

NAGARLOK

Quarterly Journal of Urban Affairs



ISSN-0027-7584



Centre for Urban Studies
Indian Institute of Public Administration

NAGARLOK

Chairman, Editorial Advisory Board
Surendra Nath Tripathi, Director, IIPA
and Editor, *NAGARLOK*

Members

ROY W BAHL
Regents Professor of Economics,
Andrew Young School of Policy
Studies, Georgia State University,
Atlanta.
P.K. CHAUBEY
Former Professor of Economics, IIPA,
New Delhi.
SANJAY KUMAR
Joint Secretary ((NULM)
Ministry of Housing and Urban Affairs
Government of India
O.P. MATHUR
Professor of Urban Governance,
Institute of Social Sciences,
New Delhi.

K.K. PANDEY
Professor of Urban Management,
IIPA, New Delhi.
P.S.N. RAO
Director and Professor,
School of Planning and Architecture,
New Delhi
ANWAR SHAH
International Consultant
of Public Economics, Brookings
Institutions, Washington DC,
Centre for Public Economics
SWUFE.
M.P. SINGH
Editor, Indian Journal of Public
Administration, New Delhi.

Member Secretary

V.N. ALOK
Associate Professor, IIPA and
Assistant Editor, *NAGARLOK*

Copy Editor: USHA JHA

About the Journal

Nagarlok emphasises research and scholarly analysis on urban themes: urban life, metropolitan systems, urban economic development and urban policy. With a cutting edge approach to linking theoretical development and empirical research, *NAGARLOK* encompasses key material from an unparalleled range of critical, comparative and geographic perspectives.

Disclaimer

The views expressed in the items published in the journal are those of the authors and do not in any sense represent those of the IIPA, publisher and editor. Copyright of the materials published belong to the IIPA but they may be reprinted/published elsewhere with our formal permission and acknowledgement to this journal plus a complimentary copy to our library. All contributions should be sent to the Assistant Editor, NAGARLOK at nagarlok@gmail.com. Business enquiries should be addressed to the Registrar, IIPA, I.P. Estate, Ring Road, New Delhi-110002.

Subscription Rates:

Annual subscription: Rs. 200
Single copy: Rs. 50

NAGARLOK

Vol. LI

October-December, 2019

Part 4

PAGE

Articles

Taking-Stock of Indian Smart Cities <i>Brijesh Bhatt and Anjula Negi</i>	1
Role of Census Towns in Rising Urbanisation of India <i>Manoj Sahu, Kailash Chandra Das and Bibhishana Bhuyan</i>	18
Knowledge Networking in Water Supply Services within Municipal Governments <i>Nilanjana Dasgupta Sur and Sanjukta Bhaduri</i>	31
Urbanisation as a Fulcrum of Jobs and Socio-Economic Change <i>A.K. Jain</i>	56
Impact of Built Environment on Pedestrian Mobility: A Case Study <i>Ashi Vashist</i>	81
Book Reviews 	110

Taking-Stock of Indian Smart Cities

BRIJESH BHATT*

ANJULA NEGI**

ABSTRACT

Cities are destined to play an even more dominant role in economy and development as India experiences major demographic shift with high urban growth. Recognising significance of cities in its future, the Government of India, in June 2015, launched the Smart Cities Mission (SCM), which focuses on sustainable and inclusive development of 100 smart cities. After reviewing the constituents of a smart city, the study analyses the key features of SCM. Based on literature review including smart city proposals (SCPs), the study identifies various issues that citizens want to get addressed under SCM (emerging after citizen engagement). We illustrate the approach taken and projects planned to address these issues. Finally, the study presents key challenges being faced towards transformation to smart cities in India and suggests way forward.

Keywords: Smart Cities Mission, Urban policies and governance, Smart solutions.

INTRODUCTION

Approach to Urbanisation in India

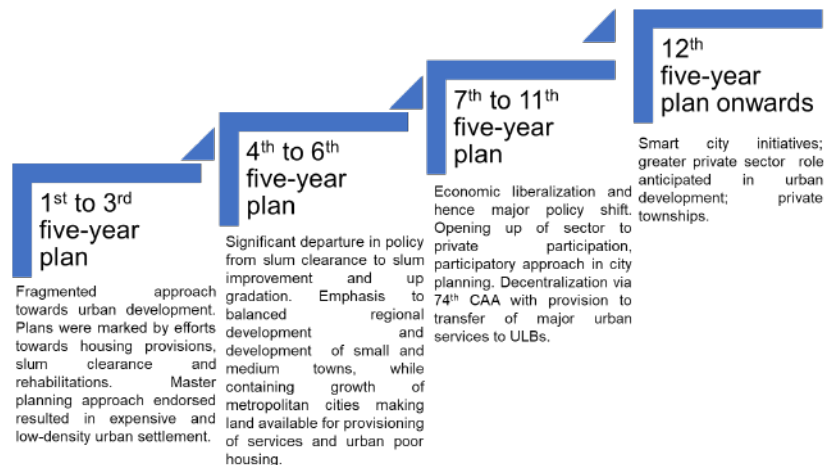
India is facing significant urban transformation, as the share of the urban population has increased from 18% in 1960 to 31% in 2011. It is expected that this growth would further accelerate, and the population would be concentrated mainly in cities, which are the existing centres of economic and social importance. Cities are thereby destined to play a dominant role in economic and social development centred on major demographic shift and high urban growth. While rapid urbanisation poses demographic, environmental, technological, financial and socio-economic challenges for cities, the approaches for urbanisation and choices to deal with these challenges remain fragmented. As the responsibilities for managing cities remain divided between central, state

*School of Real Estate, RICS School of Built Environment, Amity University, Noida. Email: bbhatt@ricsbe.edu.in

**Director, Research and Consultancy, RICS School of Built Environment, Amity University, Noida. Email: anegi@ricsbe.edu.in

and city governments, well-coordinated governance frameworks are still evolving. In this regard, the 74th Constitutional Amendment Act (CAA), 1992 has strengthened urban local bodies (ULBs), but, its implementation and enforcement of 12th Schedule tasks, effective decentralisation and financial dependence on the state and Central bodies, remain areas of concern. Moreover, a review of Central Government's urban development policies and five-year-plans reveal a progressive shift from mere focus on housing and slum clearance to master plans, citizen participation and involvement of private players thereby taking a comprehensive approach to develop urban infrastructure (see Figure 1). Over the years the Central Government has launched several policies to expedite investment in urban infrastructure. Especially since 2005 with the ambitious project-based approach of Jawaharlal Nehru National Urban Renewal Mission (JNNURM) involving citizen participation and private players. Presently, the Central Government has four major schemes for urban infrastructure development: the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) focusing on water supply and sewerage across 500 cities; Heritage City Development and Augmentation Yojana (HRIDAY) for development of 12 heritage cities; Swachh Bharat Mission (SBM) on sanitation and waste management of all statutory towns and Smart Cities Mission (SCM) to develop 100 smart cities launched in June 2015. SCM specifically has recognised heightened potential of information and communication technologies (ICT) and innovative sustainable technologies in dealing with the challenges of rapid urbanisation and in management of cities. Under SCM, Government of India plan to "...promote cities that provide core

Fig. 1: Evolution of urban governance in India



Source: Authors' compilation based on Batra 2009; and CSTEP (2015)

infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions." (MoUD 2015: 5).

While SCM is one of the approaches proposed for development of urban areas, combining multiple and inter-related aspects and governance networks within a city, this study aims to understand the way SCM conceptualises a Smart City, methods to achieve its broader goals, projects planned to make cities smart (with the backdrop of ICT services) and progress made after four years of SCM. Based on literature review, analysis of smart city proposals, and analysis of few other reports, present study contributes towards collation and comprehension of issues being faced in implementation and possible delays of SCM and provides a new perspective on implementation challenges.

The article is structured as follows: After this brief introduction Section II provides an understanding of smart cities in India while Section III discusses key features of SCM. Section IV explores the major issues being addressed through SCM, projects and funding arrangement. Section V presents the implementation status of SCM and Section VI discusses issues being faced in implementation and suggests a way forward. Section VII concludes the study.

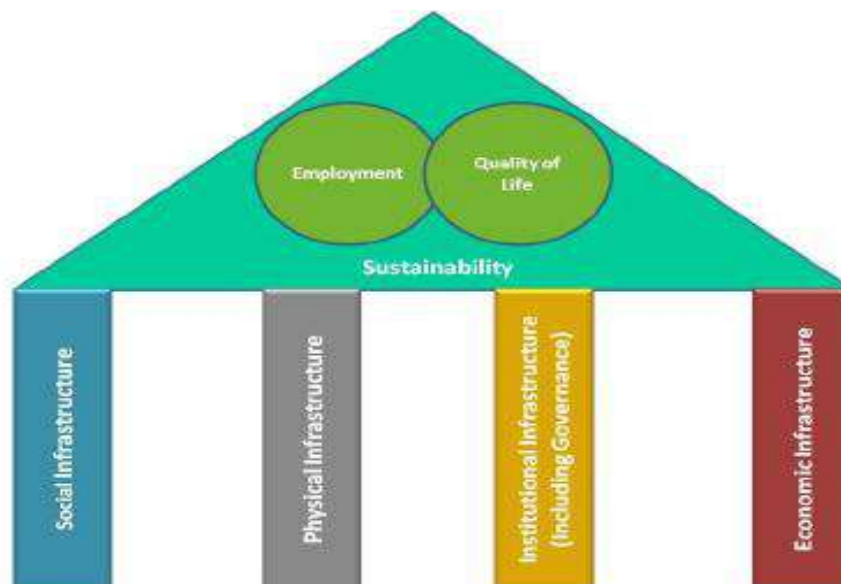
What are Smart Cities?

Around 1992, the concept of smart growth proposed by planners, architects, community activists and historic preservationists, suggested that concentration of growth in a city takes place in a compact (mixed land use & compact design) and walkable urban centres, where community participates in decision-making. Alongside, idea of 'Intelligent Cities' emerged, which mainly focused on how data and information technology could impact the way cities function. Combining these concepts of 'smart growth' and 'intelligent cities', the idea of smart cities emerged (CSTEP 2015). In 2008, during the global economic crisis as there were severe cuts in urban finances and private sector assistance was sought to address challenges in providing urban services, through involvement of information and communication-related industries such as IBM, CISCO, the smart city model emerged, where the city is treated as a system of complex information flow. In 2011, Smarter Cities was trademark registered by IBM (CSTEP 2015).

The definition of a smart city varies depending on geographical context, level of development/industrialisation, willingness to change, resources available and aspirations of citizens¹. In European context, Giffinger et al. (2007) defined a smart city based on six characteristics

as “a city well performing in a forward-looking way in these six characteristics [i.e., smart economy, smart people, smart governance, smart mobility, smart environment, and smart living], built on the ‘smart’ combination of endowments and activities of self-decisive, independent and aware citizens” (*ibid.*: 11). According to the Indian SCM statement, a smart city must feature ten core infrastructure elements (namely, adequate water supply, assured electricity supply, sanitation including solid waste management, public transport and efficient urban mobility, affordable housing especially for the poor, robust IT connectivity, good governance, sustainable environment, safety and security of citizens, health and education) and provide citizens a decent quality of life and clean and sustainable environment preferable using smart solutions. Smart solutions include the use of ICT as well as innovative and green technologies such as renewable energy, integrated waste management and the like to improve urban service delivery. As per the Ministry of Urban Development, Government of India, a smart city comprises of four pillars of physical, social, economic, and institutional infrastructure including governance (see Figure 2) that provide employment and quality of life and sustainability (MoUD, 2014). Wherein, physical infrastructure includes water, electricity, transport; social infrastructure includes education, health, recreation; economic infrastructure includes industries, commerce, finance while institutional infrastructure includes e-governance, public participation, regulation

Fig. 2: Four pillars of a smart city



Source: MoUD (2014: 5).

and enforcement mechanisms.

India's mission to make cities smart: Smart Cities Mission (SCM)

Though there were few smart city initiatives at state level such as Gujarat International Finance-Tech-city (GIFT) at Dholera and few private sector initiatives of land pooling such as Lavasa and Magarpatta in Maharashtra, which claim themselves as smart cities. Debate about 'Smart City' largely gained momentum around 2014 after the new central government under Prime Minister Shri Narendra Modi initiated the SCM programme fulfilling its pre-election manifesto. The objective of SCM is to develop 100 smart cities that will "... create a replicable model which will act as like a lighthouse to other aspiring cities...It is meant to set examples that can be replicated both within and outside the Smart City, catalysing the creation of similar Smart Cities in various regions and parts of the country" (MoUD 2015: 5).

The smart city mission is planned to be executed following an area-based development (ABD) approach. ABD adopts either one or a combination of the following three approaches namely, city improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development). Retrofitting introduces planning in an existing built-up area to achieve smart city objectives, to make the existing area more efficient and liveable. Here, an area consisting of more than 500 acres is identified by the city in consultation with citizens. Since existing structures are largely to remain intact in this model, it is expected that more intensive infrastructure service levels and a large number of smart applications will be packed into the retrofitted smart city. This strategy may also be completed in a shorter time frame, leading to its replication in another part of the city. Redevelopment will in-effect replace existing built-up environment and enable co-creation of a new layout with enhanced infrastructure using mixed land use and increased density. Redevelopment envisages an area of more than 50 acres, identified by ULBs in consultation with citizens. Greenfield development introduces most of the smart solutions in a previously vacant area (more than 250 acres) using innovative planning, planned financing and physical planning implementation tools (e.g. land pooling/land reconstitution) with provision for affordable housing, especially for the poor. Unlike retrofitting and redevelopment, greenfield developments could be located either within the limits of the ULB or within the limits of the local Urban Development Authority.

Under SCM, cities were selected through a two-stage selection process. To begin with, based on the criteria of urban population and number of statutory towns in each state/union territory (UT), few smart cities were allocated to each state/UT totalling to 100 cities.

Under stage I, states/UTs were asked to send names of potential smart cities with highest scores under four criteria namely, existing level of services, institutional system/capacities, self-financing and past track record and reforms. Thereafter, under stage II, the smart city challenge was conducted, and cities were required to submit a Smart City Proposal (SCP). The proposals were submitted in indefinite format with a pre-defined 92 page limit, in response to 43 questions under five heads (namely, city profile, area-based proposal, PAN city proposal, implementation plan and financial plan) along with its four Annexures. For ranking proposals/cities, 100 points were further sub-divided into three groups of criteria:

- 30 points for city-level initiatives (four criteria – vision and goal; strategic plan; citizen engagement; baseline, key performance indicators, self-assessment, etc.)
- 55 points for area-based development (five criteria – smartness of proposal; citizen engagement; result orientation; process followed; implementation framework including feasibility and cost-effectiveness);
- 15 points for PAN city solution: (five criteria – smartness of solution; citizen engagement; result orientation; process followed; implementation framework, including feasibility and cost-effectiveness).

Following this methodology, 100 cities that were selected in four rounds as detailed in Table 1.

TABLE 1: ROUNDS FOR SELECTION OF CITIES UNDER SCM

<i>Rounds</i>	<i>Cities Selected</i>	<i>Date of completion</i>
Round 1 (Jan. 2016)	20 (Lighthouse cities)	2019-20 to 2020-21
Round 2 (May 2016)	13 (Fast track cities)	2019-20 to 2020-22
Round 2 (Sept. 2016)	27	
Round 3 (June 2017)	30	2020-21 to 2021-22
Round 4 (Jan. 2018 and June 2018)	10	2020-21 to 2021-23
Four rounds	100	2019-2023

Source: SCM 2019.

Approach to implementation and monitoring: Unlike previous modes of implementing government schemes through respective ULBs, and/or parastatal organisations/state departments, SCM necessitates setting up of a special purpose vehicle (SPV) in each city, registered under the Companies Act, 2013 for the implementation of projects. The SPV can have government (State and municipal) and up to 40 per cent

non-public shareholders. The rationale is to “utilise corporate method of functioning and improve the efficiency of implementing government projects” (Taraporevala 2018: 10). The implementation of SCM is being monitored at three levels: (i) Central level, by an apex committee headed by Secretary, Ministry of Housing and Urban Affairs; (ii) State level by a High-powered Steering Committee chaired by Chief Secretary; (iii) city level by smart city advisory forum comprising of District Collector, MPs, MLAs, Mayor, CEO of SPV, local youth, technical experts, etc. (GoI 2018).

Smart cities: Issues, proposed solutions, projects and financing

Citizen participation in urban planning and governance is a key constituent of a smart city. In the Indian context, JNNURM was the first scheme that formally involved citizens in urban planning through the provision of City Development Plans. Under SCM, citizen engagement forms a key parameter for evaluation of SCP. Each city was expected to engage citizens through various physical and digital means (such as stakeholders meetings, mass outreach, seminars, ward committee, mass campaign-street plays, and online engagement like websites, Facebook, Twitter, YouTube, MyGov and offline like SMS, radio) and based on their feedback to decide on the area for ABD and the “core grievances” that need to be addressed and used as the basis for preparing SCP and project proposal under SCM (see Table 2). This is truly reflected in the proposal of many cities, for example in Faridabad, transport/traffic emerged as a major concern from citizen engagement and accordingly maximum share of funds was allocated to the transportation sector. SCM suggests the use of technology, information and data, i.e., smart

Fig. 3: Smart solutions in different sectors proposed under SCM to address core concerns of citizens



Source: MoUD (2015: 6)

solutions to address the issues of citizens, thereby improve urban infrastructure and services (see Figure 3).

TABLE 2: KEY ISSUES IDENTIFIED THROUGH CITIZEN ENGAGEMENT UNDER SCM

#	Issues
1	Poor physical infrastructure
2	Inadequate water supply services/loss of water/ depleting water level
3	Polluted water bodies/natural drains
4	Inadequate sewerage networks/services/sanitation
5	Ineffective waste disposal
6	Issue of flooding/water logging/cyclone
7	Lack of organised transport/inefficient public transport/declining non-motorised share
8	Lack of multimodal transport integration
9	Limited walkability
10	Lack of parking
11	Need to improve urban roads/network/ traffic congestion/ poor connectivity air and road/inadequate traffic management/ increasing traffic
12	Inadequate green coverage
13	Poor spatial planning
14	Ineffective management of public places/encroachment
15	Lack of open spaces
16	Land availability
17	Inadequate facilities in schools
18	Lack of employment opportunity
19	Inadequate heritage management
20	Out-migration
21	Air pollution
22	Over-reliance on grants
23	High growth of slums/high share of slums
24	Urban sprawl
25	Road accidents
26	Inadequate tertiary health facility
27	Lack of transparency in governance

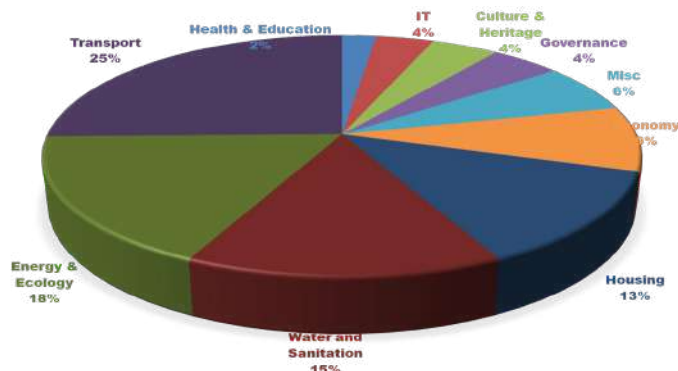
Source: Joshi 2016; SCP 2016.

Based on the analysis of SCP of first 60 cities, Taraporevala (2018) found that the top five categories/sectors receiving highest investment are: transportation, energy and ecology, water and sanitation, housing, and economy (see Figure 4).

Key projects under these categories are detailed in Table 3.

Across all 100 smart cities, 5151 projects have been identified with

Fig. 4: Investment planned in different sectors of the top 60 smart cities under SCM



Source: Based on Taraporevala (2018)

a planned investment of INR 2,05,018 crores. The key sources of funds include central government (INR 48,000 crores); state governments/ULBs (INR 48,000 crores); convergence with other government missions (INR 42,028 crores); public-private partnerships (INR 41,022 crores); loans (INR 9,843 crores) and other sources such as municipal bonds, land monetisation (INR 2,644 crores) (Deka 2019).

Are smart cities still a long way?

While SPV and city-level advisory forums have been constituted for all 100 cities, project management consultants are constituted for 91 cities only (GoI 2018). As on 25th July 2019, after four years of the mission, 933 projects (18%) of the smart city projects have been completed for INR 15,504 crores. For 1,931 projects (37%, worth INR 75,626) work orders have been issued, while for 827 projects (16%, worth INR 45,315 crore) tenders have been issued (Deka 2019; GoI 2018). While the government “has claimed it takes 16-18 months from the time of selection of these projects to get off the ground”, the progress of SCM has not been geographically uniform. Table 4 shows the top ten fast performing cities. Cities from four states namely, Karnataka, Madhya Pradesh, Gujarat and Uttar Pradesh constitute 54% of the completed projects. Whereas in 34 cities, not a single project has been completed (Deka 2019). It needs to be analysed if projects from specific sectors are facing delays across cities.

Outlook and way forward

Looking at global experiences ‘smart cities’ do offer promising solutions to deal with challenges of rapid urbanisation alongside

TABLE 3: KEY PROJECTS UNDER THE TOP
FIVE CATEGORIES IN THE INITIAL 60 CITIES

<i>Sl. No.</i>	<i>Sector</i>	<i>Key projects</i>
1	Transportation	Construction/repair of roads Public transit Parking (including smart parking/multi-level parking) Traffic Non-motorized transport and para transit Multimodal hub Pedestrian infrastructure Transport multiple Ticketing Signages
2	Energy and Ecology	Strengthening of electricity grid and distribution system Ecological restoration Renewable energy including solar and waste to energy Energy efficiency, smart poles, smart lights, meters Ecology miscellaneous Energy gas Ecological infrastructure
3	Water and Sanitation	Sewerage and solid waste management Water supply Water meter and quality control Drainage Water recycling ICT and mechanisation Rainwater harvesting Sanitation, segregation and recycling
4	Housing	Real estate Economically weaker section housing Slum development Mixed housing Hostel and rental housing Resident services Night shelter
5	Governance	Command centre Governance Security Disaster management Communication Capacity building

Source: Based on Taraporevala (2018).

TABLE 4: FAST PERFORMING CITIES UNDER SCM

<i>Cities</i>	<i>Number of projects completed</i>
New Delhi	79
Belagavi	60
Surat	49
Indore	48
Varanasi	48
Raipur	41
Tumakuru	35
Vadodara	32
Ajmer	29
Ahmedabad	27

Source: Deka (2019)

economic growth. However, in the Indian context, approaches adopted for transformation of cities to smart cities through SCM has been criticised. First, for the process adopted for selection of cities, as it did not provide a level field to all cities (Aijaj and Hoelscher 2015; Joshi 2016). However, selection through competition among cities is an encouraging step as the country finds the best way to take forward its urbanisation agenda². Second, since 80 per cent of SCM funding will be spent on ABD projects, which on an average covers less than five per cent of a city's population. Hence, SCM needs to be more cautious to not exclude vulnerable as reported by the Housing and Land Rights Network on SCM and ensure that their basic needs are provided for besides enabling them to use smart infrastructure built on innovative IT technologies (HRLN 2018). Third, citizen participation in the planning and governance of cities remain a grey area. After analysing SCP of top 60 cities Taraporevala (2018) found that "the data provided in the proposals was negligible and insufficient to justify the claims of the Mission being a bottom-up process" (*ibid*, 21). Moreover, the percentage participation as compared to the total population remained relatively small across cities.

