a Level-3 Dedicated COVID Hospital of Kolkata

Rohit Bannerji and Parama Raychaudhuri Bannerji

As the world is confronted with the spread of the COVID-19 pandemic, much of the research has been focused on identifying the most vulnerable risk groups. Literature revealed that there had been spatial differences in nature, incidence, and outcome of the infection, both at global and local scales. According to current theories based on information released by public health officials, a list of factors have emerged as drivers of increasing risk of mortality in COVID-19 cases. Some of them are age of the affected and underlying medical conditions like cardiovascular (heart) disease, respiratory condition, diabetes, and hypertension. Published data revealed that there had been a major difference in country-wise spread, probably related to the demography profile of the population or age cluster pyramids. Age, a demographic factor, thus emerged as one of the probable factors in addition to other clinical factors affecting patient outcomes. The World Health Organization (WHO), 2020 also pointed out that the ageing population of European and North American countries are more exposed to the vulnerability to COVID-19-related deaths in general. This chapter looks into some of the demographic factors affecting clinical outcomes of COVID-19 patients, and also aims to identify if there are other socio-demographic determinants affecting the incidence or outcome.

It may be also pointed out that there were limited studies conducted in India around the time that this chapter was compiled on the impact of COVID-19, taking into account India's' unique socioeconomic-demographic profile, particularly of the urban areas which are the major epicentres of this pandemic.

Thus, to study the possible effects of socio-demographic profiles on novel coronavirus infections, this research has adopted a socio-scientific approach using the case study method. The study analyses demographic and other related variables like sex, age, presence of comorbidities, clinical findings on admission, average span of hospital stay, or deaths, if any. The samples for the study are COVID-19 infected patients admitted for treatment in a medical facility who were discharged or died. The location of the study is a Level 3 dedicated COVID-19 treatment centre located in Kolkata.

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Background of the Study

Looking into the annals of history, recurring pandemics and epidemics have rocked the world and Indian subcontinent. In 1781, a troop of English soldiers returning from a coastal village in Ganjam entered the city of Calcutta, then a bustling port and army barracks, allegedly carrying the germs of a malady that had ravaged the Indian subcontinent and South Asia through the 18th, 19th, and early 20th centuries, known as cholera (Harrison, 2020). Not only cholera, but recurring waves of epidemics of Kala-azar, plague, smallpox, and the flu swept the Indian subcontinent. Notably, even then, the epicentres of these epidemics were mostly ports and commercial cities that were bustling with foreign traders and soldiers intermingling with the natives in overpopulated environments, like the cities of Calcutta and Bombay (Harrison, 2020). The 19th and early 20th century India witnessed multiple occurrences of cholera epidemics, followed by plague, flu, and smallpox. Globally, 'the Great Bubonic Plague of Marseille' in France in 1720, 'Cholera pandemics' of the 1800s, and the 'Spanish flu' of 1918 (influenza caused by a H1N1 virus) claimed millions of lives. Similarly, the epidemics of the 1800s in India (and also thereafter) resulted in a heavy death toll, mostly of the economically poor Indians (Harrison, 2020). Nonetheless, these epidemics were not only a concern for public health, but also led to social unrest and confusion, calling for a prompt development of public health facilities and sanitation works[1] (Arnold, 1986). According to Arnold (1986), the cumulative effect of cholera epidemics in India was shaped primarily by three factors: a) the peculiarities of a particular disease and its differential or general effect on the populace; b) the strong correlation between the cultural identity of a society and its own ways of coping with maladies; and c) the political, economic, and social milieu of the nation-state[2] suffering an epidemic; these are the affecting factors that logically hold true for most of the communicable diseases. Seminal work by Jared Diamond also hints at the relative and differential effects of viruses on people of different race and nationality (Diamond, 2000). Learning from the past experiences, it can be said that myriad factors play significant roles in spread, arrest, and treatment of these pandemic and epidemic diseases, including social and demographic variables peculiar to a society.

COVID-19 appeared as an infectious disease that led to a global health emergency. Though the disease started as one single case followed by a cluster of cases in Wuhan, China in December 2019, within a few months a swift upsurge of cases was observed globally. Compared to the early pandemics, COVID-19 has been marked by the highest speed of spread. According to Akhter et al. (2020), it created tension across the global public health care facilities, causing high risks of mortality among certain age groups, high morbidity, and burdening health care services. Focusing on the scientific trail of the disease's symptomatic appearance, initially the disease's presentation was more of respiratory tract infection associated with fever, dry cough, and respiratory distress, and 80% of the cases presented with

mild symptoms. However, some presented with moderate symptoms (20%), became seriously ill, developed difficulty breathing, and required hospital care (Soni et al., 2020).

In view of the vast amount of literature on the COVID-19 pandemic, it is important that one focuses on certain contexts that are relevant to the study, including the following.

Theorising the spread of pandemic COVID-19 as a spatial process

If one focusses on the geography of a communicable disease that is transmitted due to human-human interaction, there are multiple socio-spatial factors which control it, like the level of social interactions or the general health immunity of the population. Additionally, the societal or institutional response to the disease is also an important factor. According to Jessop et al. (2008), territories (T), places (P), scales (S), and networks (N) must be viewed as mutually constitutive dimensions of socio-spatial relations. Kuebert and Stabler (2020) uses this context in their study on the spatiality of COVID-19, and pointed out that there are three socio-spatial processes that played relevant roles in the diffusion of COVID-19. They were tourist returnees, superspreading festivities and events, and outbreaks in closed environments, like health care or other facilities.

Contextualizing the COVID-19 spread

Looking at the specific geographical dynamics, Akhter et al. (2020) pointed out how Wuhan in China was the first epicentre of this pandemic before it started spreading to other Asian and south Asian countries, the Middle East (Iran was the epicentre), Europe (Italy was the epicentre), and western Europe (Spain was the epicentre), and then to the USA (New York was the epicentre). However, the spread, number of cases, and case fatality rate (CFR) had varied in different countries and regions of the world, which had led to high levels of concern in the global communities. Biological and epidemiological factors, coupled with socioeconomic parameters, have a considerable bearing on the extent of the coronavirus disease spread in the population.

Reviewing the published literature, one may seek to explore if there is a related spatial characteristic of this pandemic, or if there is a difference in nature incidence and occurrence of COVID-19 between high- and low-income countries or at a lower scale between urban and rural areas.

Spatial differences in incidence, nature, and outcomes of COVID-19 pandemic

COVID-19 and Rural–Urban differentials

Malatzky et al. (2020) pointed out that cities are complex structures representing heterogeneity, where culture gets modified within certain

enclaves, while rural areas are much simpler and show considerable lesser inputs. Through the COVID-19 pandemic, the urban places started to represent workspace, while rural places represented a play space that could provide ample headroom and the experience of connection with nature, which have both become highly sought-after.

A report by the United Nations (July 2019) pointed out that out of an estimated 90 percent of all reported COVID-19 cases, urban areas had become the epicentres of the pandemic primarily due to their high population and larger global and local interconnectivity. The same report also pointed out that high levels of social, spatial, and economic inequality had a disproportionate impact on groups that were already vulnerable: the poor, the women, and the elderly population.

According to Mishra et al. (2020), the cities of the global south had been more affected by the pandemic. COVID-19 'poses particular risks for the one billion people living in informal urban settlements in the global South', which increased mainly due to the overcrowding of population. However, the same article pointed that the cities of the Global North had greater resilience in this regard.

Country-wise differences in incidence, nature, and outcomes of COVID-19 pandemic

The published data of 2020 (Worldometer, 2020) revealed that there had been major differences in country-wise spread, probably related to the demography profile of the population or age cluster pyramids. While the incidence of COVID-19 cases among the age group of 65 years and above were compared, a spatial variation was revealed. For better understanding, the population's median age (the age that divides the population into two parts of equal size) of those countries was also taken into account. In Bangladesh, of all the COVID-19 cases, 5.1% of the cases were in the age group of 65 years and above (median age is 27.6 years, Worldometer, 2020); in India, 6.1% of the total cases were among the age group of 65 years and above (the median age is 28.4 years, according to Worldometer, 2020); while in China, the corresponding figure was 10.9% (median age is 38.4 years). However, going beyond Asia, in Europe and in the UK, of all the cases, 18.3% of them belonged to the age group of 65 years and above (median age is 40.5 years, as per Worldometer, 2020) while in the USA, the corresponding figure was 15.8%. Thus, countries with a higher ageing population had a higher share of COVID-19 cases in its elderly population group.

According to Chakraborty et al. (2020), after the deadly impacts of COVID-19 in China in January 2020, it rapidly spread to South Korea, Iran, and Italy in late February and early March 2020. The USA topped the list, followed by Spain, in the number of active COVID-19 infected patients. The first case of coronavirus in India was reported on 30th January 2020 in the Thrissur district of Kerala.

Thus, one can conclude, looking at the spatial differences in the incidence and outcome of COVID infections, the societal settings and its socio-demographic contexts seemed to play a relevant role in the context of COVID-19.

Socio-demographic determinants of COVID-19 infection

According to Stojkoski et al. (2020), a multitude of socioeconomic criteria had been attributed as potential determinants for pandemic vulnerability. They identified a total of 31 determinants, which included health care infrastructure, economic performance, societal characteristics, demographic structure, natural environment, etc. The same study identified that among the demographic determinants, age, gender, population size, and density were identified as prime determinants.

Focusing on the age factors, literature reveals that the clinical factors and prognosis of the disease varied among patients of different ages. According to Liu et al. (2020), patients aged greater than or equal to 60 years showed heavier clinical issues, greater severity, and longer disease courses compared with those aged less than 60 years. Also, according to Sobotka et al. (2020), COVID-19 mortality has increased rapidly in the ageing population; however, very few deaths were reported below age 50.

As discussed, literature revealed that the impact of COVID-19 cases had been different in different countries, and age was one of the many factors affecting it. Due to variation in socioeconomic and demography profiles, the impact of COVID-19 had been differential geographically, with experiences being widely varied and of mixed nature, and containment of the epidemic also varied across the globe.

Hence, the study has been pursued to understand if socio-demographical factors like age, sex, income, occupation, etc. have any influence on the clinical profile of the patients, its presentation characteristics, or its outcome. It has also been pointed out in literature that the socioeconomic factor also plays a part in the incidence and fatality of the cases. Hence, the study focusses on understanding the nature of the pandemic looking at the available determinants discussed in literature.

Waves of COVID-19: first wave, second wave, and so on

Viewing the total span of the COVID-19 pandemic and its waves, when the coronavirus pandemic began early in 2020, experts wondered if there would be waves of cases, a pattern seen in other virus pandemics. The overall pattern so far had been one of increasing cases of COVID-19, with a surge in the summer and a larger one in the fall. Some locations that saw a high number of coronavirus infections early on, followed by a decline, witnessed the 'second wave' of increased cases. The second wave of the COVID-19 pandemic deeply affected Indian states and Union Territories, and West Bengal had been no exception. According to a study by Lancet (2021), in

mid-March 2021, the second wave started and reached to 144,829 cases on 9 April 2021. The most densely populated states of Maharashtra – Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Andhra Pradesh, Delhi, Uttar Pradesh, and West Bengal – were the worst affected. However, the increasing number of cases did not prevent the mass gatherings and several national movements, such as the farmers' movement; elections in several states went on. West Bengal had been one of the worst-hit states with a high fatality rate. There have been around 10 lakh positive cases and around 1.5 lakh active cases as of 21 May 2021. The numbers in the second wave had especially been jarring (Worldometer, 2021).

Objectives of the Study

- To understand the presenting characteristics and outcome of patients hospitalized with RT-PCR proved COVID-19.
- To establish the correlation, if any, between age-sex profile of the patients, symptoms presented, or the nature of recovery process.
- To identify if socio-demographic profile affects the clinical presentation and recovery pattern of the COVID-19 infected patients.
- To identify if there are any other socioeconomic determinants affecting the clinical presentation or the disease progression of COVID-19 infected patients.

Materials and Methods

The context

The government of India started implementing lockdown rules and enacting social distancing norms since 24 March 2020 to combat the rapid outbreak of the COVID-19 pandemic. Among the highly COVID-19-affected states in India, West Bengal was in a vulnerable situation, and Kolkata was the worst-affected district (Biswas et al., 2021).

The study has selected the case of a Level 3 dedicated COVID Hospital of Kolkata to understand the nature, incidence, and outcome of the pandemic among its population.

Socio-scientific issues have recently gained more importance in science education and are considered important components of scientific literacy. The data on socio-demographic and clinical parameters, along with their respective treatment outcomes, was collected from 58 patients admitted for COVID-19 to the selected centre, and who died or were discharged in mid-September 2020. Only a positive PCR test was considered a diagnostic criterion for the patients. The following variables were analysed:

- Sex, age (analysed as a continuous variable and also stratified into groups of 20–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80 years or older)

- Presence of comorbidities
- Clinical findings on admission (low-grade or higher fever, dry cough, productive cough, headache, diarrhoea, and other symptoms)
- Average span of hospital stays or deaths, if any

Results

Data of the COVID-19 patients was recorded and analysed under the following subheads:

- Age-sex profile of the patients
- Presenting conditions
- Patient outcomes

A total of 58 patients' data was analysed, of which 43% were female and 57% were male with a mean age of 48.8 years. Comorbidities were present in 6% of the patients, with Diabetes Mellitus being the most common. At admission, 21.7% of the patients had fever. The majority of the patients were treated with supportive care, and one patient died. All the patients belonged to the category where the monthly income of the family was less than 21,000 INR.

Gender and age differentials

Figure 15.1 illustrates the age-sex profile of the patients. The differences in age group could be explained by the younger age group among males having lower susceptibility to infection, but this is not the case for females. Female patients who were admitted with mild to moderate symptoms belonged to lower age groups (20–30 years), while the male patients belonged to a higher age group. The reason may be due to greater participation of females as health workers and nurses. Another reason may be that in developing countries, the women's labour force participation rose to escape poverty in poor households to fight the economic crisis of the lockdown, while the male labour force in the age group between 20–40 years old had lost jobs in the pandemic lockdown.

Presenting conditions

The observational study indicated that 21% of the patients with mild to moderate conditions reported fever as the presenting condition, which is considered as the most common clinical symptom in addition to cough. It is illustrated in Figure 15.2. However, in this study, the remaining 79% were afebrile.

This centre admitted only mild to moderate cases, usually with mild pneumonia, acute respiratory distress syndrome (ARDS), or Intensive Care Unit (ICU) admission.

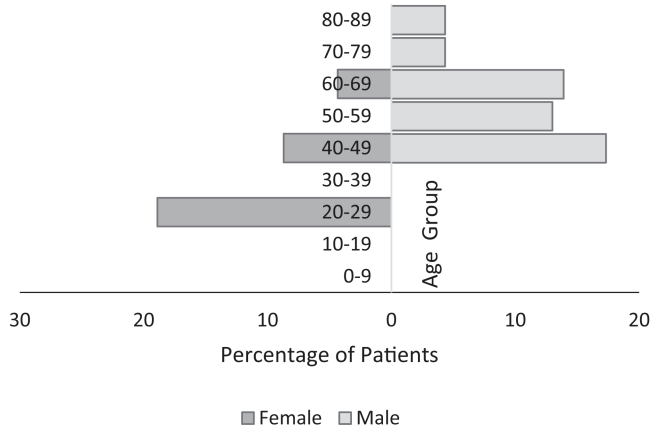

Figure 15.1 Age-sex structure of COVID-19 positive patients of the selected centre, mid-September 2020

Source: Selected Level 3 Dedicated Covid Centre Data, 2020

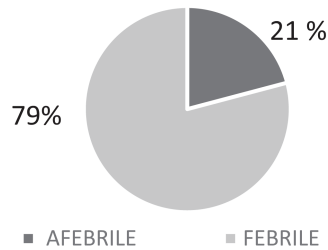

Figure 15.2 Presenting conditions of the COVID-19 positive patients of the selected centre, mid-September 2020

Source: Selected Level 3 Dedicated Covid Centre Data, 2020

Looking at Table 15.1, age-wise recorded respiration rate is reported in respirations (breaths) per minute (rpm). The average rate of respiration was 27/minute, and the rate was higher for older age groups. The World Health Organization indicates that a resting value of Respiration Rate> 30 breaths/min is a critical sign for the diagnosis of severe pneumonia in adults, while the cut-off value for younger population varies according to age (World Health Organization, 2020). The selected centre treating only mild to moderate cases showed the average respiratory rate of patients less than 30.

Patient outcomes

Patient outcomes were recorded as death, discharged, or still admitted. Out of 58 patients, only 1 death was reported.

Table 15.1 Age-wise average respiration rate

Age	*Average Respiratory Rate/min*
20–30	24
30–40	24
40–50	27
50–60	27
60–70	28
70–80	30

Source: Covid Centre data, 2020

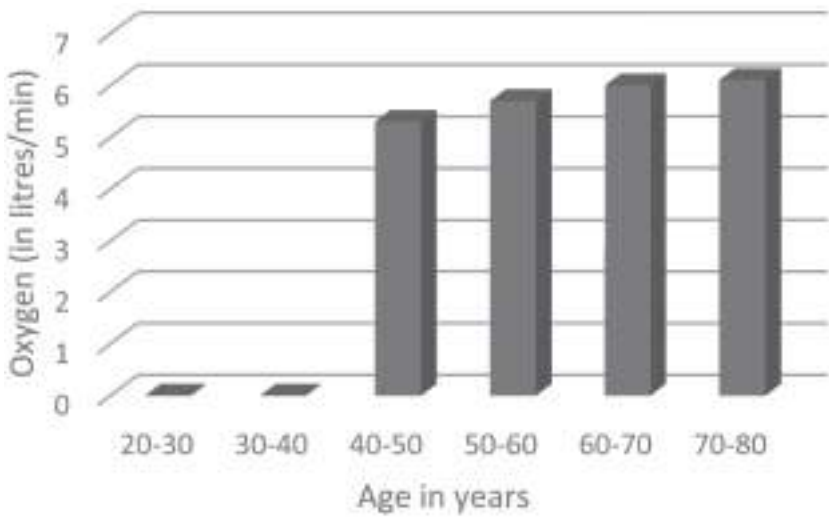

Figure 15.3 Age-wise average oxygen requirement (in litres/min) of the COVID-19 positive patients

Caption: A bar diagram showing requirements of oxygen in litres per minute on the vertical axis against age groups starting from 20 years, at an interval of 10 years up to 80 years on the horizontal axis

Source: Selected Level 3 Dedicated Covid Centre Data, 2020

COVID-19 patients experiencing severe symptoms like breathlessness often need oxygenation support and supplemental oxygen as a first essential step for the treatment of severe illness. Increasing age and presence of comorbidities escalate the need of oxygen requirement. As illustrated in Figure 15.3, while the average oxygen requirement was 5.3 litres/min, the requirement was higher amongst the older age group. Naturally, they are also under the risk of progression of the disease to become severe, thus having a higher risk of mortality. Figure 15.4 illustrates the similar trend, correlating age with oxygen requirements (litres/min). It illustrates a rising curve, showing a positive relationship between age and oxygen requirement.

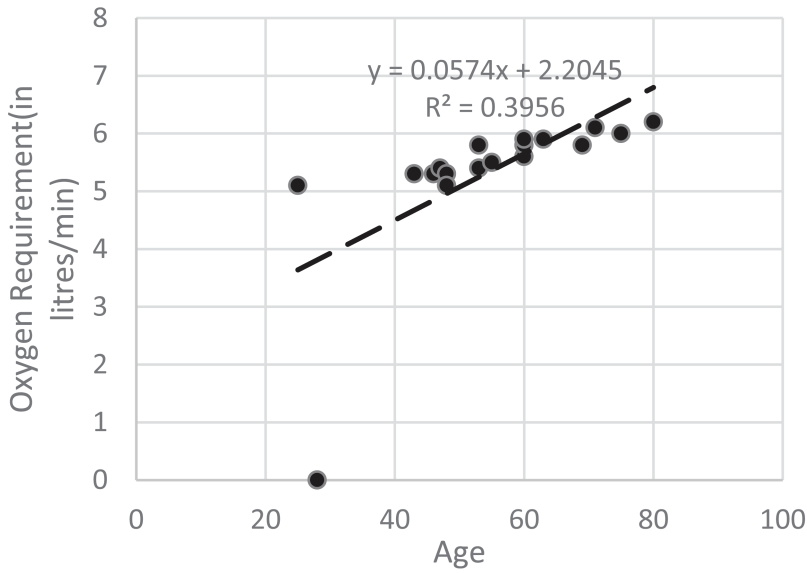

Figure 15.4 Correlating age with oxygen requirement (litres/min)
Source: Selected Level 3 Dedicated Covid Centre Data, 2020

Oxygen Saturation is a fraction of oxygen-saturated haemoglobin compared to total haemoglobin in the blood. The normal values of SpO2 range from 92 to 100%. For a healthy person, SpO2 values usually fall between 94–96%. However, a value below 94% during a COVID-19 outbreak could indicate low oxygen level, a condition known as hypoxemia.

Hypoxemia is a symptom that, regardless of the cause, can lead to multiple issues like organ failure and cardiac arrest if not treated early. In this study, the average saturation of the patients was 96%, and it was found that this average oxygen saturation decreased with age, as illustrated in Figure 15.5. The downward sloping curve indicates a negative correlation between COVID-19 patients and average oxygen saturation. It is observed that the average hospital stay for the patient was 12 days. However, when correlating with age, it was found that the younger age group had a minimum stay of 10 days, while for the older age group, the duration went up to 14 days, illustrated in Figure 15.6.

Analysis

In this single-centre study of 58 hospitalized patients with confirmed COVID-19 in Kolkata, the characteristic findings highlight the following points:

- High proportion of asymptomatic patients who remained so during the entire course of treatment.

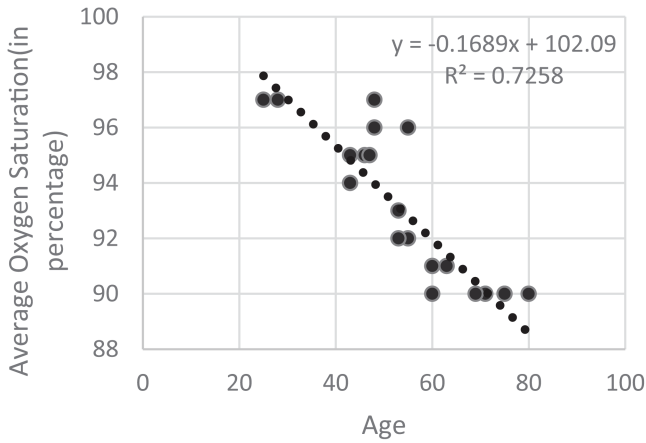

Figure 15.5 Correlating age with average oxygen saturation (in percentage)
Source: Selected Level 3 Dedicated Covid Centre Data, 2020

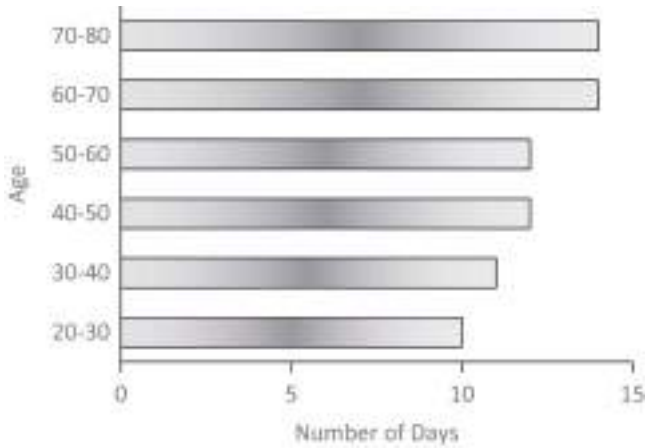

Figure 15.6 Age-wise distribution of average hospital stay
Source: Selected Level 3 Dedicated Covid Centre Data, 2020

- The average age of the COVID-19 infected patients was considerably lower (48.8 years) than that reported by most other studies (Guan et al., 2019; Richardson et al., 2020) in other countries.
- Patients had large male preponderance of 57%.
- A larger preponderance of female in the younger age group of 20–30 years while the male preponderance increased with age.