Although delays caused in implementation of SCM projects is a major area to investigate for both practitioners as well as academicians, so far only limited literature focuses on these issues specifically. For example, Rana et al. (2019) provides an exhaustive list of 31 barriers from six broad categories that can hinder the implementation of smart city projects in India (see Table 5). The barriers are identified based on a literature review and interviews

TABLE 5: KEY ISSUES IN THE IMPLEMENTATION OF SMART CITY PROJECTS

Category	Barrier to implementation of smart city projects
I. Governance	1. <i>Lack of cooperation and coordination between the city's operational networks.</i> Lack of ties between operation nodes in the smart cities implementation. 2. <i>Unclear IT management vision.</i> The lack of vision on how IT management can be effectively imposed on the development of smart cities. 3. <i>Political instability.</i> Smart cities will not become a reality until there is political stability. 4. <i>Lack of trust between governed and government.</i> Lack of trust between government and people can impede smart cities development. 5. <i>Poor private-public participation.</i> The poor private-public interaction can negatively impact smart cities development projects. 6. <i>Lack of development of a common information system (IS) model.</i> Lack of a common IS model to ensure end-to-end visibility while managing smart city infrastructure and services.
II. Economic	7. <i>Lack of competitiveness.</i> Lack of competitiveness among local firms to deal with the challenges emerging in the development of smart cities. 8. <i>High IT infrastructure and intelligence deficit.</i> Lack of IT infrastructure (e.g. solar-based electrical systems, cloud computing) and capabilities of artificial intelligence (e.g. intelligent transport system, smart communities, e-health, smart grids, smart energy solutions, etc.) 9. <i>Cost of IT training and skills development.</i> High cost of IT training and skills development programme to the IT professionals is a barrier to the smart cities development. 10. <i>Global economy volatility.</i> Increasing volatility and uncertainty in the global economy could be a major concern for smart cities development. 11. <i>Higher operational and maintenance cost.</i> High cost of IT professionals and consultancies, installation, operation and maintenance and training concerns for the smart cities development.

(Contd. on next pg.)

(Contd. Table 5)

III. Technology	12. <i>Lack of technological knowledge among the planners.</i> The planners and policymakers of smart cities development lack enabling or transformative technological knowledge that may be needed for smart cities development. 13. <i>Lack of access to technology.</i> Lack of access to modern digital technology to the majority of citizens can be a barrier toward smart cities development. 14. <i>Privacy and security issues.</i> Issues related to privacy and security (e.g. threats from hackers and viruses, low privacy, high costs, etc.) tend to be a major concern for smart cities development. 15. <i>System failures issues.</i> This failure could be anything from city-wide public Wi-Fi systems to the provisions of smart water meter in individual homes. 16. <i>Integration and convergence issues across IT networks.</i> Lack of integration of disparate technology and convergence of heterogeneous networks (e.g. Bluetooth, WLAN, heterogeneous cellular networks such as 3G, 4G, 5G, etc.) could be potential issues toward smart cities development. 17. <i>Poor data availability and scalability.</i> There is a lack of specific data and corresponding scalable methods in smart city development agenda.
IV. Social	18. <i>Lack of involvement of citizens.</i> Lack of citizens' participation in realising how exactly the smart cities could look like in their experience is reflected. The citizens should be encouraged to submit and evaluate ideas for innovation in smart city design. 19. <i>Low awareness level of community.</i> Public lacks in understanding the idea of a smart city, and its implications on their quality of life. 20. <i>Geographical diversification problems.</i> Unbalanced geographical development can hamper smart cities development. 21. <i>Degree of inequality.</i> High degree of inequality in citizens' education, income, skills, etc. can impede the smart cities development.

(Contd. on next pg.)

(Contd. Table 5)

V. Environ- mental	22. <i>Lacking ecological view in behaviour</i> Lack of ecological view in pro-environmental behaviour toward consuming energy. 23. <i>Growing population problems.</i> Rapidly increasing population could be a concern for the smart cities development. 24. <i>Lack of sustainability considerations.</i> Lack of more sustainable and more aware city (e.g. direct traffic, notify residents about available parking, reduce gas emissions, etc.) means lack of better living conditions and experiences for all. 25. <i>Carbon emissions effect.</i> Inability of shifting cities toward low carbon trajectory and emission reduction actions. 26. <i>Degradation of resources.</i> Shortage of resources like the supply of freshwater and food.
VI. Legal & Ethical	27. <i>Cultural issues.</i> Lack of inflow of creative and sharing culture of the people living together in smart cities. 28. <i>Lacking standardisation.</i> Lack of standardisation across indicators (e.g. smart technologies, security, privacy, quality of life, environmental sustainability, physical infrastructure, mobile networks, etc.) has emerged as one of the crucial hindrance in smart city context. 39. <i>Issues of openness of data and its accessibility</i> is an issue in the smart cities, which can impede the way the smart city services can be delivered to cities' residents and businesses. 30. <i>Lack of transparency and liability.</i> Inhibited transparency and unclear lines of political accountability in delivering most services could be a concern for smart cities development. The lack of transparency risks isolating the very people smart cities technology is supposed to service. 31. <i>Lack of regulatory norms, policies and directions.</i> Lack of appropriate laws, regulations or directives for the smart cities development.

Source: Rana et al. (2019)

with key stakeholders. The study further prioritised these barriers using analytical hierarchy process and found that governance, economic and technology are the top three key barrier categories. Deka (2019) attributes delay in implementation of smart city projects to “non-performing ULBs, slow pace of fund generation and long-gestation period”. For the smart city of Kochi, lack of coordination among ULBs, SCM and various other stakeholders was stated as the key reason for delays in implementation (Express 2018).

It has also been reported that cities are struggling to generate required fund via public-private partnerships, land monetisation and the like. Similarly, land acquisition, involvement of private players and finally law enforcement also remain a cause of delay in implementation. Here, the use of ICT itself can be a great enabler in overcoming the silos and ensuring greater coordination between and within government agencies. Meanwhile, the government also need to adequately invest in capacity building to ensure skilled manpower, especially at the city level, as the commissioners of the cities or SPV officials are typically experienced in traditional projects but have never done cyber-physical integration (Sachdeva 2019). Lastly as a pre-condition to ‘smartness’ cities need to ensure basic infrastructure services such as potable water, sewage and solid waste disposal systems, street lights, footpaths to all its citizens alongside embracing innovative technologies and ICT enabled services for limited populace of the city, as to counter critic to SCM.

CONCLUSION

With urbanisation gaining prominence in the global policy debate and imperative for Indian national context, this study analysed one of the ambitious schemes of the Government of India, the Smart Cities Mission (SCM). The Scheme is a broad attempt of technological leapfrogging in 100 Indian cities to make urban infrastructure services ‘smart’ in given planned and unplanned areas including cities outgrowths. Based on literature review, key features, progress and challenges faced in policy implementation are analysed. Success of SCM seems to be hinged around more inclusivity and extent of structural issues of Indian cities including urban governance, capacity of urban local bodies, enforcement issues, physical planning, service provisioning, etc. Further, there remains a need to learn from experiences of previous urban renewal missions, undertake an overall impact analysis and a commitment to develop the next phase of smart cities mission. Smartness in effective delivery and efficient service mechanism is a necessary evil that is indispensable for developing a sustainable economy and future sustained growth.

Endnotes

1. Various smart cities indices such as Global Smart City by Juniper Research rank cities globally every year wherein the foremost rankers are often cities like Barcelona, New York and London.
2. For example, need to learn from China on the selection of cities along major corridors spread across the country and with urban agglomeration. Different ways – (i) spatial urban cluster development strategy of China; (ii) Urban hierarchy approach of Kerala [i.e. having a compact core, an intermediary urban and a peri-urban area] (iii) Metropolitan regional development approach of Karnataka [it facilitates regional linkages and thus reduces regional disparities].

REFERENCES

1. Aijaz R., Hoelscher K. (2015). India's Smart Cities Mission: An Assessment. Observer Research Foundation (ORF). Issue Brief Issue no. 24.
2. Batra L. (2009). A review of urbanisation and urban policy in post-independent India. Working Paper Series April 2009 CSLG/WP/12. Centre for the Study of Law and Governance. Jawaharlal Nehru University, New Delhi.
3. CSTEP (2015). Reconceptualising Smart Cities: A reference framework for India. Centre for Study of Science, Technology and Policy.
4. Deka K. (2019). Why the Smart Cities Mission will miss its deadline. *India Today*
5. Insight. Available at: <https://www.indiatoday.in/india-today-insight/story/why-the-smart-cities-mission-will-miss-its-deadline-1574728-2019-07-29> Last assessed on 15 August 2019.
6. Express (2018). Greater coordination needed for projects under 100 Smart City Programme *Express-News*, 27th March 2018.
7. GoI 2018. Reply to Lok Sabha question. Government of India. New Delhi.
8. Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. (2007). Smart Cities – Ranking of European medium-sized cities. Vienna University of Technology.
9. HRLN (2018). India's smart cities mission: Smart for whom? Cities for Whom? Housing and Land Rights Network on Smart Cities Mission. New Delhi.
10. Joshi R. (2016). Financial Sustainability of Smart Cities Mission. Presentation at RICSSBE.
11. MoUD (2014). Draft concept note on smart city scheme. Ministry of Urban Development, Government of India. New Delhi.
12. MoUD (2015). Smart Cities Mission Guidelines. Ministry of Urban Development, Government of India. New Delhi.
13. SCP (2016). The smart city challenge stage 2. Smart city proposals of cities in round 1 and round 2. Available at <https://smartnet.niua.org/>

14. Taraporevala P. (2018). Demystifying the Indian Smart City: An empirical reading of the Smart Cities Mission. Centre for Policy Research.
15. Rana N. P, Luthra S. Mangla S. K., Islam R., Roderick S., Dwivedi Y. K. (2019). Barriers to the development of smart cities in the Indian context. *Information System Frontiers* 21: 503-525.
16. Sachdeva S. (2019). Government to establish National Urban and Innovation Stack for Smart Cities to tackle implementation challenges at the ground level. Available at: <https://www.firstpost.com/india/govt-to-establish-national-urban-and-innovation-stack-for-smart-cities-to-tackle-implementation-challenges-at-the-ground-level-6480381.html> Last assessed on 15 August 2019.
17. SCM (2019). Smart Cities Mission website <http://smartcities.gov.in/content/>. Last assessed on 20 July 2019.

Role of Census Towns in Rising Urbanisation of India

MANOJ SAHU*
KAILASH CHANDRA DAS**
BIBHISHANA BHUYAN***

ABSTRACT

The process of urbanisation is one of the key growth engines for any developing economy as urban centres act as prime hotspots for manufacturing and service industries. Since Independence, India has experienced a dramatic growth in number, size and volume of statutory towns, but very little importance has been given to the census towns which have significantly contributed to the overall urbanisation of the country. The present article is an attempt to understand the role of census towns in the process of urbanisation using census data from 1981-2011 and it also highlights the growth, distribution and emergence of new Census Towns in 2011.

Keywords: *Urbanisation in India, Census Towns, New Towns.*

INTRODUCTION

The urbanisation of India is very special and exceptionally top-heavy in nature in comparison to the rest of the developing world, which accommodates every twelfth city dweller of the world and every seventh of the developing countries (Jayswal, N. et al., 2014). Whereas, within the nation two of every five urban dwellers (43 per cent) live in the 53 million plus cities/ urban agglomerations only (Guin and Das, 2015).

Urbanisation is the process of shifting of a settlement from a traditional agrarian economy to a modern industrial and service economy. A society may switch to an urban centre by increasing its population, introducing non-agrarian economic activities and facilitating

*Project Officer, International Institute for Population Sciences, Mumbai- 400088
Email: sahumanoj40@gmail.com.

**Professor, Department of Migration and Urban Studies, International Institute for Population Sciences, Mumbai- 400088.
Email: daskc@yahoo.com

***Ph.D. Scholar, International Institute for Population Sciences, Mumbai- 400088.
Email: bibhishanabhuyan@gmail.com

'urban features'; however, the definition of urban varies by place and time. The 2011 Census of India follows two criteria for defining urban; the administrative criteria and the demographic and economic criteria. As per the first criteria, the state governments declare settlements as urban areas, which include all types of Urban Local Bodies (ULBs), e.g. Municipal Corporations, Municipalities, Notified Area Committee/Councils, *Nagar Panchayats*, etc. These towns are known as Statutory Towns (STs) or Municipal Towns. On the other hand, the Census of India recognises settlements as urban if they satisfy certain demographic and economic criteria, i.e. a place having a population of 5000 or more; a density of 400 persons or more per square kilometre (1000 persons per square mile) and at least 75 per cent of the male workforce are engaged in the non-agricultural sector. As these settlements are recognised as urban by the census, they are termed as Census Towns (CTs). The Census of India first recognised the Census Towns in 1971. However, administratively the Census Towns are still rural, the government does not recognise them as urban areas and which are being administered by *Gram Panchayats*. Before the 2011 Census, the number of census towns was significantly lower than that of the statutory towns which formed a mere 31.5, 36.1 and 26.4 per cent share to the total towns in the country in 1981, 1991 and 2001 censuses respectively. In the 2001 census, the number of Census Towns was 1362 which experienced a drastic fall from the previous census of 1991 (1693). However, in 2011, this number nearly trebled to 3894 which also significantly raised the share of census towns (49.1 per cent) at par with the statutory towns (50.9 per cent) indicating a dramatic increase in the number of Census Towns.

As the Census of India characterised the faster increase in urbanisation than it expected and with the release of urbanisation figures from the 2011 Census, it has evoked several reactions. The unanticipated increase in the urbanisation is especially due to the increase in census towns rising from 1362 to 3894 between 2001-11. The new census towns of 2011 account for almost 34 per cent of the urban growth and around 69 per cent of the total Census Towns in the last decade. The unanticipated rise in the number of Census Towns in the 2011 census has brought them into notice and raised many questions like reasons for this unexpected growth. See Table 1.

Initially, experts like Kundu (2011) argued that phenomenal increase of census towns seems to be because of 'census activism' which might be artificially inflected by the census authority because not a single projected urban growth figure implied such an increase. In census activism, the state directorates of the census may have been a bit more enthusiastic in identifying new urban centres as the Registrar General

TABLE 1: TYPES OF URBAN SETTLEMENTS

<i>Census Years</i>	<i>No. of Census Towns (CTs)</i>	<i>Share of Census Towns to Total Towns</i>	<i>No. of Statutory Towns (STs)</i>	<i>Share of STs to Total Towns</i>
1981	1271	31.5	2758	68.5
1991	1702	36.3	2987	63.7
2001	1361	26.0	3880	74.0
2011	3894	49.1	4041	50.9

Source: Census of India, 1981, 1991, 2001 and 2011.

of India's office was under tremendous academic and administrative pressure to review its methodology for collecting data on urban centres. On the other hand, subsequent studies (Bhagat, 2012; Pradhan, 2013; Guin and Das, 2015) have opined and extended their arguments that there was no such activism by the census authorities as alleged. Therefore, it is essential to examine the role of Census Towns especially the newly emerged ones propitiously the growth of Indian urbanisation both in terms of absolute settlement number and population perspective.

The 2011 census marked an unanticipated rise of new Census Towns which are small in size. The identification of any new census town for any census is done before the enumeration of the population. Therefore, there is no possibility of using the results of the current census to identify new Census Towns (Guin and Das, 2015).

During the period 1991-2001, the census towns increased in almost all the states except a few, like Bihar, Kerala and Karnataka where the Census towns are either recognised as Statutory Towns or might have been declassified as villages for failing to fulfil the criteria set by the Census of India. The findings of the 2011 census are fascinating, some states gained a significant number of Census Towns like West Bengal (780), Kerala (461), Tamil Nadu (376), etc. This massive increase in the number of Census Towns initiated conflicts among researchers. Some researchers believe that the emergence of these Census Towns cannot be explained by the sectoral diversification in the villages, while some also ruled out the possibility of 'census activism' as the most important factor. Some researchers also argued that these towns mainly emerged due to a shift of economic activities from primary agricultural activities to secondary and tertiary activities.

The changes in the quantum of Census Towns between two consecutive or different census periods can happen in several ways, such as an increase resulting from the 'upgradation' of villages and outgrowths, and rarely 'degradation' of Statutory Towns into Census

Towns; and a decrease due to the denotification of the existing Census Towns to villages, reclassification or amalgamation of existing Census Towns into Statutory Towns.

The Census Towns are distributed all over the country, from the extreme north to extreme south and extreme west to east, but it should be noted that Mizoram had no Census Towns either in 2001 or 2011. West Bengal and Kerala played crucial roles in raising the number of Census Towns in India in between 2001-2011. One-fifth of the Census Towns in 2011 were in West Bengal, which experienced a three times jump in the number of Census Towns from 252 in 2001 to 780 in 2011. Similarly, in Kerala, the Census Towns increased from 99 to 461 in the same period forming a share of 11.8 per cent of the total census towns of the country. (See Table 2).

TABLE 2: TYPE OF URBAN SETTLEMENTS BY
STATE AND UNION TERRITORIES OF INDIA

<i>Types of urban settlements (1991-2011)</i>						
<i>States</i>	1991		2001		2011	
	<i>CTs</i>	<i>STs</i>	<i>CTs</i>	<i>STs</i>	<i>CTs</i>	<i>STs</i>
All India	1702	2987	1361	3880	3894	4041
Andaman and Nicobar Islands	0	1	2	1	4	1
Andhra Pradesh	4	260	93	119	228	127
Arunachal Pradesh	10	0	17		1	26
Assam	19	74	45	80	126	88
Bihar	99	172	5	125	60	139
Chandigarh	3	2	0	1	5	1
Chhattisgarh*	-	-	22	75	14	168
Dadar and Nagar Haveli	1	0	2	0	5	1
Daman and Diu	0	2	0	2	6	2
Goa	19	12	30	14	56	14
Gujarat	0	264	74	168	153	195
Haryana	10	84	22	84	74	80
Himachal Pradesh	1	57	1	56	3	56
Jammu and Kashmir**	-	-	3	72	36	86
Jharkhand*	-	-	108	44	188	40

(contd. on next pg.)

(contd. Table 2)

Karnataka	71	235	44	226	127	220
Kerala	131	66	99	60	461	63
Lakshadweep	4	0	3	0	6	0
Madhya Pradesh	1	464	55	339	112	364
Maharashtra	88	248	127	251	279	257
Manipur	3	28	5	32	23	32
Meghalaya	3	9	6	10	12	10
Mizoram	0	22	0	22	0	23
Nagaland	1	8	1	8	7	19
NCT of Delhi	29	3	59	14	110	3
Odisha	22	102	31	107	116	107
Puducherry	5	6	0	139	4	6
Punjab	8	112	18	139	74	143
Rajasthan	29	193	38	184	112	185
Sikkim	0	8	1	8	1	8
Tamil Nadu	0	469	109	723	376	721
Tripura	6	12	10	13	26	16
Uttar Pradesh	43	710	66	638	267	648
Uttarakhand*	-	-	12	74	42	75
West Bengal	148	382	252	124	780	130

Source: Town Directory, Census of India, 1991, 2001 and 2011.

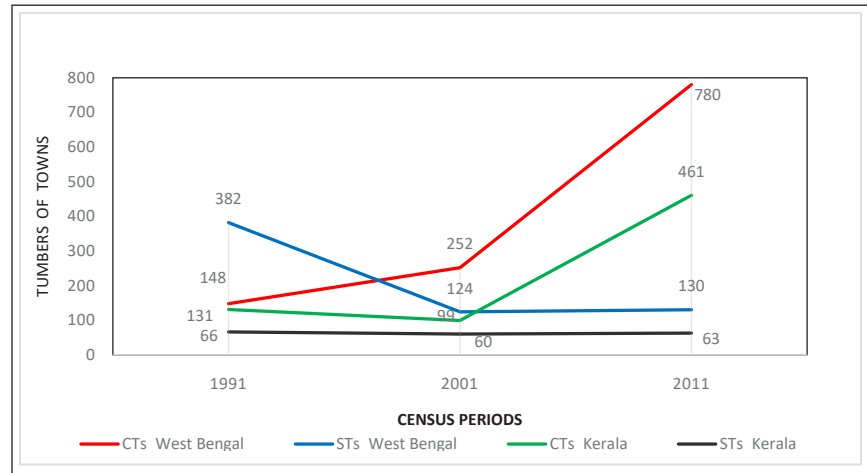
*Census 1991 data for Bihar, Madhya Pradesh and Uttar Pradesh includes Jharkhand, Chhattisgarh and Uttarakhand.

**Census was not conducted in 1991. The article was written before the reorganisation of Jammu & Kashmir.

The reason behind the growth of a huge number of Census Towns in West Bengal is due to the change in the economy, which includes the massive decline of male workforce in agriculture and related activities along with the shift to the tertiary sector (Karmakar, 2015). While the causes of the rise in the numbers of new Census Towns in Kerala are similar along with improvements in transportation facilities (Kuruvilla, 2014). The situation of Kerala and West Bengal is different as the rural-urban gap in Kerala is quite silent as the towns are small while the villages are large. On the contrary, the Census Towns in West Bengal are mostly mushrooming around large cities (Dasgupta, 2000). (See Figure 1).

Other states with a significant number of Census Towns in 2011 are

Fig. 1. Urban settlements of West Bengal and Kerala, 1991-2011

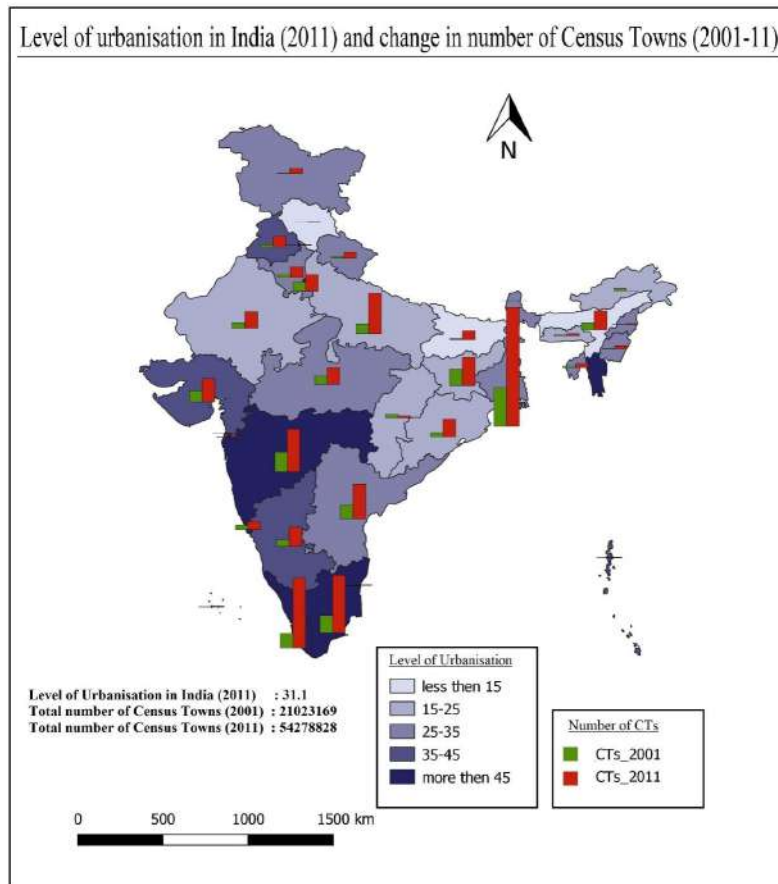


Tamil Nadu (376), Maharashtra (279), Uttar Pradesh (267) and Andhra Pradesh (228), these six states form a mammoth 61.4 per cent share of the total Census Towns in the country. Surprisingly, Jharkhand a state from East-Central part of the country known for low urbanisation has witnessed a significant emergence of 107 Census Towns from villages during 2001-11 indicating rising non-agricultural economic activities in rural settlements in the state.

Arunachal Pradesh and Chhattisgarh are the only states where the total number of Census Towns have reduced over the period. In Arunachal Pradesh, either all 17 Census Towns were upgraded or merged into other Statutory Towns, while only a new Census Town was upgraded from the village. Similarly, in Chhattisgarh, 13 out of 22 Census Towns were either upgraded or merged with other Statutory Towns, and ten new towns were upgraded from villages in this period.

Map 1 shows the statewise level of urbanisation in 2011 and the number of Census Towns in 2001 and 2011 Census. The level of urbanisation is more in the industrial and relatively developed states of India. Whereas in the Empowered Action Group (EAG) states along with Assam the level of urbanisation is low. The number of Census Towns is more in the states with a higher rate of urbanisation with the exception of Mizoram, where the level of urbanisation is 52.1 per cent without having any Census Towns.

The north-eastern states are relatively less urbanised with the exception of Mizoram which remains highly urbanised where more than half of its population lives in urban areas. The city of Guwahati, the



Map 1

largest city of North-east India may be considered as a primate city of this region, even if the level of urbanisation in Assam is very low (14.1 per cent). The case of Primate cities in less urbanised states like Guwahati-Assam is also visible in cases of Patna-Bihar and Jaipur-Rajasthan.

New Census Towns in India

A town in the current census which didn't have the status of a town in the previous census either through statutory, administrative or discretionary criteria is considered as a new town. The new towns include both Census Towns (CTs) and Statutory Towns (STs), although most of the new towns are Census Towns in most of the states. Many of the previous studies (Kundu, 2011; Guin and Das, 2015; Kundu, and Malik, 2016) . reveal that most of the new Census Towns were unusually concentrated around the metropolises and within the large UAs.

TABLE 3: DYNAMICS OF CENSUS TOWNS BETWEEN 2001 AND 2011

Sl. No.	State	Total CTs in 2001	Change in 2001 CTs			New CTs in 2011			Total CTs in 2011
			De-notified to village	Upgraded/merged with STs	Not Known	Other urban areas to CTs	From village to CTs	Not Known	
	All India	1362	55	144	11	141	2553	48	3894
1	Andaman and Nicobar	2					2		4
2	Andhra Pradesh	93	6	18		22	137		228
3	Arunachal Pradesh	17		17		0	1		1
4	Assam	45	2	3		6	80		126
5	Bihar	5		1		4	52		60
6	Chandigarh	0					5		5
7	Chhattisgarh	22	2	13	3	0	10		14
8	Dadar and Nagar Haveli	2		2			5		5
9	Daman and Diu	0					6		6
10	Goa	30				1	25		56
11	Gujarat	74	1	24		21	83		153
12	Haryana	22		4	2	8	49	1	74
13	Himachal Pradesh	1		1		0	3		3
14	Jammu and Kashmir	3				6	27		36
15	Jharkhand	108	4	23			107		188
16	Karnataka	44		11		13	81		127
17	Kerala	99				16	346		461
18	Lakshadweep	3					3		6
19	Madhya Pradesh	55	3	4		18	46		112
20	Maharashtra	127	11	8			171		279
21	Manipur	5					18		23
22	Meghalaya	6					6		12
23	Mizoram	0					0		0
24	Nagaland	1		1			6	1	7
25	NCT of Delhi	59	3		1		55		110
26	Odisha	31	1				86		116
27	Puducherry	0				2	2		4
28	Punjab	18	3	1		5	55		74
29	Rajasthan	38	3	2	1	4	76		112
30	Sikkim	1		1			1		1
31	Tamil Nadu	111	6				227	44	376
32	Tripura	10	1	6			23		26
33	Uttar Pradesh	66	4		3	2	204	2	267
34	Uttarakhand	12	1			2	29		42
35	West Bengal	252	4	4	1	11	526		780

Source: Census of India, 2001 and 2011.

A deep look at the information provided in Table 3 reveals that from 2001 to 2011, most of the Census Towns are upgraded from large villages. The majority of the newly emerged Census Towns were concentrated in five states i.e., West Bengal, Kerala, Tamil Nadu, Uttar Pradesh and Maharashtra, which combinedly constitutes more than half of the total New Census Towns of the country. The newly emerged Census Towns were mostly reclassified from village to Census Towns (2553 settlements) which constitutes around two-thirds of the total Census Towns. Further, 141 settlements have been reclassified from outgrowths or Statutory Towns to Census Towns. Besides, there are 48 towns (44 from Tamil Nadu alone), on which much information is not known. On the other hand, 55 Census Towns were declassified as villages. Another 155 Census Towns were recognised as Statutory Towns or merged with other Statutory Towns during this period.

Urban dynamics in India is a major issue of current research. The growth rate of urbanisation between 2001 and 2011 did not slow down, as it was expected to, but increased marginally (Registrar General and Census Commissioner, 2006; Bhagat, 2011). Newly added Census Towns contributed 32.4% of the total urban localities in the 2011 census. In 2011 census there are a total of 2742 new census towns among which 2553 were recognised as Census Towns from villages, 141 towns are converted from either outgrowths or Statutory Towns, and the status of 48 towns is unknown. The newly formed census towns form a mammoth 70.4 per cent share of the total number of Census Towns of India. The state with the maximum number of new census towns is West Bengal (537), followed by Kerala (362), Tamil Nadu (271) and Uttar Pradesh (208) forming shares of 13.8 per cent, 9.3 per cent, 7 per cent and 5.3 per cent, respectively. The union territories and smaller states have contributed a little in the number of new Census Towns.

Contribution of Census Towns to Urban Growth

The rapid increase in the number of Census Towns in India is a familiar and widely discussed statistical fact. In recent years, the census towns have contributed much more than the previous census years. Although the census towns don't contribute much to the overall urbanisation of the country due to their smaller size, their rise indicates the growth of rural settlements with urban characteristics. The growth of census towns in states can be considered as an indicator of development as they are new pockets of non-agrarian economies even though smaller in size and volume.

Table 4 shows the level of urbanisation, the share of total urban population living in census towns as well as their decadal changes

TABLE 4: STATE WISE SHARE OF CTS IN
URBAN GROWTH AND DECADAL CHANGE

States	Level of urbanisation			Share of total urban population living in CTS (in %)			Decadal change in the urban population share of CTS	
	1991	2001	2011	1991	2001	2011	2001	2011
All India	25.7	27.9	31.1	4.7	7.3	14.4	2.6	7.1
Andaman and Nicobar	26.7	32.6	37.7	0.0	14.0	24.7	14.0	10.7
Andhra Pradesh	26.9	21.7	33.4	0.2	12.0	14.6	11.8	2.6
Arunachal Pradesh	12.8	20.8	22.9	100	100	1.2	0	-98.8
Assam	11.1	12.9	14.1	9.6	12.1	22.0	2.5	10.0
Bihar	13.1	10.5	11.3	16.9	0.5	4.2	-16.5	3.7
Chandigarh	89.7	89.8	97.3	4.9	0	5.4	-4.9	5.4
Chhattisgarh*	-	20.1	23.2	-	6.5	2.3	6.5	-4.2
Dadar & Nagar Haveli	8.5	22.9	46.7	100	100	38.8	0	-61.2
Daman and Diu	46.8	36.2	75.2	0	100	62.7	100	-37.3
Goa	41.0	49.8	62.2	33.4	38.7	52.3	5.3	13.6
Gujarat	34.5	37.4	42.4	0.0	5.3	6.9	5.3	1.6
Haryana	24.6	28.9	34.9	2.1	4.7	10.3	2.6	5.6
Himachal Pradesh	8.7	9.8	10.0	0.8	0.9	2.6	0.1	1.7
Jammu & Kashmir**	-	23.0	27.4	-	0.7	7.9	0.7	7.3
Jharkhand*	-	22.2	24.0	-	36.6	32.5	36.6	-4.1
Karnataka	30.9	34.0	38.7	7.2	2.3	5.2	-4.8	2.9
Kerala	26.4	26.0	47.7	37.4	26.8	64.6	-10.6	37.8
Lakshadweep	56.3	44.5	78.1	100	100	100	0	0
Madhya Pradesh	23.2	26.5	27.6	0.2	3.2	5.6	3.0	2.4
Maharashtra	38.6	42.4	45.2	4.1	4.2	7.9	0.1	3.7

(contd. on next pg.)

(contd. Table 4)

Manipur	27.5	26.6	32.5	9.0	5.4	22.0	-3.6	16.6
Meghalaya	18.6	19.6	20.1	9.2	29.2	36.9	19.9	7.7
Mizoram	46.1	49.6	52.1	0	0	0	0	0
Nagaland	17.2	17.2	28.9	4.2	4.8	11.5	0.6	6.7
NCT of Delhi	89.9	99.0	97.5	10.3	19.0	30.3	8.7	11.4
Odisha	13.4	15.0	16.7	4.8	4.8	11.7	0.0	6.9
Puducherry	64.0	66.6	68.3	11.5	0.0	10.7	-11.5	10.7
Punjab	29.5	33.9	37.7	1.1	2.0	6.6	0.8	4.6
Rajasthan	22.9	23.4	24.9	3.0	3.0	7.3	0.0	4.3
Sikkim	9.1	11.1	25.2	0.0	24.0	3.8	24.0	-20.1
Tamil Nadu	34.2	44.0	48.4	0.0	5.0	14.3	5.0	9.3
Tripura	15.3	17.1	26.2	26.1	32.1	30.2	6.0	-1.9
Uttar Pradesh	19.8	20.8	22.3	2.4	3.3	8.0	0.9	4.7
Uttarakhand*	-	25.7	30.2	-	6.0	16.0	6.0	10.1
West Bengal	27.5	28.0	31.9	0	13.0	23.5	13.0	10.5

Source: Census of India, 1991, 2001 and 2011, Urban Directory.

*Census 1991 data for Bihar, Madhya Pradesh and Uttar Pradesh includes Jharkhand, Chhattisgarh and Uttarakhand.

**Census was not conducted in 1991. The paper was written before the reorganisation of Jammu & Kashmir.

between the three recent censuses. It is well known that India is a developing country where urbanisation is still at a young stage and the level of urbanisation has a great scope of ascending upwards. As per the 2011 census, the level of urbanisation of India is 31.1 per cent which was around 10.84 per cent during the 1901 census. Most of the smaller states and union territories have the level of urbanisation of more than fifty per cent, on the other side, none of the bigger states has similar urbanisation levels.

If we consider merely the number of towns, then Census Towns share around fifty per cent (Table 1) of the total towns of the nation, but interestingly when the urban population volume is taken into consideration, the census towns' shares only 14.4 per cent in 2011 census which grew from five per cent in the 1991 census (Table 4).

In some of the major urbanised states like Tamil Nadu, Maharashtra and Gujarat, the contribution of census towns to the level of urbanisation is not that noticeable. It is either because of the state governments are recognising larger villages with urban potential as statutory towns well before the census are being conducted or the merger of potential census

towns into larger urban agglomerations. In case of Kerala, the scenario is totally different from other major states. In this state, the census towns play a pivotal role in raising the level of urbanisation in the state by contributing close to two-thirds of the state's urban population.

CONCLUSION

In the decade 2001-2011, India has experienced a distinctive rise in urbanisation, where the Census Towns have contributed significantly to the total level of urbanisation of the country. A number of settlements rose to the ranks of Census Towns improving their urban characteristics although being administered as rural areas. This implies a rise in settlements with non-agrarian economies throughout the country and particularly in southern and western states. Looking at the recent trends it can be anticipated that the 2021 census will bring out a large set of new census towns with it.

The importance of Census Towns was well recognised by the Ministry of Urban Development and in May 2016 it has asked all the States to take immediate and necessary action to convert the 3784 (excluding the 110 of NCT of Delhi) Census Towns into statutory Urban Local Bodies to promote planned urban development. The ministry in its letter to the states has highlighted "the need for statutory ULBs for planned and coordinated infrastructure development, enhancement of revenues and efficient delivery of services to citizens leading to the overall growth of economic activities". It also stressed that "the opportunity of planned urban development might get lost if unplanned construction and ad hoc provisioning of infrastructure is allowed to take place over a long time". The conversion of Census Towns into Urban Local Bodies will entitle them with central assistance as per guidelines of the 14th Finance Commission to develop, manage and maintain the urban infrastructures. However, it is unclear that how many states took this letter seriously and took steps in converting Census Towns into Urban Local Bodies.

The state governments should also identify the rural settlements with at least 4000 population (in the previous census) surrounding towns with the buffer zone increasing with the size of the parent town to infuse 'urban features' into them. The radius can vary between five to 30 km depending upon the size of the parent towns. This step will prevent the unplanned growth of both the parent town and its outgrowths and will help in promoting the sustainable distribution of services. Urban services should also be introduced into larger villages with 10000 and more population to serve the people with better facilities. Further, this will lead to an escalation of the level of urbanisation in the country with the emergence of new towns (both statutory and census towns).

REFERENCES

1. Bhagat, R. B. (2011). Emerging Pattern of Urbanisation in India. *Economic and Political Weekly*, 46(34), 10-12.
2. Bhagat, R. B. (2012). A Turnaround in India's Urbanization. *Asia-Pacific Population Journal*, 27(2), 23-39.
3. Dasgupta, B. (2000). Contrasting urban patterns: West Bengal, Punjab and Kerala. In A. Kundu (Ed.), *Inequality, mobility and urbanisation: China and India* (pp. 219-256). Delhi: ICSSR and Manak Pub. Pvt.
4. Guin, D. and Das, D. N. (2015). New Census Towns in West Bengal "Census Activism" or Sectoral Diversification. *Economic and Political Weekly*, 50(14).
5. Jaysawal, N. and Saha, S. (2014). Urbanization in India: An Impact Assessment. *International Journal of Applied Sociology*, 4(2), 60-65.
6. Karmakar, J. (2015). Emergence of Census Towns and its Socio-Economic Condition : Case of West Bengal. *International Journal of Humanities & Social Science*, 5264(22), 22-35.
7. Kundu, A. (2011). Method in Madness: Urban Data from 2011 Census. *Economic & Political Weekly*, 46(40), 13-16.
8. Kundu, C. and Malik, U. S. (2016). Role of census towns on urbanization in West Bengal. *Indian Journal of Regional Science*, 48(1), 101-113.
9. Kuruvilla, Y. Z. (2014). Census Towns in Kerala: Challenges of Urban Transformation, 1-12.
10. Pradhan, K. C. (2013). Unacknowledged Urbanisation. *Economic and Political Weekly*, 48(36), 43-51.
11. Press Information Bureau. Ministry of Housing & Urban Affairs- Government of India. (2016, May 13), Retrieved from <http://pib.nic.in/newsite/PrintRelease.aspx?relid=145405>

Knowledge Networking in Water Supply Services within Municipal Governments

NILANJANA DASGUPTA SUR*
SANJUKTA BHADURI**

ABSTRACT

Strengthening urban local governments through capacity development, knowledge networking and better financial management is identified as a key strategy by the Ministry of Urban Development, Government of India. The Department identifies lack of skilled manpower as one of the key concerns and recommends strengthening knowledge networking and capacity development for municipalities. The office has also undertaken several initiatives under JNNURM and other schemes to augment the capacity of municipalities to implement projects and reforms. On the other hand, cities need to continuously gear up for addressing issues and challenges in service delivery. This article is drawn from the key learnings derived from the Doctoral Research Study on "Knowledge Networking and Capacity Development of Urban Local Bodies in India for Improved Service Delivery", carried out by the authors.

Keywords: *Knowledge networking, Service delivery mechanisms, Water supply and sanitation, Evaluation and Impact analysis.*

INTRODUCTION

The International Institutions, broader donors and the development communities acknowledge "knowledge as development". They believe that capacity development through knowledge networking can contribute to the consummate development of a country. In India, one of the biggest challenges faced by the Ministry of Urban Development (MoUD), Government of India and Municipalities, when implementing projects, reforms and services in urban areas, is

*Assistant Professor, Department of Urban Planning, School of Planning and Architecture, New Delhi. Email: Nilanjanadsur@gmail.com

**Dean of Research and Professor, Department of Urban Planning, School of Planning and Architecture, New Delhi. Email: sanjukta.bhaduri@gmail.com

knowledge and capacity constraints. The Urban Local Bodies in India, are vested with administrative duties for providing basic infrastructure and services to cities. In urban areas, administration of basic amenities like water supply, drainage, public health and sanitation is essential. Providing efficient services to the citizens is one of the mandates of any ULB. But in the process, they face many issues and constraints in the smooth functioning of the system. One of the major constraints being the knowledge and capacity gaps that exists within ULBs. Therefore, it becomes significant to understand the knowledge gaps that act as hindrances in the effective functioning of the ULB. To understand the gaps in the process, it becomes vital to ascertain the knowledge needs and linkages that exist and are required to run an efficient service delivery mechanism. Based on the above background, and need of the study, the research work is thus centred on the "identification of knowledge networking needs and linkages of urban local bodies for an effective service delivery mechanism". This article concentrates on the Water Supply Services within Municipalities in India.

Approach to the Study

The research design is the conceptual structure within which research is conducted (Kothari, 1988). It is the logic that links the data to be collected (and the conclusions to be drawn) to the initial questions of the study (Yin, 2009). Therefore, this study explores the relationship between knowledge networking on service delivery of ULBs. Since the identified areas of the study, are not explicitly referenced in any acts, manuals or guidelines, selected secondary sources (literature) were examined and analysed to develop the assessment guidelines for the research areas. The scope of the research is limited to the case study of four selected cities of PAN India.

Through an intensive literature review, an overview of theories and concepts of knowledge networking provisions within water supply service delivery systems of urban local bodies in India, the constitutional design and norms, guidelines, benchmarks, steps and stages for carrying out knowledge networking has been established. The exhaustive literature review background has been used for the assessment and identification of indicators and variables for knowledge networking, capacity development and service delivery in water supply systems. Further, four case study cities (Surat, Pune, Coimbatore and Gurugram) covering PAN India, were selected on the basis of their functions and performance measures under JNNURM. Based on field visits, data was collected and analysed for each case study city. Therefore, with the help of both secondary and primary information, the need, types, patterns, process and linkages for knowledge networking within water supply services' was identified.

Water Supply Services in Municipalities

Legislation Facets

As per 74th Constitution Amendment Act, water supply services are obligatory functions of the municipality and the entire responsibility lies with this organisation. In parallel, municipalities are to coordinate and administer with other agencies that are involved in these services and not just be accountable to them. So an effective decision-making power, supporting resources and set standards are required in order to make the service a success. There are a very few supporting resources available for the services. While there are no specific legal obligations for water supply departments, there are a number of specifications relating to water supply services that need to be followed and administered. They are given below:

- *74th Constitutional Amendment Act, 1992*
- *Municipal Bylaws* – These enable the local bodies to discharge their functions.
- *Technical Norms* – The Manual on Sewerage and Sewage Treatment of the Central Health and Environmental Engineering Public Organization (CHEEPO), Ministry of Urban Development (MoUD), sets out technical norms for water supply system management. The manual also makes reference to relevant Indian Standards and Codes of Practice notified by the Bureau of Indian Standards¹.
- *Benchmarks* – The Ministry of Urban Development (MoUD)'s Service Level Benchmark, Performance Assessment System (PAS Project, 2011) and the International Benchmark Network for Water and Sanitation Utilities (IBNET) are the existing decision making benchmarking support tools in the urban sanitation sector.
- *The Environment (Protection) Act, 1986* – This Act applies in principle to every establishment, agency, or individual discharging any pollutant into the environment.
- *Case Studies* – There are a number of best practices documents that have been released by the ministry and state governments under programmes like Process and Experiment Automation Realtime Language (PEARL), JNNURM, Computer Based User Documentation (CBUD) and so on. Institutes like National Institute of Urban Affairs (NIUA), The Advertising Standards Council of India (ASCI), All Indian Institute of Local Self-Government (AIILSG), etc. have come out with

various best practices documents that can be studied and replicated from time-to-time.

- All Indian Standards' codes represent a standard of good practice and therefore take the form of recommendations. They are not mandatory unless made so under contract conditions while some are routinely ignored.

Government Agencies Engaged in the Development of Urban Water Supply Sectors²

- *Central Government:* Ministry of Urban Development along with the Ministry of Health and Family Welfare and the Central Water Commission are engaged for these sectors.
- *State Government Departments:* Public Health and Engineering Department (PHED), Public Works Department (PWD), Urban Development Directorate (UDD).
- *State/Metropolitan level Boards and Corporations* are part of the Water Supply/Drainage Boards at the metropolitan level.
- *Local or Town Level Statutory and Non-Statutory Authorities:* They are also referred as the Urban Development Authorities.
- *Municipal Governments or Urban Local Bodies* (Municipal Corporations, Municipal Councils, Nagar Panchayats).

Training Institutions and other Organisations in India are:

- The Engineering Staff College of India (ESCI);
- The Anna University;
- The India Water Works Association (IWWA);
- The Human Settlement Management Institute (HSMI);
- The Chennai Metropolitan Water Supply Board Resource Centre;
- The All India Institute of Local Self-Government (AIILSG); and
- The Society of Promotion of Area Resources Centre (SPARC); and
- Others

Classification and Functions of Human Resources involved in the Departments

As mandated in the Central Public Health and Environmental Engineering Organisation (CPHEEO) Manual, the executive powers are vested with the Municipal Commissioner or the Chief Executive

Officer, who is assisted by the Chief Engineer. The later is in-charge of many other officials and staff from four different key functional areas and levels of hierarchy. The four different key functional areas are: administration, accounts, technical, operation and maintenance. There are three levels of hierarchy – senior, mid-level, junior officials followed by the skilled and non-skilled staffs (Table 1).