- Most symptomatic patients had developed mild respiratory symptoms such as nasal symptoms, throat irritation, and cough, in addition to fever.
- Age was a positive factor, and oxygen requirement increased with age as the saturation level declined with age.

Summarising the results, the study points out that while majority of the cases (73%) belonged to an age group of more than 55 years, the analysis of the data shows a relatively even distribution of infections between women and men (43% versus 57%, respectively). However, contrary to other countries' published data, the study found that the mean age of the patients was considerably lower (48.8 years) than that reported by most other studies (Guan et al., 2019; Richardson et al., 2020) in other countries like China or the USA. Another aspect of the study which was in conformity with a published study by Sobotka et al. (2020) was among people of working age-group; women diagnosed with COVID-19 substantially outnumbered infected men. The study revealed a larger preponderance of female in the younger age group of 20–30 years while the male preponderance increased with age. However, the study was limited to in-hospital only and follow up details were not available; thus, information of relapses was not reported.

This study highlights some important differences in Indian patients from those already reported in literature from China, Europe, and the USA (Guan et al., 2019; Richardson et al., 2020). Guan et al. reported the mean age for getting infected with COVID-19 was 55.5 years in China, while Richardson et al. reported the mean age to be 63 years in the USA; our study reported 48.8 years.

Another aspect of the study which was in conformity with a published study by Sobotka et al. (2020) was among people of working age; women diagnosed with COVID-19 substantially outnumbered infected men. However, this trend did not persist at older ages; men were more affected than females. The findings of the study are also in conformity with published studies like Akhter et al. (2020), which state that 20% of the patients exhibit moderate symptoms like fever and require hospital. In our study, 21.7% of the cases presented with fever during admission.

Cities and Pandemic

Cities represent the centres of innovation and diversity, making them thriving centres that attract and accommodate a larger population than the hinterlands. The rising densities of population had several problems like crowding, slum development, traffic congestions, housing shortages, and environmental pollution. The present pandemic reveals that rising densities now have another threat parameter – that of critical infectious diseases that makes the cities more vulnerable than before. However, though it has been pointed out in literature that for the cities of the global south with 'surplus

humanity' found in its all-pervasive slums (Harvey, 2009), the pandemic has more lethal consequences, it has not been found so in this particular case study. As per the study, the level of mortality among the selected case pool was minimal, which was reflected in the other Indian cities as well. However, the large population size with an equally large population density increased the spread and the volume in terms of infected persons. Mortality was considerably low.

Conclusion

As the pandemic surges are still ongoing, it is a major challenge to derive conclusions from a single study based on 2020 data, since it is evident that the nature and challenges have been changing with each phase. This study was limited to a single dedicated COVID Centre and involved the in-hospital cases only, where follow-up details were not available; thus, information about relapses was not reported. Furthermore, by virtue of being a referral centre and not accepting patients directly, the majority of the patients had mild-to-moderate disease; the spectrum of severe illness was underrepresented. The nature of the virus is gradually changing, and the concurrent impacts of the successive mutations are still partially unknown. In this regard, the difference in fatality rates between countries, as well as the geographical variation in risk groups, is very much undefined and requires a more thorough enquiry. The results of the analysis support this theory, confirming that a higher burden of comorbidities, male sex, and older age may be considered substantial determinants of enhanced risk of death. This study addresses only a select sample and thus also accepts that it is in no way conclusive, though the needs for such studies have great value in data creation for future.

Notes

1 The efforts were ramped up by the British Government in India and is enumerated in the Imperial gazetteer of India, Vol. IV, p. 469, circa 1909
2 Nation-state in terms of Hart and Negri's definition from the book 'Empire' (2000)

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16 Changing Scenario of Government Primary Schools

Myths and Realities

Dola Karmakar, Utpal Roy and Indranil Maity

Educational attainment of the masses is the key input that determines the nation's social, economic, and cultural development. Education index is one of the four important indicators used for measuring Human Development and Gender Development, alongside health, income, and gender. The quality of education amongst a population is considered an important determinant of its quality of life. It is well accepted that universal education, and especially education of women, are necessary precursors to the improvement of overall conditions of society. The Primary Education system in any country ideally educates, nourishes, and holds potential value (Feigenbaum, 1951; Peters and Waterman 1982; Juran and Gryna, 1988), and there is a need to pay close attention to the child's sustainable well-being and provide adequate amenities that both parents and children can value. In recent times, privatization and globalization have opened up innumerable new possibilities in the sphere of teaching-learning methods that should ideally be attractive and motivating for the students. In India, primary education became free and compulsory for all children from the ages of 6 to 14 years in 2010 in pursuance of the RTE Act of 2009, which recognizes the right to elementary education as a fundamental right guaranteed by the 86thAmendment to the Constitution. It is in line with the universal Human Rights framework (1948) and MDGs, or Millennium Development Goal (2000). However, the sector suffers from major setbacks that limit its access in terms of 'resources like teachers, infrastructure, administrative staff, well-equipped classrooms, libraries and open spaces'. The lack of access further hinders the attainment of quality education at the primary level (Govinda and Varghese, 1993). A major sector of the primary education infrastructure has been provided free of cost to the population by the Government, in view of the adoption of the philosophy and policy of achieving universal education. However, the Government schools have suffered from a downward trend in terms of enrolment and, inspite of being completely free, people have increasingly lost faith in the system.

The Niti Aayog, Ministry of Human Resource Development, and the World Bank, along with other experts, prepared a report entitled *'The*

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Success of Our Schools: School Education Quality Index' (SEQI) based on 30 indicators and divided into two broad categories, namely, Outcomes and Governance Processes Aiding Outcomes. Outcomes include learning, access, infrastructure and facilities, and equity outcomes; while Governance processes aiding outcomes cover student and teacher attendance, teacher availability, administrative adequacy, training, accountability, and transparency. It uses 2016–17 as the reference year and 2015–16 as the base year. Kerala achieved hundred percent primary education in January 2016 through a literacy programme called '*Athulyam*', and it became the first state to achieve this goal (Shokeen, 2016). Arunachal Pradesh, Uttar Pradesh, Bihar, Chattisgarh, Jammu and Kashmir, Punjab, and Haryana are in the lower rung in terms of overall performance. Chandigarh secured the topmost position of this ranking order among the seven Union Territories. West Bengal did not participate in this assessment process and hence does not feature in this report, but several other sources of literature point to similar trends of decline.

Objectives and Methods

This study aims to probe into the reasons behind the sharp decline in enrolment in the Government Aided Primary Schools in Kolkata and subsequently tries to find out the gap, if any, between the philosophy of universal education, quality of education imparted at the primary level, and the problems and challenges faced by the stakeholders. It is an attempt to probe into the system in terms of quality of education, quality of infrastructure, performance, efficiency, and subsequently attempts to explore the causes of rejection of this crucial service that is provided free of cost to citizens. Further, it aims to assess the initiatives taken by the Government to bring back the lost glory of the fading institution, and discusses the steps that can bring about its resurrection.

As data supports, the educational Circles XI, XIII, and XXIII of Kolkata have been surveyed, and a more detailed case study was conducted across the 31 Government Aided Primary Schools covering the entire Circle XIII. This Circle was selected for detailed analysis because its rank in Education Development Index among all circles in Kolkata is fifth; out of its 44 Government primary schools, 31 are running and remaining 13 schools have been closed in the recent past.

Respondents were selected by purposive random sampling from three groups: teachers, parents, and administrative staff. The survey was conducted with help of in-depth interviews and Focus Group Discussions. It is supported by participant observation by the researchers as they interacted with staff and students at selected schools during their working hours.

Information gathered from brief perception surveys from all schools from Circle 11, 13 and 14 have been compiled for a general analysis (**Table 16.1**).

Table 16.1 Circle wise municipal wards and number of government aided primary schools

Circle	*Ward Number*	*Number of Schools*
Circle-XI	63,69,70,71,72,73,84,85,86 & 87	99
Circle-XIII	96,98,99,100 & 102	44
Circle-XXIII	133,134,135,136,137,138,139,140 & 141	155

Source: District Primary School Council, Kolkata

Besides this, responses from the in-depth interviews and FGDs conducted in Circle XIII were studied intensively. The data for Circle XIII has been integrated to form a composite index, calculated by selecting seven components: quality of infrastructure, advanced learning, essential facilities, Mid-Day Meal, student enrolment status, administration, and application of curriculum. These seven components are given weightages from 1 to 5, which represent degree of performance of all criteria concerning facilities provided by the school. After aggregating these weighted scores, schools were classified into different categories to priorities the issues of their management.

In effect, the study attempted to explore the manifestations of the growing lack of interest and demotivation in availing of the Government Primary Education facilities as a freely available amenity that should ideally be accessible to every child in the country. The study then provides a plan for resurrection of the lost glory of this institution with reference to the city of Kolkata.

Contextualising the Issues of Declining Enrolment in Kolkata: Looking Back at Past Glory

In Kolkata, like most cities in India, there are a large number of both Government and Private schools. The trend of degradation of Government schools and the subsequent rise in number of private schools is disturbing, as a free public utility seems to be consistently wasting away, although the institution has a strong and rich history, especially in Kolkata. Leaders of the realm of education, like Raja Rammohan Roy, Ishwar Chandra Vidyasagar, Rabindranath Tagore, and Annie Besant began their work here, contributing passionately to children's education, setting up education centres, and fighting for womens' education and empowerment. *Barna Parichay* by Ishwar Chandra Vidyasagar and *Sahaj Path* by Rabindranath Tagore were created for learning the Bengali language in the most creative and rhythmic manner. At a later stage, around the 1970s, the Left Front Government brought uncertain changes by removing English from the Primary curriculum and replacing *Shahaj Path* and *Barna Parichay*, calling them too difficult for Classes I and II, a decision which was majorly protested against

by intellectuals and educators of Kolkata. Some of these political decisions and the protests of the times are discussed and contextualized by Acharya (1981) in a paper entitled '*Politics of Primary Education*'. The phrase summarises the turmoil of the times, but the very fact that primary education was debated, discussed, and passionately ascribed is a fact that has never been witnessed at a later date. It has never grasped the imagination of the common people; it seems it is sufficient to leave it to the Committees, caring little about outcomes. Elderly citizens will tell us of the glory of Government institutions, as they took pride in seeking education in the Government primary schools as the building blocks of the future. Gradually, these institutions have failed the expectations of citizens and today, most citizens of the upper and middle-income groups are inclined to choose private schools for their child's education, because they are perceived as providing a better quality of infrastructure, adequately trained teachers, and successfully implementing activity-based learning in their curriculum for their students (Kingdon, 2007). The perceptions are not completely erroneous, as literature will confirm. What, then, is the reason behind allowing a passionately built creative institution to walk down the path of degradation? Sadly, it is a fact that even the teachers in Government Schools do not send their own children to these schools for the same reasons (evident from conversations during field work). On the other hand, poor residents of the city are pressured to take their children to private schools to enable them to have a quality education at a higher fee, whereas they could have easily availed themselves of the free public utility. Those belonging to the lower income group, and especially those amongst the poorest, who are also first-generation learners, are often compelled to opt for the free enrolment in Government Aided Primary schools due to their financial constraints (Tejaswani and Sridevi, 2012; Ghosh, 2006). The resultant divide created between the poor and better-off results in further divergence in society.

A study by Kayal (2019) provides a small insight into the problem: no district from Bihar and West Bengal features in the group assigned 'Good Performance (an EOI of >0.6)' out of the 161 districts from six states selected for the study, whereas a good number of districts from Tamil Nadu, Odisha, Maharashtra, and Karnataka feature in this category.

Critical deficiencies in the curriculum, exclusion of the English language, lack of work culture and motivation among a section of the teachers, absence of proper training in teaching-learning methods, lack of teaching aids, and the lack of interest in upgrading and modernizing these schools by the Government are the main reasons behind the sad plight of the Government Aided Primary Schools (Shokeen, 2016; Singh, 2013; Bordoloi, 2011). Government Schools have supportive services that are mandatory, like providing each child with the Junior Weekly Iron and Folic Acid Supplementation (WIFS) programme, as well as free aids and mid-day meals, which often become a push factor for the parents to send their children to school. Often

the meals and aids are more attractive than the learning itself. In India, especially in rural areas, teachers are involved throughout the year in different kinds of non-teaching activities, like child tracking, election duty, political assignments, and Census operations duty, which should not be assigned to teachers during the teaching session (Mittal, 2011). Government Aided Primary Schools (GAPS) do not have support staff for clerical work, which also falls upon the teachers, along with teaching assignments throughout their service period. Most of the schools don't have the basic infrastructure for preparing the meals per students' requirements due to lack of kitchen, storerooms, and source of clean water (Sahai, 2014). Often, schools are compelled to assign different bodies like Self Help Groups to provide the meals, and lack of funds do not allow them to maintain a good quality of meals. Scarcity of funds is the main hindrance in most cases (Pratichi Institute and Shiksha Alochana, 2018). Literature defines the foremost problems of these primary schools as '*under-equipped, underfunded, and under-staffed*', that is, infrastructure, human resources, capacity building, specification, curriculum, and pedagogy (The PROBE Team, 1999; Vanitha, 2016; Pratichi Institute and Shiksha Alochana, 2018). These are the three reasons that hinder the growth of Government Aided Primary Schools and also deprive the children with special needs. Smart classrooms are a far cry, as simple visual aids and computer-based education systems are not provided in these schools. This discourages parents from enrolling their children, as they believe that their wards shall fall behind while competing in the real world. In addition, the Continuous and Comprehensive Evaluation (CCE) system, that can bring about the fundamental changes in the functioning of the school system, is implemented in a careless and inefficient manner. The students of classes-I and II struggle with the weight of their textbooks, where a single book contains around 348 pages (Pratichi Institute and Shiksha Alochana, 2018).

The quality of a school's environment, along with positive-minded human resources and infrastructure, would help attain learning in a quality environment. The supportive essential elements, like classroom, playroom, teaching aids, safe drinking water, clean toilets, etc. are the indicators of assessing the quality of a school's infrastructure. Only in recent times have utilities like computers, library, and even basic essential services, like toilets for students and teachers, water supply, kitchen for cooking mid-day meals, and determining the quality of meals been taken into consideration for measuring the overall quality of Government Aided Primary schools. These in general and a lack of financial resources have emerged as the key hindrances to the proper development of primary education institutes in Kolkata, in West Bengal, and in many other cities and towns in India. Along with the other challenges, progress in operations and management of primary schools is a principal challenge. In West Bengal, the Government's Primary Education system was highly acclaimed as an institution even a few decades back, but

the system has undergone substantial decay and it has gradually fallen from glory, due to its decreasing student enrolment alongside increasing politicisation of the system.

In the case of Kolkata, the Pratichi Trust Report (2007) makes a conclusive statement from their analysis of the status of Government Primary Schools that '*the most underprivileged being stuck with the worst-run institutions*'. What can be more tragic for Bengal, the forerunner in educational achievements in the country?

Analysis of Findings

Primary schools of the city may be classified on the basis of the management or funding: a) Managed and funded by the State Government (Government schools), b) Funded and managed by the KMC (Kolkata Municipal Corporation Primary schools), c) Funded and managed by Private Stakeholders (Private schools). The responsibility of primary education in Kolkata comes under the West Bengal Board of Primary Education, which is a nodal body with its power vested by the West Bengal Primary Education Act of 1973. District Primary School Councils of State Government run around 1297 primary schools in Kolkata, and on average, 7 primary schools are located per square kilometer. In Kolkata, around 58% of primary schools are funded and managed by Department of Education. The DISE 2009–10 report on Kolkata summarized the Educational Development Index, calculated with the help of the access index, infrastructure index, teacher's index, and outcome index. As per the selected components in measuring the status and performance of schools in different circles of Kolkata, circle-XIII out of 23 circle held the 5th position with index value 0.76, and circle -XIV and circle-XXIII hold 1st and 23rd position in this rank table with 0.86 and 0.16 respectively in academic session 2009–10 (DISE, 2009–10). The varying rank of schools in different circles is attributed to diverse factors like demographic features, socioeconomic group, location, connectivity, and accessibility. A few localities and neighbourhoods across the city are homogenous in terms of social status, parents' assessment, and ability to pay for private schools that make to the government primary schools less important for them. In addition, the

Table 16.2 Enrolment in Government and Private Schools in Kolkata

Enrolment in academic year 2009–10	*Boys*	*Girls*	*Total*
Govt Aided Primary School	89400	91674	181074
Private Primary School	56034	58060	114094

Source: DISE Report, 2009–10

deteriorating quality of mass primary education leads to steady rejection if there is the slightest ability to pay a higher price for education at the primary level. The same report reveals the steady rise in enrolment in Private Schools (Table 16.2).

The graph in Figure 16.1 reveals the steady decline in the number of KMC schools, and the number is substantial. Figures 16.2 and 16.3 reveal the distribution of students by medium of instruction and the number of schools by medium of instruction, showing that Bengali is the dominant medium of

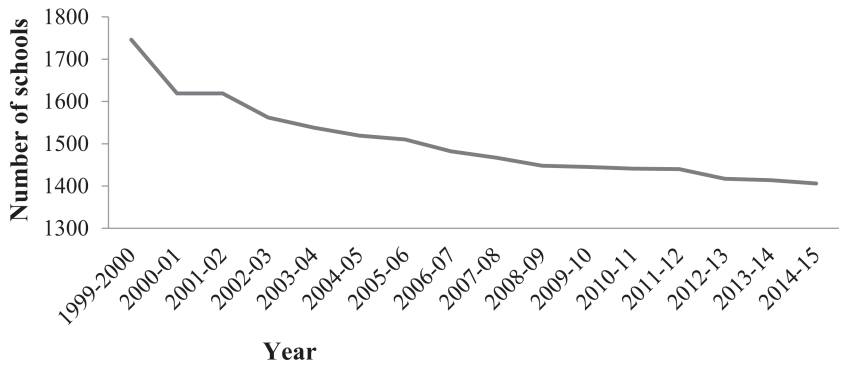

Figure 16.1 Declining Trend of Government Primary Schools

Source: Compiled by authors from Bureau of Statistics (different years)

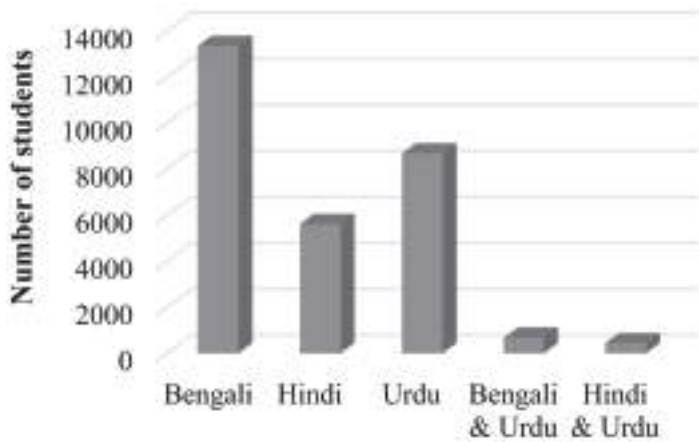

Figure 16.2 Distribution of students in different medium of Primary Schools under KMC

Source: kmcgov.in/KMCPortal/jsp/KMCSchoolsList.jsp

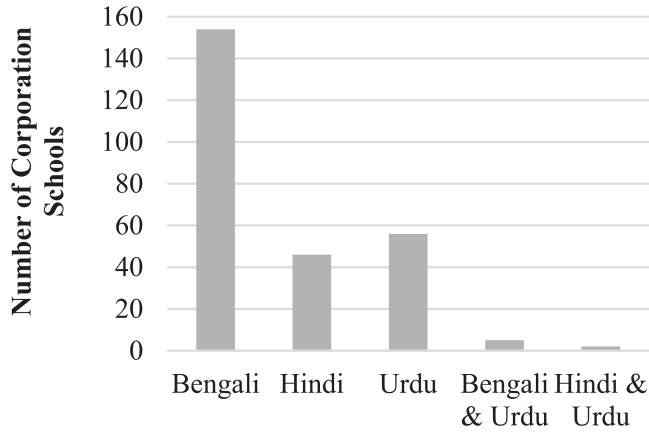

Figure 16.3 Distribution of Corporations Schools by Medium of Instruction
Source: KMC Website

instruction in the KMC schools. It is, however, true that if parents wish to avail of locational advantages, a child belonging to Hindi-speaking parents can get enrolled in a Bengali medium school or vice versa. The amount of support provided for learning the language is not clearly known. In 1982, the Left Front Government in West Bengal abolished the teaching of English in Primary Schools, which led to debates and controversies around the prospects of higher education. Years later, when career prospects of the young were affected, the same Government began to rethink this, but it does remain one of the key reasons for the falling enrolment ratios, as opined by most available literature and reiterated in the present perception study as well. Today, the rural population and the urban poor feel they cannot access learning English because of their inability to pay higher fees for Private Schools.

The map (Figure 16.4) indicates the spatial distribution of KMC schools and their student intake by Education Circles. The Circles undertaken for survey are also identified.

Some of the key outcomes explored through the respondent interviews and focus group discussions across the schools in the study area are summarized here:

Quality of education

Quality includes two sets of factors – firstly, the quality of amenities and secondly, the quality of education imparted. Basic facilities of schools include

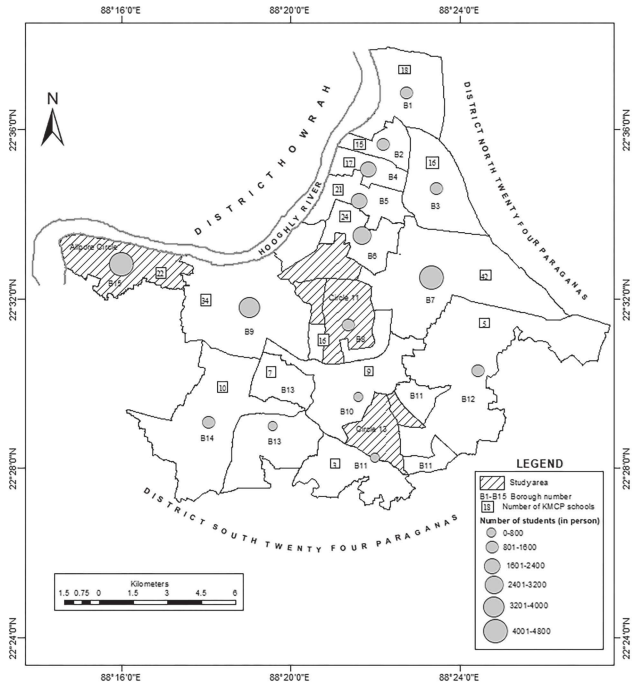

Figure 16.4 KMC Primary Schools: Number and Enrolment (Borough Wise, 2020)
Source: Prepared by authors

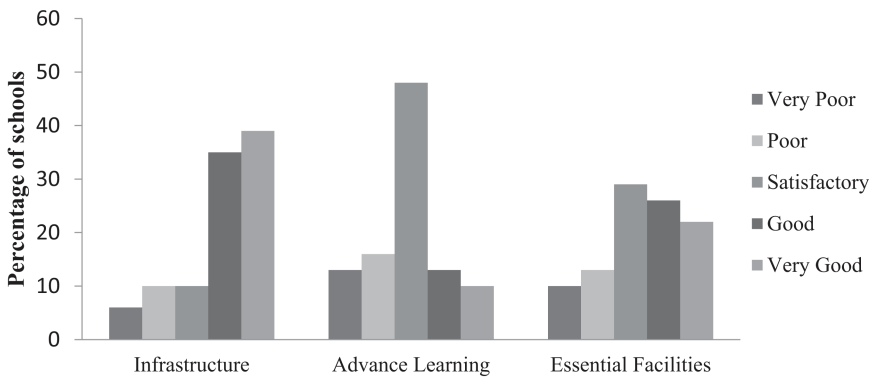

Figure 16.5 Category of schools by quality and availability of select components
Source: Primary Survey of 31 primary schools in Circle XIII, 2018–19

the building, playground, playrooms, classroom, furniture, blackboards, well-illustrated books, computers, and other teaching aids. The availability of all these in sufficient numbers may fulfil the needs of the students and teachers.

Among the primary schools across the study area, about 15% of schools come under the 'poor' category in terms of quality of infrastructure. Most of the school's basic infrastructures are satisfactory; some schools do not have their own building and run from rented accommodations, which consist of only two rooms with a bathroom. All the schools give library facilities to the students because they receive a book grant from the Government which enables them to purchase books. The Government doesn't provide any grants for buying computers, but a few schools offer computer education to their students subject to sponsorship from different Non-Government Organizations or as donations from individuals. Primary schools mostly don't have sufficient and clean places to cook mid-day meals for their students, and they often do not have grants to build a separate toilet for teachers, let alone separate toilets for boys and girls. 62% of the schools visited did have sufficient water supply and toilets in moderate condition. All schools receive equal treatment from the Kolkata Primary School Council (KPSC), and every school gets the School Improvement Grant (Rs. 5000) and School Maintenance Grant (Rs. 7500) annually, but teachers have shared that three problems arise: a) this amount is not enough for complete upkeep and (b) some schools fail to utilize even this small amount because of poor management and (c) there is corruption. The amount is so small that it would be easier to utilize it gradually and improve the state of infrastructure instead of practicing corruption. There is an urgent need to identify those schools whose management and utilization of resource is poor and take corrective action.

Incidentally, schools that are attached to higher secondary schools provide better quality of infrastructure and are equipped with better-quality essential services. The majority of schools in the study area do not have adequate space for play and no visual aids, which are the two most important items to improve the quality of teaching to students at the primary stage. Most teachers opine that two problems exist simultaneously: one, the lack of infrastructure and two, the lack of sincere efforts in taking care of the limited amenities they do have.

The other consideration of quality of education was difficult to assess during surveys. Parents interviewed mostly did not have any complaints about the quality of education, but lamented the lack of modern methods, especially the use of computers. Some parents interviewed came from poverty-ridden households and did not have any idea about syllabus content or quality of teaching. They were happy to conclude that the school is a safe place to be when they are away at work and that the child gets meals, books, clothes, etc.

Modernised and computer aided teaching-learning inputs

Computer aided learning is universally recognized as an essential element for young learners. It enhances the essential skills of students and increases retention amongst students because most people can remember better what they see, hear, and do simultaneously[1][7][23][20] (Devi et al., 2012; Sarkar, 2012; Arvindkumar, 2016; Pyla, 2012). Most of the Government Aided Primary Schools of Kolkata, including those under study, did not provide children with computer aided learning. 68% of Primary schools do not have computers to aid in teaching. Over time, lack of political will and lack of initiatives from the government are causing demotivation due to lack of basic modernization. Today, a computer is no longer a dream item; it is essential equipment. The researchers feel that more than learning how to use the computer, it is important as a provider of audio-visual content that attracts the child and makes learning easier. There is no provision for purchasing computers in Government schools. Naturally, only 32% of Primary schools can provide computer-based education to their students because they received computers from different Non-Government Organizations or as a gift or donation from individuals. Teachers (88%) agreed that Smart Classroom based teaching was important, but 12% of the schoolteachers don't agree with this, and would prefer books to computers. Around 8% of teacher respondents refused to adopt the concept of smart classrooms because they opined it would waste limited resources. According to their opinion, 40% of their students are first-generation learners, so they are unable to get accustomed to Smart Class systems. This seems like a negative attitude, as Smart Classroom users learn better with a combined impact of visuals, sound, and text and one should not distinguish between first- or second-generation learners in terms of impact of teaching-learning methods. For a child at Primary level, learning is just beginning, so differentiating first-generation learners as a group is a problematic perception of the teacher, not the student. Providing visuals cannot have differential impacts upon first-generation learners and children from educated families.

Insufficient arrangement for Children with Special Needs (CWSN Child)

The District Primary Education Project (DPEP) is equipped with Integrated Education for the Disabled Children (IEDC) and other Governments and Non-Government Organization programmes to bring more special children into the regular schools (Chaudhari, 2016; Jalan and Glinskaya, 2003) and introduce them to the classroom alongside normal children for their faster growth. The children in this category need barrier-free access -not only the physical barriers, but teaching-learning barriers as well. Physical access can be improved with ramps and internal classroom arrangements, safe floors, wheelchair access, leveled ground, low-level wash basins, wide doors for toilets, presence of handrails, and equal heights insteps, etc. (Sharma and

Kohli, 2018; Kaur, 2013; Ishmael, 2015). Most of the Government Primary Schools failed to provide any of these facilities to the special children. There are no special teachers either. The Government appoints only two or three special educators in each circle. But these educators are not sufficient in number. This case study reveals that amongst 31 schools in one Circle, there was no special educator, though each and every school had Special Children on their roll. They depend on special educators who visit schools at intervals of 2 to 3 months or more. Ideally, Special Children are supposed to get extra attention for overall development. Economically worse-off families are compelled to send their children with special needs to those schools despite knowing that they will get no special support.

Extended services: distribution of school uniform, mid-day meal, and textbooks

Several schemes have been introduced by the Government to promote public education, especially to encourage primary education amongst all children.

- Distribution of free **school uniforms** is done once a year, at the beginning of each session for pre-primary to class III. Irrespective of type and category of schools, an amount of INR 400 per student is available from the Government for the school uniform. Both parents and teachers shared their concerns about the quality of the supplied dress. Administration cites issues with the disbursement of amount for their inability to provide uniforms on time. Teachers and parents both mentioned that the supplied dress often does not fit in size or is of a very poor quality.
- The **Midday-Meal Scheme is** designed to improve the nutritional status of elementary school children nationwide. This programme gives free food to the students of primary and upper primary classes under Sarva Shiksha Abhiyan (SSA).This joint project of State and Central Govt. is a programme for achieving Universal Elementary Education (UEE). West Bengal renamed the scheme as *Sarva Shiksha Mission (SSM)* in 2002–03 to offer equitable education to all children between 5–14 years of age, which is administered by the Department of School Education and Literacy. Central Government and State Government allot for each student INR 380 and INR 150, respectively. Most of the Government Aided Primary Schools in Kolkata do not cook Mid-Day Meals at their school premises because of insufficient space and lack of staff for monitoring the whole work. It is outsourced to self-help groups. However, the self-help groups mostly do not maintain quality of the food because of paucity of funds and corrupt practices. Interviews reveal that around 44 % of the children of do not have Mid-Day Meals due to the poor quality and unhygienic handling. But the 56% of students who take Mid-Day Meals from their schools does so under compulsion of their financial condition; it provides some nutrition. Even though the parents are aware of the poor

quality, '*At least the child gets some food and doesn't go hungry in my absence*' says a mother of two, who has no alternative as all household members work and there is no one to take care of them at home until 3 pm. About 32% of students usually refuse to take the meal because of its poor quality, and naturally, they belong to non-poor households.

- The Government also provides the **textbooks** from pre-primary to Class-V at the beginning of the session. Each and every Government Aided Primary School is bound to provide these books. But few schools' teachers say that *'they don't get sufficient number of books according to their requirement at the beginning of the session'*. Some books, like 'Wings' for class III and IV, are provided in the middle of the session. Sometimes this stretches to the end of the session. This is a critical problem for the poorest households, where parents cannot provide books or tuition for keeping up with the classwork. Availability of the free books on time is crucial to such children.

The matter of declining enrolment

It is evident from Figure 16.6 that there is a steady decline in the number of students in government primary schools; however, splitting the same data by WBBPE and KMC, the enrolment in the former has increased overall, but the decline is critical for KMC schools. The case study results provide the supporting information that 13 schools in Circle XIII now cease to operate, and goes on to reveal this harsh reality.

It is not the first time that such a finding has been made. Ghosh (2006) discusses the matter of over-reporting by Government and gives evidence to show that enrolment really stood at less than 50%, when the reporting was 100.26% based on Gross Enrolment Ratio (for the specific year of 2004). That the matter of over- or under-reporting by Government agencies is typical of several countries is also discussed. The example of the report by academicians of IIM Calcutta being denied by the Government is also stated in this chapter.

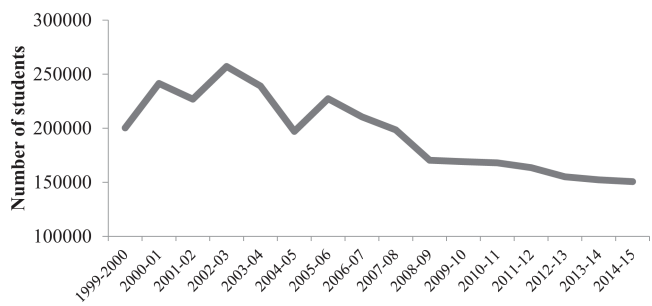

Figure 16.6 Declining trend in students' enrolment in Government Primary Schools
Source: Compiled by authors from Bureau of Statistics

From our survey, it is found that teachers strongly feel that several factors have led to this decline:

- Abolition of teaching of English Language
- Absence of modern teaching aids
- Inefficiency and lack of knowledge amongst teachers are also cited by some teachers as well as some educated parents.
- Abolition of the Pass-Fail system

Combining information from individual surveys and Focus Group Discussions, it is found that 68% teachers consider abolition of English language learning from the curriculum as the major cause of decline, and 42% of them assign the abolition of Pass-Fail system as the second major cause. However, the researchers feel that there is a general lack of understanding of the term *Continuous Comprehensive Evaluation* or *CCE* that was introduced to remove the pressures of the traditional examination system from children aged 6–14 years (which the teachers are stating as 'abolition of Pass-Fail system'). The new system actually evaluates almost daily with each lesson, which is in reality a pressure upon the teacher – to assess whether each child has been able to comprehend what is transacted in the classroom. The process of 'Failing' at the Primary level may never be comprehended by a 6-year-old child, though the ostracization and teasing of friends may affect the same child deeply. The onus of teaching the youngest of children is more on the teacher than the student as the children are first-time learners.

In 2017–18, when the survey was conducted, only 20% of schools were found to have more than 150 students, while 70% schools have fewer than 20 students in a class. 68% of schools did not maintain the enrolment records properly. In many cases, the administration records a student 'on leave' even when they are aware that the child has left permanently. When probed further, we are told that many children do not return from their native places and do not inform the school whether they will join or leave permanently. This is likely to happen, but there are cases of wrong record-keeping as well.

During our conversations, we encountered disturbing trends about lack of awareness among teachers. One of the senior teachers conveyed another insight that needs careful consideration by the authorities: '*Teachers earlier used to teach with authority; they were liberal and broadminded, like how a teacher should be, they were prolific readers and could tell many tales to keep the children engrossed; as they began to retire, we lost irreplaceable resource. We are struck by the limitations of bookish knowledge of the current young teachers; they often teach incorrect things; they do not charm the children with folktales and fairy tales. It is shocking that some new generation teachers have never heard of Dakshinaranjan Mitra's Thakurmar Jhuli or Sukumar Rays Abol Tabol and Khai Khai'*(iconic children's books in Bengali), *'they seem to be doing their job mechanically. Children of primary*

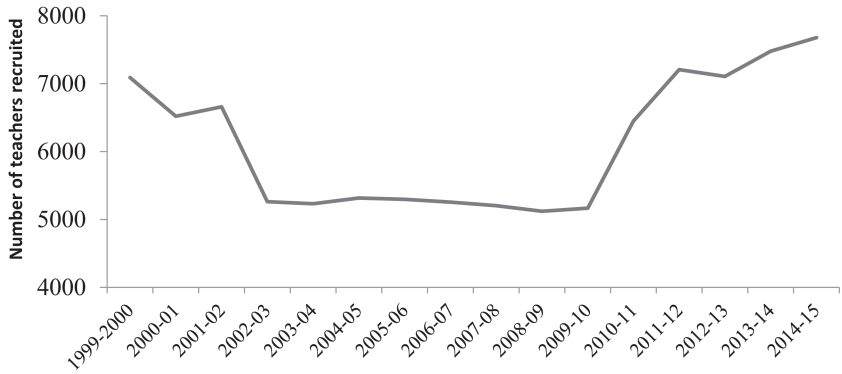

Figure 16.7 Rising trend in appointments of teachers in government primary schools

Source: Bureau of Applied Economics and Statistics (BAES), Government of West Bengal, Kolkata

school deserve an active, creative, and sensitive teacher'. Parents in a Focus Group Discussion clearly mentioned, '*The reason for poor quality of teachers is that appointments are made by considering political background and favouritism; it is sad that to our leaders, the vote bank is more important than the future of the children.*'

Figure 16.7 reveals that the last few years have seen a rise in teacher recruitment, which is a positive trend, but the situation is not likely to improve if such appointments are more beneficial as vote banks than the future of young children.

Inspection of schools: a key ingredient for resurrection

For the proper monitoring of the performance of schools, the Government appoints School Inspectors (SI), who are supposed to visit schools at certain intervals to supervise their performances and guide the development of institutions. Table 16.3 clearly states that the frequency of visit of the SI to school is not sufficient to properly monitor the school throughout the year. This encourages the irresponsible and careless behaviour amongst the staff, who are habitually inconsistent in performance of their duties. The situation of school inspections is almost the same for most Government schools across the city.

In our encounters during the survey, we came across many teachers who are passionate about making a difference and conveying to someone that things need to be corrected. Many of them felt strongly that the key factor of School Inspections can actually make a clear difference in the quality of amenities and quality of teaching. The funds are not all that much, and

Table 16.3 Frequency of visits of the School Inspector

Visits of School Inspector during academic year	*% of responses of Primary school teachers*
Once	52
Twice	28
Thrice	8
Four times	8
More than Four times	4

Source: Primary Survey, 2018–19

pilferage of the small grants can easily be stopped by the authorities. There seems to be a lack of interest amongst the people who can make a difference. The inspections are more about making an event out of it where the staff put up their best, decorate the school, and organize cultural programmes by the children. Ideally, the inspections should be sudden, unannounced visits to monitor the real situations. In an instance of an unannounced visit, a teacher was found abusing and beating the poor children selectively while they were standing in queue for their meal. Instead of taking corrective action against the teacher, the Teacher-in-Charge reprimanded other teachers about allowing the Inspector to encounter the incident. It appeared that the abusive teacher did this on a regular basis, but others ignored the matter as she was politically connected. This actually leads to questions beyond the matter of inspections; it points to the lack of basic understanding of the philosophies of life – about care and nurture, and about removing barriers along the lines of class differentiation that ought to be engrained in a teacher. Such qualities, along with patience and adaptability, are key characteristics of a teacher for primary levels and exactly the reason why, in many advanced countries, the salaries of the primary school teachers are substantially higher than the other services.

The balanced utilisation of surplus teachers

Ghosh (2006) reports in her study that the decline in the number of teachers was affecting the primary education system. She quoted data from the Bureau of Statistics that reveals that in the five years between 2000 and 2005, the drop was substantial, i.e., from 5320 to 4497 for the WBBPE Schools, and an even more drastic fall from 1760 to 820 in KMC schools. During this phase, the high student-to-teacher ratios were a matter of concern– rightly so, as pointed out by many authors (Ghosh, 2006;The PROBE Team, 1999).

In a stranger-than-fiction situation where every Indian institution faces shortages in human resources, some schools reflected that in their cases there are surplus teachers. In Kolkata, 40% of GAPS have more than 15 teachers

Table 16.4 Number of teachers in GAPS

Number of teachers in a school	*% of schools having following number of teachers*
1–5	32
6–10	20
11–15	8
More than 15	40

Source: Primary Survey, 2018–19

because of a massive recruitment drive in 2017 in West Bengal (**Table 16.4**). Nearly 400 Primary teachers were recruited for the Kolkata District alone.

Teachers are the fulcrum of the teaching-learning process and are responsible for building future generations. From ancient times, teaching has been considered a noble profession, especially in primary stages where the teacher is the most vital input for progress. The unfortunate picture of a section of the teaching community of GAPS being engaged with numerous activities other than teaching is a critical problem, especially in West Bengal. After getting the job, the teachers are not made aware of pedagogical developments in the primary education system, and there is rarely understanding of the child's psychological issues. Good teachers are especially crucial to GAPS, as they often encounter a number of first-generation learners with no reading habits in their respective homes. A participant in the survey mentioned that some of the new recruits do not care to perform their duties and their allegiances are elsewhere; they feel duty-bound to perform in various forums other than the classroom. Some have taken this to another level altogether by outsourcing the teaching services to fill up the void created by their absence. The recruitment drives need to be praised unequivocally, but the grey areas of systemic failures also need to be highlighted.

The feeling that teachers are in surplus would not have been present if the adequately or over-staffed schools created environments of specialized care and dedicated services that could be made possible in instances of adequate availability of human resources.

Improper implementation of the curriculum and evaluation system

- The curriculum, as one may encounter in the official portal of the Education Department, is of an ideal way to educate a child, stressing development of the domains of motor, sensory, cognitive, language, emotional, social, creative, aesthetic, and personal, and in its 21 pages *summarises* the objectives of creating well-rounded personalities. The problems emerge at another level– namely, the ability and willingness

of the teacher to transact the rather ideal curriculum. Parents who are extremely poor and illiterate cannot even *read* the curriculum, and leave their futures in the hands of the teacher, expecting them to understand the meanings of social, emotional, and cognitive domains! Around 15% of the teachers we conversed with could tell us about these elements in the curriculum. Some of course know the curriculum by heart, but could not envision how to develop aesthetics amongst slum children.

The philosophy and thought behind the formulation of the Continuous Comprehensive Evaluation (CCE) was noble indeed. Introduced under the Right to Education Act of 2009, it seeks to provide quality education to students aged 6–14 years where '***Continuous***' indicates that the assessment needs to be done every day, while teaching in class and even after teaching, so that difficulties faced by students can be diagnosed regularly; '***Comprehensive***' indicates that the evaluation is to cover all aspects – cognitive, emotional, and functional. However, as discussed earlier, a substantial number of the teachers firmly believe that the abolition of examinations and Pass-Fail formats has been harmful, but they do not wish to discuss the benefits of daily evaluation of the child's understanding at the end of a class. It is true that the reality of trying to evaluate after each class can be a distant dream –since in many cases, children of two classes sit back-to-back in the same room; while one class reads out spellings loudly, the other class is supposed to do math! (Participant Observation).

Key Issues Identified by Ranking Variables on the Basis of Perception Analysis

Table 16.5 enlists the variables considered to evaluate the performance of the 31 primary schools of Circle XIII only, on the basis of perceptions of our sample respondents who represent both the teacher and parent communities.

On the basis of these variables, the Composite Index was calculated in a simplistic effort to identify the performance status of the 31 schools under study (Table 16.6).

The study intentionally avoids naming the schools. The schools under these categories represent only a part of the study, as higher index values have been found in some cases. The categorization was made on a qualitative basis in a comparative mode in relation to the schools under consideration for this study.

Concluding Remarks

It is to be understood without doubt that primary education is the foremost critical indicator of development of the nation. Nation-building begins here, and each child can imbibe the values of education if they are able to receive it. The access to this essential element is as important for the

Table 16.5 Different variables and their aspects for measuring the overall performance

Variables	*Factors included*
Quality of infrastructure	School building, classrooms, office room, furniture blackboard playground or outdoor and indoor games facility, electricity, and fan
Quality of advanced learning	Library, adequate computers or other visual aids, use of advanced techniques of teaching-learning by teachers like field trips, group activities, learning with audio-visuals
Quality of essential facilities	Separate toilets for girl and boy students, separate toilet for teachers, water supply in toilet and kitchen, availability of drinking water, regular inspection of health and hygiene
Quality of Mid-day meal	Quality of cooked food, maintaining the nutritional food chart, cleanliness and hygiene of cooking area, serving area and persons serving to children. Cleanliness and hygiene of delivery vehicles and delivery persons, behaviour of delivery persons and maintaining the timing
Application of curriculum	Knowledge of the teachers about the CCE, implication of the CCE, training of the teachers regarding CCE, and proper application of the curriculum in the textbooks
Quality of enrolment status	Number and quality of student enrolment compared to the past years, guardians' satisfaction level of student's performance
Quality of administration	Teacher's participation in administrative work, surveillance of SI, proper utilization of funds, ascertaining delivery of goods according to funds spent, proper maintenance of records, qualifications of administrative staff

Source: Prepared by authors

Table 16.6 Assessment of primary schools in Circle XIII, based on Composite Index Values

Index Value	*Number of Primary schools [Circle-XIII]*	*Category of schools*	*Variables considered for measurement*
16–20	6	Poor	Quality of infrastructure, advanced learning, essential facilities, application of curriculum, enrolment, and administration
21–25	14	Moderate	
26–30	11	Satisfactory	

Source: Index value calculated by authors

mind as clean drinking water is for the body. It is evident from literature as well as the present study that too much remains to be done in the sector of primary education. We cannot turn away from the harsh reality that there are sharp cleavages in the urban society along the lines of caste, religion, and most importantly economic status. The large number of people who migrate to our cities not only find jobs for their own livelihood, but

also serve the city in multiple ways. The city and its government should be able to accommodate them with the dignity they deserve. Perhaps the government cannot provide them all with nutritious food and a clean shelter, but they can definitely nurture their children with quality education and care for the growth of their mental faculties. We say this as we find that government schools are availed primarily by the poor slum dwellers and homeless. We look towards a time when our government schools will emerge as the rational choices to educate our children in the near future. We shall avail of the vast universal educational service provided to us free of cost and as a fundamental right as citizens of India. We conclude that with a little sensitivity, the government can easily imbibe the philosophy of nurturing the educationists to deliver the best quality education amongst all cities in India, as Kolkata has often shown the way, time and again, in more directions than one.

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17 Towards Disaster-Resilient Slums in Kolkata

Ranita Karmakar and Lakshmi Sivaramakrishnan

Kolkata has experienced a steady flow of migrants from rural Bengal, especially the rural poor who commute to the city basically for livelihood purposes. The evolution of slums in Kolkata can be traced back to colonial Calcutta prior to industrialisation, but enduring patterns of slum formation and growth took shape as industries created a demand for labour. Since they did not have the means to spend on travel by railways or roadways and could not commute regularly, neither could they afford the high rental for houses. They had to live in comparatively low-priced areas, unsuitable for human habitation, in shanty places of the city in an unhygienic and subhuman condition near the factories. Prior to industrial development, the first slums emerged on the fringes of the European residences to provide domestic help for them (Purkait and Halder, 2016), so slums are not only the unique characteristics of new age Kolkata. Some of these are over 100 years old. In Kolkata, there are 2011 registered slum and 3500 unregistered slums situated in the 16 Boroughs and 144 wards (World Bank, 2011). Most of the slums are situated in the eastern, mid-western, and central parts of Kolkata, which form the industrial and business centres.