TABLE 1: CLASSIFICATION AND FUNCTIONS OF HUMAN RESOURCE IN WATER SUPPLY DEPARTMENTS

<i>Sl. No.</i>	<i>Hierarchy</i>	<i>Key Functions</i>	<i>Designations</i>
1	Senior Level Officials	Administrative Management	Commissioner, Chief Executive Officer,
		Operational Management	Chief Engineer
		Technicians	Mechanical Engineer, Electrical Engineer, Civil Engineer, IT Engineer
		Finance & Accounts	Finance Officer
2	Mid-Level Officials	Administrative Management	Superintendent Engineer
		Operational Management	Executive Engineer, Deputy Assistant Engineer, Sub-Divisional Officer
		Finance & Accounts	Accounts Officer, Revenue Accountant
		Manager	Material Accountant, Personnel & Training, Public Relations Officer, Staff Welfare Officer
3	Junior Level Officials	Administrative Management	Section Officer, Assistant Engineer,
		Technicians	Mechanical Engineer, Electrical Engineer, Civil Engineer, IT Engineers
4	Staff	Skilled	Technical Helpers, Operating Staff, Security Guards, Lab Assistants
		Non-Skilled	Manual Labourer, Gardener, Dusting, Sweeping, House Keeping, Peons

Source: Manual on Water Supply and Treatment; Third Edition; Expert Committee, CPHEEO, MoUD; 1999; Manual on Operation and Maintenance of Water Supply Systems; CPHEEO; MoUD & WHO; 2005.

The work of the departments differs from city-to-city as per the state policies. Provision of water supply in several states has either been taken over by the state governments or transferred to parastatal agencies. It is also a shared responsibility in many states. Besides these state level agencies, City Improvement Trusts and Urban Development Authorities, like Delhi Development Authority (DDA), have been set up in a number of cities³.

However, based on the selection criteria for case studies, the focus is on those cities which provide internal services, i.e. these cities plan, design execute, construct, operate and maintain the projects under the water supply sectors all by themselves. No other department is involved in this service sector.

Fig. 1

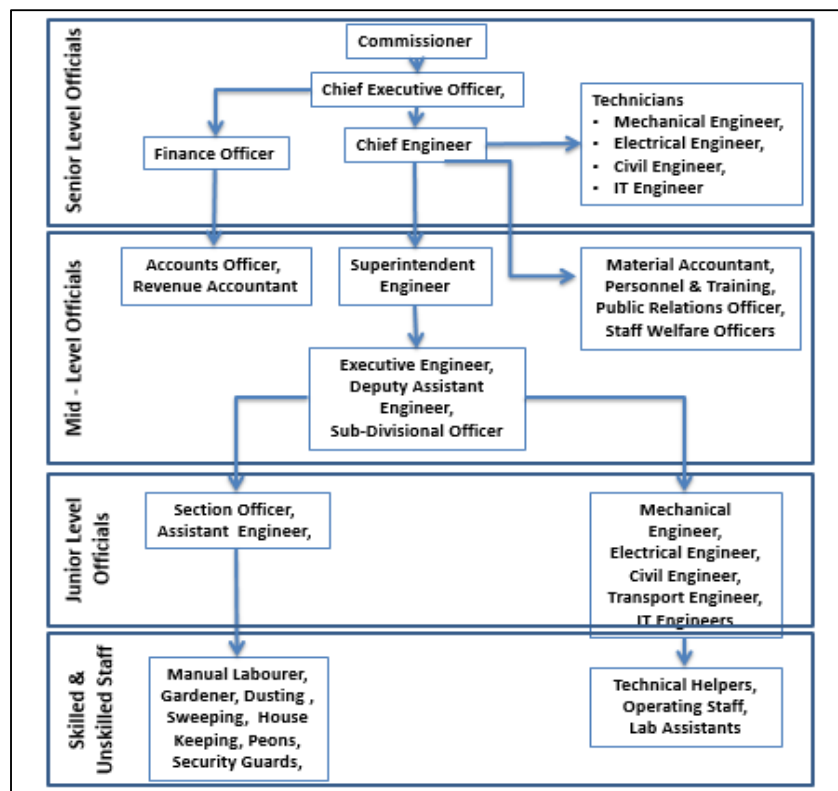


Fig. 1: Conceptual Organisational Structure of an ULB for Water Supply Departments

Source: Various Documents (The Manual on Sewerage and Sewage Treatment of the Central Public Health and Environmental Engineering Organization, Ministry of Urban Development; Sustainable Sanitation Strategy, MoUD; 74TH CAA; Model Municipal Law; Service Regulations Law.

Organisational Setup

The organisational structure of a municipal corporation or an Urban Local Body in India is basically a decentralisation system of the above-mentioned designations. This is a conceptual organisational structure⁴ (Figure 1) based on different acts, manuals, norms and guidelines provided for the service sector.

Administrative and Management Issues

Staff attrition, excess work burden and non-revision of existing human resources systems are of major concern in the water supply departments. There is a lack of information, low capacity, skill and non-motivated staff present within the departments. Lack of coordination and consolidation of field initiatives, poor strategising and positioning of plans and manpower leads to poor executive powers. Disconnect between regional and national teams; poor access to sector information; multiple institutional arrangements; and financial constraints are other areas of concern. Pricing of water, low tariffs hamper water supply connections to the poor; metering inaccuracies; unbilled and unauthorised consumption; illegal tapping are areas of concern for fiscal issues. The loss of staff members in key positions at critical times affected the effective transfer of knowledge, continuity and institutional memory.

Institutional Arrangements for Technical Activities of Water Supply Services

The technical activities involved in a water supply system are source development, conveyance, storage reservoir/filtration plant, distribution network, operation and maintenance. This entire system is handled by three broad institutional frameworks that are apparent in states in India with regard to water supply services. First are the states where the entire system (technical) is with a department or a parastatal of the state government; second, where the municipalities themselves handle the entire activity and, third, as in some large cities, where exclusive water supply boards have been set up for the entire city (Table 2). However, for the current research work, emphasis has been given to municipal governments including municipal corporation, municipal councils and nagar panchayats who are handling the entire activities all by themselves.

Service Level Benchmarks

Water supply standards have been designed by various agencies after making an assessment of the requirements of water for different purposes and checking up the physical and financial feasibility of

TABLE 2: TYPOLOGY OF INSTITUTIONAL ARRANGEMENTS FOR TECHNICAL ACTIVITIES IN URBAN WATER SUPPLY SERVICES SECTORS

Sl. No.	Technical Activities				
	Source Development	Conveyance	Storage Reservoir / Filtration Plant	Distribution Network	Operation and Maintenance
1.	Municipal Government				
2.	State Department		Municipal Government		
3.	State Department	Parastatal Agency	Municipal Government		
4.	Metropolitan Agency				
5.	State Department or Agency				

Source: Chetan Vaidya and Hitesh Vaidya, 2009

attaining these requirements. As the basic principle, cities of smaller sizes (as per population) do not need the same level of service that a bigger urban centre will need. It is observed that in a small town, some of the non-essential uses could be satisfied from non-protected sources (wells, ponds, etc.) which in a big city have to be met only from piped water sources. However, water standards will vary from one neighbourhood to another, according to functional, climatic and other characteristics, including habits of the people. Minimum standards have been set by the Central Public Health and Environmental Engineering Organisation (CPHEEO), Government of India, at 125 to 200 litres per capita per day for cities with the population of 50,000 and above. The Urban and Regional Plan Formulation and Implementation (URPFI) Guidelines 2014, has suggested water standard of 70 to 250 litres per capita per day (LPCD) with an average supply of 140 LPCD irrespective of the population size of the town. The guidelines have also recommended on an average, coverage of 90 per cent of the urban population by protected water supply.

However, a set of indicators have been used to determine the efficiency and effectiveness of municipal bodies in delivery of water supply to their citizens. These are: water utilisation factor, population coverage, per capita water supply and per capita spending on the water distribution operations. The performance indicators for service delivery as given in the Service Level Benchmarks prepared by the Central government for water supply services are given in Table 3.

TABLE 3: PERFORMANCE MANAGEMENT FOR SERVICE DELIVERY THROUGH
SERVICE LEVEL BENCHMARKS

Sl. No.	Indicators	Benchmarks
	<i>WATER SUPPLY</i>	
1	Coverage of Water Supply connections	100%
2	Per Capita Supply of Water	135 lpcd
3	Extent of Non-Revenue Water	15%
4	Extent of Metering	100%
5	Continuity of Water supplied	24 Hours
6	Efficiency in redressal of customer complaints	80%
7	Quality of Water Supplied	100%
8	Cost Recovery	100%
9	Efficiency in Collection of Water Charges	90%

Source: MOUD, 2010. Handbook on Service Level Benchmarking.

Technical, Operation and Management Issues

Depletion of water sources, water pollution, inefficient use of water, are due to the presence of technical issues. Lack of technical knowledge and information about the areas also leads to small portion of the urban population being covered by the water utility. Irregular water supply provided by the utility water being not potable indicates the presence of weak technical capability among staff. Wastage through Non-Revenue Water (NRW) losses are other technical issues present in the process.

Poor operation and maintenance leading to system losses; inequitable and inadequate distribution of water supply; inefficient management of water supply systems; poor asset management, etc.; Unaccounted for Water (UFW); increase in illegal connections; absence of volumetric metering at consumer level; old distribution system with less individual connections – are issues that occur due to lack of a proper operation and maintenance system.

Brief Profile of the Selected Cities

In order to carry forward with the analysis, it is necessary to understand the profile of all selected case study cities. For the research work, four case study cities [Surat (Western India), Pune (Western India), Coimbatore (Southern India) and Gurugram (Northern India)], have been selected on the basis of their functions and performance measures under JNNURM. All the four cities have an Internal Service Delivery Mechanism, i.e. all functions and responsibilities of service delivery lie with the urban local body. The brief profiles for Surat, Pune, Coimbatore and Gurugram Municipal Corporations are given in Table 4.

TABLE 4: BRIEF PROFILE AND PHYSICAL EXTENT OF
SMC, PMC, CMC AND MCG

Surat Municipal Corporation (SMC)	
Location	Gujarat, India
SMC Area	326.515 sq. km.
Population (2011)	45 lakhs (approx.)
Population (2018)	60 lakhs (approx.)
Slum population (2011)	4.7 lakhs
Migration of population	26% of the total population of 2011
Major Govt. Projects	JNNURM, AMRUT, Smart Cities, etc.
Pune Municipal Corporation (PMC)	
Location	Maharashtra, India
PMC Area	243.95 sq. kms
Population (2011)	32 lakhs (approx.)
Population (2017)	39 lakhs (approx.)
Slum population (2011)	6.90 lakhs
Migration of population	18% of the total population
Major Govt. Projects	JNNURM, AMRUT, Smart Cities
Coimbatore Municipal Corporation (CMC)	
Location	Tamil Nadu, India
CMC Area	257.04 sq. km
Population (2011)	16,17,711 lakhs
Population (2017)	23,00,000 lakhs (estimated)
Slum population (2011)	34,343 lakhs [12.29 % of total population]
Major Govt. Projects	AMRUT, Smart Cities
Municipal Corporation Gurugram (MCG)	
Location	Haryana, India
MCG Area	338.72 sq. km
Population (2011)	8.76 lakhs
Population (2017)	18.00 lakhs (estimated)
Slum population (2011)	1.44 lakhs [16% of total population]
Major Govt. Projects	AMRUT, Smart Cities

Source: SMC, PMC, CMC and MCG, 2018

Surat Municipal Corporation (SMC): Surat Municipal Corporation (SMC) is the urban local body responsible for the administration of the Surat city. SMC has come into being under the Bombay Provincial Municipal Act (BPMA), 1949. The corporation was established in October 1966. It carries out all the obligatory functions and discretionary functions entrusted by the BPMC Act, 1949. Surat is located on the banks of Tapi river, which is the main source for water and this river divides Surat city in two parts. SMC is responsible for distribution of water supply to the whole city. SMC had prepared a long-term Water Supply Master Plan in the year 1995 to fulfill the water demand for the projected population of 2021.

Pune Municipal Corporation (PMC): The Pune Municipal Corporation (PMC) is the civic body that governs Pune. It is in charge of the civic needs and infrastructure of the metropolis. The executive powers of PMC are vested in the hands of the Municipal Commissioner. The Pune Municipal Corporation (PMC) is accountable for the implementation of the functions under the Bombay Provincial Municipal Act (BMPC), of 1949. PMC is primarily involved in the design, implementation, operation and maintenance of the water supply system within the city limits. It is also responsible for maintaining the old water treatment plants. Entire municipal area is served by treated and piped water supply.

Coimbatore Municipal Corporation (CMC): Coimbatore was constituted as a Municipality in the year 1866 and was elevated to the Corporation status in the year 1981, the third in Tamil Nadu. The Engineering Department in CMC is primarily responsible for the plan preparation and implementation of all developmental works within the Corporation limit. The Corporation provides a number of services to the residents of the city that include new water supply connections; water supply through water tanker in non-network areas; changes in transfer of water supply connection networks, etc.

Municipal Corporation of Gurugram (MCG): The Municipal Corporation of Gurugram (MCG) is geographically divided into Four Zones with 35 wards for administrative convenience. MCG provides its services within the municipal limits covering both old and new Gurugram areas. Service regulations and personnel management system are followed as per the Haryana MC Act of 1994. In Gurugram, water supply from surface sources constitute for 49% of the water being consumed and 51% of the usage is being met by underground water sources.

Knowledge Networking in Water Supply Services in ULBs

Typology of Knowledge Required by Different Stakeholders

Based on the literature review and analysis of the four case studies, a list of crucial areas can be identified from within the system that can be recognised as the knowledge areas for the entire system. These are different kinds of knowledge and information areas based on which the system works. Identifying and managing these knowledge areas therefore becomes important. "Knowledge management is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an organisation's information assets. These assets may include databases, documents, policies, procedures, and previously or current un-captured expertise and experience in individual workers" (Gartner, 2001). Therefore, different types of knowledge areas were identified, required for delivering the service areas (Table 5). These knowledge areas were further grouped under various heads by the researcher in order to have an in-depth understanding of the case studies. These knowledge types are: Technical Knowledge, Special Area Knowledge, Administrative Knowledge, Financial Knowledge, Statistical Knowledge and Digital Knowledge. The descriptions of each knowledge type has been provided in Table 5.

TABLE 5: TYPES OF KNOWLEDGE AREAS REQUIRED FOR
THE SERVICE SECTORS

<i>Sl. No.</i>	<i>Knowledge Type</i>	<i>Description</i>
1	Technical Knowledge	Corporate policy, planning and management, personnel management , organisational development , management of urban utilities, construction management, project preparation – feasibility studies, Engineering drawing, maintenance and repairs of infrastructure, instrumentation, systems engineering, analysis of industrial effluents, rehabilitation of structures, planning and monitoring of metering and billing for water, civil engineering structures, maintenance and rehabilitation, preparation of manual on servicing and repair and testing of electrical and mechanical equipment, water treatment plants, water networks and machineries

(Contd. on next pg.)

(Contd. Table 5)

2	Non-Technical Knowledge	Personnel management and industrial relations, maintenance, manuals – updating, human resource development, labour laws and industrial relations, general management, office management and administration, policies, guidelines
3	Special Area Knowledge	Safety procedures, customer relation, environmental impact assessment, unaccounted for water management, water audit, energy audit, water conservation, rainwater harvesting, water rejuvenation
4	Financial Knowledge	Financial management - commercial pattern & budgeting systems, commercial accounting, basic financial management, metering, billing and customer services, budgeting and audit – procedures, capital budgeting, costing, cash flow and credit management, stores accounting, book keeping and accounts, materials (stock) accounting, management accounting, costing, budgeting and accounting, bilateral/multilateral funding and management
5	Statistical Knowledge	Statistical quantity control, collection of samples, analysis, water quality standards, data collection and statistical analysis
6	Digital Knowledge	Management Information system – automation & application, computers in engineering applications, computer aided designing, standardisation of designs, systems engineering – simulation/modelling, hydrographique survey techniques, total station survey – computerised analysis and mapping of survey data, gis methods preparation and updating of maps, e-governance

Source: Manual on Water Supply and Treatment; Third Edition; Expert Committee, CPHEEO, MoUD; 1999; Manual on Operation and Maintenance of Water Supply Systems; CPHEEO; MoUD & WHO; 2005; Primary Survey in four case study areas;

Human Resources and Knowledge Type

Knowledge is a vital part of human resources in an organisation. It assumes that human capital in an organisation is an element of intellectual capital. Thus, it becomes important to understand which

human resource within an organisation deals with what type of knowledge. It also helps in understanding how human resources apply knowledge processes to support the day-to-day work activities within the service sectors. Therefore, based on the studies of human resources in the water supply service sectors (Section 3.2) and the different knowledge types required within the sectors (Section 5.1), the different knowledge processes were determined. These processes have been explained in Table 6.

TABLE 6: HUMAN RESOURCES AND APPLICATION OF KNOWLEDGE TYPE IN THE WATER SUPPLY SECTORS

Sl. No.	Hierarchy	Key Functions	Designations	Knowledge Type
1	Senior Level Officials	Administrative Management	Commissioner, Chief Executive Officer	Technical Knowledge, Non-Technical Knowledge, Special Area Knowledge, Digital Knowledge
		Operational Management & Technicians	Chief Engineer Mechanical Engineer, Electrical Engineer, Civil Engineer, IT Engineer	Technical Knowledge, Special Area Knowledge, Statistical Knowledge, Digital Knowledge
		Finance & Accounts	Finance Officer	Financial Knowledge, Digital Knowledge
2	Mid-Level Officials	Administrative Management	Superintendent Engineer	Technical Knowledge, Non-Technical Knowledge, Special Area Knowledge, Digital Knowledge
		Operational Management	Executive Engineer, Deputy Assistant Engineer, Sub-Divisional Officer	Technical Knowledge, Special Area Knowledge, Statistical Knowledge, Digital Knowledge
		Finance & Accounts	Accounts Officer, Revenue Accountant	Financial Knowledge, Digital Knowledge
		Manager	Material Accountant, Personnel & Training, Public Relations Officer, Staff Welfare Officers	Technical Knowledge, Non-Technical Knowledge, Digital Knowledge

(Contd. on next pg.)

(Contd. Table 6)

3	Junior Level Officials	Administrative Management	Section Officer, Assistant Engineer	Technical Knowledge, Non-Technical Knowledge, Digital Knowledge
		Technicians	Mechanical Engineer, Electrical Engineer, Civil Engineer, Transport Engineer, IT Engineers	Technical Knowledge, Special Area Knowledge, Statistical Knowledge, Digital Knowledge
4	Staffs	Skilled	Technical Helpers, Operating Staff, Security Guards, Lab Assistants	Technical Knowledge, Statistical Knowledge, Digital Knowledge
		Non-Skilled	Manual Labourer, Gardener, Dusting, Sweeping, House Keeping, Peons	Technical Knowledge, Non-Technical Knowledge, Digital Knowledge

Source: Researcher, 2019 through Primary Survey in four case study areas.

Knowledge Networking Patterns in Service Sector

Networking is a common phenomenon in development practices. It is about organisations, institutions and individual actors joining forces around a common concern. It is about building relationships with other independent actors to share knowledge, goods and experiences and to learn from each other with a common goal in mind [Padron (1991), Plucknett (1990), Engel (1993)]. Within an ULB, networking for knowledge and information exchange is a constant process that takes place. These networking processes can either be internal, i.e. within the organisation or external, i.e. outside the other organisations.

“Knowledge networks also consist of relationships between human resources (nodes). These relationships constitute of a means by which human resources search for information and knowledge, a medium through which information and knowledge diffuse and flow, and a lens through which human resources evaluate each other” (Podolny, 2001). The study has researched a variety of characteristics of formal and informal relationships that influence knowledge outcomes within this service sector. The pattern of relationships that exists among a

set of human resources affects knowledge outcomes. Broadly, two patterns of knowledge networks have been identified: the internal pattern of knowledge networking and the external pattern of knowledge networking. The internal pattern of knowledge networking takes place between the identified human resources within the organisational setup, while external pattern of knowledge networking takes place between the human resources and the external nodes. The patterns differ from one municipality to other municipality and depends completely on the organisational structure.

Internal Networking

Internal networking takes place when individuals within an organisation or ULB interact with each other for the purpose of sharing knowledge, information and experience. Officials and staff interact with themselves for the purpose of service coordination and collaboration regarding administrative, managerial, operation and management of services. This networking happens between the senior, mid-level, and junior officials and the skilled and unskilled staff.

External Networking

Urban Local Bodies also collaborate and coordinate with external parastatals and other organisations for the purpose of exchanging knowledge, information and experience. This is external networking. Few of these external organisations or “external nodes” are:

The Central government—serves as a clearing house of information and topics relating to local self-government both at home and abroad. The Central government provides financial assistance and consultancy services to the state and the local bodies.

The state government—Urban local self-government falls within the jurisdiction of the states. It is created, sustained, regulated and abolished by the states.

Elected Representatives—Elected representatives of ULBs play a major role in ensuring proper service delivery to citizens.

Multilateral and Bilateral Agencies—These are nonprofit agencies based in a single country or multiple governments that provide aid funds for projects to municipalities.

Consultants and Private Sectors—provide professional support or expert advice to an urban local body.

Parastatals—are a company, agency, or intergovernmental

organisation that possesses political influence but serves various activities of a ULB.

External Organisations – are organisations surrounding an ULB that influence its activities and choices, and determine its opportunities and risks. There are also called operating environment.

Experts – are persons who are very knowledgeable about or skillful in a particular area and help a municipal body in its functions.

Research Institutes – a research institute or research centre is an establishment founded for doing research and help an ULB in its functions.

Citizen/Consumer – is a person who is entitled to enjoy all the legal rights, privileges and services granted by an urban local body to the people comprising its constituency.

Training Institutes – are an accredited public or private institutions of higher education which have implemented a training programme for ULBs designed to improve skills in supervising and evaluating student teachers.

Knowledge Networking Process in the Services

Consequently, it also becomes vital to understand how this knowledge is then created, captured, organised, accessed and used as an information asset, (including the uncaptured knowledge of the human resources) within the entire system. As discussed above, knowledge networking process is a holistic approach in knowledge building, creating, sharing and transferring it between different individuals within the organisation. In the process, various knowledge instruments and activities are used to transfer knowledge. Based on the literature review and case studies, the knowledge networking process within a water supply service sector was studied and compiled. Tables 7 and 8 illustrate two kinds of knowledge networking processes that are active within the system. They are internal knowledge networking process and external knowledge networking process which is both tacit and explicit in nature.

Conceptual Framework for Creation of Knowledge in Water Supply Services

A results framework is an explicit articulation (graphic display, matrix, or summary) of the different levels, or chains, of results expected from a particular intervention – process, project, programme, or development strategy. The results specified typically comprise of the longer-term objectives (often referred to as “outcomes” or “impact”)

TABLE 7: INTERNAL KNOWLEDGE NETWORKING PROCESS IN WATER SUPPLY SYSTEMS

Internal Nodes	Knowledge Type	Networking Instruments	Human Resource-Key Functionaries
Senior Level Officials – Administrative Management	• Non-Technical Knowledge • Financial Knowledge • Digital Knowledge	• Workshops / Seminars • ICT • Meetings • Dialogue • Peer Consultation	• Mid-Level Officials – Administrative & Operational Management • Juniors Level Officials – Administration & Operational Management
Senior Level Officials – Operational Management	• Technical Knowledge • Financial Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Brainstorming • Action Planning • Workshops / Seminars • ICT • Peer Consultation	• Senior Level Officials – Administrative Management • Mid-Level Officials – Administrative & Operational Management
Mid-Level Officials – Administrative Management	• Non-Technical Knowledge • Digital Knowledge • Statistical Knowledge	• ICT • Meetings • Dialogue • Peer Consultation	• Senior Level Officials – Administrative Management • Junior Level Officials – Administrative Management
Mid-Level Officials – Operational Management	• Technical Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Brainstorming • Action Planning • ICT • Peer Consultation	• Senior Level Officials – Operational Management • Junior Level Officials, Technicians & Operational Management
Juniors Level Officials – Technicians and Operational Management	• Technical Knowledge • Digital Knowledge • Statistical Knowledge	• ICT • Peer Consultation • Dialogue • Meetings	• Mid-Level Officials – Administrative & Operational Management • Staff – Skilled

(Contd. on next pg.)

(Contd. Table 7)

Staff – Skilled and Non-skilled	• Technical Knowledge • Non-Technical Knowledge	• Dialogue • Meetings	• Mid-Level Officials – Administrative & Operational Management • Junior Level Officials – Technicians & Operational Management
---------------------------------	--	--	--

Source: Manual on Water Supply and Treatment; Third Edition; Expert Committee, CPHEEO, MoUD; 1999. Manual on Operation and Maintenance of Water Supply Systems; CPHEEO; MoUD & WHO; 2005. India Water Tool; World Resource Institute and India Water Tool; Technical Note; 2015. Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas; CHPEEO, MoUD; 2015; and Primary Survey in four case study areas;

TABLE 8: EXTERNAL KNOWLEDGE NETWORKING PROCESS IN WATER SUPPLY SYSTEM

External Nodes	Knowledge Type	Networking Instruments	Human Resource (Key Functions)
Central Government of India	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge	• Meetings • Workshops / Seminars • ICT • Dialogue • Peer Consultation	• Senior Level Officials – Administrative Management
State Governments	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge	• Meetings • Workshops / Seminars • ICT • Dialogue • Peer Consultation • Brainstorming	• Senior Level Officials – Administrative Management
Multilateral and Bilateral Agencies like World Bank, ADB, DFID, GTZ, etc.	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Workshops / Seminars • ICT • Expert Visit • Study Tour • Demonstration of Good Practices	• Senior Level Officials – Administrative & Operational Management • Mid-Level Officials - Administrative & Operational Management

(Contd. on next pg.)

(Contd. Table 8)

Consultants/ Private Sector	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Workshops / Seminars • Action Planning • Expert Visit • Demonstration of projects and case studies • ICT • Peer Consultation	• Senior Level Officials — Administrative & Operational Management • Mid-Level Officials — Administrative & Operational Management
Parastatals – water users in agriculture, industry, water agencies, etc.	• Technical Knowledge • Non-Technical Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Meetings • ICT • Dialogue • Peer Consultation • Brainstorming	• Senior Level Officials — Administrative & Operational Management • Mid-Level Officials — Administrative Management
External Organisations like electricity boards, roads & communication, railways, telecom, pollution control, revenue, industries, Housing, Telecom, PHED	• Technical Knowledge • Non-Technical Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Meetings • ICT • Dialogue • Peer Consultation • Brainstorming	• Senior Level Officials — Administrative & Operational Management • Mid-Level Officials — Administrative & Operational Management
Experts	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Expert Visit & Advise • Panel of Experts on Monitoring mechanism • Role Play	• Senior Level Officials — Administrative & Operational Management • Mid-Level Officials — Administrative & Operational Management

(Contd. on next pg.)

(Contd. Table 8)

Research Institutions	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• Workshops / Seminars • ICT • Demonstration of Good Practices	• Senior Level Officials — Administrative Management & Technicians • Mid-Level Officials — Administrative & Operational Management
Political Representatives	• Non-Technical Knowledge • Financial Knowledge	• Meetings • Dialogue • Peer Consultation • Brainstorming	• Senior Level Officials — Administrative Management
Citizens / Consumers	• Technical Knowledge • Non-Technical Knowledge	• Meetings • ICT • Dialogue • Peer Consultation • Brainstorming • Action Planning	• Mid-Level Officials — active & Operational Management • Juniors Level Officials — Technicians & Operational Management • Staff - Skilled Staff
Training Institutions Identified for Capacity Development	• Technical Knowledge • Non-Technical Knowledge • Financial Knowledge • Digital Knowledge • Special Area Knowledge • Statistical Knowledge	• On-the-job or off-the-job training • Online classes and ICT • Study Tours and demonstration of best practices	• Senior Level Officials — Administrative & Operational Management • Mid-Level Officials — Administrative & Operational Management • Junior Level Officials — Technicians & Operational Management • Staff - Skilled and Non-Skilled Staff

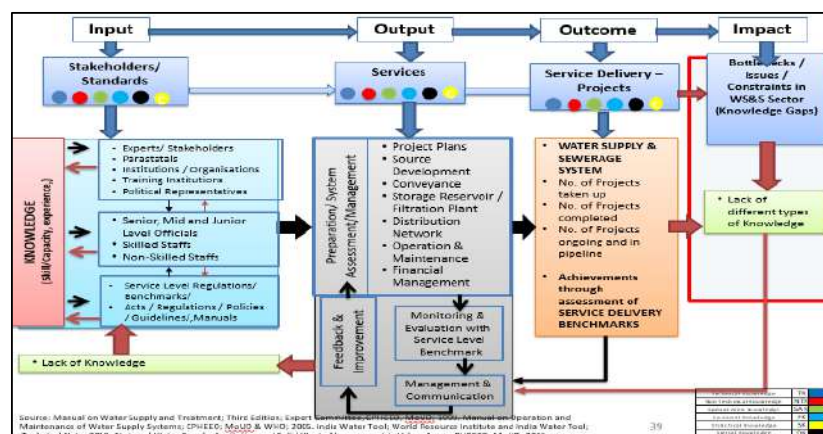
Source: Manual on Water Supply and Treatment; Third Edition; Expert Committee, CPHEEO, MoUD; 1999. Manual on Operation and Maintenance of Water Supply Systems; CPHEEO; MoUD & WHO; 2005. India Water Tool; World Resource Institute and India Water Tool; Technical Note; 2015. Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas; CHPEEO, MoUD; 2015; and Researcher, 2019; Primary Survey in four case study areas.

and the intermediate outcomes and outputs that precede, and lead to, those desired longer-term objectives (World Bank). Thus, the results framework captures the essential elements of the logical and expected cause-effect relationships among inputs, outputs, intermediate results or outcomes, and impact.

Therefore, to understand the knowledge creation and knowledge delivery process within the water supply system, the researcher has used the results framework in the current research. A conceptual framework (Figure 2) of how knowledge is formed and transferred through this system has been therefore developed. In the given framework or the process, the inputs come from various external interactions that happen within the system, i.e. the external nodes, the training programmes and the service manuals and guidelines available for the system covering both tacit and explicit knowledge. Output is basically the implementation process for the services that happens through internal networking amongst human resources. Outcome and impact are end results, where outcome is the service that has been delivered in the form of projects; achievable service benchmarks and standards, etc. and impact is the effect that the service brings at the end of the process in the form of issues and bottlenecks within the system.

Outcomes and impacts are the main focus of a results framework; project inputs and implementation processes are generally not emphasised, although outputs are often noted. This conceptual presentation of a results chain (outputs, outcomes, and impacts) is

Fig. 2: Conceptual Framework for Knowledge Formation in a WS&S System



Source: Researcher, 2019.

accompanied by a detailed plan for monitoring progress toward the ultimate objectives through measuring the achievement of outputs, outcomes, and impacts at different intervals of time. Results are typically defined through indicators, which are quantifiable and measurable or observable.

The conceptual framework and the indicators used for assessing the knowledge flow within a water supply service sector, as derived by the researcher, can be attributed as an ideal situation for any city. The flow can be measured in terms of its indicators and through the presence and absence of knowledge at every stage. The results would give an understanding of the status of knowledge flow within the sector. If the input, output and outcome has presence of knowledge flow, the impact will be low or there will be less amount of absence of knowledge and vice versa. Therefore, while assessing the status quo of any city based on their knowledge flow and networking, the above method can be considered for detailed introspection.

CONCLUSION

Based on the above analysis, it can be concluded that the functioning of a municipal body is dependent on the availability, flow and networking of knowledge within the system that will encourage further research, application and capacity building, which will lead to the smooth delivery of services within the sector. Through this article, the researcher has tried to explore those areas within the service sector where knowledge and knowledge networking is desired. This article can be further used in assessing the knowledge requirements within the service sector for any given ULB.

To strengthen the ULBs, the government needs to strengthen the entire structure and legislative system of local governance in the country. Implementation of the 74th CAA and devolution of all powers to the ULBs will make it more strong. Along with this, a robust system with proper infrastructure and latest technology is the need of the hour. And last but not the least, the human capital or the intellect, needs special attention, motivation, incentives and accountability along with knowledge networking and capacity development to establish a strong and dynamic urban local body.

Endnotes

1. A Guide to Decision-making Technology Options for Urban Sanitation in India; WSP, September 2008.
2. The World Bank, Background Paper – India Water Supply & Sanitation, January 2006; MUDPA, 2011-12; Planning Commission, 1985-90; Shukla, 2002.

3. Municipal Finance and Municipal Services in India: Present Status and Future Prospects, Dr. Mukesh P. Mathur, NIUA, New Delhi, India, June 2010.
4. One must note that since this is only a conceptual organisational set-up prepared by the researcher based on the sources available, this may not be considered an ideal scenario.

REFERENCES

1. Kothari, C.R. (1988). Research Methodology - Methods and Techniques; Wiley Eastern Limited.
2. Yin, R.K. (2009). Case Study Research: Design and Methods (4 ed.) Los Angeles, CA: Sage.
3. Gartner (2001). Gartner Summary Annual Report.
4. Plucknett, D.L., N.J.H. Smith and S. Ozgediz (1990). Networking in International Agricultural Research, Cornell University Press: New York, 224 pp.
5. Engel, P.G.H. (1993). Daring to share: networking among non-government organisations' In: Linking with farmers, networking for low-external-input and sustainable agriculture ILEIA: Leusden.
6. Podolny, J.M. (2001). Networks as the Pipes and Prisms of the Market; *American Journal of Sociology*; 107, 33-60.
7. World Bank (2012). Designing a Results Framework for Achieving Results: A How-To Guide.

A SELECT READING

1. A Guide to Decision-making Technology Options for Urban Sanitation in India; WSP, September 2008; https://www.wsp.org/sites/wsp/files/publications/Urban_Sanitation.pdf
2. Appraisal of Jawaharlal Nehru National Urban Renewal Mission (JnNURM), Final Report – Volume I, Grant Thornton, March 2011; <http://www.cmamp.com/CP/FDocument/JnNURMvolumeII.pdf>
3. Capacity Building Scheme for Urban Local Bodies (CBULB), (Revised), Ministry of Urban Development, Government of India, 2011; <http://mohua.gov.in/upload/uploadfiles/files/CBULB17.pdf>
4. Central Public Health and Environmental Engineering Organization (CPHEEO), Ministry of Urban Development, Government of India; Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas (June 2005); <http://mohua.gov.in/cms/cpheeo.php>
5. Handbook of Service Level Benchmarks; Section I – Service Level Benchmarks in The Context of Performance Management of Urban Services; ASCI; <http://www.asci.org.in/sslb/SLB%20toolkit.pdf>
6. Overview of Municipal Service Delivery Mechanisms, National Business Initiative, Standard Bank Corporate and Investment Banking and Rand Water, August 2006; <http://niti.gov.in/content/financially-empowering-municipalities-way-forward>

7. Role of Urban Local Bodies in Service Provision and Economic Development in India; governance.Paper.jha&chetan.2009; https://www.academia.edu/9586269/Role_of_Urban_Local_Bodies_in_Service_Provision_and_Economic_Development_in_India
8. Urban India, *A Journal of National Institute of Urban Affairs*, New Delhi, Vol.XV (No.1), January-June, 1995
9. "Urbanization in India faster than rest of the world", *Hindustan Times*, 27 June 2007. Retrieved 13 June, 2012.

Urbanisation as a Fulcrum of Jobs and Socio-Economic Change

A.K. JAIN*

ABSTRACT

The question whether urban India should choose the option of greenfield development or brownfields has to be seen in a larger eco-system and policy perspective. The answer need not be in black or white, but can be both. India with the wide variations of geographies and demographics can adopt a mix of the two options based on a comprehensive urban policy. The paper deliberates on the aspects of urban policy and strategies to respond to projected needs of 600 million urban population by 2031. A comprehensive insight into urban issues should be the basis of evolving a vision and to promote the strategies of decentralisation, localisation, partnerships and equity.

Keywords: Urban mission, sustainable development planning, Greenfield vs. Brownfield.

INTRODUCTION

India's urbanisation in 2011 was 31.1 per cent, much lower than China, Indonesia, Brazil and Mexico. Still it is one of the largest at 377 million people. Urban India is expected to house 600 million people by 2031, an increase of 59 per cent from 2011 (See Table 1). India's urban housing shortage is around 19 million (revised to 12 million in 2018). People who belong to the economically weaker sections have no regular jobs, earn daily wages and live in slums. The 2011 Census stated that nearly 65.5 million people reside in slums in Indian cities (13.9 million households), which proliferate in all metropolitan cities.

As per 2011 Census, 70.6 per cent of urban population is covered by individual water supply connections, compared with 91 per cent in China, 86 per cent in South Africa and 80 per cent in Brazil. Duration of water supply in Indian cities ranges from one hour to six hours, compared to 24 hours in Brazil and China and 22 hours in Vietnam.

*Former Commissioner (Planning) DDA, Member Ministry of Urban Development (MoUD) Committee on DDA (2015), Member Government of National Capital Territory of Delhi (GNCTD) committee on Delhi Vision 2030 (2017), UN Habitat Consultant. Email: ak.jain6@gmail.com

In a MoUD (Ministry of Urban Development) study in 2010, none of the 483 cities studied had “healthy and clean” drinking water.

TABLE 1: INDIA'S URBAN TRAJECTORY

<i>Year</i>	<i>2011</i>	<i>2031</i>
Population	1210 million	1440 million
Urban Population	377 million (31.16%)	600 million
Cities and Towns	7935	-
Million + Cities	47	68
5 million + Cities	6	10
Housing Shortage	18.78 million units	30.40 million units
Slum Population	65.49 million	100 million
GDP Urban	60%	70%
Jobs	65 to 70%	75 to 80%

Source: Census of India, 2011 & McKinsey Global Institute (2010) India's Urban Awakening, Mumbai.

A major outfall of urbanisation has been air pollution. Yale Centre for Environmental Law and Policy study states that among 132 countries, India's air quality is the world's unhealthiest. According to Central Pollution Control Board, particulate matter in the air of 180 Indian cities was six times higher than World Health Organisation standards. More people die of asthma in India than anywhere else in the world.

Evolution of the Urban Pattern

During 1608-1757, the East India Company set up factories and trading posts in India, mostly in coastal areas. Surat, set up in 1608 was the company's first headquarters town. It was followed by a Machilipatnam on the Coromandel Coast, and other coastal cities. During 1757-1858, the Company gradually acquired sovereignty over large parts of India, and established Presidencies at Madras, Bombay and Calcutta. North-Western Province was added later with its headquarter at Allahabad, then at Agra from 1834 to 1868. Hooghly, Calcutta was founded by Job Charnock in 1686, where the Presidency at Fort William was established. Fort St. George was established as the headquarter of Madras Presidency.

This was the beginning of a modern town planning in India, transplanted from Europe. The cities, buildings and fortified cantonments had no relationship with Indian people, dust and heat, poverty and culture. (Jain A.K., 2018, City Planning for a Changing India)

Cantonments

Sixty two notified cantonments and 44 unlisted Garrisons/ Cantonments have also been developed in India. These generally have a grid iron pattern, large parade grounds, parks, bungalows and barracks, mess and clubs, mall roads, Sadar Bazar, schools, hospitals and dispensaries, military training centres, barracks, etc. General pattern is low-rise, low-density development.

Hill Stations

The British rulers developed 40 hill stations with race courses, cricket clubs, tennis courts and public parks. These provided refuge as places to rest and recuperate from the arduous life on the plains.

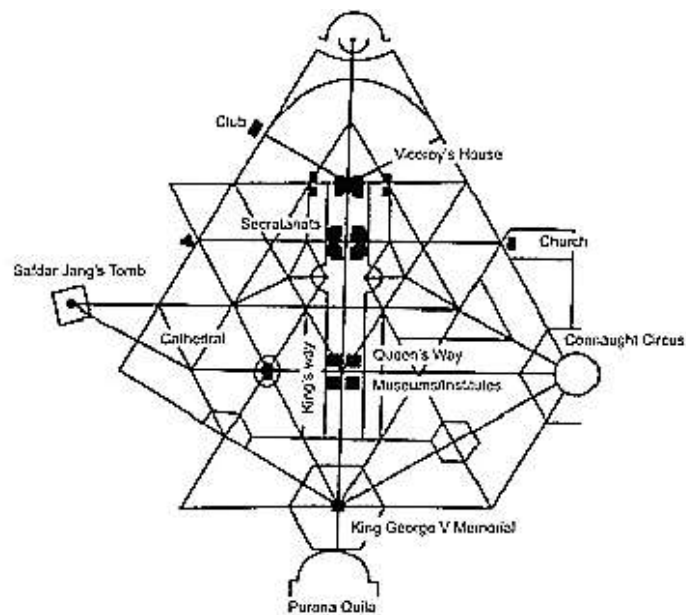
Imperial Delhi : The colonial urban pattern reached its zenith in the planning of Imperial Delhi, which was laid out by Edwin Lutyens as a garden city covering 8,200 acres to accommodate a population of 65,000. It was accessible from the Walled City only through two underpasses, Minto and Harding Bridges. Beyond this, New Delhi was laid in a geometric pattern over a triangular base formed by the Connaught Place, Viceroy House and India Gate. With its wide avenues, double row of trees, the Central Vista was the centrepiece of the new city. The residential areas were planned for lower and middle income employees to the north of the vista and the bungalows for British officials to the south, in an hierarchical pattern. (Figures 1 and 2)

Imperial Delhi lent India a place of pride among the countries with great capitals, like, Washington, Paris and Canberra. The Central Vista and the vast green avenues accentuated the grandeur and superiority of the new city. The panorama of monumental buildings enveloped within a rich landscape is unique. The Central Vista has become symbolic of New Delhi, a stage of the world's largest democracy. The grand vista functions as a ceremonial path during the celebrations of the Republic Day Parade held annually on the 26th of January when the avenue comes alive. The Secretariats were planned, flanking the Viceroy House on two sides.

Concept of Conservative Surgery

While New Delhi was being developed as a magnificent green city, Patrick Geddes, an English sociologist, advocated brownfield development. He adopted conservative surgery approach which was based on the understanding of the spirit of the place and small adjustments, not magniloquent grandiose works. His plans were moderate in terms of cost and population. He was disturbed by the

Fig. 1



While planning New Delhi, Lutyens conceived a garden city with buildings below tree height except the buildings in the monumental grid i.e. along the Central Vista. India Gate and Government Complex were linked by a monumental grid, known as the Central Vista. The India Gate, symbolic city gate was planned on the river side, while the Capital Complex dominating the skyline was placed at the Raisina Hill. A hexagonal grid provided visual continuity of the city with the ancient monuments, like Purana Qila, Jama Masjid, Safdarjung Tomb, Ferozshah Kotla, Lodhi Garden, Humayun Tomb, etc. The new Capital was carefully placed between two natural features of the site, viz. River Yamuna on the East and the Ridge towards the West.

Fig. 2 : Central Vista, the Centrepiece of New Delhi



Source: Central Public Works Department (CPWD) Archives.

cities growing without the concern of health, clogging up all their common spaces, overcrowding and segregation of different castes. Geddes did not favour the Romantic conservatives and suggested that city planning must be based on Civic and Diagnostic Surveys. To improve the dilapidated, congested city, he suggested that only the most dilapidated houses be pulled down for creating open spaces within the congested areas and also allowing ventilation for each house. The few families displaced were resettled with a basic standard of housing and environmental hygiene. He advocated slum rehabilitation and improvement, and shifting of industrial areas outside the Old City (Figure 3).

New Cities after Independence

After Independence, Indian cities witnessed unprecedented immigration. There was a zeal to build a new India. Several new cities and industrial townships were taken up such as Chandigarh, Bhubaneswar, Gandhinagar, Bokaro, and Faridabad.

Chandigarh, the capital of Punjab and Haryana, was designed by Le Corbusier. It was based on his concept of city as a human system,

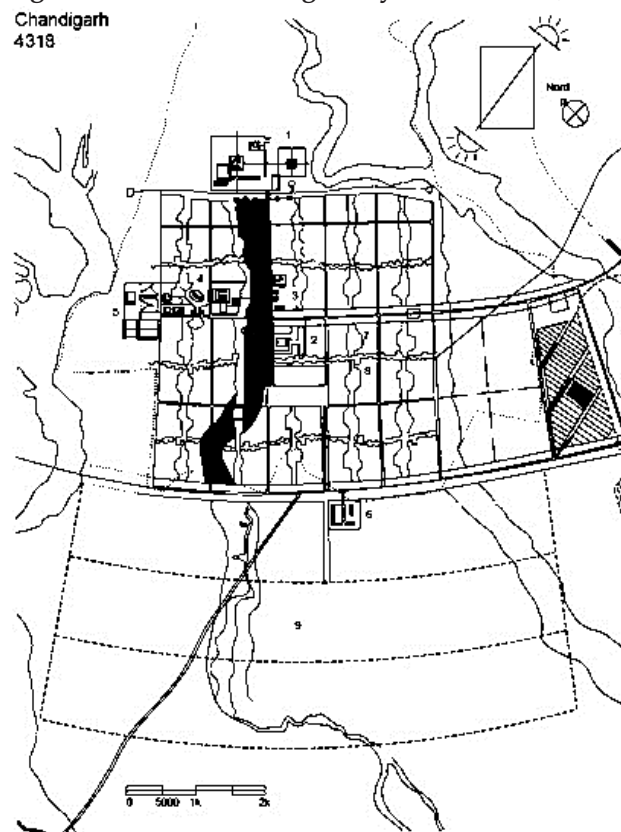
Fig. 3: Indore: Expansion of the New Industrial City in the North-East Quadrant



Source: Patrick Geddes

comprising the head, heart and hands, with roads as the veins. In the great Indian cities of Mughals, the water flowing from the mountains and rainwater was collected into lakes, reservoirs and channels, where the gardens were located (e.g. Shalimar Bagh in Srinagar). Le Corbusier applied the same principle in Chandigarh and established lake Sukhna that impounds the water flowing from the Shivalik hills and a leisure valley along an existing stream. It brings the landscape in the midst of the city and has become an ecological asset. The capital complex was located at the head of the city, with the hill landscape in the backdrop. A hierarchical system of V-7 roads, streets and pathways provided mobility to its citizens. The City Centre was at the heart of the city. The industrial zone was buffered by a 'invioable' green belt (See Figure 4).