Most of these slums are densely packed and are situated in vulnerable locations unsuitable for human habitation along canals and railway lines. The density of population is very high and most of these houses are makeshift; the roof is usually covered with either plastic, tali, tin, or asbestos; and the walls are not properly made up with brick; generally, they are made with wood or plastics, bamboo, or torn bedsheets, which are all highly combustible substances. In addition, slum dwellers store kerosene, cooking gas, and wood, which are all highly combustible, in their rooms. Most of them use illegal electricity connections via a hooked wire that makes the slums a hotspot for fire hazards. Fires in Kolkata's slums are a common feature, and from 2010 to 2020, 107 major fires have been recorded (Ghosh and Mondal, 2019). Some of the most hazardous fires in the slums of Kolkata in the last 10 years (2010–2020) are given in Table 17.1.

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Table 17.1 Some devastating fires in slums of Kolkata – 2010 to 2020

Slum name	*Date and time*	*Cause*	*Effect*
Basanti Colony	13 January 2010 13:18	Electrical short-circuit	Around 2000 people became homeless, 30 people injured and 1 casualty were reported.
Tiljala Slum	20 December 2011 08:10	Short circuit	2 people were injured and no report of casualties so far.
Kalikapur slum	22 January 2012 22:10	Burst of gas cylinder	5 people were injured, and 1 casualty reported so far.
Basanti Slum Ultadanga	27 January 2013 05:00	Firewood,	150 people became homeless, 6 people injured, and no casualties reported so far.
Park Circus Railway Station slum	7 April 2014 22:00	Short circuit	More than 300 houses burned, 10 people injured, and 1 casualty reported so far.
Dumdum Park slum	26 December 2015 20:41	Burst of gas cylinder	10 people injured and 1 died.
Brace Bridge Railway Station Slum	11 January 2016 15:15	According to Focused Group Discussion, due to political issue it was a manmade or planned hazard	10–12 people injured and no casualties reported so far.
Baranagar Gopal Lal Thakur slum	12 November 2017 17:22	Explosion of gas cylinders	Around 3–4 people injured; no report of casualties so far.
Burra Bazar slum	16 September, 2018 20:19	Short circuit	No report of injuries and casualties so far, but lots of property loss.
Kaikhali Mangal Ghati Slum	29 October 2019 9:50	Firecrackers	3 people got injured and no casualties.
Duttabad slum (Near Bengal Chemical)	22 December 2020 18:38	Firewood during winter	30–35 people got injured, but no report of casualties.
Topsia slum	10 November 2020 15:30	Fire caught at oil factory	110 families became homeless, 10–15 people injured, but no casualties were reported.

Source: Web References

Slums and Resilience

Work on disaster resilience in slums, with particular respect to fire hazards, is quite limited. Social networks within slums as well as linkages to external agencies often play an important role in the recovery and reorganization of a slum area after a disaster (Islam and Walkerden, 2014). 'Resilience' is defined as the ability to resist, absorb, respond, and recover from the effects of a hazard. There are five components of disaster resilience: social, economic, institutional, infrastructure, and community capital (Cutter, Burton and Emrich, 2010). Of these, the social and community components are very strong in slums. Often, governmental infrastructure is limited in dealing with fire disasters, particularly in slums where accessibility due to narrow lanes becomes difficult. Thus, the community must be active in preventing fire hazards. Cohen, Leykin and Lahad (2013) mention that the fundamental element of disaster preparedness is community resilience. Communities that are resilient to fire can withstand, respond to, and recover from severe fire incidents, thereby contributing to residents' broader well-being and long-term development (Arup, 2018).

Objectives

The main objective of the study is to determine the preparedness among slum dwellers in combating fire accidents, and, if a fire has already taken place, then to determine how to save lives with minimum property loss. The role of community participation and management planning to combat the disaster will also be studied. Finally, this study also tried to figure out how to deal with new or sudden hazards, like the Amphan super cyclone and COVID-19, and how some safety measures and preparedness strategies could be undertaken in future.

Methodology

In order to achieve the necessary objectives, secondary information and data were obtained from archives of various newspaper offices, Kolkata Municipal Corporation, Borough offices, and the ward offices of Ward numbers 66 and 80. The study started with an assessment of the vulnerability of the slums to fire hazards on the basis of distance from the nearest water source, presence of emergency exits, average distance from nearest fire brigade, road inaccessibility during fire, and condition of electrical wiring. To identify the level of vulnerability in the slums of Kolkata, a Vulnerability Index map of the slums of Kolkata was prepared, taking into account the major variables that help in controlling the fire. Data for the same was obtained from a Report of Survey in connection with the Possibility of Fire Hazard within Slum Area of KMC (KMC, 2011a).

Two slums of varying ethnic composition that fall in the high vulnerability zone were chosen for in-depth study with the help of primary data

collected through household surveys and discussion with key informants by administration of an interview schedule and through detailed observation. To understand the social and community participation and resilience in combating fire hazards, focus group discussions were used.

Study Area and its Selection

Kolkata is one of the oldest metropolises of India. The total area of Kolkata Municipal Corporation (KMC) is 205 sq.km and the east-west dimension of the city is comparatively narrow, stretching from the Hooghly River in the west to roughly the Eastern Metropolitan Bypass in the east – a span of 9-10 km (KMC, 2011c). KMC, with a total population of 4.5 million and a floating population of 6,000,000 per day is one of the most densely populated cities of India, with a density of 24,306 people per sq. km. (Census, 2011).

Mumbai, Delhi, and Kolkata are the top three most densely populated cities in India. Mumbai and Kolkata have almost 1/3rd of its population living in slums. Mumbai has the highest slum density as well as the world's largest slum, Dharavi. The reasons for selecting KMC as the study area are first due to the fact that slums in Kolkata are scattered all over the city, except for KMC Ward nos. 42, 43 and 87. So slums and other residential areas, including high-rise buildings, are seen side by side. The second reason is the clusterisations of slums in terms of ethnicity and differences in colonial slums of North Kolkata and post-Independence slums of South Kolkata. Depending on these factors, two slums were chosen for the study, namely Topsia Slum and Brace Bridge Railway Slum (Figure 17.1).

Brace Bridge Slum is situated between 22°31'3.95"N, 88°18'9.36"E and 22°31'7.92"N, 88°17'58.18"E in Borough No 9, Ward No 80 just along the eastern side of Brace Bridge Railway Station (platform number 2). The total area of the slum is 11700 sq. metres and supports 350 families with a total population of 1827 people. This slum has mainly a Hindu population (KMC, 2011b).

Topsia Slum is situated between 22°32'8.84"N, 88°23'34.75"E to 22°32'21.85"N, 88°23'17.31"E, in Borough number 7, ward number 66. This place is just between Baitul Muazam Masjid in the West (towards Topsia more, 4 no. bridge connector main road) and Bagh e Madina (Eastern Metropolitan Bypass) in the East along the canal between Dr. B. N Dey Road in north and Gulam Jelani Khan Road in the south. The total area of this slum is 8901 sq. metres, accommodating 165 families with a total population of 667. It is mainly populated by Muslims (KMC, 2011b).

Fire Hazard and Vulnerability

Fire hazard is a constant threat for slum dwellers. Fires start from electrical shorts, firewood, firecrackers, bursting of gas cylinders, etc., and spread

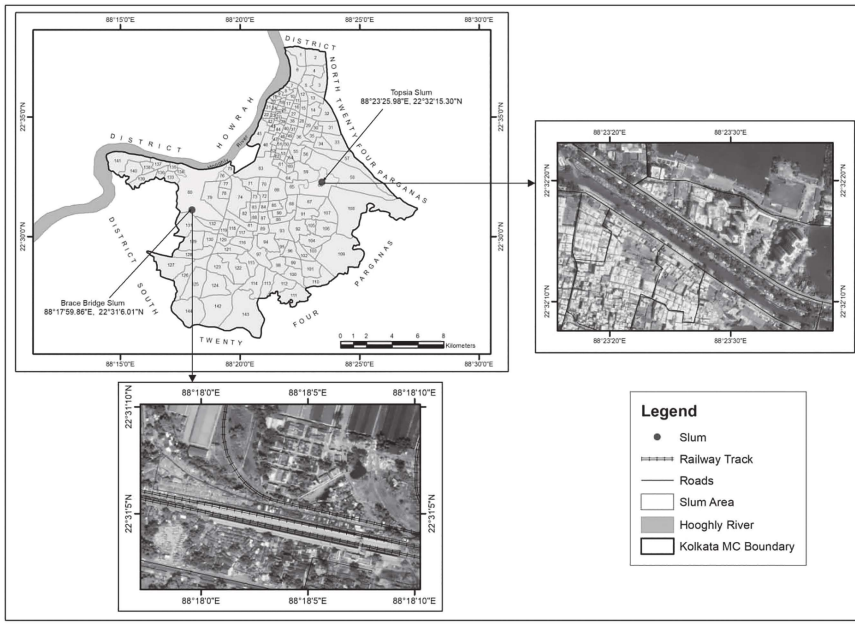

Figure 17.1 Location map Topsia Slum and Brace Bridge Railway Slum
Source: Prepared by authors

rapidly, destroying the densely packed dwellings made of flammable materials. Sometimes fires are lit intentionally to evict slum dwellers. It interesting to note from Table 17.1 that most of the fires in Kolkata have occurred in the winter season, probably due to the burning of materials for warming up during winters. Slum households lack preparedness measures and resources to combat fires and are often left devastated, losing all their belongings.

On the basis of the five variables, certain maps were prepared (Figures 17.2–17.6). It can be seen that with respect to water availability for dousing the fire, most slums have access to water within 240 metres or 0.24 km (Figure 17.2). Emergency exits from slums are present in most of the slums of north Kolkata i.e., the colonial slums, while they are absent in many of the slums in the southern part of the city (Figure 17.3). Most of these slums were developed to host the refugee population in the post-Independence period and lack any planning, as they developed overnight in any vacant space.

Vulnerability Measures in Slums for Fire Hazard

The average distance to the nearest fire brigade is lowest in the slums of the central part of the city, but in other parts the average distance varies from

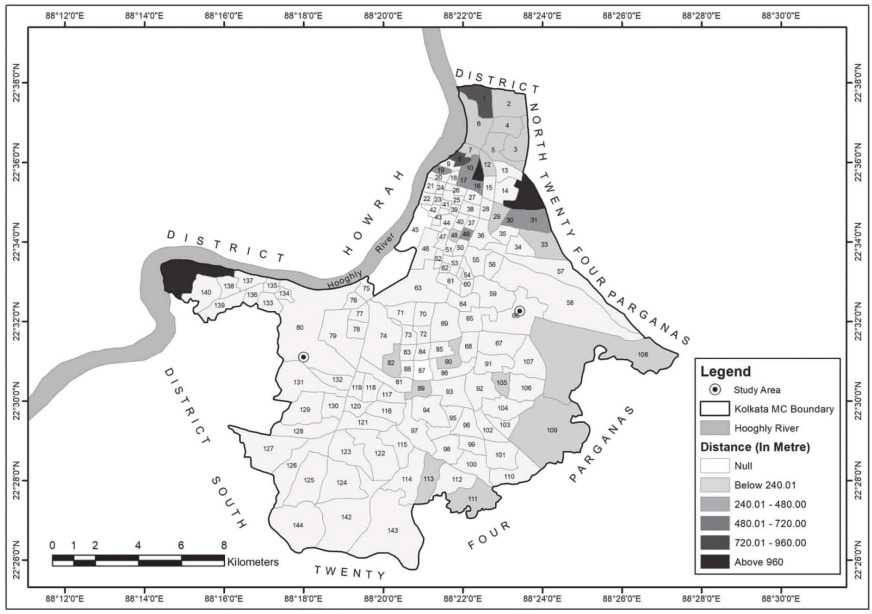

Figure 17.2 Nearness to the water source

Source: KMC, 2011a

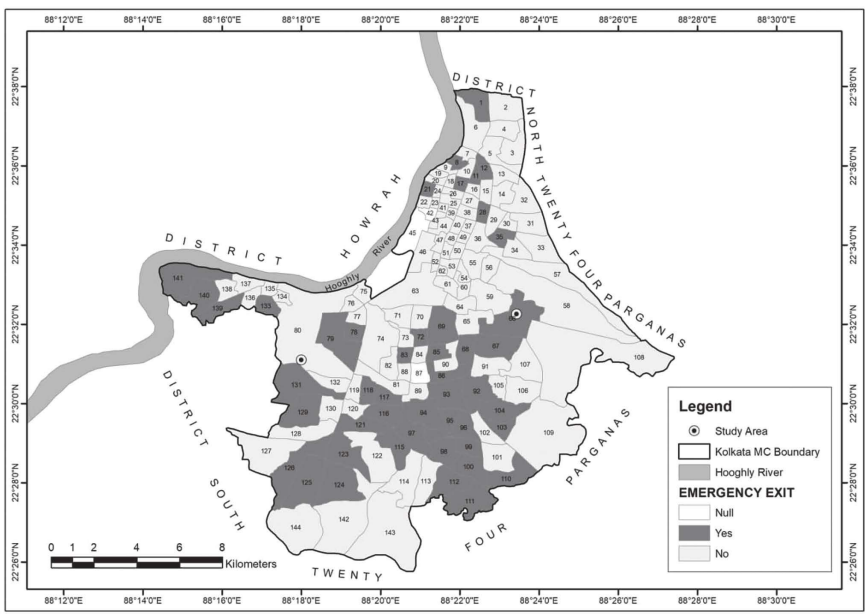

Figure 17.3 Presence of emergency exit

Source: KMC, 2011a

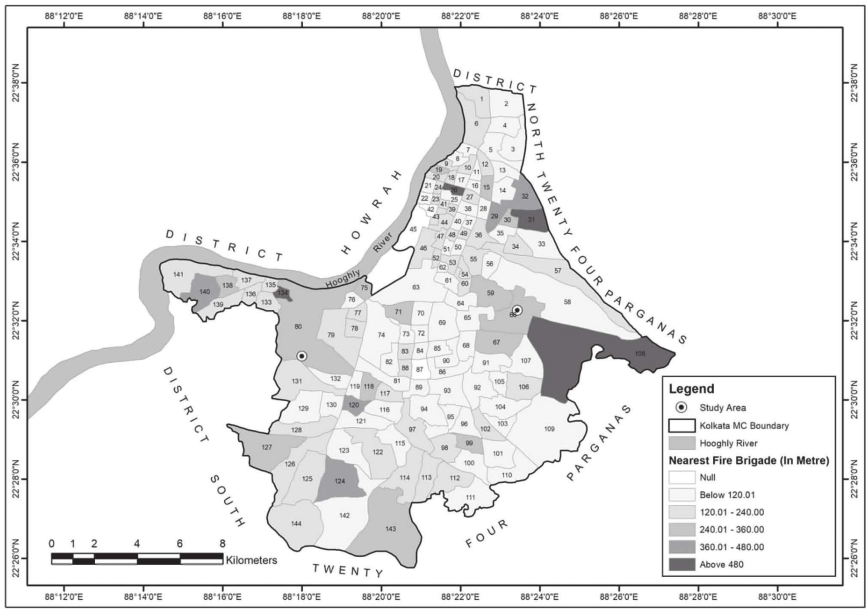

Figure 17.4 Average distance from nearest fire brigade
Source: KMC, 2011a

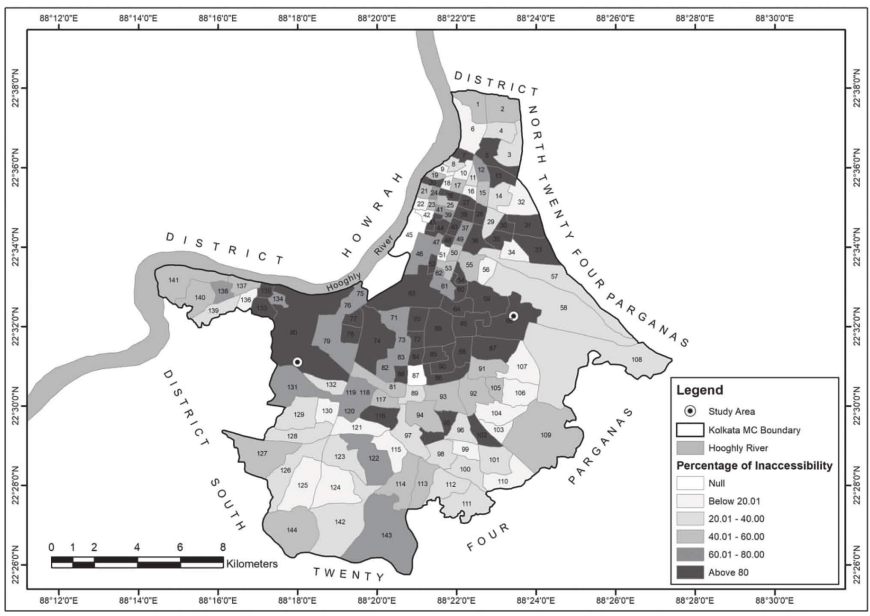

Figure 17.5 Road inaccessibility during fire hazard
Source: KMC, 2011a

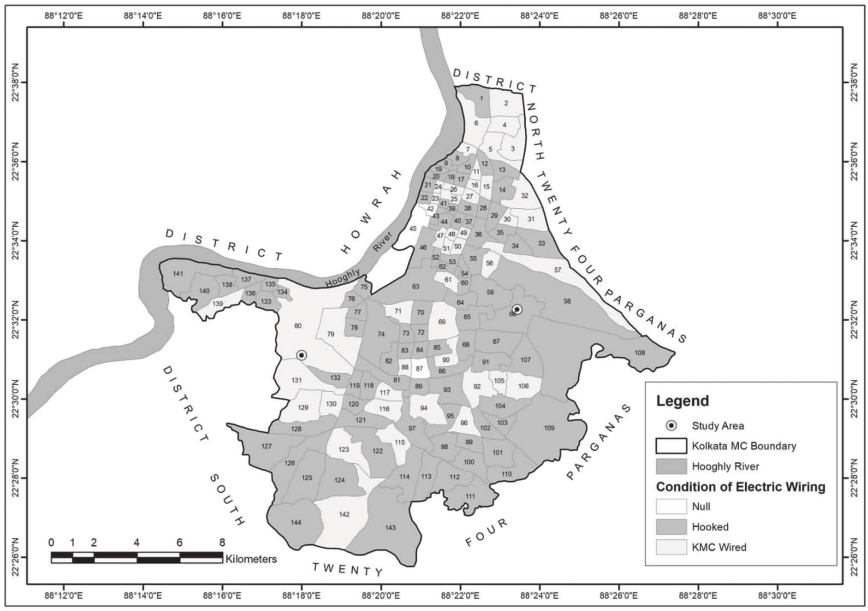

Figure 17.6 Condition of electric wiring
Source: KMC, 2011a

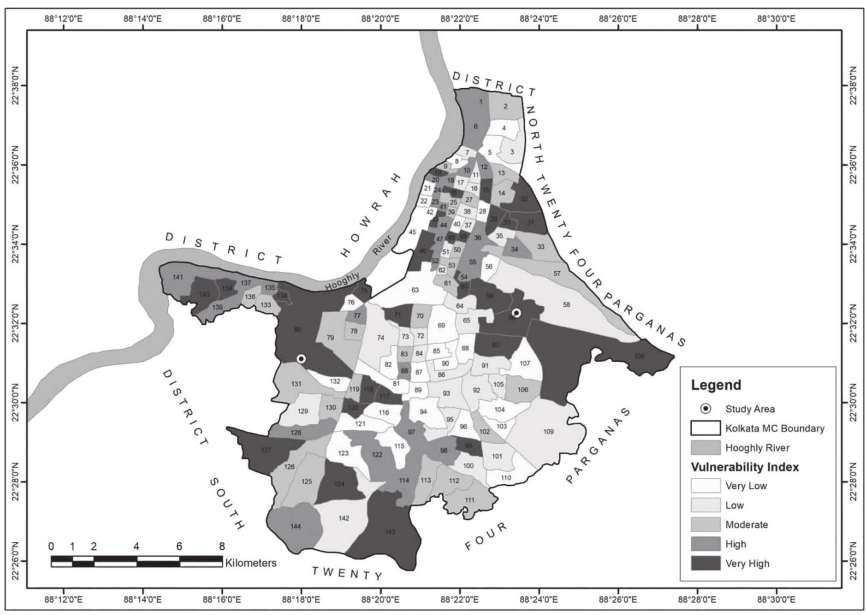

Figure 17.7 Vulnerability index of slum
Source: Prepared by authors

240 to 480 metres (Figure 17.4). Here the problem arises more from the traffic congestion; the fire engines have to face difficulty in the narrow lanes in the slums of North Kolkata, which is depicted in Figure no. 17.5 with respect to accessibility. Hooking of electrical wires, which often causes fire, is rampant in most of the slums of Kolkata (Figure 17.6).

The Vulnerability Index map was prepared on the basis of these variables. Firstly, the variables were ranked individually, then with the weighted rank a composite index was prepared to show the vulnerability (Figure 17.7). It clearly reveals that apart from the central part of the city, the vulnerability ranges from moderate to high in most of the slums. Two slums falling in the high vulnerability index zone were chosen for in-depth study, namely Topsia Slum in Ward No. 66 and Brace Bridge Slum in Ward No. 80.

Topsia Slum

Topsia Slum is one of the most congested slums in Kolkata and is located just behind the posh commercial buildings along the EM bypass along a narrow canal. Though it is situated along the canal, when this area caught fire on 10 November 2020, it took less than five minutes to spread the fire all over the slum from a small starting point. From focused group discussion and primary survey, the reason has emerged that three oil factories were the source of that fire. From an electrical short circuit, one of the oil factories burned, and, oil being the catalyst, caused the flames to spread all over the slum quite rapidly. Around 110 families with more than 400 people became homeless overnight. No casualties were reported, but properties were completely damaged. Around 10–15 people were injured during the incident. Slums were completely burnt to ashes. After this incident, the local councilors paid a visit to the slum and tried to compensate them with daily necessities of food and clothing. They also provided the homeless with other essentials like '*Tripol*' (English: tarpaulin), and a onetime economic compensation of Rs. 15,000. But after one month, no further care was initiated and the promise of reconstructing their houses has not yet been fulfilled as of the end of December 2020. Tabiza Rahman stated, 'This kind of fire hazard has not occurred first time in the slum; before this also this slum faced several time fire accidents in 2003, 2007 and 2012, but nobody took any serious action till date'.

Brace Bridge Railway Slum

Brace Bridge Slum is one of the most highly populated slums in Kolkata. This slum is situated along the side of railway platform No. 2 of Brace Bridge. A massive fire incident occurred in 2016. Although many sources and news reports say the cause of fire could not be recognized, the focus group discussion on the primary survey reveals that it was an intentional man-made hazard that occurred due to political interests. The truth of this

statement came to light when the survey was done, and it could be seen that the fire was not continuous but was only in some pockets. Observation from the field reveals that the fire was intentionally started from various spots near the outer side of the slum. If it had been an accidental fire, the burning would have been continuous. Around 600 people became homeless overnight; many people were injured due to overcrowding and congestion. They were unable to run away quickly. For two months, the Government provided food to them, and later they remade their shanties, but it could be seen that some portion of the slum still remained void and burnt. Arpita Mondal, a random slum dweller, stated, 'The slum is situated on acquired land of the Railways, so 2016 was not the first time but it was attempted many time. Eventually, 2016 was a successful attempt'.