Figure 4: Plan of Chandigarh by Le Corbusier, 1951



1. Capitol complex; 2. Central business district; 3. Hotels, restaurants and visitors' center; 4. Museums and stadium; 5. University 6. Wholesale market; 7. Park through residential areas; 8. Shopping Street (V4); 9. Area for expansion of the city.

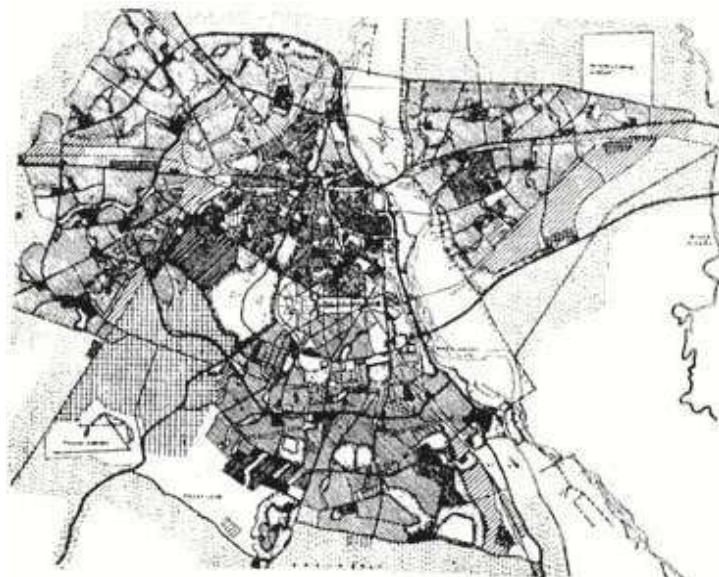
Boesiger, W. (ed) (1999) Le Corbusier, Complete Work, Birkhauser Publisher, Basel.

Delhi in 1947, witnessed an estimated half a million refugees seeking shelter. For these jobless and homeless people, 36 rehabilitation townships sprang up which include Nizamuddin, Lajpat Nagar, Kalkaji, and Malviya Nagar, the three Patel Nagars, Moti Nagar, Ramesh Nagar, Tilak Nagar, Kingsway Camp, Gandhi Nagar, Kalkaji, Tihar and Sheikh Sarai. However, for a more comprehensive citywide planning and development, the Delhi Development Act, 1957 was enacted and the DDA took up the planning of Delhi with the help of Town Planning Organisation and Ford Foundation.

The Master Plan for Delhi was given statutory shape on September 1, 1962. It assessed the existing deficiencies in housing, community facilities, services, etc. and projected the requirements of 4.6 million (revised to 5.3 million) population in 1981. The Delhi Master Plan earmarked the Old City for Urban Renewal, comprising redevelopment, rehabilitation and conservation (See Figure 5).

Many states in India modelled their Town Planning legislation on the basis of Town and Country Planning Act, (1947) of United Kingdom. A Model Town and Regional Planning and Development Act (1962) was drafted by the Town and Country Planning Organisation (TCPO). Many cities in India enacted legislations for the preparation of Master Plan and Zonal Plans on the lines of the Delhi Development Act.

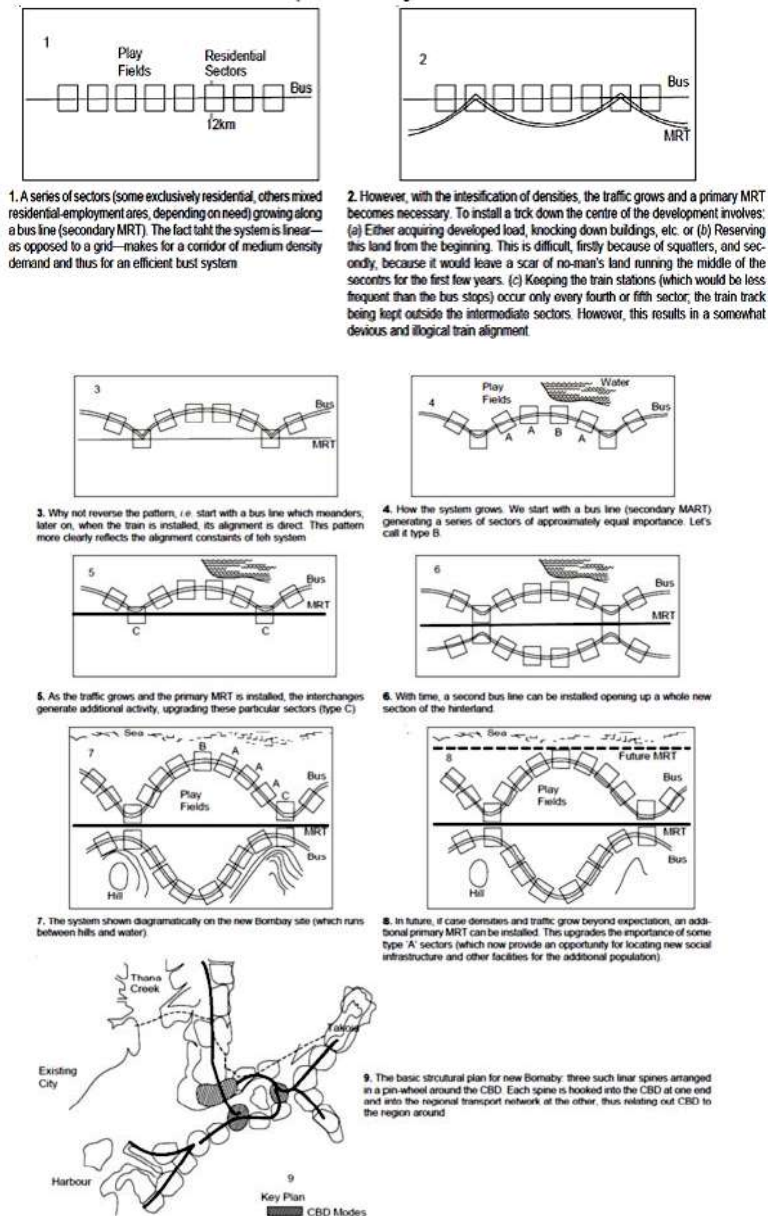
Figure 5: Master Plan for Delhi-1962*



*Master Plan for Delhi-1962 was first statutory Master Plan in India. It was planned for a population of 5.7 million (1981) covering an urban area of 44,000 Ha. Source: Delhi Development Authority (1962) New Delhi.

In **Mumbai**, Charles Correa in 1970 developed a proposal for development of New Mumbai, a necklace of greenfield township along the MRTS and bus corridors. (See Figure 6).

Fig. 6: The Concept of New Bombay (Mumbai)*

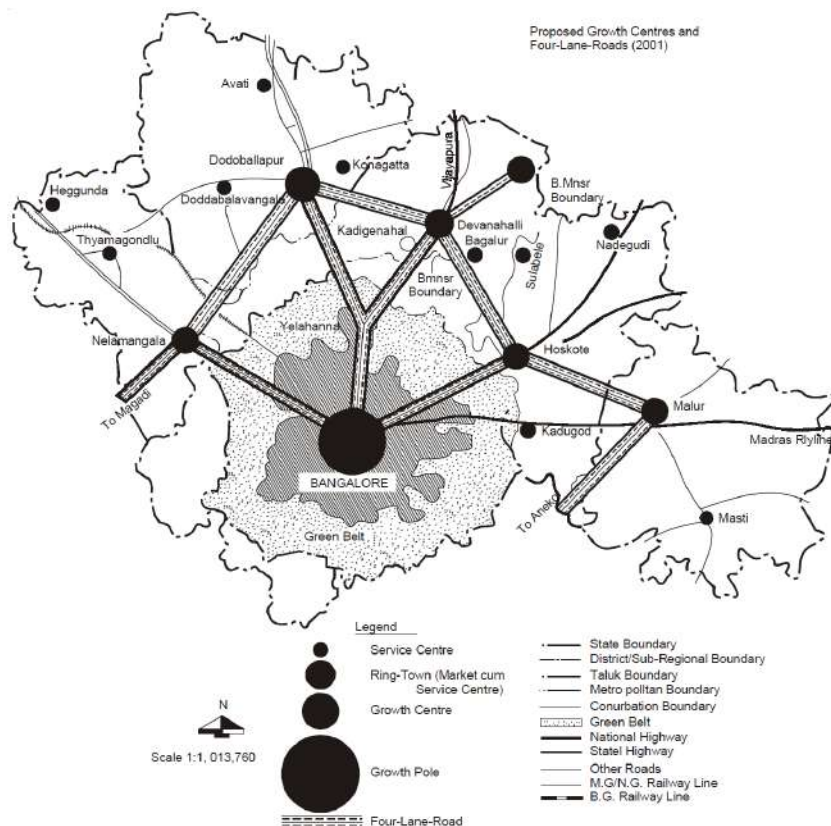


*The concept of New Bombay (Mumbai) developed by Charles Correa is based on 'beads in a string' pattern, the MRT corridor tying up new cities in the region
Source: Frampton, Kenneth (1996) Charles Correa, Perennial Press, Mumbai

In 1985, the National Capital Regional Planning Board was constituted by an Act of Parliament. The idea was to prepare a comprehensive plan for integrated development of the region. The Ministry of Urban Development and Planning Commission floated the scheme of Integrated Development of Small and Medium Towns, which covered 235 cities and towns across the country. Besides Delhi NCR, The Regional Plans of various metro cities, such as Mumbai, Kolkata, Chennai, Hyderabad, Bangalore, Ahmedabad, etc. were prepared. Figure 7 illustrates the Structure Plan of Bangalore.

In 1992-93, the 73rd and 74th Constitutional Amendment Acts emphasised the Urban Local Bodies to prepare District and Local Plans, and constitution of District Planning Committees and Metropolitan Planning Committees. However, many states did not abide by these provisions and perpetuated with conventional Master Planning.

Fig. 7: Structure Plan of Bangalore Metropolitan Sub-Region*



*Structure Plan of Bangalore Metropolitan Sub-Region based on Radial Transport Corridors (2001).
Source: Bangalore Development Authority.

Under the Special Economic Zone Act, 2003, about 350 SEZs have been developed. Several private sector townships have also come up, which include Amby Valley and Lavasa in Maharashtra.

Urban Development Plans Formulation and Implementation (UDPFI) Guidelines (1996) were prepared by the Institute of Town Planners, India for the Ministry of Urban Development. The UDPFI Guidelines have been revised as the Urban and Regional Development Plans Formulation and Implementation Guidelines (URDPFI) in 2014–15. In view of 73rd and 74th Constitutional Amendment Act (1992-93) and Right to Fair Compensation in Land Acquisition, Resettlement and Rehabilitation Act 2013, a revised Model Town and Country Planning and Development Law has been drafted, as a part of URDPFI Guidelines. The MOHUA have also issued Transit Oriented (ToD) Guidelines in 2015.

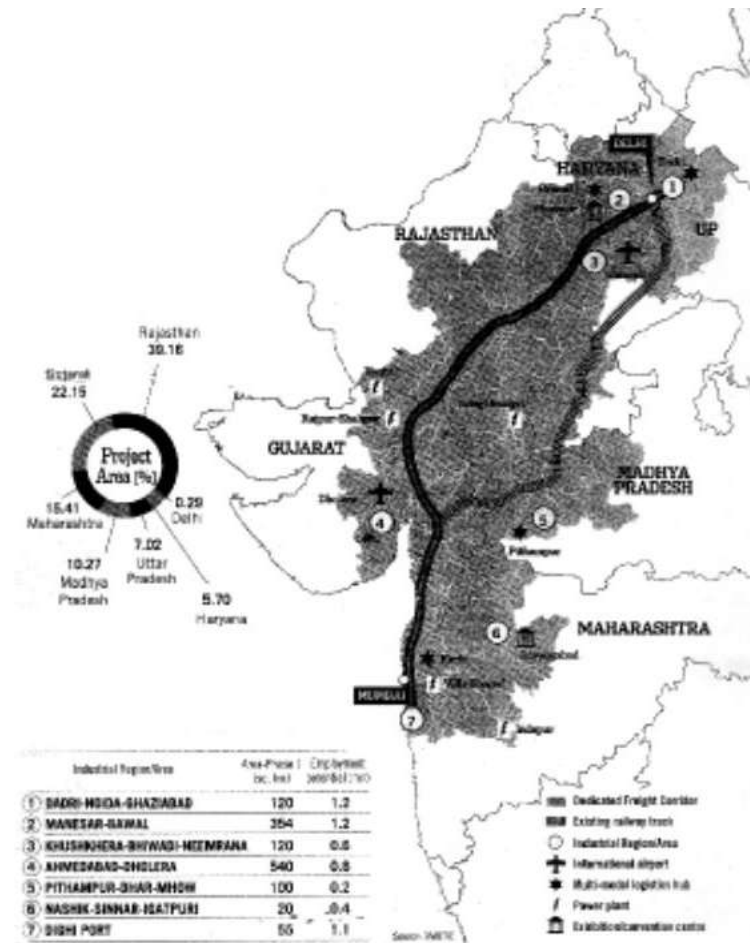
The "Golden Quadrilateral" network of National Highways linking Delhi, Mumbai, Chennai and Kolkata as well as the Western corridor (1,483 kilometres) Delhi-Mumbai Industrial Corridor (DMIC) and Eastern (1,279 kilometres) Delhi-Kolkata Rail Freight Corridor have been taken up during last 10 years.

The Delhi-Mumbai Industrial Corridor (DMIC) is Asia's biggest urban development project, which is expected to create 24 smart cities (7 Industrial Regions) spanning six Indian States, including Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra. The key features of these cities include digital planning and governance, compact, vertical development, efficient public transportation system, technology for smart grids and better management of civic infrastructure, recycling of sewage and wastewater for industrial use, green spaces and easy access to goods, services and other community activities. See Figure 8.

Urban Missions

During last five years, the Government of India has launched several new urban missions, viz. Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Pradhan Mantri Awas Yojana, Historic City Development and Augmentation Yojana (HRIDAY) and Swachh Bharat Mission (SBM). These missions target the provision of core infrastructure services like water supply, sanitation and solid waste management, efficient urban transport, affordable housing for the poor, 24x7 power supply, IT connectivity and e-governance. These missions emphasize upon participatory planning and governance, livelihoods, connectivity and provide better education, healthcare, urban

Fig. 8: Delhi-Mumbai Industrial Corridor



Source: Delhi-Mumbai Industrial Corridor (DMIC) Ltd.

safety and services. This is an opportunity to indigenise urban planning and make it part of larger eco-system of sociology which addresses our own demographics, culture, humanity and local geography. The Ministry of Housing and Urban Affairs has already selected 100 cities for development as smart cities. (Jain A.K., 2015)

These Missions envisage to harness the public, private and community resources together with Central Government grants. Planning is to be inclusive that provides jobs, livelihoods, local economic dynamism and cultural expression. Besides 100 smart cities, a network of smart cities is proposed on Delhi-Mumbai Industrial Corridor. Gujarat International Finance Tec-City (GIFT) city Gandhinagar and Amravati, the new capital for Andhra Pradesh.

Sustainable Development Planning

The current planning in India is by and large reactive, which has not kept pace with the socio-economic environmental and technological changes. This is reflected by shortages of infrastructure services, housing, jobs and pollution.

Planning is a process of organising people, resources and activities in space and time which establish inter-linkages for a holistic development. Planning aims at optimum use of land, together with communication routes so as to secure the maximum degree of economy, convenience and beauty. It manifests collective intelligence and foresight to chart out a direction, order, harmony and progress relating to the economy, environment, culture, climate and community welfare.

Planning can be seen as a matrix or intersection between the three levels, i.e., policy, strategic and action planning, and five spatial scales as given below: See Figure 9.

- (i) Regional/Sub-Regional
- (ii) City
- (iii) Zone/Sub-Zone/Sector
- (iv) Ward/Local Area
- (v) Projects

Planning can be divided into three interconnected phases-Long term, Short term and Annual. Long term plans are usually the vision and policy plans, short term are strategic plans (usually for five years) and project Plans are operational, action plans.

The inter-linkages among development planning and projects aim to achieve social welfare through inclusive economic growth,

Fig. 9: Matrix of Planning Levels and Spatial Scale
(Shaded area shows the predominant interventions)

Spatial state Level	Regional	City	Zone/ Sector	Local	Project
Policy Planning					
Strategic Planning					
Action Planning					

Source: Jain A.K. (2017), Urban Transformation, Discovery Publishing House, New Delhi.

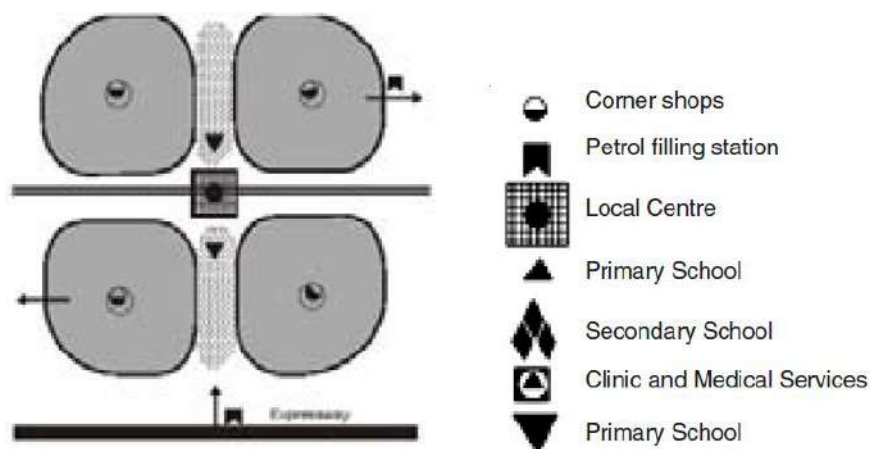
employment, equity and social justice. National Development Plans are the blueprints in organising population, economy, resources and mobility over space. Regional Development Plan aims at orderly settlements development of a region, their efficient functioning and enhancement of the quality of life. The basic module of urban planning is the walkable community which links the bio-shpere systems and social and physical infrastructure by public transport, cycle tracks and footpaths (Figure 10).

The Regional and Master Plans are broadly Policy Plans, while the Zonal Plans act as 'Strategic Plans'. The strategic and action planning have gained a wider acceptance as the new ways of dealing with both localised issues and larger social objectives (environmental, jobs, transport, poverty, etc.).

Greenfield Versus Brownfield Development

Often a question is raised, whether to go for greenfield development or renewal of existing cities. This needs to be seen in the context of potential of jobs, multiplier effect of economic aggregation, land, economics, ecological and other aspects. See Table 2. However, it is a myth that large cities are unsustainable and for financial burden. On the contrary, new cities take a long time for heavy investments to become livable. Naya Raipur started 20 years ago is still a ghost town. Amravati, the new capital of Andhra Pradesh is facing various hurdles in its development.

Fig. 10: The Community Module along Public Transit with Social Facilities



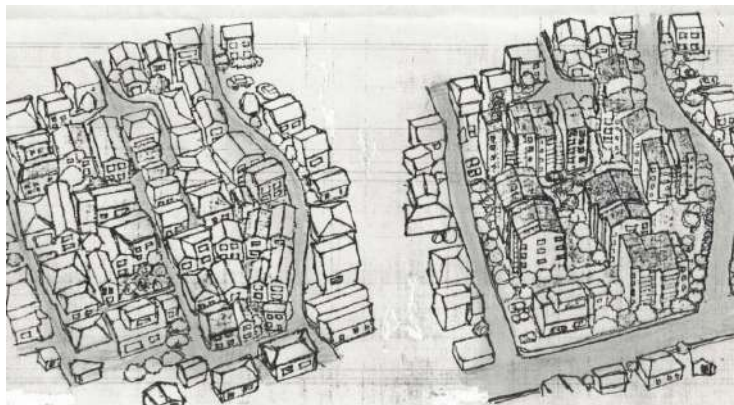
Source: Ling (1997) A Runcorn New Town Master Plan, Runcorn Development Corporation.

TABLE 2: GREEN AND BROWN AGENDAS FOR URBAN DEVELOPMENT

Green-Field Development	Brown-Field Redevelopment
• Costly and time consuming land acquisition or pooling	• No land acquisition involved
• Freedom to plan and design	• Compromise with planning norms and regularisation of unplanned existing development
• Services to be laid de-novo	• Services upgradation
• Disruption of community, jobs and economy	• Minimum dislocation of people and jobs, social, community and cultural relationships continue
• Provision of open spaces, parking and roads as per the norms	• Lack of open spaces, parking and wider roads
• Usually PPP, no community engagement	• Redevelopment not possible without community participation and engagement
• White elephant and ghost town syndrome	• Generally self-financing.

Figure 11 indicates option of existing low-rise, dilapidated urban areas. Figure 12 presents an example of Transit Oriented Development, based on intensive development of areas along public transit terminals. This is crucial for conservation of transport, optimum use of resources/ land and economic urban development.

Fig. 11: Urban Renewal in Japan



*Urban Renewal in Japan: Congested housing areas with low-rise houses were replaced by multi-storied housing releasing ground for roads, parks and common facilities. Special regulations enabled combination of properties for joint development
Source: Jain A.K., Housing and Community Planning, Discovery Publishing House, New Delhi.

**Fig. 12: East Delhi TOD Hub (DDA), a Brownfield Development
Project Architects: DOM and C.P Kukreja & Associates**



Source: DDA and C.P Kukreja & Associates

As the cities are expanding and attracting the people from a wider region, it is necessary to adopt an integrated planning approach in the context of region. While providing for the urban requirements, the natural features like the ridge, forests and other major green areas, water bodies and areas of ecological importance are to be conserved. The telescopic approach dovetails regional plans with the participatory city and local area plans. This involves the following:

- Digital planning in place of traditional cartographic planning;
- Digitise land records and enact legislation on land pooling;
- Strengthen urban planning capacity and constitute empowered Local Area/Ward Planning Committees;
- Take up the preparation of a District/Regional Plan and environment policies;
- Take up physical, social, environmental and financial audits;
- Review the Town Planning and Municipal legislations; and
- Bridging the gap between planning and implementation by constitution of monitoring and coordination groups at policy, strategic and project levels.

According to the Intergovernmental Panel on Climate Change, urban areas account for more than half of global primary energy use and energy related CO₂ emissions. They account for 67 to 76 per cent

of global energy use and 71 to 76 per cent CO₂ emissions. This needs adopting a low carbon (thus low emission) urban form and structure. Figures 13 and 14. According to the IPCC (Climate Change Report, 2014, WG III), the critical aspects of spatial planning for clean air comprise:

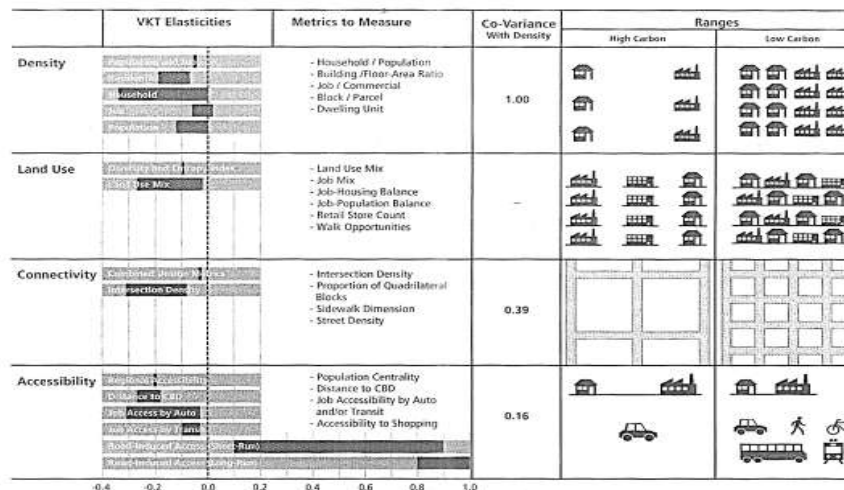
- Density and Floor Area Ratio for optimising land use
- Land use and job mix, walkability
- Connectivity, intersections, block size
- Accessibility to facilities by streets, public transport, cycles and walk

Pollution control plans at district, municipal, and local levels need to be prepared incorporating circular economy, renewable energy, zero net energy buildings, black hole technology of waste management and smart utilities. Intelligent and smart systems, Big Data Analytics, SCADA, ERP solutions, Integrated Digital Control/Command Centres and satellite surveillance are indispensable for pollution control. (Jain A.K. 2019 Planning for Clear Air.)

The planning paradigm for sustainable, smart and inclusive development involves the following:

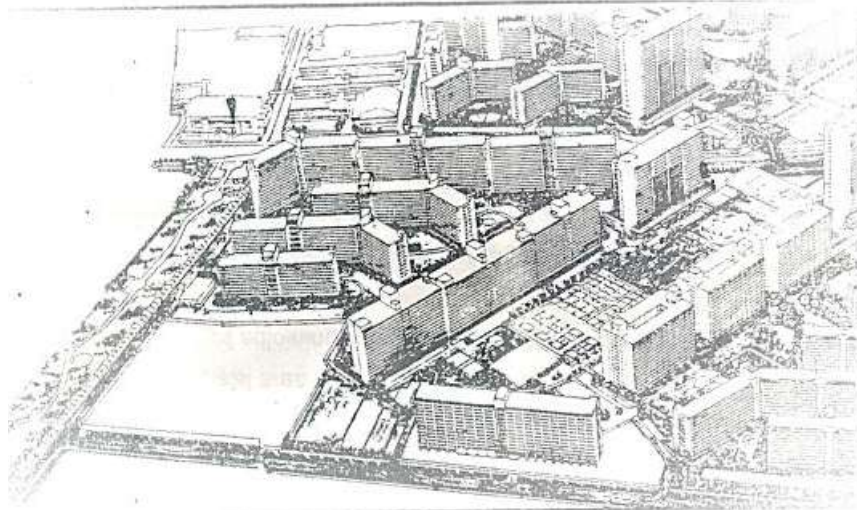
- Urban structure commensurate with the dynamics of growth, decentralisation of activities, economy of scale and better quality of life.

Fig. 13: Density, Land Use, Connectivity and Accessibility for Sustainable Urbanism



Source: IPCC, 2014

Fig. 14: High Density and Compact Urban Pattern for Optimum Use of Land



- Higher level of mixed land use, densities and compact urban form based on environmental performance criteria.
- A coherent urban form, place making, controlled streetscape, enveloping of inner-city areas, landmarks, nodes, pedestrian precincts, *chows* and squares.
- Wide variety and intermixing of socio-cultural activities, relationship of commercial and public activities with public transportation.
- Prioritise brownfield redevelopment, services, traffic and housing improvements.
- Built form consistent with historical, socio-cultural context and potential of an area/region.
- Exclusion of environment endangering land uses.

A major focus area has to be local economic promotion and poverty reduction. A large number of the unemployed are forced to take on informal, illegal or uncertain jobs, and entrepreneurial potential and development opportunities lie untapped. The economic development stagnates, while the vicious cycle of poverty perpetuates. As such, there is an urgent need to focus on the local and regional economy, facilitating micro and small business and attracting investments that provide jobs and reduce poverty. At least 10 per cent of commercial areas may be reserved for the informal sector (street vendors, kiosks, fruit and vegetable stalls, etc.).

Creating Jobs

In India, the cities generate the country's 60 per cent of GDP and 70 per cent of the jobs. However, the lack of affordable space is stagnating their potential.

The Niti Aayog projects that with a financial growth of seven to eight per cent per annum, per capita residential space in India will increase from 5.9 m² in 2012 to 35 sqm in 2047 and commercial space from 0.7 m² to 5.9 m² per capita. There is a need for a quantum leap in the supply of commercial, mixed use and residential spaces. As most of unemployed and homeless belong to the informal sector, sufficient number of the shops, kiosks, open markets and vending spaces should be available on rental basis. A target of 10 million jobs in urban areas can be achieved in next five years by development of *janta* markets, workshops/ sheds, kiosks, shops, small offices, etc.

We can learn from the past. After the partition of the country in 1947, half million homeless and jobless refugees arrived in Delhi. There was an emergency. The Government of India rose on the occasion and planned 36 Rehabilitation Colonies in Delhi with 70,000 plots/ dwelling units to provide shelter and also realising that the Government cannot provide job to all, it created a network of market in these colonies and other areas, e.g. Janpath and Yusuf Zai Market in Connaught Place. A large number of shops in form of platform, *janta* markets, kiosks, fruit and vegetable *mandis*, etc. were provided where just one to two square metre of space creates one livelihood against three to six sqm of space per formal shop.

Planning Regulations and Conservation of Land

As urbanism is vital for India's economic growth and social change, it should ensure reducing the consumption of land and natural resources, while expanding access to jobs, urban services and shelter. High density, compact, smart and more accessible urban pattern can reduce the need to travel and also the transmission losses of water, energy and other services.

In most of the major Indian cities the normal Floor Space Index (FSI) ranges between 1.0 and 4.0. On the other hand, Singapore, Tokyo and cities in China, US and other countries have an FSI of 10.0, which can be even 40 in some cases.

The urban densities in Indian cities indicate wide variations, e.g. Delhi has a density of 9,340 persons per sq. km., Mumbai (overall density 27,348, which is 50,000 for built up areas and 1,00,000 per sq. km in some dense neighbourhoods), Chennai (24,331), Kolkata (24,454),

Bengaluru (19,125), Hyderabad (17,600), Ahmedabad (15,000) and Kanpur (24,700). The densities per sq. km in global cities are- Cairo (40,000), Manila (41,014), Tokyo (13,333), Paris (24,672), Hong Kong (15,880) and Manhattan (25,849). The working population density (day time) of London is 115,384 persons per sq. km.

The lack of street space is a central issue. In Mumbai, the city's streets cover only about 11 per cent of its surface and in Kolkata less than seven per cent, as compared to 21 per cent in Delhi and 22 per cent in New York City. The already limited street space is poorly managed and further reduced by on street parking and encroachments.

A compact city form has significant implications to conservation of greens, climate change and environment. Critical instruments for this policy option include coordination with public transport, infrastructure development, mixed land use, urban boundary, and synergy among different levels of government. Although there are objections to the idea of high-density planning, accumulated data from international cities, such as that by Kenworthy and Laube (1999), indicate correlation of urban density with less transport energy use and car use per capita. This leads to adoption of the "compact smart growth" and transit-oriented development, which create more accessible land use patterns and reduce the amount of travel needed. This also supports a high transit-share and makes walking and cycling attractive.

Shanghai provides an interesting case study of urban turnaround. It has achieved densification together with manifold increase in its green area, transport infrastructure, social facilities and urban services. Shanghai in 1990 had average road area per capita of 2.28 sqm. and public green area per capita of 1.02 sq m. By 2003, it increased average road area per capita more than five folds to 12.3 sq m and public green area per capita more than nine folds to 9.16 sq m. This was possible by the planned densification and redevelopment. Delhi also aims to enhance the area under circulation/ roads, green spaces and social infrastructure at a minimum of 10 sq m. per capita each. This can be a basic factor to determine its 'carrying capacity' and to compute the density and Floor Area Ratio (FAR) vis-a-vis greens, common social facilities/utilities, and roads/parking.

In order to accommodate continuous in-migration and population growth, rationalisation of FAR/FSI, height and densities are vital. Suburbanisation is not the answer, as it works against the principle of maximum distance of 15 minutes from residence to place of work and day-to-day facilities. In order to accommodate the population pressure, the strategy to intensify central district while creating dispersed housing in the para-urban districts has not worked.

The densification and urban restructuring can lead to travel reduction, economy of services and conservation of agricultural areas. The Indian cities have an overall density of 100 to 240 PPHa, which can be selectively doubled along public transit corridors, excluding the archaeological, heritage and conservation zones. It may be noted that India's entire urban population of 400 million can be accommodated an area of one million Ha @ 400 persons per hectare, which is less than the area of the NCR or Greater Mumbai. As such, population is not a problem, but we need to plan and manage the resources differently. The focus has to be on redevelopment of the brownfields, infrastructure services, transportation, public greens and facilities. With the aim to create jobs, shelter and services for all, and to reduce pollution and environmental impacts, urban eco-system has to be compact and dense. Such an urban pattern can help in improving the urban liveability, equity and sustainability (Jain, 2020 b).

As an example, for accommodating 10,000 dwelling units at 100 Du/Ha, 100 Ha of land will be required. By increasing the density to 200 Du/Ha, the land requirement will be half. As land cost in a mega-city is as much as a 70 to 80 per cent of the cost of dwelling unit, it means reduction of housing cost by 35 to 40 per cent. All service lines – water system, electricity, cables, sewerage, drains, roads and pathways will be reduced by half, thus making the development and services economical. The transmission, leakages and losses and manpower required will also be much less. In this context, the urban form which saves on site area, urban footprint, energy and costs can be worked out rather than the sprawling urban pattern (Figure 15).

As we have limited developable land, the supply of affordable housing can be enhanced by optimising the zoning regulations and enhancing the open spaces, infrastructure services and transportation networks.

Fig. 15: Comparison of Surface Area, Energy and Construction Costs for Eight Housing Units in Different Configurations

Building form	 8 separate houses (ground floor plus basement)	 2 terraces of 4 houses/ (ground floor plus basement)	 block of 8 flats (2 storeys plus basement)
Site area	100 %	70 %	34%
Envelope surface area	100%	74 %	35%
Heating energy	100 %	89 %	68 %
Construction costs	100%	87%	58 %

Source: Presig H. R, et al (1999) Okologische Baukampetenz, Zurich

Strategies to Control the Environmental Pollution

According to the reports of the Central Pollution Control Board (2018) large number of Indian cities are facing severe air and water pollution. This needs a radical approach towards the sustainable development that aims at striking a balance among the economic, human—social, cultural and environmental goals and their integrity. The human interventions in natural system have to be limited to the extent of carrying capacity of an area.

In a resource constrained landscape, it is necessary to map and assess the natural, financial and energy resources and to work out the disruptive technologies which are ecologic, equitable and efficient. This involves adopting the concept of decoupling, which refers to discontinuance of “economic goods” from the “environmental bads”. It aims at doing more with less and reduction of inputs of resources and energy in order to reduce environmental footprints while achieving higher economic activity.

The rivers and water bodies in urban areas usually have a high level of pollution, which is mainly from the untreated sewer and waste form adjacent industrial/urban areas. Besides, the enforcement of Water Pollution Control Act, an environment-based strategy, as given below, is essential for their improvement:

- Linking of the natural water body and river with the population by access and landscape development.
- Control of pollution of water from industry, drainage, sewerage, flyash, garbage and waste dumping.
- A drainage and flood control strategy linked with water supply.
- Control of land uses which are incongruous with environment, such as polluting industry and coal-based thermal power plants.

The revival of the concept of watershed development, harvesting and conservation of rainwater and recharging of underground water can substantively resolve the urban water crisis. Several technologies, such as decentralised and compact water treatment units, solar/aerobic/oxidation and root zone cleaning systems can be employed to purify potable water from natural sources.

The objective of sustainable development is based on the following considerations:

- Conservation of green areas, fertile land, forests, geology and hydrology;

- Rejuvenation of rivers and water bodies, ground water augmentation;
- Pollution prevention (water, air, noise, transport);
- Management of pollution sources (industries, transport, households);
- Provision of efficient sustainable infrastructure (energy, water supply, sewage, sanitation, liquid and solid waste management, etc.); and
- Provision of compatible land uses with compact and smart urban growth.

Greens and Public Spaces

With the expanding city, agricultural land and food production is diminishing. This is making food more expensive with longer haulage. The concept of vertical urban farming can effectively address these issues. Satellite controlled micro-irrigation system cuts water consumption and use of the power by pump. Wastewater recycling, with dual piping would reduce water demand. Vertical farms could reduce fertilizer and freshwater use, shorten transport and recycle grey water otherwise dumped by treatment plants. These can be the new frontiers of urban landscape.

For an urban area, about one-fourth of the total area should be available for Recreational land use, which includes district/regional/local parks, urban forests, sports and playgrounds, etc. Besides this, about 10 to 15 per cent of the area should be planned for neighbourhood parks and playgrounds within the residential areas. In a city about 10 sq. m of recreational area per capita should be preserved as open space. A system of landscaped linkages connecting various parts of the city, neighbourhoods and important monuments should be planned. The parks and gardens, should provide a sense of oasis and shelter from oppressive climate. Peripheral green belts can be utilised as wind breakers, filters of dust-storms and as transition zones.

The greenways along natural drainage corridors and harvesting of rainwater in balancing lakes and ponds are the new frontiers in water and landscape management.

The urban form, land use planning, landscape and green/noise buffers can help in reducing the noise levels. It is not desirable to locate residential areas along major arteries and non-residential activities inside the residential localities that would invite traffic. By proper land use planning, mixed land use, location of public/semi-public

and commercial activities along major transport arteries, a buffer can be created for residential zone. The green buffer with thin leave trees, land formations, mounds, embankments, etc. provide effective barriers to transmission of noise.

Sustainable and Resilient Buildings

It is estimated that 60 per cent of the buildings required for urban India by 2030 are yet to be built. This is a unique opportunity to shift towards sustainable, resilient and green buildings, based on the following principles and strategies:

- Sustainable site planning;
- Building envelope design;
- Building system design HVAC (heating, ventilation and air conditioning), lighting, electrical, and water heating;
- Optimum use of energy and reducing its need by day lighting, courtyards, green roof, ventilation, etc.;
- Integration of renewable energy sources;
- Selection of ecologically sustainable materials (with high recycled content, renewable resources with low emission potential);
- Passive design of building for climatic comfort;
- Water conservation and recycling;
- Solid and liquid waste management, its treatment and reuse;
- Efficient building systems, construction and maintenance.

It is necessary to specify building materials which are locally sourced, have low embodied energy and require less energy for transportation to the site. These should be preferably natural, or recycled from reclaimed construction and demolition wastes including timber steel and aluminium.

Rooftops painted white reflect heat, lowering a building's cooling cost and a city's heat build-up. Rooftop vegetation insulates building against heat and cold and absorbs storm-water. Passive Evaporative Draught Cooling (PEDC) and Earth Air Tunnel (EAT) incorporating ingress of naturally cooled air 4m below ground level via clay pipes saves about 60 per cent of air conditioning load. (Klaus, Daniels, 1994)

Smart and green buildings can give energy saving up to 30 per

cent, reduce carbon emissions, provide higher efficiency and comfort with lesser energy consumption. The city and buildings have not only to be comfortable, green and efficient, but also intelligent and integrated.

CONCLUSION

India is poised to have 600 million urban population by 2031, which is a big challenge. This has to be seen in a larger eco-system and policy perspective. India with wide variations of geographies and demographics can adopt a mix of the options of greenfield and brownfield development which should be based on a regional perspective. The urban policy involves a series of steps to be taken in a long journey. These include the following:

- Urbanisation as a fulcrum of growth for jobs and to safeguard the economic, social and ecological rights;
- Planning at regional/district, city and local levels, as a medium of reflection, negotiation and urban debate on multiple concerns, metropolitan kinetics, informality and civil society;
- Setting up the benchmarks, standards and norms;
- Preparation of action plans at policy (regional/district), strategic (city/zone) and operational (local/project) levels;
- Strategic coalition and capacity building;
- Legal and procedural reforms;
- Financial planning, outcome budgeting and harnessing the resources of government, private and community sectors;
- The strategies of decentralisation, localisation, partnership and equity.

A comprehensive insight into urban issues should be the basis of evolving a sustainable urban vision.

REFERENCES

1. Bangalore Development Authority (2001) Bangalore Master Plan, BDA Bangalore.
2. Boesiger, (ed) (1999) Le Corbusier, Complete Works, Birkhauser Publisher, Basel.
3. Census of India (2011). Census Commissioner, Ministry of Statistics and Programme Implementation, New Delhi.

4. Central Pollution Control Board (2018) Reports on Air Pollution in India, New Delhi.
5. Delhi Development Authority (1962) Delhi Master Plan, New Delhi.
6. Frampton Kenneth (1996), Charles Correa, Perennial Press, Mumbai.
7. IPCC (2014) Climate Change Working Group III, 5th Assessment Report, Cambridge University Press, UK and New York.
8. Jain, A.K. (2020a) Housing and Community Planning, Discovery Publishing House, New Delhi.
9. Jain, A.K. (2020b) Tall Buildings and Vertical Urbanism, Discovery Publishing House, New Delhi.
10. Jain A.K. (2018) City Planning for a Changing India, Bookwell Publishers, New Delhi.
11. Jain, A.K. (2015) Smart Cities: Vision and Action. Discovery Publishing House, New Delhi.
12. Jain A.K. (2019) Spatial Planning for Clean Air, *ITPI Journal*, July-September, New Delhi.
13. Klaus, Daniels (1994) Technology of Ecological Building. Berkhauser, Verlag, Berlin.
14. Ling A (1997) Runcom New Town: Master Plan, Runcom New Town: Master Town, Runcorn Development Corporation.
15. McKinsey Global Institute, 2010, India's Urban Awakening, Mumbai.
16. Presig H.R., et al (1999) *Okologische Baukompetenz*, Zurich.

Impact of Built Environment on Pedestrian Mobility: A Case Study

ASHI VASHIST*

ABSTRACT

In recent years, walkability has become a major topic in urban planning. Cities across the nation, are implementing pedestrian master plans, and builders are starting to develop walkable communities. But what is it that makes a place pedestrian-friendly? Why is pedestrian mobility so important, and why is this topic gaining so much attention now? The purpose of this article is to explore indicators of pedestrian mobility. In doing so, it looks at walking as an alternative to driving, and as a way to incorporate physical activity into daily life. Against this backdrop, the paper attempts to study the indicators of pedestrian mobility and how built environment encourages them to walk in an open and other urban spaces. It also includes, elements of built environment that fulfil the requirements of a public space, and at the same time, work as a social interactive space, based on the choice of pedestrians or users. The study is limited to urban spaces particularly in mega cities where land value is relatively high. It is confined to pedestrian movements and not the other modes of transportation particularly motor vehicles.

Keywords: *Walkability, pedestrian mobility, built environment*

INTRODUCTION

Walking has been associated with many benefits, ranging from reducing: a) traffic congestion; b) air pollution, and c) scarce resource consumption to solving obesity and other health problems. It has been regarded as an essential factor in the creation of “liveable communities”, encouraging neighbourly interactions and making the urban environment a more enjoyable and safer place to live (Emery and Crump, 2003).

With such associated benefits, one of the most critical questions to be asked is how to encourage people to walk. This question has been

*Independent Researcher, MBS School of Planning and Architecture, Delhi.
Email: ashivashist1998@gmail.com



particularly addressed to urban planners in terms of the contribution of the urban built environment in encouraging and promoting walking. From one perspective, the relation of the built environment with walking behaviour has been mostly intuitive, as there has been little scientific evidence in supporting the extent and intensity of such relation (Park 2008). From another point of view, research has provided sufficient evidence on the link between built environment and walking (Handy 2005), and focus should be set in identifying and assessing the built environment attributes that make up a pedestrian friendly environment.

Pedestrian mobility has been recently introduced as a concept that translates the extent to which the urban environment is pedestrian friendly (Abley, Turner & Singh 2011). By assessing (or measuring) it, planning professionals may be able to address the quality of the pedestrian environment, what may facilitate the progress towards more integrated, appealing and pedestrian-friendly spaces.

INDICATORS OF PEDESTRIAN MOBILITY

The first step to deductive operationalisation of pedestrian mobility, or developing a composite pedestrian mobility index, was to divide the construct of pedestrian mobility into a small number of more concrete and tangible components, which are called “pedestrian mobility components”.

There is no agreement on a single tool on measuring and quantifying pedestrian mobility. Its indicators are broad. Thus, various indicators of pedestrian mobility can be grouped as following (Abley et al., 2011) :

- *Sense of safety from traffic*: Sense of safety in walking on the sidewalk affected by traffic, sense of safety in pedestrian crossing affected by traffic;
- *Sense of security from crime*: Existence of others, night visibility;
- *Comfort*: Sidewalk level of service and continuity, microclimatic conditions, street furniture;
- *Convenience*: Accessibility, adjoining activities, sidewalk effective width; and
- *Visual Interest*: Planned public spaces, visual attractiveness.

Sense of Safety from Traffic

Sense of Safety in Walking on the Sidewalk Affected by Traffic

It is observed that pedestrians move away from the traffic as they walk alongside on the sidewalks. The reason is to stay safe and to avoid

traffic noise. It is found that the combination of the closeness of the traffic particularly without a barrier fence and the speed of the traffic and the traffic noise make them feel unsafe (Osman, 2016).

Sense of Safety in Pedestrian Crossing Affected by Traffic

In relation to the pedestrian crossing, the key issues can be identified. It is not just one factor that makes crossing the roads such a hard experience and there is a cumulative effect of multiple interactions between the pedestrians, the built environment and the traffic.

The existence of a confusing road layout where the pedestrians do not always know in which direction traffic is moving in and the traffic lights being positioned at the wrong places makes the crossing particularly difficult (Kelly, 2011).

Sense of Security from Crime

Existence of others

It is also known that the presence of people increases the perception of safety of the physical environment (Newman, 1972). People feel safer when they are surrounded by people, on the other hand, people avoid visiting those areas which appear isolated. (Mehta, 2008)

Following are some elements of built environment:

- The placement of windows also plays a major role in providing safety to pedestrians by allowing residents to naturally survey the exterior.
- The dwellings, their entries and amenities should also be placed in such a way so as to incorporate the streets within the sphere of residential environment.