Preparedness by Slum Dwellers During the Disaster in Brace Bridge Slum and Topsia Slum

- Most of the households were demolished within an hour of the fire outbreak, because they were made with bamboo slices and roofs were covered either by tarpaulin or were bamboo-thatched, which resulted in rapid spread of the flame. Thus, the dwellers were forced to settle in the railway station, the immediate implication being congestion and conflict among them due to scarcity of basic amenities.
- The people had to use only one community toilet at the railway station, which was not only unhygienic, but also not secure for females.
- Most of the household assets including their clothes were totally burnt. As it was winter, they faced acute hardship due to the shortage of blankets and warm clothes. Some of the victims managed to get some from the daily passengers on the trains in the railway station.
- Lack of proper, nutritious food, especially for the children and infants. Health problems associated with respiratory problems cropped up among the children due to suffocation on account of constant exposure to smoke from flames in the area.
- The lanes and by-lanes connecting the slums were very narrow. This caused problems not only for the dwellers to gain fast displacement to a safer location, but also for the steps taken by the slum dwellers during the disaster.
- The immediate rescue operations came from the slum dwellers themselves. They tried to extinguish the billowing flames by throwing buckets of water.
- The fire brigade was called; however, it arrived after nearly an hour, during which time approximately 300 households were completely burned. The slum dwellers gathered at Brace Bridge railway station for shelter during the hazard.
- In the case of Topsia Slum, they did not have access to any shelters and stayed in the open under tarpaulins.

- They had no access to toilets and have been using the open space near the canal for this.
- Children of Topsia Slum have been unable to get proper education to date; as all educational belongings were burnt, they also could not appear for their final examinations.

Problems Faced by Slum Dwellers Due to Fire

- The huts that have been constructed are too small relative to the ones they owned before the disaster. Thus, there is lack of both space and privacy.
- The lane separating two rows of houses has an average width of only 0.5 metres. Consequently, there is not only a problem of mobility, but also one of suffocation and congestion. Moreover, there is no space between two adjacent houses in a row.
- Some of the new households have been built just beside the drains. Consequently, water logging becomes a great menace during heavy rains. Several health issues, like cholera and intestinal disorders, have also cropped up among the children and women.
- Financial crisis due to huge loss of property of the poor slum dwellers, with no monetary aid given to them to date.
- There has been total disruption of livelihood opportunities for a remarkable number of the dwellers. No vocational training has been provided to the victims as a means of restoring their livelihood. Quite a large number of families have been forced to discontinue their children's education due to economic strain after the hazard.

Steps Taken by the Government and NGOs During the Disaster

- Nearly 20 firefighters battled the flames for 5–6 hours.
- A temporary pandal was constructed with bamboo shafts for the victims to take shelter in.
- Food supply was procured from the government for two months, while Century Ply provided the victims with fresh drinking water.
- Paramedic staffs were sent to the affected area to provide first aid to people who had suffered minor burns and blisters.

Post-Disaster Preventive Measures

- Several huts have been constructed for rehabilitation of the victims of the fire hazard, which were handed over to them after four months (in May 2016)
- Bathing and toilet arrangements have been made for the aggrieved dwellers.

- Electricity supply has been facilitated and streetlights have been erected after the disaster.
- Some of the households have also received clothes and cooking utensils.

Resilience of Slum Dwellers to Fire Accident

Some planning has to be done in future to build up resilience among slums, not only for fire hazards but also for COVID-19 and Amphan. Some measures that can help are:

1) Sources of water should be recreated near the slum to help reduce the devastation of the hazard
2) Some basic precautions could be taken to reduce the destruction, like proper preservation of kerosene oil or storage of firewood, or a change to a less destructive cooking oil.
3) The wall of the slums is the main accelerator for fire, as those are made of wood in many cases, while in most cases the roof of the house is covered with plastic. Therefore, with the help of Pradhan Mantri Awas Yojna and the support of state government housing loans, those kaccha houses could be converted to pucca houses.
4) For slums which are far away from the nearest fire station, with the help of the nearest ward officer, they should be provided a fire operation or a fire officer with minimum preparedness of gadgets to streamline the process.
5) The hooking of electrical wires should be checked by corporations to avoid mishaps.
6) Roads between the slums should be wider than they are at present; in many cases, the middle road between slums are less than 1 metre, so in case of fire or accident casualties occur due to lack of space. In most cases the escape road is nonexistent in slums, which increases the loss of property and human lives.
7) The internal structure of the slum is another indicator of poverty, so internally not much can be done, but with help of the government, fire alarms could be provided to increase residents' awareness of a fire.
8) Some quick actions, like an abundant presence of sand and government-sponsored fire extinguishers, should be kept slum wise so the fastest service could be provided when the fire sets.

Lastly and most importantly, people should be aware with presence of mind and should get faster help during a fire hazard.

In order to analyze the community participation which helps in building resilience, a SWOT analysis was done in both the slums to find out if ethnic status had any role to play in it.

Table 17.2 SWOT Analysis

Parameters	*Topsia Slum*	*Brace Bridge Railway Slum*
Strength	a) Accessibility and connectivity with roadways are very good, as this slum is adjacent to metaled road and further attached to EM Bypass b) Community participation during the disaster was very strong. The nearest club (Topsia Maulana Azad Sporting Club) is situated just 10 metres away from the adjacent slum; other than this Topsia Boys Slum Club (within 500 metres), Jugni Sporting Club (300 metres), and Topsia Azad Sporting Club (1 km) is situated around the area. All of them helped in management of the fire and the people c) This place is near to the water source. A canal is running just within the slum area.	a) This slum is bigger and more spacious, as it is situated by the side of railway station very near to the railway car shed. So movement during disasters in easier and an advantage for this slum b) Community participation during disaster is not very strong as the only local club within 1 km. is Yuvasakti, which provided only help after the disaster in the form of food supplies c) Accessibility with railway routes is very good and within 10 meter railways connected with Ballygunge (up) and Budge Budge (Down).
Weakness	a) Space crisis took an important role over here. Houses faced each other at a distance less than .5 metre. b) This area is far away (5.9 mile) from the nearest fire brigade station. c) Non-presence of emergency exits.	a) Nearest water source is more than 5 km away from this slum. b) Railway acquired places, so no houses could be made in future with government help. c) Politically targeted area for a long time. d) Absence of clean drinking water as no corporation water is supplied in the slum, so they usually travel 1.5 km to reach nearest drinking water source.
Opportunities	a) As the space is located at a posh area, proposal of affordable housing has been made by the government; also many NGO helped them occasionally, so in future it could be a prosperous settlement	No such opportunities for the slum in future.
Threats	a) Congested area with no presence of important parameters to demolish fire during hazard could lead the place to heavy disaster with loss of lives and properties.	a) Presence of political targets, imprudence of all essential parameters, and this slum is vulnerable in case of fire hazard and loss of lives and properties.

Source: Prepared by Authors

Building Future Resilience in Slums for Disasters Like COVID-19 and Amphan

COVID-19 and Amphan have brought to light several problems which need to be addressed to build up the resilience of the slum dwellers. The density and size of the families are larger in the slums. Sharing of basic amenities like water and toilets is common. This means the basic requirement put forward by the World Health Organisation (WHO) to resist the pandemic was not possible in the slums. They were also not prepared for the cyclone; although they were shifted to shelter, their own houses were completely destroyed.

As poverty is the ruling factor in the slums, and there is lack of space and money for permanent measures like construction of mobile toilets and water tankers for water, spraying sanitizers in slums or construction of sanitizer tunnels in strategic points in the slums can help in controlling the spread of the disease. In addition, masks, sanitizers, and soap can be distributed. The most important would be spreading awareness in the slums. Initiatives should also be taken to formalize these areas so that they come in the ambit of future development projects with respect to basic infrastructure. Health and hygiene should be given priority in the slums. Slums are an integral part of urban areas and in order to cope with such disasters, they must be brought under the urban planning process.

Conclusion

The present study has identified the vulnerability of slum dwellers to fire hazards in the slums of Kolkata Municipal Corporation. It reveals their preparedness to such events and how vulnerable they are to such hazards. The study shows that community participation has greatly helped them to overcome this disaster as the loss of lives is nominal in both the slums, but loss of property and livelihood is immense. The SWOT analysis shows that community participation is the main strength which makes them resilient to such disasters. As they are unauthorised, threats are great from political parties in conjecture. The most important thing is that slums need to be formalised and legalised so that benefits from development projects in urban areas also reach down to them.

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18 Climate Adaptation Planning for the City

The Case of Cyclone Amphan

Parama Raychaudhuri Bannerji

Several developing countries today are vulnerable to natural disasters because of the increasing impacts of climate change. With a considerable surge in the number and frequency of extreme climatic events like cyclone and storm surges, many city planning authorities are facing the crisis and challenge of implementation of a full-fledged disaster resilience strategy. It is well known that prevention is less costly than managing the aftermath of a disaster (Nath et al., 2008), but it is unequivocally true that 'prevention' is a misnomer for some disasters; Amphan, the super-cyclone, is a case in point. The impact of a disaster or the challenges of recovery from such an event require a detailed preparatory exercise and can only be understood on a contextual basis, particularly because each disaster impacts the built and living components differentially. Given these stark realities, this chapter takes up a qualitative disaster research to understand the formal and informal institutional arrangements that exist for management options for Kolkata. This may or may not be relevant to other cities of the developing countries in general. Kolkata faced a crisis due to the cyclone impacting at a time of steep rise in the number of COVID-19 cases. Physiographically, the city is located in the path of cyclones, but the super cyclone was a severe one. High densities of population and poorly developed infrastructures have placed the city in a more vulnerable situation. Though the coast bore the brunt of the cyclone, the city faced an imminent crisis as well.

Objectives of the Study and Methodology

This study is set up in the context of a challenging scenario: a biological and natural disaster debacle. The basic objective of the study is to understand the formal and informal institutional arrangements that exist for disaster management in Kolkata. Besides this, it also attempts to understand the nature of challenges faced by stakeholders, institutional actors, or local communities while trying to reconcile with the impacts. The study adopts a case-study method to approach the objective through the lens of qualitative disaster research. A coherent method of synthesising narratives and evaluating the policy imperatives has been adopted. Content analysis is used

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from narrative experiences as disaster stories from newspaper accounts and community archives. Newspapers are dominated by day-to-day events that are dramatic, topical, and immediate (Hall, 1975). There have been studies in disaster research. such as Sexton (2010) in her study. '*Katrina's Story: A Narrative Analysis of News Coverage and FEMA's Crisis Response Strategies'* pointed out that during Katrina, and especially in the hurricane's aftermath, the media became the main channel of communication and source of information for the global community. This method has also been used in this study, as newspaper narratives were a main source of data. The study has synthesised information from open-access sources and attempts to reveal the challenges of the communities or critical facilities that were exposed to twin crisis.

Besides this, the study adopts a convergent approach where the quantitative data is converged for coherent analysis, borrowing from the qualitative resilience framework; namely, Rockefeller Foundation's 100 Resilient Cities (ARUP's City Resilience Framework) and the Sendai Framework for Disaster Risk Reduction.

Key Findings from Research Data

According to the United Nation Disaster Risk Reduction (2015), urban areas are not only impacted by climate change, but they are also the leading contributors of greenhouse gas emissions that are bringing about climate change. The Intergovernmental Panel on Climate Change (IPCC, 2014) has been focussing and providing mitigation for increasing urban climate change risks. While cities cover 2% of the earth's surface, they produce about 70% of the emissions. Hence, urban climate adaptation plans, especially building more resilient infrastructures adapted to withstand extreme events and energy efficient transport, are critical here.

According to the report '*Cities and Climate Change'* by OECD (2014), Asian urban areas are particularly vulnerable to climate change as fluctuating and extreme weather events can be especially disruptive to urban systems since a large proportion of urban populations live in low-lying coastal areas. Vulnerability to storm surges and rising sea levels is set to increase rapidly over the coming decades, particularly in urban Asia. Hallegatte (2013), made a list of 136 cities in the world with the highest projected flood loss by 2050 due to both socioeconomic factors (growing population and assets) and climate change (subsidence and increased frequency of extreme weather events). While Ghangzhou tops the list with average annual flood losses to the tune of 1.32% of Urban GDP, Kolkata holds the fourth position, where losses are at 0.21% of the city's GDP.

Climate change is a greater threat to developing countries than the developed ones due to higher densities and poverty, which are already considered 'an element of risk'. This vulnerable community is most impacted by climate change across the globe. According to the NDC-Global Outlook

Report (2019), countries around the world put their support behind a vision of a resilient, sustainable, and low-carbon future. This report also pointed out that lack of awareness and unreliable data remain major bottlenecks in developing countries, limiting climate change resilience plans. However, a concrete initiative adopted was the CDP Cities Programme in 2014, which became the world's first global platform for municipal governments to disclose greenhouse gas emissions, climate change risk, and adaptation. CDP, in alliance with C40, a global cities network, focussed on low carbon emission infrastructure in 2019 (World Business Council for Sustainable Development, 2020). Incidentally, India has six C40 Indian Cities of which Kolkata is one.

Other progress in this direction includes the Sendai Framework for Disaster Risk Reduction, which was framed with seven major targets and identified four priorities for action. According to United Nations Office for Disaster Risk Reduction (2019), this was adopted by UN Member States on 18 March 2015 at the Third UN World Conference on Disaster Risk Reduction in Sendai City, Miyagi Prefecture, Japan. It contributes to measuring disaster-related goals and targets of the 2030 Agenda for Sustainable Development, where Sustainable Development Goal 11 is intended to 'make cities and human settlements inclusive, safe, resilient, and sustainable'.

In this context, a city requires a concrete adaptation plan for climate change. However, it has been pointed out by the OECD (2014) report that financing climate adaptation is a challenging issue that is essentially determined by the taxes paid by the citizens to the local authority. In developing countries, this capacity varies widely. In the case of Latin American countries, decentralisation has strengthened tax bases for cities and supported environmental innovation over the last 20 years. However, in Africa and Asia, a high proportion of urban governments still have extremely limited investment capacities, as most of their revenues go to recurrent expenditures.

Here the question arises: how do the cities in developing countries that are vulnerable to climate change adopt and manage the impacts of climate change? Bangladesh has prepared a climate change strategy and action plan with funding earmarked for implementation. Most vulnerable cities in continents of Africa lack the infrastructure to withstand the harmful effects of climate change (United Nations, 2015).

On a global scale, there has been diversity in the adaptation and mitigation framework of a city, vulnerable to climate change risks. Associated with the question of adaptation policy of an urban area is the concept of 'urban resilience'. According to Notre Dame Global Adaptation Initiative Urban Assessment (ND-GAIN UA) (2018), resilience is the 'Capacity of a system or city to absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and adapt, reorganize, and evolve into more desirable outcomes that improve the sustainability of the system, leaving it better prepared for future proofing climate change impacts'.

As observed, there is a gap in knowledge regarding the case-by-case city's resilience capacity to such disasters. Though there has been much published literature related to trends in climate change in cities in developed countries, this is not the case for developing nations like India. Based on the need to address this gap, this study focuses on trends in developing countries by selecting a case study approach, adding to the body of knowledge available.

The Indian Context of Urban Disaster Management and Climate Change Mitigation

The climate change crisis became relevant in the Indian context as a post-Rio phenomena after 1992, though India had been preoccupied with other pressing challenges like poverty, unemployment, slum proliferation, and urban pollution. According to Revi (2008), India had adopted the climate change policies on risks, adaptation, and mitigation process, but they were largely externally funded and focussed on the 'science of climate change'. But India has a complex problem of high densities of vulnerable population living on the edge.

A silver lining was the post-reconstruction and mitigation programmes after disasters like the super-cyclone in Odisha (1999) or the Indian Ocean Tsunami (2005). Incidentally, during this period, a number of urban development and renewal programmes, like Jawahar Lal Nehru National Urban Renewal Mission (JNNURM), targeting infrastructure development, urban poverty, and governance, had also come up. However, there was little or no consideration of urban vulnerability and disaster risk reduction in JNNURM. There is no clearly defined disaster-adaptation strategy for cities as such. In 2009, the government of India urged the states to develop a State Action Plan on Climate Change, and developed a framework document to help them identify and plan adaptation and mitigation priorities in line with the country's National Action Plan on Climate Change. However, according to the International Institute of Sustainable Development (2014), insufficient institutional capacities, budgetary constraints, and inadequate attention to the plans' potential to support climate-resilient development, has impeded the potential benefits of these plans.

One of the broader aims of this study is to addresses and understand the nature of this gap between the climate change risk mitigation measures and its convergence with urban planning and development processes in an urban context. As mentioned, for a detailed account, the study has to be contexualised.

Climatic Features of Kolkata

The city of Kolkata is located upon the delta of the Ganga. According to Bagchi (1944), most parts of the city are in the mature delta sub-region. Kolkata falls under tropical humid climate ('Aw' category in Köppen's Climatic

Classification). The annual mean temperature is 26.8 °C and monthly mean temperature varies from 19–30 °C. The city receives an annual rainfall of 1582 mm from June to September. Almost every year, various parts of the city are affected by waterlogging due to the sudden excessive rainfall. Cyclonic storms are common in the Bay of Bengal region and have been increasing in magnitude and frequency. While the location of Kolkata places it in the region of the life-giving monsoons, the catastrophic disasters caused by tropical cyclones, storm surges, and floods pose substantial threats to this region.

West Bengal is one of the most climatically vulnerable states of India, historically reporting a high number of severe cyclones along the Bay of Bengal coast. The Bay of Bengal region was struck by the highest number of cyclones in May and November according to the long-term analysis between 1891 and 2018, as revealed by the report entitled 'Assessment of Climate Change over the Indian Region' (Krishnan et al., 2019). The report revealed that the Bengal region was hit by 41 severe cyclonic storms and 21 cyclonic storms in May during the given period. The figures jumped to 72 and 55 in November during the 127-year timeline. During this period, the Arabian Sea coast was struck by fewer cyclones. The report also pointed out that a significant eastward shift in tropical cyclone genesis in the Bay of Bengal region during post-monsoon seasons had enhanced the risk for the coastal regions of West Bengal.

Relevant Findings and Analysis

This section has been subdivided for interpretation into the context, management of the disaster, the elements at risk, the level of cooperative federalism in disaster management, and the last subsection focuses on how this disaster was seen as an unprecedented debacle of biological and natural disaster.

The Context

Super Cyclone Amphan hit Bengal on 20 May 2020. The Indian Meteorological Department (IMD) had issued warnings for Cyclone Amphan, predicting a storm surge of about 13 to 16 feet (4 to 5 metres) above tide level, likely to inundate low-lying areas of South and North 24 Parganas and about 10 to 13 feet (3 to 4 metres) over the low-lying areas of East Medinipur District of West Bengal during the time of landfall. It sustained windspeeds of 170–200 km/hr. It hit the city as the coronavirus pandemic was raging and all resources were focussed upon the pandemic.

As per the reports of The Washington Post (May 2020),[1] Tropical Cyclone Amphan underwent a period of rapid intensification at the Bay of Bengal in the absence of wind shear that could have interfered with its circulation, as well as abundant moisture surrounding the storm. As reported by BBC on

22 May 2020,[2] the death toll from Amphan rose to 86 in West Bengal, 19 of whom were from Kolkata. Many neighbourhoods in Kolkata were completely waterlogged as the massive gusts of wind damaged its green cover. As reported by the Indian Express, the Mayor of Kolkata stated in a meeting on 1 June 2020 that around 15,000 trees in and around Kolkata were uprooted.

Disaster and its Management

Early warnings on Amphan by the India Meteorological Department triggered large-scale evacuations in the coastal districts of Bay of Bengal states in Odisha, West Bengal, and Bangladesh. However, according to Pal (June 2020)[3] of the Asian Institute of Technology, Thailand, the state government should have been better prepared to handle this disaster using the early warning system. According to Ghosh (2020), the disaster management of Amphan in West Bengal exposed a key weakness in India's disaster management processes that were almost exclusively comprised of relief and aid (not even rehabilitation). It is the latest reminder that one has to upgrade the disaster management system as the state struggled through a mounting relief operation amid the unprecedented COVID-19 pandemic.

An interesting observation was made by writer Amitav Ghosh[4] in his interview with the Telegraph on 1 June 2020, when he pointed out that he warned his sister and mailed his friend in the city. Quoting Ghosh, '*This is a normal reaction in Calcutta as people tend to be unshakeable in their belief that all storms either veer towards Odisha or hit Bangladesh, never affecting Calcutta*'.

This cyclone multiplied the risk of displacement by natural disaster. According to Action Aid International (2020),[5] the pandemic risk of maintaining social distance made the cyclone shelter another inevitable threat. With a lack of proper sanitation facilities, the disaster mitigation infrastructure fell short of the need to ensure social distancing. It also pointed to the need for more evacuation centres to accommodate fewer people with greater assurance of distancing, and more medical facilities and quarantine centres.

According to Majumdar and DasGupta (2020), the Chief Minister of West Bengal said that nearly 300,000 people had been evacuated from the coastal districts to 100 evacuation centres, which implies an estimated average of 3000 persons per centre.

Elements at Risk

'Elements at risk' is a generic term implying everything that might be exposed to a disaster, ranging from individual persons to communities and buildings. Linked with this idea is the concept of exposure and vulnerability that relies on area approach. In the area approach, vulnerable communities

and critical facilities are considered to be 'elements at risk' if they stay in an area that is susceptible to a disaster.

Communities

The squatters or slum dwellers and informal sector workers, suffering from multiple insecurities due to poor governance, are the communities at maximum risk due to the onslaught of disasters. Kolkata has a considerably large size of this vulnerable population. According to the Census (2011), Kolkata's slum population is 1,409,721. According to a report in Times of India (21 May 21 2020),[6] Kolkata Police had evacuated nearly 2500 slum dwellers to various community centres, schools, and night shelters before the arrival of the cyclone. In spite of being a substantial effort, this didn't secure everyone.

It is pertinent to mention here that there had been a long process of loss of jobs during the pandemic lockdown. Most poor people were thus in a hazardous situation and were exposed to environmental health risks due to lack of proper sanitation and water supply, along with nutritional deficiencies caused by hunger due to livelihood losses.

Critical Infrastructure

Both public and private infrastructure, starting from roads, railways, flyovers, airports, and other transportation systems, water and sewerage lines, power and telecommunication structures, and critical social infrastructure like schools or hospitals, already affected by the COVID-19 crisis, were affected further.

According to NDTV,[7] (as reported on 4 June 2020), Kolkata Police and the Municipal Corporation had initially sealed the city flyovers and removed road barricades. After Amphan, the Government of West Bengal sought the help of the Defence Ministry to restore the damaged infrastructures. Ten teams from National Disaster Response Force (NDRF) also came for rescue operations. The city experienced water logging and power cuts, particularly at its southern fringe, lasting almost 48 hours in certain locations. Telecommunication and mobile connectivity were also disrupted. As per the report in Indian Express on 7 June 2020, the Government of West Bengal informed the Inter-Ministerial Central Team that the losses for Amphan had been almost INR 80,000 crores.

Cooperative Federalism

In the Indian administration, disaster mitigation appears to be the joint responsibility of the centre and the state governments, but there are no constitutional mandates and there is a lack of clarity on critical issues – even the definition of 'disaster' – on the sharing ratio of expenditure between the

centre and the state governments for relief and rehabilitation. However, our Prime Minister had announced INR 1000 crores to be given as relief funds on the following day, though it was pointed out by the opposition that this Amphan relief fund was insufficient (as reported in Business Standard[8] on 24 May 2020).

The Debacle of Pandemic and Climate Change

According to the reports by Mazumdar and DasGupta (2020), Super Cyclone Amphan had been reported to have broken the spine of a state which was already impaired by the COVID-19 pandemic and the subsequent lockdowns. At that time, the pandemic was on a steep curve. With an abrupt shutdown of all economic activities, the state tried to combat the increasing spread of the disease. According to official estimates, West Bengal lost Rs. 12,000 crore in two months due to the pandemic, while the devastating effects of the cyclone incurred a loss of nearly Rs. 1 lakh crore (Mazumdar, 2020).

Lessons Learnt and Ways to Find

Evaluating the Resilience Capacity of the Urban Area

A conceptual framework was developed based on the definition of 'urban climate resilience'. Considering the case of Kolkata, a summarised evaluation has been done on the city's resilience capacity. Based on the qualitative resilience framework, namely the Rockefeller Foundation's 100 Resilient Cities (ARUP's City Resilience Framework), the following table (**18.1**) has been prepared to understand the complexities of the city and the 'drivers' that contribute to their resilience.

As one can observe, Kolkata, with a population of almost 5 million, is located in a cyclone-prone zone and has a reactive disaster management policy focussed on evacuation and infrastructure restoration. As an attempt at disaster preparedness, it had used the information of the early warning system, but as the findings reveal, the challenge of tackling the pandemic crisis had already compromised the capacity of the city to bounce back. Further, limited hazard mitigation techniques have been incorporated into the urban planning scenario. Coupled with this, Kolkata has a high population density, with a large section of the community living in slums with inadequate water and sanitation conditions and other amenities, which are very exposed to environmental health risks. This precarious situation has increased the vulnerability of the community. Post Amphan, the city was also challenged in infrastructure restoration. Hence, one can conclude that disaster resilience is yet to be developed on a large scale in Kolkata.

As Table 18.1 reveals, it was not the only lack of finances that restricted the preparedness, but also the flaws in disaster management system increase

Table 18.1 Assessing resilience of Kolkata, post-Amphan (applying ARUP's City Resilience Framework)

City	*Population*	*Region*	*People potentially affected by storm surge in Kolkata Metro area*	*Policy Type*	*Challenges to Policy Implementation*	*Resilience and Adaptive Capacity Indicator*		
						GDP (PPP)	Infrastructure	Community Facilities
Kolkata-West Bengal	4486679 (as per last census in 2011)	West Bengal (Eastern India)	1.4 million*	Disaster Risk management in Kolkata is largely inclined towards disaster response and reactive in nature. Management rescue operation, evacuation and system restoration.	Urban development or renewal programme has not been integrated into short -term or long term hazard management services. There is also a lack of clarity in the modality of responsibility sharing in disaster management-financial, social etc, between centre and state. A large size of the community is highly vulnerable to the biological and natural disaster debacle due to poverty and engagement in informal economy.	US $150.1 Billion	Housing design and design, in general do not follow hazard management principles. The urban population has access to electricity, water and sanitation services. However infrastructure system restoration like electricity, water and transport post Amphan took time.	Absence of decentralised structure for local service delivery. Adoption of responsive disaster management system. Information dissemination to community has improved utilising the technology of early warning system.

Source: Author, 2020

* (Adapted from "Mind the Risk-A global ranking of cities under threat from natural disasters, 2019")

the exposure to disaster risk. There is a growing need for the right economic and infrastructural planning towards sustainable development and the selection of appropriate policies, which were the prime challenges in the twin disaster management policy. The city also requires a new building code for the disaster-prone zones, which needs to be implemented in all houses. Besides this, protection from the rapid loss of water bodies, revamping the existing drainage systems, and addressing land subsidence that collectively make the city more prone to water logging need to be addressed, and a plethora of urgent policies which may increase the disaster preparedness of the city is the need of the hour.

Understanding the Future Disaster Risk Reduction Preparedness

As discussed, for adopting an urban mitigation framework, the objective would be to achieve the substantial reduction of disaster risk and losses in lives and livelihoods, and also prevent the loss of economic, physical, social, cultural, and environmental assets.

While the disaster risk reduction practices need to be multi-hazard-centred and multi-sectoral, inclusive, and accessible, one example in this direction may be of the Sendai Framework, which manages to guide the multi-hazard management of disaster risk in development of all sectors. It seeks to estimate if the disaster risk reduction strategies are in place. This framework has been applied in a number of studies to understand the risk of both small- and large-scale disasters, focussing on collection, analysis, and dissemination of data. Information dissemination is critical to disaster management. Data gathering, data analysis, and scientific knowledge are valuable sources of information for local and regional governments to design and assess their resilience strategy. This growing availability of data provides significant opportunities for urban planning and design. Planning for resilience requires methods of working with data and systems which can be easily translated to decision-makers to develop evidence-based, replicable practices in easily-communicated scenarios that can inform the resilience planning process.

To support the assessment of global progress in achieving the goals of the Sendai Framework, seven targets have been identified. These targets have been listed in **Table 18.2** and evaluated in the case of Kolkata post-Amphan. However, in the case of Amphan management, the official reporting of estimates showed discrepancies and the validity of the reports were subject to question.

The availability of reported data following the disaster in particular areas was divided into four sections: estimation not started, in progress, ready for validation, and validated.

As shown in Table 18.2, only the reported figure of mortality and loss of infrastructure were consistent. In other areas, data or reporting suffered from discrepancies. As reflected, there was hardly any robust estimate of the

Table 18.2 Assessment of disaster risk reduction preparedness after Cyclone Amphan in Kolkata (applying Sendai Framework)

TARGET REPORTING	*Estimation not started*	*Estimation In Progress*	*Estimation Ready For Validation*	*Validated*
Mortality			✓	
People Affected		✓		
Economic Loss		✓		
Critical Infrastructure			✓	
Disaster Risk Reduction Services		✓		
International Cooperation	✓			
Early Warning System				✓

Source: Compiled by author, 2020

composite loss due to Amphan. There were official estimates on mortality, but the grey areas in question were the people affected both directly and indirectly, so the estimated economic loss and whether the authorities both at the central or state level had sought for any international cooperation to address the disaster are questionable. Before any disaster strikes, risk adaptation and mitigation techniques need to address the particular population and elements at risk. At the city level, there were hardly any decentralized adaptive strategies to form a continuum from the neighbourhood to local level, regional, or natural level (Nath et al., 2008). Hence, the estimates reflected the same pattern.

A Suggested Urban Climate Change Mitigation Framework in Context of the Amphan-COVID Debacle

As reflected, developing an urban climate change-resilient framework would require robust dialogues among all stakeholders on urban development and growth, particularly the vulnerable ones. It is of utmost importance that the disaster risk reduction programmes are mainstreamed into urban re-development programmes and mobilization from below in terms of community-based organizations, or NGOs, are thereby crucial.

A step-by-step hierarchy is desirable.

At the **national level**, the country has not yet developed the National Adaptation Programme of Action (NAPA), which is a plan to be submitted by the country to the United Nations Framework Convention on Climate Change (Revi, 2008). Though the National Disaster Management Authority is the apex central body, its activities are carried out by respective state governments. Their programmes may be merged with the central urban development programme.

At the **state level,** changes are required at the state housing and urban planning and transport development to integrate the disaster resilient measures into spatial planning. If required, state functionaries could be trained, and capacity building initiatives are to be drawn.

At the **city level,** urban governance, planning, and service delivery network has to be developed, and institutional arrangements must be made to link the urban renewal and development programme with short- and long-term hazard management.

Looking at the logical analysis, the study can conclude that the need for such vulnerable cities as Kolkata is to build a holistic strategy combining policies addressing structural (requiring infrastructure investment), financial (to develop precautionary measures and recovery costs), and post disaster resilience capacity programmes, like contingency planning.

Conclusion

Though climate change is a global problem, its consequences are concentrated in urban areas and may disproportionately affect the poor and disadvantaged populations. Looking at this scenario, the stakeholders of the cities have a crucial role in integrating climate change adaptation and socio-economic realities into their resilience strategy. The pandemic has also been a call to reinvent urban habitats, and the need of the day is to prioritise social insurance for the poor and vulnerable, with formulation of locally led adaptation policies keeping disaster prevention goals in mind. There is an urgent need for institutional investment in economic activities that would create jobs and resilient infrastructure that protects communities and natural ecosystems.

Notes

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19 Municipal Finance

A Study of Structural Changes in Kolkata Municipal Corporation

Chandreyee Som and Santanu Ghosh

India is the largest and probably the most diverse democratic country with a federal form of government. In a federation there are three tiers of government – Central, State, and Local, each entrusted with certain functions and therefore requiring revenue generation. The functional jurisdiction of sub-national government at a given layer is significantly similar but need not be identical to each other. The central government is primarily entrusted with the management of national finance, commerce, national defence, foreign affairs, etc. The main role of a state government is to focus on social sector, viz. schools, hospitals, conservation of the environment, roads and public transport, public works, agriculture and fishing industries, community services, sports and recreations, consumer affairs, police provisions, and emergency services. Apart from the central and the state governments, there exist local governments. The local government has an important role to play both in urban and rural areas. The local government works independently of the state government, supervising the specified areas assigned to it.

As far as urban areas are concerned, the local bodies can be classified into three types:

> Municipal Corporation (to cater to the needs of the people of larger urban areas); Councils and Committees (to cater to the needs of people of smaller urban areas); and Nagar Panchayats (to cater to the needs of people of areas in transition from a rural to an urban area)

The main focus of a local government is on municipal planning and monitoring, service delivery, law-making and enforcement, policy development, representation and advocacy, etc. All the local governments of India have to perform certain responsibilities which are divided into two broad categories: Obligatory Functions and Discretionary Functions.

Some of the obligatory functions performed by the local governments in India are registration of births and deaths; supply of pure drinking water; construction and maintenance of public streets; lighting and watering of public streets; cleaning of public streets, places, and sewers; naming of

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streets and numbering houses; establishment and maintenance of primary schools; maintenance or support of public hospitals.

Some of the discretionary functions which are performed by the local governments in the country are: planting and maintenance of trees; housing for low-income groups; construction and maintenance of public parks, gardens and libraries, museums, rest houses and other public buildings; securing or removal of dangerous buildings or places.

In this chapter, we would like to analyse the budget structure of a local municipal government, and as a case study, we consider the budgetary position of Kolkata Municipal Corporation (KMC).

A budget consists of two major sides/components: viz. income and expense, including overheads and production costs and monthly, annual, average, and projection totals. Budget may be divided into two divisions: (a) Revenue Account and (b) Capital Account:

a) revenue account can further be divided into 1) Revenue Receipts and 2) Revenue Expenditures. Revenue receipts consist of direct taxes, indirect taxes, and non-tax receipts, such as fees and surpluses of public sector enterprises, while revenue expenditures consist of expenditures on defence and administration, education and health, subsidy, transfer payments, interest on public debt, etc. Revenue receipts also include another important component: government grants. The government grant is a financial award given by the federal state or local government to an eligible grantee;
b) the capital account can be divided into i) Capital Receipts (recovery of loans, proceeds from sales of assets, loans taken from the public, loans taken from the central bank, etc.) and ii) Capital Expenditure (investment of public sector enterprises).

The Kolkata Municipal Corporation (KMC) was established in 1876, under the guidance of the first minister of Local Self-Government in Bengal, Sir Surendranath Banerjee. KMC is responsible for the civic infrastructure and administration of the city of Kolkata. The city is divided into 144 administrative wards that are grouped into 15 boroughs. Each of these wards elects a councillor to the KMC. Each borough has a committee consisting of the councillors elected from the respective wards under the boroughs. The Mayor is responsible for the overall functioning of the KMC and has a tenure of five years.

The KMC is responsible for administering and providing basic infrastructure to the city, i.e., to provide water purification and water supply, street lighting, health services, education, electricity, roads and pathways, survey and records, information and public relations, garbage disposal and street cleanliness, building and maintenance of roads (streets and flyovers), solid waste management, tax on trade, property tax, etc.

The main objective of this chapter is to analyse the structural changes and patterns of the budget of the KMC over the period from 1995–96 to 2018–19.

Review of Key Debates

Though there is a rich literature on government budget in general and on India's budgetary position, there is however a relative paucity of literature on local finance in the Indian context; and as far as finance of the Kolkata Municipal Corporation is concerned, it is rather difficult to find a full-length or exhaustive study on the topic. The study of local and municipal finance assumes significance in a federal democratic setup, especially in the case of a city like Kolkata, which is not only one of the biggest metro cities, but also is one of the oldest municipal corporations in the country.

Musgrave and Musgrave (1989) showed the different pattern of federalism and discussed the different functions of the various levels of government and also covered the principles of grants design and discussed the forms and objectives of grants.

In one of the early studies, Crecine (1967) discussed increasing awareness of the importance of urban governmental activities, which drew attention to municipal expenditures and the municipal budget. This study focused on the questions of how municipalities allocated their resources. The work represented an attempt to develop a positive theory of municipal resource allocation for large metropolitan communities by empirical tests.

Kopańska (2017) analysed the revenue-expenditure decentralisation for Polish municipalities and also examined how the limits of spending and revenue autonomy influenced local government's spending behaviour, and concluded that the government's efficiency and allocative functions were restricted and influenced by the limits of local revenue and expenditure.

Bartle et al. (2011) examined the revenue trends of local government and current challenges that local government had to face for raising revenue. They also looked into the future to make recommendations to governments regarding their revenue structure. They concluded that the major changes in government revenues had been a pragmatic response to major external events like war, recession, inflation, etc. and stated that the local revenue is also influenced by the state government's policies.

Garay et al. (2013) jointly examined the relationship between the allocations of funds of local government and the economic well-being of the citizens. They discussed the optimal ways in which every dollar could be spent by the local government. The result suggested that some kinds of government expenditure positively influenced the well-being of the citizens. They also argued that the allocation of expenditures of local government affects the wealth status of the citizens, especially education.

Mitra (2002) discussed the KMC's utilisation of private services to solve its waste management problem in the largest wholesale fruit market in the city of Kolkata. As is well known, like any other old and large municipality, the KMC is required to discharge wide-ranging and extensive civic functions. This ranges from the running of primary schools, maternity homes, slaughterhouses, and markets to the provision of water supply and waste management services, among others. It has come to be recognised that the provision of many such services has no direct bearing on their civic responsibilities.

Kelly and Riverbark (n.d.) jointly researched the use of performance measurement points. Most municipalities self-reported that they had collected performance data on a regular basis, but would use the information only sparingly during the budget preparation process. To explore what was actually happening, the authors began a case study of small-sized municipalities and expanded it into similar-sized cities in the same area. They concluded that most municipalities were indeed collecting performance data, but were simply adding them to the budget document after the deliberation process was over.

Skidmore and Deller (2008) tested the convergence of government spending using detailed data from Wisconsin for a variety of municipal government expenditure categories over the period from 1990–2000, and their empirical exercise provided compelling evidence of convergence in per capita government spending for all the expenditure categories they studied.

Objectives and Methods Used

The main objective of this chapter is to provide an analysis of the state of the financial health of the Kolkata Municipal Corporation (KMC) and examine the structural change, if any, in the KMC's budgetary position during the period from 1995-96 to 2018-19.

As far as the methodology for the purpose of the analysis is concerned, we use simple statistical tools and techniques, like tables, line diagrams, and pie charts. We have attempted to analyze the trend in total revenue receipts and total expenditures vis-a-vis trends in surplus/deficit over the period under consideration. In order to derive the compound annual growth rates of the relevant variables, we use the following linear equation:

$$\text{Ln } Y_t = a + b.t + u_t \quad (1)$$

We estimate the trend line by the Ordinary Least Square (OLS) method. It needs to be mentioned that as per this equation, we cannot regress deficits because deficits are negative values. There are some digits with negative values and the log cannot take the negative values.

Since the study is basically a time series analysis of the budget of the KMC, one requires preferably continuous data, i.e., data without gaps. Unfortunately, budget data were not available for a few years. In order

to fill the gaps and make the series continuous, we used the interpolation method in these cases.

In order to examine the changing structure in the budget and/or financial health of the KMC, we have also used a simple formula for the concentration index (Hirschman Index). The index is given by the following formula:

$$H = \sqrt{\sum x_i^2} \tag{2}$$

where x_i is the share of the i-th component in the total. The value of the index varies between 0 (zero) to unity (1). As the value of the index increases or gets closer to 1, the degree of concentration increases. Thus, by looking at the trend in H, one may understand the changing composition in the budget structure. When, for example, the value of H is small, that means the budget is more balanced in terms of shares of different components. We have presented a univariate analysis of each concentration index for tax revenues, non-tax revenues, government grants, and expenditures, and have compared the trend of different concentration indices in terms of line diagrams. The regression equations have been estimated using R software.

The database of the study is primarily the budget documents of the Kolkata Municipal Corporation.

Analysis of the Budget Structure

Any budget has two broad sides: revenue side and expenditure side. In general, we speak of receipts and expenditures, where receipts are usually divided into revenue receipts and capital receipts, while expenditures are divided into revenue expenditures and capital expenditures. For national and state governments, capital receipts and expenditures, especially the latter, assume importance. For a local government, the scope of importance of these components is relatively limited. For our purposes, we shall therefore confine ourselves to revenue receipts and expenditures. Each of these two can again be divided into different sub-categories. Revenue receipts can be divided into tax revenues, non-tax revenues, and government grants. The components of expenditures and non-tax revenues are divided into three broad parts: 1) infrastructural services, 2) social services, and 3) other services. Expenditures on infrastructure contain water supply, roads and footpaths, administration and support, sewerage and drainage and electricity services; social services contain education, health, and *bustee* services; the category 'other services' contains solid waste management, municipal markets, motor vehicles, and special programmes.

For non-tax revenue component, infrastructure contains water supply, sewerage and drainage, land and estates, roads and footpaths; social services contain amusement fees and health services; and 'other services' contain receipts from car parking, receipts from licences, solid waste management, building plan sanction fees, and municipal markets.

Having made these preliminary remarks, let us now delve into the changing state of the financial health of the KMC. We do so by analysing item-wise revenues and expenditures. Before proceeding further, we need to mention that for the purpose of our analysis some items of revenue and expenditure have not been considered because of non-availability of continuous data and/or relative insignificance of the components in the overall budget. The items that have been omitted from our analysis are charges on central government's properties; receipt on advertisement fees, receipt from sales of condemned materials, interest on fixed deposit, unclassified receipts (all under non-tax revenue); and expenses on social welfare and urban poverty alleviation, loan charges, and payments towards security arrangement (under expenditure). Accordingly, while presenting the data in the tables at the end in the appendix, in some cases some apparent discrepancies may apparently emerge, which should disappear once we take into account all the components for all the years.

The Trend in Total Revenues and Total Expenditures

In Figure 19.1, we have shown the trend in revenues and expenditures of the KMC during the period from 1995-96 to 2018-19 by plotting the line

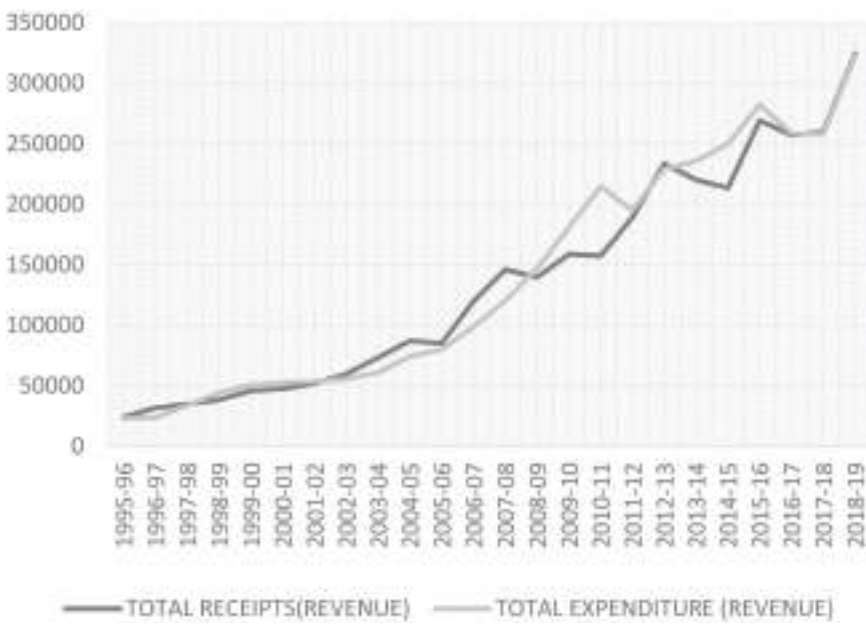

Figure 19.1 Trend in total receipts and total expenditures, 1995–2019 (figures in Lakhs of Rupees)

Source: Computed from KMC budget documents

diagrams of the same – i.e., over a span of two decades; the figures have been presented in Table 19.11 while Figure 19.2 depicts the corresponding trend in budget surplus/deficit.

It is observed that receipts and expenditures were very close between the years 1995 and 2003; during 2002–2008, a small budget surplus emerged. Between the years 2008 and 2012, the receipts lagged behind the total expenditures, resulting in the budget deficit. After 2013, a budget deficit again emerged (when one considers the actual figures instead of planned or projected figures). Again, from 2016, receipts and expenditures became very close.

From the figure, we observe during the period under consideration that there was a budget deficit in two years, 2000–2001 and 2001–2002. The KMC started to enjoy a budget surplus from a part of the year 2001–2002, reaching the peak level at Rs. 25549.92 lakhs in the year 2007–2008. It continued up to a part of 2008–2009 and after that, it started to decline, and it reached a minimum when deficit stood at Rs. 57492.72 lakhs in 2010–2011. Then after 2017, we again observe a state of surplus.

Table 19.1 Total receipts and total expenditures, 1995-96 to 2018-19 (figures in Lakhs of Rupees)

Year	*Total Revenue Receipts*	*Total Revenue Expenditures*	*Surplus or Deficit (Rounded)*
1995–96	24159.2	23213.8	945
1996–97	31623	23668.2	7955
1997–98	34769.3	33763.3	1006
1998–99	38366.4	43916.4	–5550
1999–00	45780.9	50607.8	–4827
2000–01	47461.1	52591.6	–5131
2001–02	51850.8	53476.3	–1626
2002–03	59729.2	55811.7	3918
2003–04	73286.1	60834.5	12452
2004–05	87094.9	74242.2	12853
2005–06	85145.2	80029.6	5116
2006–07	119770	98708.7	21061
2007–08	145942	120392	25550
2008–09	139540	146961	–7421
2009–10	158664	180840	–22176
2010–11	157331	214824	–57493
2011–12	189067	194848	–5781
2012–13	233559	229281	4278
2013–14	219993	235650	–15657
2014–15	213464	249902	–36438
2015–16	269200	282213	–13013
2016–17	257096	258422	–1326
2017–18	259988	257975	2013
2018–19	324474	322717	1757

Source: Computed from KMC budget documents

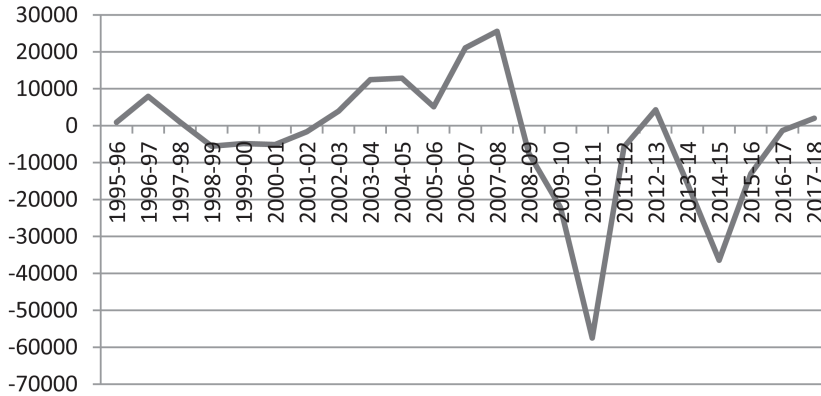

Figure 19.2 Trend in budget surplus and deficits, 1995–2019 (figures in Lakhs of Rupees)

Source: Computed from KMC budget documents

Having depicted the overall trend of revenues and expenditures, let us now examine the compound annual rates of growth (CARG) of the components of these two broad budgetary variables. In order to estimate the CARG of the major components of the budgetary components, we now regress Tax Revenue (TXR), Non-Tax Revenue (NTR), Government Grant (GG), Total Receipt (TR), Total Expenditure (TE), and Own Resource (OR) over time (t); we have estimated Equation (1) for each of the variables by applying the '**R**' software.

The parameter estimates are reported in Table 19.2. On the basis of the parameter estimates furnished in the table, we find that total government grants recorded the highest growth rate (12.69%) while the resources recorded the lowest growth rate (9.59%).

This is understandable, given the tendency among policy-makers in the government to take populist measures and/or reluctance to make harsh decisions in spite of economic reforms. Further, the government grant also grew at a rather higher rate, and this may be because of greater decentralisation and devolution, especially after the 74th Constitution Amendment, which gave greater powers to the municipalities. It also indicates that on the one hand, the local governments rely more on the financial resource transfer from above and on the other hand enjoy, possibly, limited scope to generate its own resources. One needs to recall here that while the union government constitutes Finance Commissions in every five years as per the Constitutional provision and obligation, the state governments do not follow the same. It is the task of the State Finance Commission, analogous to the Central Finance Commission, to recommend formulas for the devolution of the resources from the State to the lower/local tiers of government.

Table 19.2 Parameter estimates of growth equation

VARIABLES	*INTERCEPT (a)*	*SLOPE COEFFICIENT (b)*	*R-SQUARE*	*CARG*
Ln(TXR)	9.1116	0.1027	0.96	10.82%
SE	(0.065)	(0.00456)		
t-stat	(140.15)***	(22.52)***		
Ln(NTR)	8.7714	0.1027	0.90	10.82%
SE	(0.1014)	0.0071		
t-stat	(86.49)***	(14.46)***		
Ln(GG)	9.2126	0.1195	0.98	12.69%
SE	0.049	0.0034		
t-stat	(187.96)***	(14.41)***		
Ln(TR)	10.1686	0.1109	0.97	11.73%
SE	0.0560	0.0039		
t-stat	(181.58)***	(28.44)***		
Ln(TE)	10.1005	0.1160	0.96	12.30%
SE	(0.0694)	(0.0048)		
t-stat	(145.54)***	(24.17)***		
Ln(OR)	10.3476	0.0916	0.83	9.59%
SE	(0.1128)	(0.0098)		
t-stat	(91.73)***	(9.35)***		

Source: Computed from KMC budget documents

*** 1% level of significance

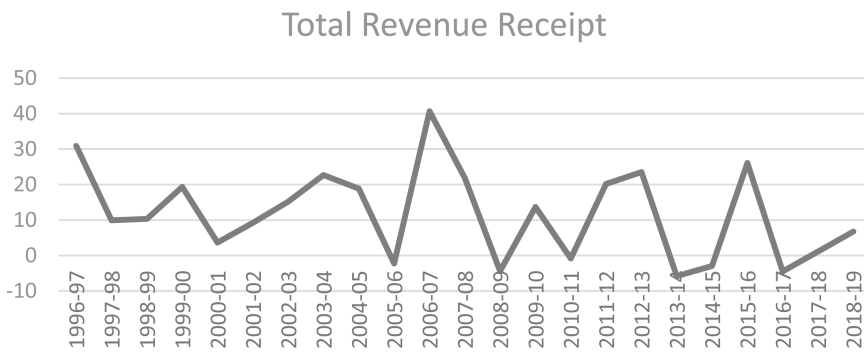

Figure 19.3 Annual (year-to-year) growth rates in total revenues

Source: Computed from KMC budget documents

Unfortunately, this is not followed at the state level and as a result, municipal and other local bodies do not enjoy the scope of increase in or greater power of own resource generation. These bodies, accordingly, have to rely heavily on the state government for funds.

Figure 19.3 shows the year-to-year changes of the revenue receipts and from it, one infers that the annual growth rate in the total revenue receipt is

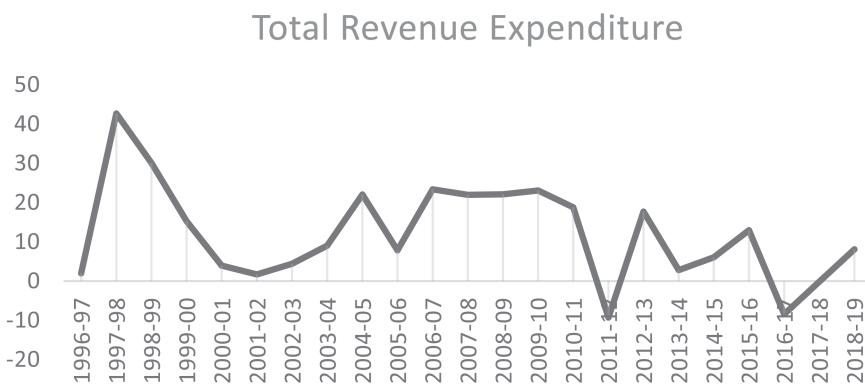

Figure 19.4 Annual (year-to-year) growth rates in total expenditures
Source: Computed from KMC budget documents

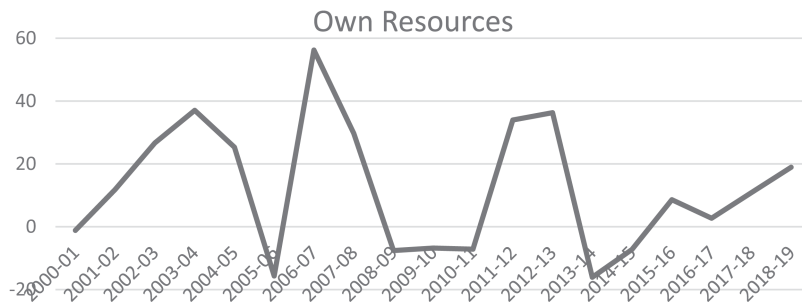

Figure 19.5 Annual (year-to-year) growth rates in own resources
Source: Computed from KMC budget documents

more or less haphazard or fluctuating. In the case of expenditures, the fluctuations in the annual growth rate have comparatively been lower. Thus, we may possibly assert that while revenue expenditures have been less stable, revenue expenditures have behaved rather consistently. The annual growth pattern of own resource has also fluctuated, though in this case, the revenue receipt has a less pronounced fluctuation.

Trend in Expenditures

Having discussed the revenue side, we now turn toward the expenditure side of the budget and its different components. We divide the expenditure components into three sub-groups: infrastructure, social, and others.

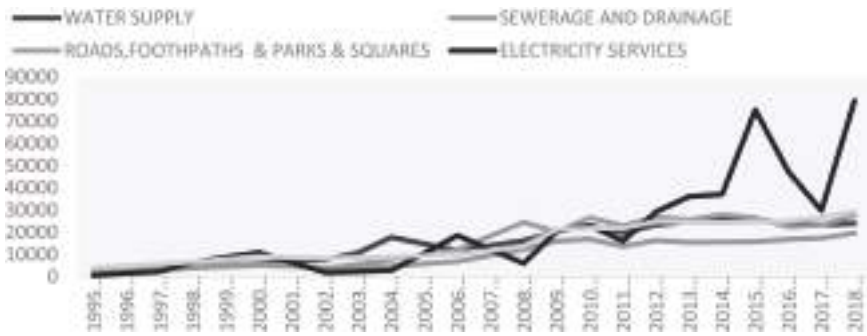

Figure 19.6 Trends in infrastructure expenditures on major components (in Rs. Lakhs)

Source: Computed from KMC budget documents

Infrastructural services contain water supply, sewerage and drainage, roads and footpaths and parks and squares, administration and support, and electricity services. Figure 19.6 depicts trends in the components of expenditures. We find that there is a steady increase under every head of expenditure from 1998–99. After the new/present government assumed power in 2011–12, expenditures in water supply and electricity have increased more than before. The rise in electricity expenditure is understandable because of the fact that since the installation of the Trinamool Congress (TMC)-led government, the authorities have taken a big step in beautification and as part of that, the roads and streets under the KMC are being illuminated rather profusely. Expenditures on administration and support have increased more than the other components over time. Expenditures on electricity increased the most in 2015–16, but decreased suddenly in 2018–19 and then increased again. We may say that administration and support and electricity have received more attention than the other components under the regime of the ruling party.

It needs to be noted that expenditure on 'other services' includes expenditures on solid waste management, motor vehicles, municipal markets, and special programmes. Here also, there is an increasing trend in every component. A glance at Figure 19.7 reveals that expenditures on special programmes jumped sharply after 2006–07, with a sudden drop in 2013, and thereafter it regained its level to a large extent. As far as this figure is concerned, one trend needs to be stressed with respect to solid waste management. This item of expenditure occupies a very important place in municipal finances. The population and the various activities under the KMC have grown; along with this growth, the KMC is facing growth in municipal wastes; the changing lifestyle of the urban population where '*use and throw*'

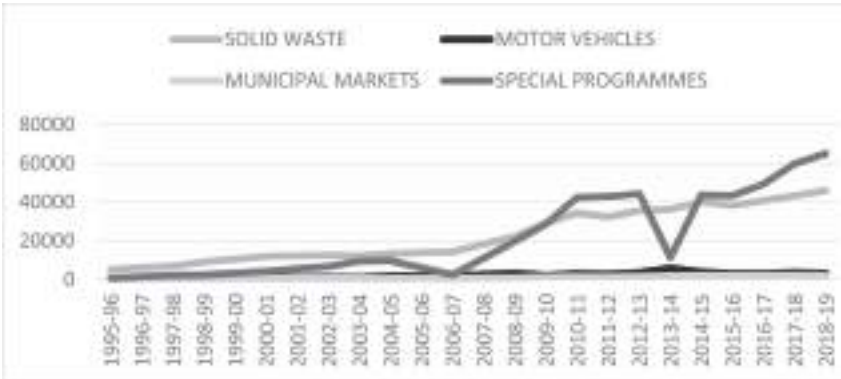

Figure 19.7 Trend in expenditures on other components (in Rs. Lakhs)
Source: Computed from KMC budget documents

culture has become quite pronounced is one of the causes of the steep rise in solid wastes; in recent years, the so-called e-wastes have also become a cause of concern. The city needs a proper garbage disposal plan, and the citizens also need to be made aware of the issue. Unfortunately, the overwhelming population under the KMC jurisdiction has still not inculcated the habit of garbage segregation and there is very little attempt to induce people to go for the *reduce-reuse-recycle* philosophy.

In Figure 19.8, we have shown the trends in the different components of social services. This category contains education, health, and *bustee* services. After 2006–07, expenditures on health service increased sharply, but after 2013–14 it slightly decreased and again decreased in 2016–17. Bustee services also increased, though the increase became rather sharp after 2006–2007. The erstwhile Left Front government won its last elections in the state in 2006 and it is possible that after the elections, the government took a more proactive role in extending municipal services to the slum population. We also find that of the three components under social services, education occupies the lowest priority in terms of expenditure. We should recall that in recent decades, the demand for municipal primary schools has significantly declined due to a number of economic and social factors. Many of the KMC schools have been closed down or have been merged with others for want of an adequate number of pupils. In contrast, *bustee* services and health services still occupy important places in the budgetary provisions, and governments have usually attempted to become populist. In order to understand the nature of emphasis on three broad sub-groups of expenditures, we have divided the whole period into two: the first phase covering the years 1995-96 to 2010-11 and the second phase covering the period 2011-12 to

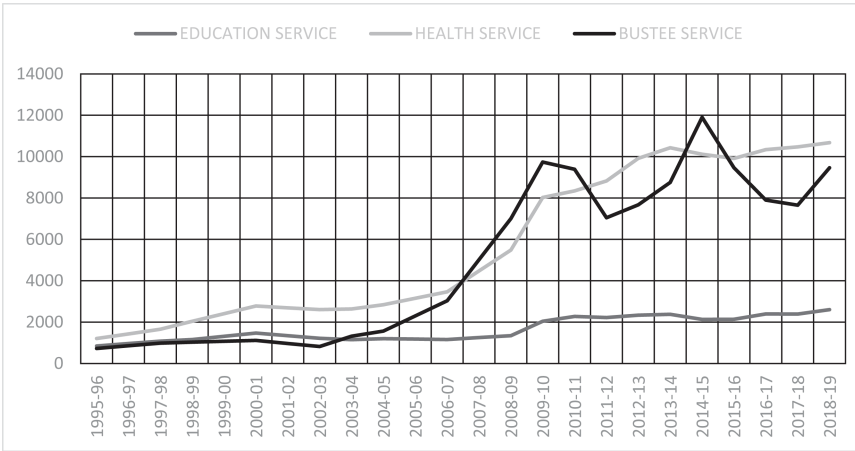

Figure 19.8 Trend in expenditures on social services (in Rs. Lakhs)

2018-19. While the first phase refers to the erstwhile Left Front rule, the second phase refers to the TMC regime. As far as the relative importance of the components is concerned, we find that during the period between these two phases, one cannot discern substantial change in the expenditure scenario. Infrastructure accounts for the major head of expenditure under both the regimes, though in the TMC regime there is some decline in the emphasis on infrastructure while in case of 'other services', it is the opposite. In 1995–2003, infrastructure accounted for the major share of total expenditure, viz. 58%, followed by expenditure share of social sectors at 33% (Figure 19.9). A comparison of the shares across the three sub-periods 1995–2003, 2003–2011, and 2011–2019 indicates that there has been little change in the broad composition.

The Trend in Tax Revenue Receipts

We now take up the revenue side of the budget. Figure 19.11 depicts the trend in the property tax revenues over the years under consideration.

From this figure, we can conclude that property tax has almost steadily risen over time and reached the maximum in the year 2018–2019 at Rs. 84405.8 Lakhs.

The major items of tax revenue are property tax, tax on trade professions and callings, tax on advertisements, and tax on carts and carriages. In the diagram for Figure 19.12, we show the trend with respect to non-property tax revenue: tax on trade, advertisement tax, and tax on carts and carriages. Of the three components, tax on carts and carriages is the least important source of revenue, while in recent years income from trade professions and

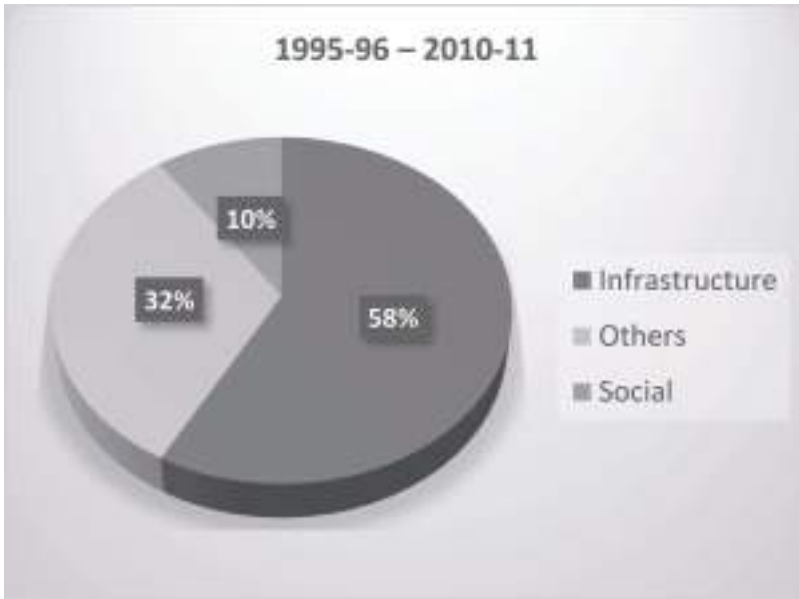

Figure 19.9 Expenditure shares of broad components, 1995-96 to 2010-11
Source: Computed from KMC budget documents

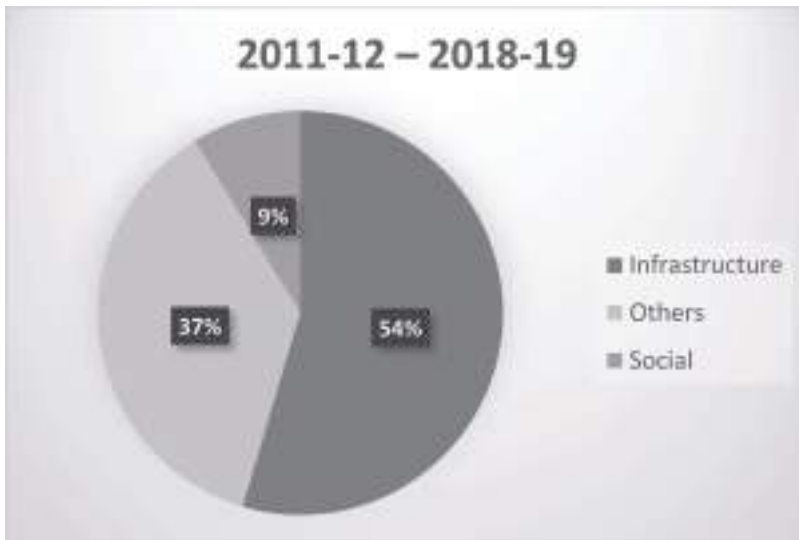

Figure 19.10 Expenditure shares of broad components, 2011-12 to 2018-19
Source: Computed from KMC budget documents

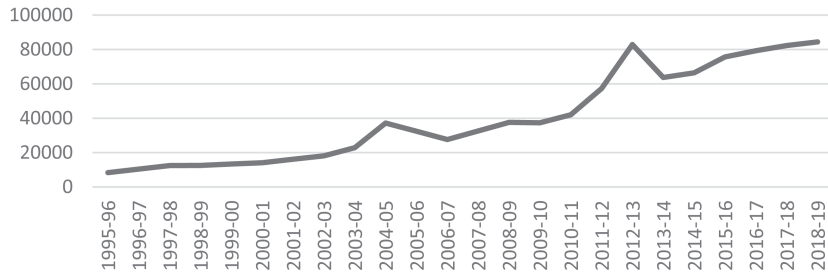

Figure 19.11 Trend in property tax revenues (in Rs. Lakhs)
Source: Computed from KMC budget documents

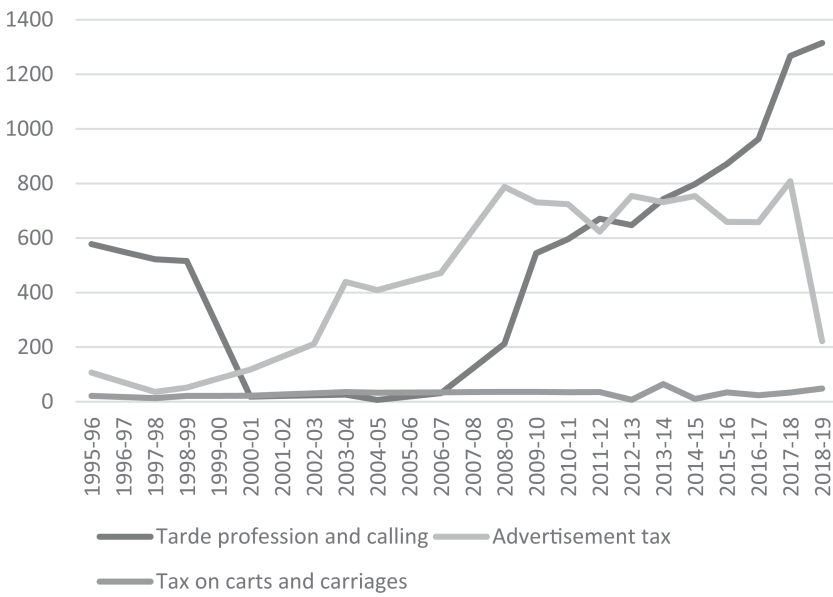

Figure 19.12 Trend in components of non-property tax revenues (in Rs. Lakhs)
Source: Computed from KMC budget documents

callings has not only been steadily rising but also has become the principal source in this sub-category. This points out the greater role of and growth in trade and commerce under the jurisdiction of the KMC. Tax from advertisements is also an important source, which is obvious from the fact that the KMC area has been flooded with giant flexes, among other modes of advertisements.

Having discussed the trend in absolute figures of tax revenue and its components, we now look at the shares in the two sub-periods – i.e., during the Left rule and during the rule of the present party. We have represented the scenario in the pie charts.

From the charts it is observed that of the four components, property tax contributes the overwhelming share, and across the three sub-periods or

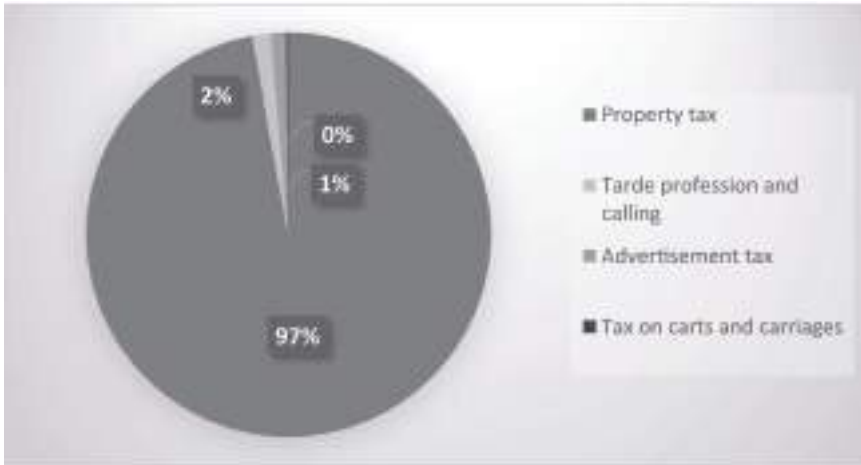

Figure 19.13 Tax shares of different components, 1995-96 to 2010-11
Source: Computed from KMC budget documents

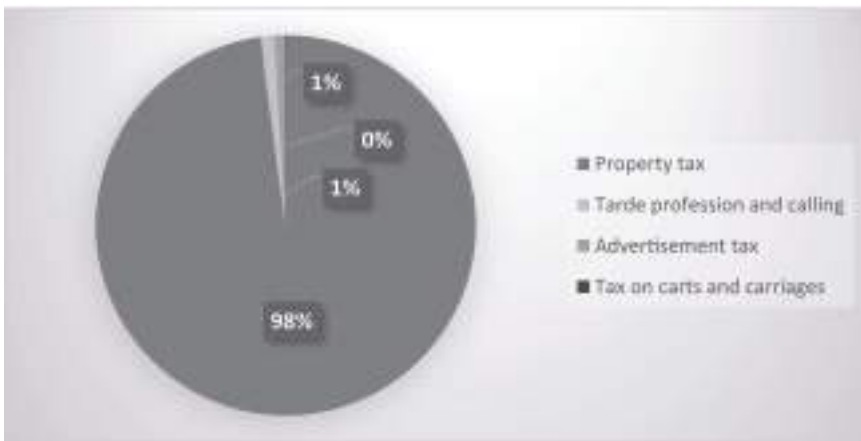

Figure 19.14 Tax shares of different components, 2011-12 to 2018-19
Source: Computed from KMC budget documents

throughout the study period under consideration, there has virtually been no change in revenue composition. The KMC still heavily depends on property tax collections and, accordingly, utmost attention is required to rationalise and modernise the property tax rules, as well as plug leakages in it as the result of alleged corruption in the KMC's building department. One should also recall that the KMC area stretches over a larger geographical area than it did a few decades ago. The traditional area of the city is full of old buildings, many of which are in dilapidated condition and have been occupied by tenants for generations who pay paltry rents; again, there are numerous buildings which are entangled in family disputes and litigations. Th scarcity of space and rising demand for accommodation in the KMC area have created a new building boom; construction of high-rises and flats has ensured that the new residents or the owners of the newly constructed flats are assessed of their properties at higher rates.

The Trend in Non-Tax Revenue Receipts

Let us now take up the non-tax revenues. Here, receipts come from three sub-groups, viz. infrastructure, social, and others (as in the case of tax revenues). Infrastructure receipts contain revenues from the water supply, sewerage and drainage, land and estates and roads, parks, and squares. In Figure 19.15, we have shown the trend in absolute volumes of different items. But among these items, receipts from parks and roads and squares increased more than the other components after 2006–2007, reaching a peak level at Rs. 12638.64 lakhs in 2017–18. This increase is possibly

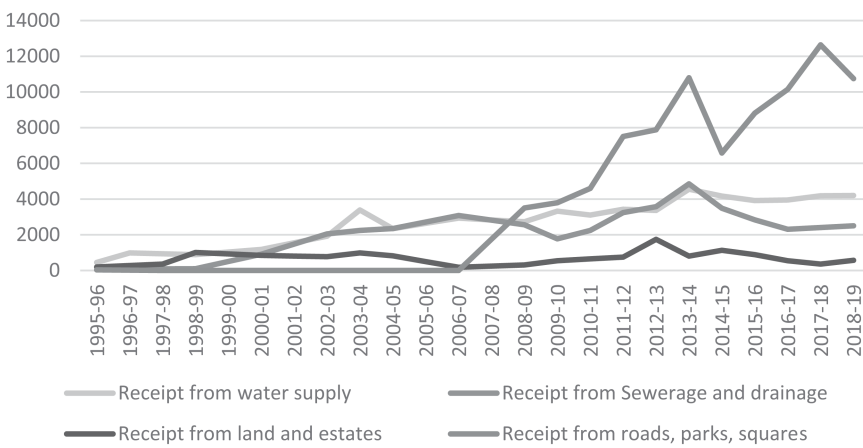

Figure 19.15 Trend in non-tax revenues from infrastructure, 1995-96 to 2018-19 (in Rs. Lakhs)

Source: Computed from KMC budget documents

attributed to a marked increase in the sale of vehicles and same on the city roads.

Receipts from social services contain revenue from amusement fees and health services. While receipts under amusement fees have steadily been increasing at an increasing rate, the same from health services has also more or less risen steadily (see Figure 19.16).

The category 'other services' contains revenues from car parking, solid waste management, charges from licences, building plan sanctions, and municipal markets. Looking at the trend in the components, we can state that the revenues from car parking fees, solid waste management, and building sanction have increased faster than the other components, especially after 2000–2001. The contribution of the components like licences and municipal markets has relatively been rather meagre. It needs to be mentioned that the bulk of the daily trading in vegetables and many other items in the KMC area takes place on pavements and on open roads, thereby depriving the KMC of claiming trade taxes and other fees as applicable to licensed traders.

We now consider the shares of non-tax revenue components across the two sub-periods, stated earlier.

A comparison between Figure 19.18 and Figure 19.19 indicates that there has been some distinct structural shift in the composition of non-tax revenues across the two phases or regimes. While during the Left Front rule the category of 'others' dominated as the non-tax revenues, in the post-2010 era, the dominance of this category has fallen to some extent and the slip in the share of this component has mostly been accounted by the rising

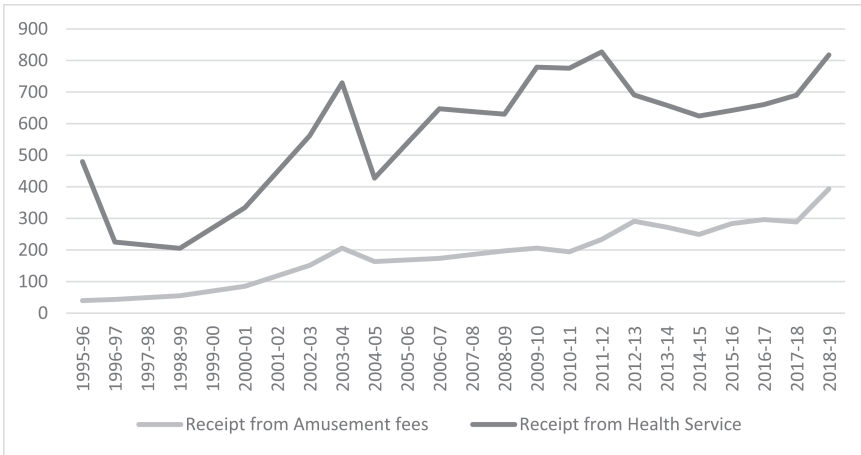

Figure 19.16 Trend in non-tax revenues from social services, 1995–2019 (in Rs. Lakhs)

Source: Computed from KMC budget documents

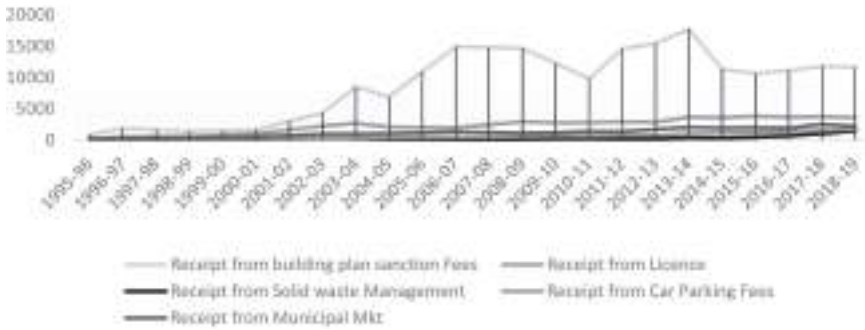

Figure 19.17 Trend in non-tax revenues from other sources, 1995–2019 (in Rs. Lakhs)

Source: Computed from KMC budget documents

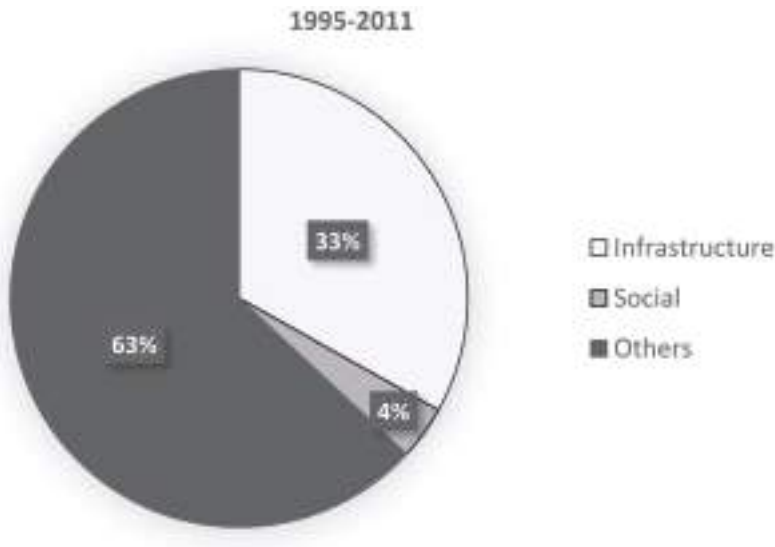

Figure 19.18 Trend in shares of non-tax revenues, 1995-96-2010-11

share of the 'infrastructure' category. The role of social services as a source of revenue is almost negligible in terms of shares. This is understandable because of the fact that many of the social services of the government are fundamentally public goods, mostly enjoyed by the low-income classes and, accordingly, there is limited scope to heavily tax such services and/or impose high user charges.

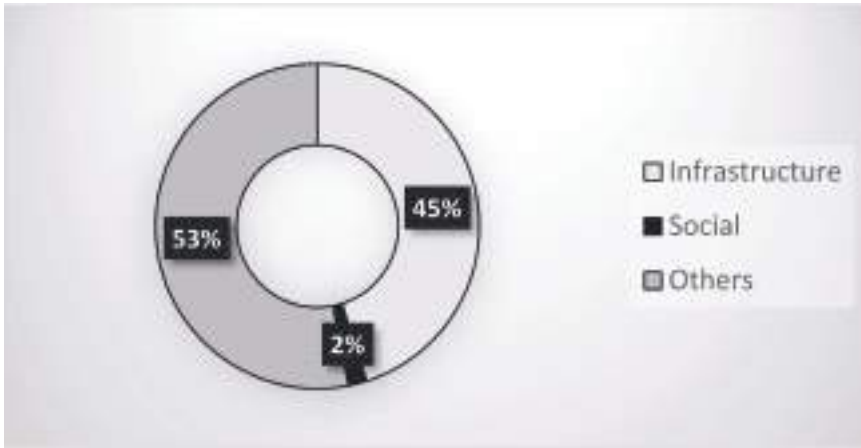

Figure 19.19 Trend in shares of non-tax revenues, 2011-12 to 2018-19
Source: Computed from KMC budget documents

Government Grants

Finally, we consider the component 'government grants'. There has been a marked rising trend in the shares of pulse polio programme and development grants in total grants over the years.

Concentration Index

So far, our focus of analysis has mostly been examination of the trend in the different components of the budgetary variables and the relative importance of the various items in the total receipts and expenditures. While analysis of growth of the variables is one aspect, there is another objective of the present study: examination of the structural change, if any, in the budgetary position. The question of the structural change is important as it helps us to capture the qualitative changes in budgetary health. This issue may be captured in different ways. For our purpose, we propose to do in the simplest manner by relying on the Hirschman Index of Concentration (H), the formula of which was given in Equation 2. As stated earlier, a rising value of H indicates a rising imbalance within the budget components where few items dominate in terms of respective shares. On the other hand, a falling tendency would indicate a greater degree of equality among the different categories and, consequently, greater diversification in the structure of the budget. A change in the value H may be inferred as an indicator of structural change. In order to analyse the nature of change in the composition of different components in the total budget of the KMC, we have computed

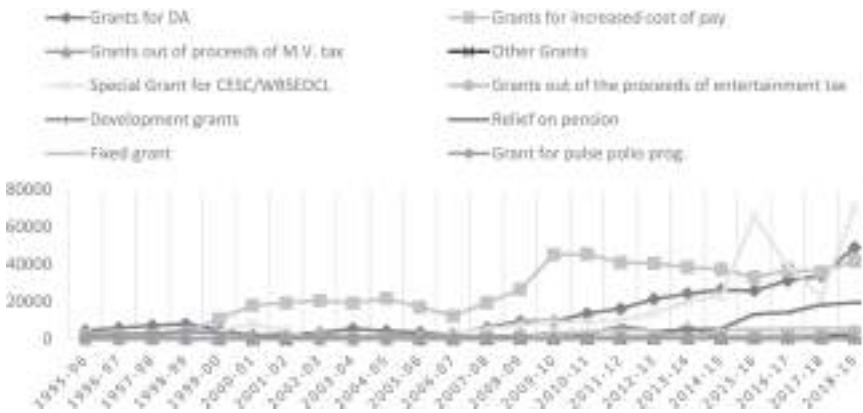

Figure 19.20 Trend in different components of government grant (in Rs. Lakhs)
Source: Computed from KMC budget documents

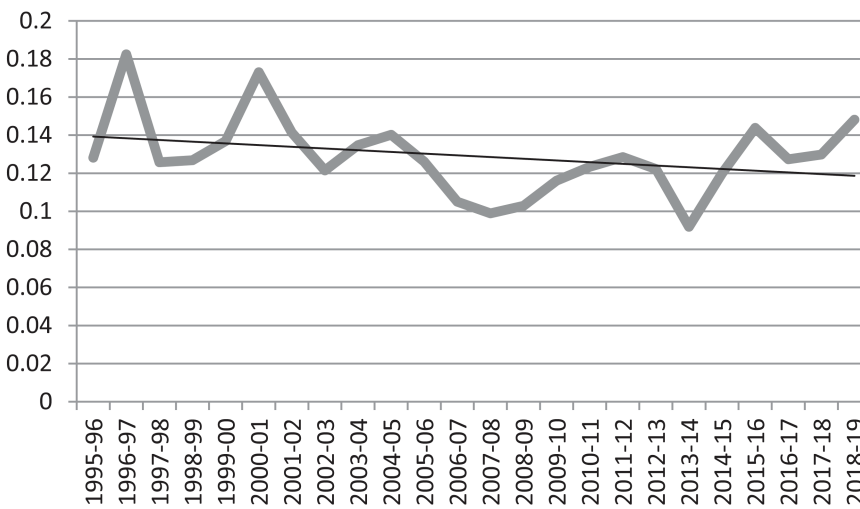

Figure 19.21 Index of concentration for revenue expenditure
Source: Authors' computation

the Hirschman Index of Concentration (H) and examine its trend over the years.

Based on the following trend lines, we observe that the value of the concentration index for (i) revenue expenditure is showing a slightly declining trend; (ii) non-tax revenue receipts are fluctuating; and (iii) tax revenue is nearly stable.

In Figure 19.23, we have depicted the concentration index for tax revenue; in this case, the trend line is nearly or mostly flat, thereby indicating no structural transformation within this category. The relative importance of different components of tax revenue has virtually remained unaltered over the years. Among other things, we also observe (from Figure 19.25) that the index of concentration for tax revenues has consistently been much higher than other categories. This is corroborated by the fact that the property tax has an overwhelming dominance as a source of tax revenue. After comparing the concentration index for non-tax revenues and expenditures, we conclude that concentration on non-tax revenue is more or less higher than the concentration on expenditure, although in the late years.

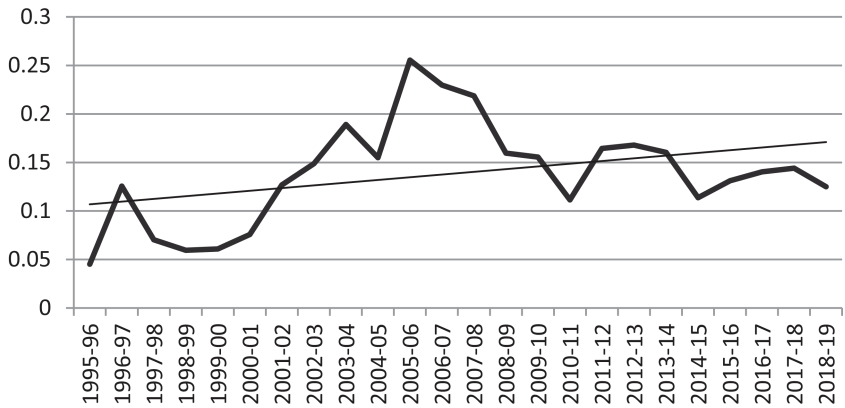

Figure 19.22 Index of concentration for non-tax revenue receipts
Source: Authors' computation

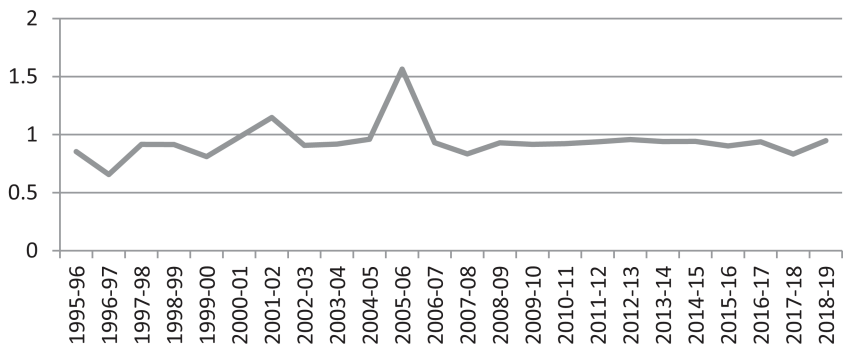

Figure 19.23 Index of concentration for tax revenue
Source: Authors' computation

Figure 19.24 Index of concentration for government grants
Source: Authors' computation

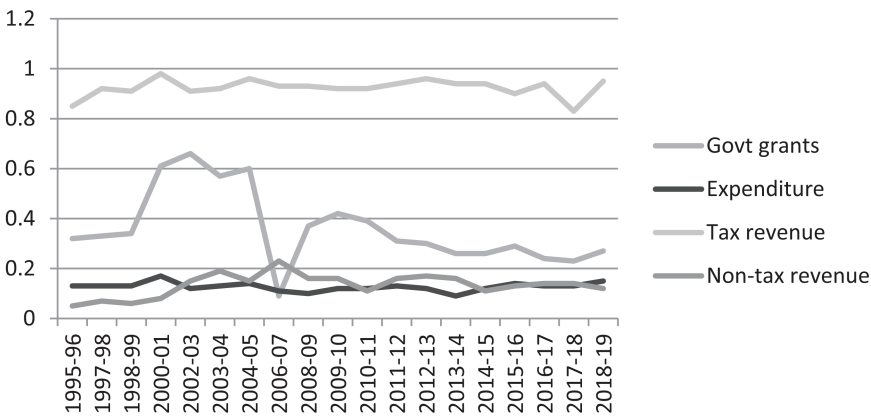

Figure 19.25 Comparison of indices of concentration for different items
Source: Authors' computation

In the 1990s the degree of concentration within the non-tax revenue category was lower than the same on the expenditure side. The concentration index in the case of government grants is on the whole higher than the non-tax revenue and expenditure, in spite of a sharp fall in the value in 2006–07. From the picture, it emerges that as far as government grants are concerned, there may be greater degree of imbalance within it, but there is a declining trend that indicates some structural change within this item.

Conclusions

In the preceding sections, we have made a rather detailed study of the trend and broad structural changes in different heads and components of the budget of the KMC over a span of roughly two and half decades. Based on our analysis, we may now make the following concluding observations:

Comparing total revenue receipts and total expenditures, we have found that both the receipts and expenditures have increased over time. In the early phase, there was a surplus, but later it turned into a deficit. Hence, the KMC needs to finance the deficit either by lowering the unnecessary expenditures or by increasing the tax collection. Further, we have found that the compound annual rate of growth has been highest for expenditures. Analysis of the budget data suggests that expenditures on health services, bustee services, special programmes, electricity, administration, and support and infrastructure receive more emphasis than other heads, while expenditure on education has become least important. As far as receipts are concerned, property taxes are the dominant source of revenue. With respect to non-tax revenues, collection from roads, parks and squares, health service, car parking, building plan sanctions, and solid waste are much higher than the other components. Finally, comparing the concentration indices, we infer that the Hirschman Index (H) for tax revenue is higher than the other items; in other words, the KMC's tax base is relatively lopsided because of relatively heavy dependence on property taxes as a source of revenue. On the whole, in terms of trends in the value of H for different categories, one may not discern the significant structural change in the composition of the KMC's budget.

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Note: **Bold** page numbers denote references to tables and *italic* page numbers denote references to figures

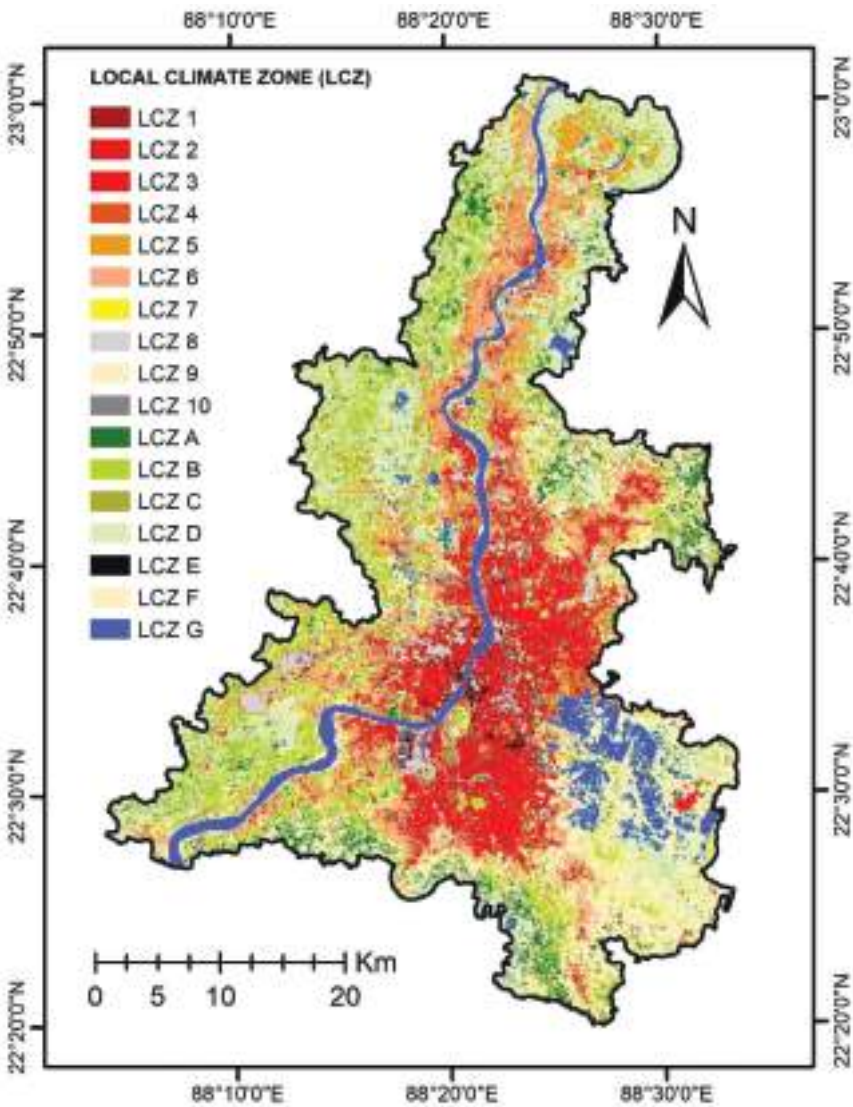

Figure 11.2 Local Climate Zone (LCZ) over Kolkata Metropolitan Area (KMA). Prepared based on level 0 methodology proposed by the World Urban Database & Access Portal Tools (WUDAPT: Stewart and Oke, 2012).

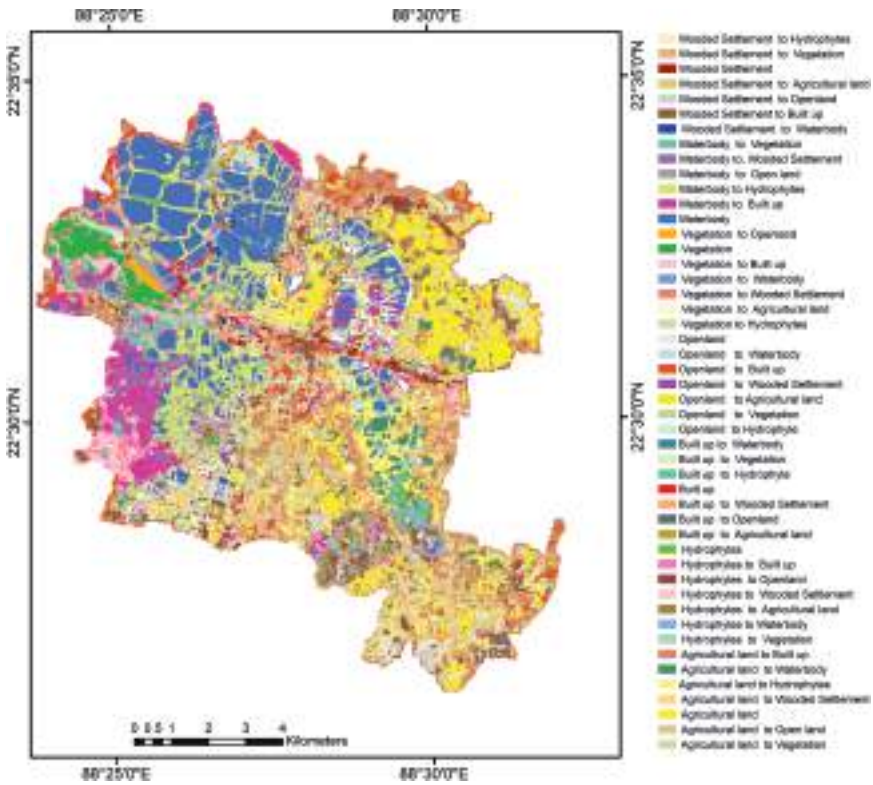

Figure 13.6 The spatial distribution of LULC changes between 1970 and 2020