Night Visibility

The pedestrian mobility is affected by a number of factors including pedestrian safety at night. Insufficient visibility during nights is a major factor to safety hazards of pedestrians. Studies have shown that pedestrians are considered vulnerable road users. About 270,000 people are killed each year on roads worldwide as per the statistics. Most of these accidents occur at night or in dim lighting. Pedestrians are mostly at risk during the first hours of darkness. Dark conditions reduce pedestrians' visibility, making it harder for pedestrians to 'stand out' from their environment and more difficult for drivers to see, which contributes to collisions (Mian and Caired, 2017).



Comfort

Sidewalk Level of Service and Continuity

The continuity of the sidewalk is also an important factor for pedestrians, especially for the disabled or elderly ones. Continuous sidewalks are those that do not have any ups and downs. At times, obstructions hinder the pedestrian path and reduce the width of the sidewalk below the allowed minimum. Sidewalk obstructions are usually caused by utility poles, tree trunks, signposts, fire hydrant, etc.

Sometimes, the same is done by encroachments. Encroachments are any temporary objects caused by commercial or any other activities that obstruct the sidewalk and reduce its width below the allowed minimum. Encroachments can be a garbage bin, plants, bushes, hoardings, cones, advertising signs, restaurant tables, vehicles parked on the street, etc. (Shaaban, 2019). In addition, heaps of garbage, construction material etc. are also there.

Microclimatic Condition

Studies on the effects of environmental factors on human behaviour show that comfortable microclimatic conditions, including temperature, sunlight, shade and wind, are important in supporting outdoor activities (Mehta, 2008). Good microclimatic conditions that may largely be a consequence of man-made conditions altering the natural climate become a prerequisite for supporting outdoor activities in public spaces.

Microclimatic conditions can be altered by various methods such as by installing a water body or fountains or by providing several shading devices.

Street Furniture

Well-placed benches invite the pedestrians to rest, creating a comfortable walking experience (Osman, 2018).

- Benches should be provided in locations that experience heavy pedestrian traffic in order to provide a respite for weary travellers, a meeting place, or a place to wait for others.
- Benches may be placed at transit stops to encourage multimodal travel.
- Benches should be conveniently located adjacent to the pedestrian walkway, but should not impede pedestrian traffic.

Convenience

Accessibility

Alfonzo (2005) suggests that feasibility and accessibility (in that order) are the first order needs of walking. Besides individual factors, the viability of any strolling or destination-oriented walking trip may be limited by choice of mobility, time, and other responsibilities. Once a walking trip is perceived to be feasible, the next factor influencing the walking trip is its accessibility. It includes the ability of a person to be able to access the destination; the distances to a destination; the physical and perceived barriers to walking to a place; and the connectivity between the land uses.

Two criteria suggested by Southworth (2005) that deal with accessibility are connectivity and linkage with other modes. While some studies (including Alfonso's) include the variety, quality, and quantity of activities as part of accessibility, the conceptual framework used in the present study puts these under another category called "usefulness." This study is concerned with the microscale characteristics of the neighbourhood main street that support walking. Therefore, it is assumed that first order needs of feasibility and accessibility have already been met for the person making the walking trip to the main street.

Adjoining Activities

Usefulness is the ability for the environment to satisfy the individual's basic day-to-day needs for shopping, eating, entertainment, and so on; and this ability or lack thereof affects walking behaviour. Studies show that people are likely to walk to places with eating establishments such as restaurants and cafes, a variety of shops, and the presence of retail and local shopping (for example, Montgomery 1998 & Handy and Clifton 2001). However, not only the presence, but also the quality of goods and services provided by businesses and other uses, and the quantity of such land uses, make the environment useful and more desirable for walking. Usefulness translates the general criteria of land-use diversity to make it meaningful to the individual whose walking needs are being considered.

Further, studies in phenomenology suggest that by satisfying day-to-day needs, environments encourage repeated visits and increased frequency of use. This increased frequency of use translates into a familiarity with the environment and becomes a routine that creates a sense of place and place-attachment for the users of the environment (for example, Seamon 1980). Seamon suggests that when these repeated



individual time-space routines come together at one place they “may also produce a climate of familiarity which participants appreciate and to which they also grow attached”. Such time-space routines were at the core of Jacobs’ (1961) observations on the life of the streets and sidewalks in Greenwich Village, New York City. Hence, usefulness of the street results in possibly satisfying higher-order needs that encourage walking to the Main Street.

Sidewalk Effective Width

Sidewalks require a minimum width of 5.0 feet if set back from the curb or 6.0 feet if at the curb face. Any width less than this does not meet the minimum requirements for people with disabilities. Walking is a social activity. For any two people to walk together, 5.0 feet of space is the bare minimum. In some areas, such as near schools, sporting complexes, some parks, and many shopping districts, the minimum width for a sidewalk is 8.0 feet.

The desirable width for a sidewalk is often much greater. Some shopping districts require 12, 20, 30, and even 40 feet of width to handle the volumes of pedestrian traffic they encounter (Federal Highway Administration).

Visual Interest

Planned Public Spaces

Open public spaces are places for socialisation, where users rest, have fun and talk. Moreover, “Seeing others and being seen” is a condition of socialisation. Intensity of life in public spaces provides qualities like safety, comfort and attractiveness. Furthermore, open public spaces represent a spatial framework for meetings and multi-leveled interactions, and should include virtual flows, stimulating merging of physical and digital reality. They attract more citizens and visitors, assure a healthy environment, quality of life and sociability (Osman, 2018).

Public spaces are the right environment to enjoy with all the senses. Images, sounds, colours and smells are qualities that can be felt because the attention doesn’t focus on how to avoid cars but freely turns to what really touch the heart of the user. They offer a richness of experience, possibilities for action and leisure. Furthermore, open public spaces are places of collective presence, communication, gatherings and celebrations, or political rallies.

What differentiates open and closed public spaces is that visitors

to the former are there without a specific reason, they are not oriented towards a certain activity, they simply relax, look around at passers-by. In open public spaces, one can find again his/her freedom, which the function and aesthetics of closed spaces has taken away from him/her (Djukic, Vlastos, Joklova 2019).

Visual Attractiveness

Attractiveness and interesting appearance were measured on a visual rating scale, and related to stimuli from fixed, semi-fixed, and movable elements such as the articulation of the building facade; the openings at street level; lighting fixtures; furniture on the sidewalk; signs, plantings, and displays; and the variety in these elements. It is also argued that to achieve interest in the street space, a moderate level of complexity should take place (Rapoport, 1990). It is also affected by the street furniture, landscape elements, people and in turn related activities, including even movements and sounds (Zacharias, 2001). Hence, attractiveness and interesting appearance were set up as measures in an attempt to capture the sensory pleasure that the street environment as a setting was able to offer to its users. The results of the survey indicate that the blocks that seemed more attractive and interesting in appearance to their users were also the ones they walked on the most (Mehta, 2008).

CASE STUDIES

Criteria for Selection of Case Studies

Planned and Developed District Centres

To study the qualitative aspects of the district centres, the changes brought about them, the effect of surrounding context on the development of such centres leading to their success or failure have been detailed below.

- (a) Janakpuri District Centre, Delhi
- (b) Netaji Subhash Place District Centre, Delhi
- (c) Priya Complex, Delhi

Framework for Analysing Case Studies

To understand the pedestrian mobility in district centres and derive clues for understanding a design vocabulary for urban design interventions for developing the same with comfortable and easy walkability, the case studies have been analysed under the heads of indicators of pedestrian mobility.



Janakpuri District Centre, Delhi

Janakpuri is in the Southwest Delhi district of Delhi, India. It is among the most popular and posh districts of Delhi. It is located near the Delhi Cantonment area and is accessible by road and Delhi Metro.

The main commercial centre is the Janakpuri District Centre which houses various regional offices of companies and firms as well as shops selling food, apparel, handicrafts and jewellery. A 'crafts bazaar' within the complex sells handicrafts and home decor items.

The Delhi Metro has three metro stations in Janakpuri (Uttam Nagar East, Janak Puri East and Janak Puri West), all on the Dwarka-Noida line. Also, under the third phase, Janak Puri got a new underground station, Dabri Mor near the DDA Park in C2 Area, on the Magenta Line (Janakpuri west - Botanical Garden) which has been opened for public on 29 May 2018. This corridor will have the first driverless train in Delhi Metro Network. Janakpuri West Metro Station has been expanded to accommodate the new Magenta Line. It is also the nearest metro station to Janakpuri district centre.

The Hari Nagar Bus Depot is also located in the vicinity (Fig. 1).

- *Sense of security from traffic*

Sense of Safety in Walking on the Sidewalk Affected by Traffic: Since the district centre is planned on a high plinth, barriers are constructed along all the sidewalks. Along with that there is a difference of about 1.2 m in level of roads and sidewalks. Thus, people feel safe walking on the sidewalks.

Sense of Safety in Pedestrian Crossing Affected by Traffic: The movement of traffic is on the periphery of the district centre. The centre is entered by flights of steps since it is constructed on a plinth of about 1.2m, which creates a barrier between the pedestrian and vehicular movement. There are also spaces defined for parking. It doesn't hinder the pedestrian mobility.

- *Sense of security from crime*

Existence of others: The spaces around the commercial areas remain crowded and lively around 11am to 10pm. Whereas the footfall in spaces nearby to INOX cinema increases according to the show timings. However, the scenario is different on the rear side of the district centre. Thus, people do not feel safe in those spaces.

Night Visibility: Tube lights are present on the ceilings of the colonnades in a part of the centre. However, rest of the space remains dark during night.

Figure 1: Janakpuri District Centre



Source: Based on Author's study.



- **Comfort**

Sidewalk level of service and continuity: The sidewalks or colonnades are well maintained and clean in some parts, particularly around retail shops, INOX cinema and some restaurants. All sidewalks are around 2.1 m wide which appears comfortable according to the footfall in the space. However, near the computer market, the sidewalks are encroached by informal sectors. It leaves no space for pedestrian mobility and people are forced to use the open spaces adjacent to the colonnades.

It can also be seen that in various parts, the sidewalks seem to discontinue abruptly and form a dead end, which hampers the pedestrian mobility.

Microclimatic Condition: The centre has planned and defined paths for pedestrian mobility through shaded colonnades. Thus, the path remains comfortable for walking irrespective of the temperature of the surroundings. On the other hand, in spaces, where the colonnades are encroached by informal sector, pedestrians are forced to use the open spaces for mobility which reduces their footfall.

Street Furniture: Street furniture is placed at regular and comfortable distances from the sidewalks and from each other in open spaces. They are placed in such a way that two benches face each other, so as to create a social space for the pedestrians. On the other hand, in certain open spaces, street furniture is completely absent. The space appears like a barren land.

- **Convenience**

Accessibility: Parking spaces are provided at the periphery of the district centre which allow people to park their vehicles at comfortable distance from their desired activity. However, as the district centre is accessed by a flight of steps, it is difficult for elderly pedestrians and the physically disabled to reach their desired spaces. The district centre is also easily accessible by metro, which also plays a vital role in high footfall of the area.

Along with this, the centre is adjacent to its surrounding residential spaces.

Adjoining activities: The district centre is an amalgamation of office spaces, recreational activities, eateries, restaurants and commercial spaces.

If one enters the centre through north west side, we would find retail shops. The space is planned as a courtyard with informal activities in

its centre. On the other hand, open seating arrangement of a restaurant and a children's park are also planned in similar spaces.

INOX cinema is the largest attraction of the district centre for most of the people of neighbouring areas. Since the space surrounding the cinema appears as the most crowded space of the district centre, restaurants like McDonald's, Pizza Hut and Dilli Darbaar are also placed in such a way so that they are easily accessible to the crowd.

On the other side of the centre, electronics (computer) market is established, which is also one of the main reason for the current footfall in the space.

Most of the office areas are planned on the above storeys with commercial spaces below it.

Sidewalks effective width: Sidewalks for pedestrian mobility has an effective width of 2.1 m. which appears comfortable for walking. However, the width is reduced in some parts of the centre because of encroachment through informal sector.

- ***Visual Interest***

Planned Public Spaces: The district centre has various public spaces planned around the built form. As one enters the centre, he is welcomed by an open space. Which leads to another open space through a colonnade.

Some open spaces are planned around commercial and recreational areas. Street furniture and green spaces further enhance these spaces. thus, it appears dynamic and lively.

However, open spaces planned in the latter half of the centre, are surrounded by dead walls or old dilapidated shops. Thus, people avoid to visit these spaces and appear static and dead. Unpaved areas also restrict pedestrian mobility.

Visual Attractiveness: Most of the open spaces and colonnades appear clean and maintained, however they do not look visually attractive because they lack vegetation. Another reason could be that the walls of the built form are ruined and in dilapidated stage.

Sidewalks which discontinue at some points, are not used on regular basis, thus they are not maintained properly.

Old green spaces which are not maintained properly have turned into dump areas which reduce the visual attractiveness of the space.



Analysis (Case Study: Janakpuri District Centre, Delhi)

1. ***Sense of security from traffic:*** In terms of safety of pedestrian mobility from traffic, Janakpuri district centre seems safe, as the complex is constructed on a plinth of about 1.2m. Thus, pedestrians feel safe while walking on the sidewalks. Along with that, the whole complex is pedestrianised, restricting the vehicular movement inside the complex, giving a sense of security for pedestrian mobility.
2. ***Sense of security from crime:*** It can be said, half of the complex appears lively and rest of the spaces appear deserted. Thus, people feel safe to walk only on those spaces which stay lively in comparison to other spaces. Night visibility also affects pedestrian mobility, as reduced footfall can be noticed in spaces with lower visibility in evening.
3. ***Comfort:*** According to the footfall in the complex, width of the sidewalk, i.e. 2.1 m appears comfortable for pedestrian mobility. Since these sidewalks are also clean and well-maintained, these enhance pedestrian mobility. These are covered with colonnades, which provide a shaded path. Thus, pedestrians feel comfortable walking even in harsh climatic conditions. Street furniture is also present in similar spaces further enhancing the pedestrian mobility in those spaces.

The scenario is not similar in the other half of the complex, i.e. sidewalks are encroached near the computer market, these are also accompanied by dead ends at several spaces. Street furniture is also absent in its surroundings. All these restrict pedestrian mobility in the space.

4. ***Convenience:*** Accessibility to the complex seems convenient for people both by vehicles and metro. Since the complex is at a distance of about 25m only, from Janakpuri metro station, parking lots have been provided at the periphery of the complex. The complex is designed near residential spaces; thus, it is at a walkable distance from many residences.

The complex proves convenient for daily needs of people living near it. Thus, spaces near restaurants, recreational activities, retail shops, etc. appear lively throughout the day. However, approximately 1/3rd of the complex consists of some buildings which are closed down and restricts pedestrian mobility around them.

5. ***Visual Interest:*** It can be noticed that open spaces work as

welcoming areas for people. These connect one space to another. Open spaces with street furniture and green belts are more inviting as compared to others.

However, much has not been done in order to enhance the visual attractiveness of the space. Walls are in dilapidated states, green spaces are not maintained and cleaning is not done on regular basis.

Netaji Subhash Place District Centre, Delhi

Pitampura is a residential area in North West Delhi District of Delhi, India. It is a planned neighbourhood developed by the DDA in the 1980s. It is accessible by road and Delhi Metro.

The main commercial centre is the Netaji Subhash Place District Centre which houses various regional offices of companies and firms as well as shops selling food, apparel, convenience stores and informal sectors selling food.

Nearest metro station to the District Centre is Netaji Subhash Place metro station, which is also at distance of 3.6 km. Thus, vehicles are the primary mode of transportation to access the district centre.

The Bus Depot is also located in the vicinity (See Fig. 2).

Sense of Security from Traffic

Sense of Safety in Walking on the Sidewalk Affected by Traffic: The District Centre has been divided into several blocks with vehicular movement on the periphery of each block. Along with this, pleasant sidewalks have been designed for pedestrian mobility inside a block. These sidewalks are separated from the vehicular traffic by use of a green belt. At some places, particularly in the blocks in north, sidewalks have been designed on a high plinth of approximately 1.5 m from ground, which further separate them from vehicular traffic. Thus, people feel safe while moving on these sidewalks.

However, at some places, sidewalks are completely missing, particularly, on the main roads, increasing the chances of accidents among pedestrians as they are forced to use the main road for mobility.

Sense of Safety in Pedestrian Crossing Affected by Traffic: The District Centre is divided into several blocks, it is done in such a way, that vehicular traffic is allowed to run in the periphery of all blocks. However, there are no facilities for pedestrians to move from one block to another, creating pedestrian vehicular conflict at these nodes, causing safety issues for pedestrian mobility.

Figure 2: Netaji Subhash Place District Centre



Source: Based on Author's study.

Sense of security from crime

Existence of others: The northern block generally remains active and lively from 12 am to 12 pm. People can also be seen in the southern block, although it can be said that the footfall in the southern block is much less than that of the northern block. Movement in the same takes place around 6am to 8pm. Thus, most of the spaces in the District centre appear safe to people in terms of existence of others. However, very few people visit the western blocks.

Night Visibility: Lamps have been installed on roads for vehicular traffic, however, at times, they do not work properly, which reduces the night visibility in the area, and it seems unsafe. The northern blocks don't have any street lamps. But the space appears safe, because the light from the retail shops and restaurants is enough for the visibility. There are spaces in the southern block too, which are clearly visible at night, because of the light coming from some small shops. The block in the centre appears dark at night, creating safety issues for pedestrian mobility.

Comfort

Sidewalk level of service and continuity: Sidewalks are clean and well maintained and they are continuing around a block without any dead end. However, at some spaces there are no sidewalks at all, affecting the pedestrian mobility in those spaces.

On the other hand, sidewalks consist of many ups and downs, particularly in the northern block which creates problems in pedestrian mobility especially for disabled and elderly people.

It can be said that width of the sidewalks is enough to cater to the footfall of that space. But, there are certain sidewalks, where some obstructions like construction equipment hinder the pedestrian mobility by reducing the width of the sidewalk below the allowed minimum.

Microclimatic Condition: No such elements have been involved in the design of District centre in order to alter the microclimatic condition thus, it remains same as that of the surroundings. One water body with a fountain has been installed at an open space in the northern block, which seemed to reduce the ambient temperature of its surrounding spaces.

Along with this, many trees have been planted along the main roads and some sidewalks which provide shade to the surrounding spaces and make the microclimatic conditions comfortable for pedestrian mobility.

Street Furniture: Street furniture has been placed in open spaces at comfortable distances from each other. Along with this, the furniture

also doesn't hinder the pedestrian mobility on the sidewalks. However, street furniture is completely absent in the blocks other than the northern block.

Convenience

Accessibility: Each block in the District Centre has been designed in such a way that traffic is allowed to run at its periphery. A space is also allocated for car parking nearby each block. In some blocks, especially malls, basement parking has also been provided. Along with that, cars are also parked on both sides of the roads. Thus, it seems very convenient for people to access their desired spaces.

Adjoining activities: The district centre is an amalgamation of office spaces, recreational activities, eateries and restaurants and commercial spaces. Most of the blocks of northern block consist of restaurants making the place lively and dynamic throughout the day (12 am to 12 pm). Teenagers, families, youngsters as well as elderly pedestrians, all can be seen here.

Southern block consists of malls and offices. Thus, comparatively a smaller number of pedestrians are seen in this block. The middle blocks comprise of offices and a large barren land in between which further restricts the pedestrian mobility in its surrounding spaces.

Pedestrian mobility is completely absent in western block as there are sites under construction along with a building which is not in use.

Sidewalks effective width: Sidewalks are wide enough to handle the volumes of pedestrian traffic the space encounters. However, width of some sidewalks is reduced due to presence of certain obstructions like construction material.

Visual Interest

Planned Public Spaces: The district centre has various public spaces planned around the built form. Sidewalks connect these open spaces. Most of the open spaces are planned in between two buildings thus the open space serves as an area for pedestrian mobility. Such spaces can be seen particularly in the northern block. Along with this, these spaces are designed on high plinth allowing pedestrians to simply relax, look around at passers-by.

Most of the malls are also designed in such a way that they are accessed through an open space. These spaces also appear lively throughout the day.

Visual Attractiveness: In the northern block, most of the spaces appear clean and well-maintained. Vegetation and trees are also planted at regular intervals and along the sidewalks, which increase the visual attractiveness of the space. The built form also enhances the attractiveness of the surroundings.

However, some roads and parking spaces are in dilapidated stage affecting the pedestrian mobility in its surrounding spaces. Along with this, the District Centre consists of a very large piece of land which is left barren which also restricts pedestrian mobility around it.

Analysis (Case Study: Netaji Subhash Place)

1. **Sense of security from traffic:** In terms of safety of pedestrian mobility from traffic, green belts have been provided along each sidewalk in order to create a safe path for pedestrian mobility. At some places these are created on a high plinth, further enhancing the security of pedestrian mobility from traffic.

However, since the complex has been divided into several blocks with vehicular traffic on the periphery of each, it is difficult for people to move from one block to another.

2. **Sense of security from crime:** It can be noticed that most of the spaces in the district centre stay lively throughout the day, making it safe for pedestrian mobility.

However, footfall in the northern block is greater as compared to others especially at nights due to poor visibility.

3. **Comfort:** According to the footfall in the complex, widths of the sidewalks, appear comfortable for pedestrian mobility. These are also clean and well-maintained in most of the spaces. Street furniture is also present in similar spaces. This enhances pedestrian mobility in those areas.

However, sidewalks in the northern block, consists of many ups and downs, which hamper mobility of many people. Along with this, most of the sidewalks of the district centre are encroached, which restrict pedestrian mobility.

Along with this, no elements have been installed in order to alter the microclimatic conditions. Thus, it is difficult to walk during harsh climatic conditions.

4. **Convenience:** Accessibility to the complex seems convenient for vehicles. Since parking lots have been provided at the periphery of each block.



The complex also proves convenient for teenagers, families and people working in offices in the district centre. Thus, spaces near restaurants, recreational activities, retail shops, malls etc. appear lively throughout the day. People working in offices can be seen near informal sectors or restaurants during particular times of a day.

5. **Visual Interest:** It can be noticed that open spaces work as welcoming areas for people. These are planned at the entry of each block. Open spaces with street furniture and green belts are more inviting as compared to others. In order to enhance the visual interest, sculptures have been installed in many of these open spaces.

However, green spaces, which are left barren and walls in dilapidated states, restricts pedestrian mobility in the its surrounding spaces.

Priya Complex

Priya Market in Vasant Vihar, Delhi was one of its most trendy shopping centres till a decade ago.

Originally known as Basant Lok Market, Priya market got its name from the popular theatre on its premises. It used to be a hub of activity, featuring pubs, restaurants, banks, bookshops, high-end grocery stores and open spaces, free of traffic.

Its decline began when many of the shops shifted out of the market to the malls. Popular among them were Swatch, Reebok, Adidas, Nike, Puma, Woodland, Punjabi by Nature, Nirulas, Yo! China, United Colours of Benetton, KFC, Passion - My cup of Tea, TGIF, and Subway.

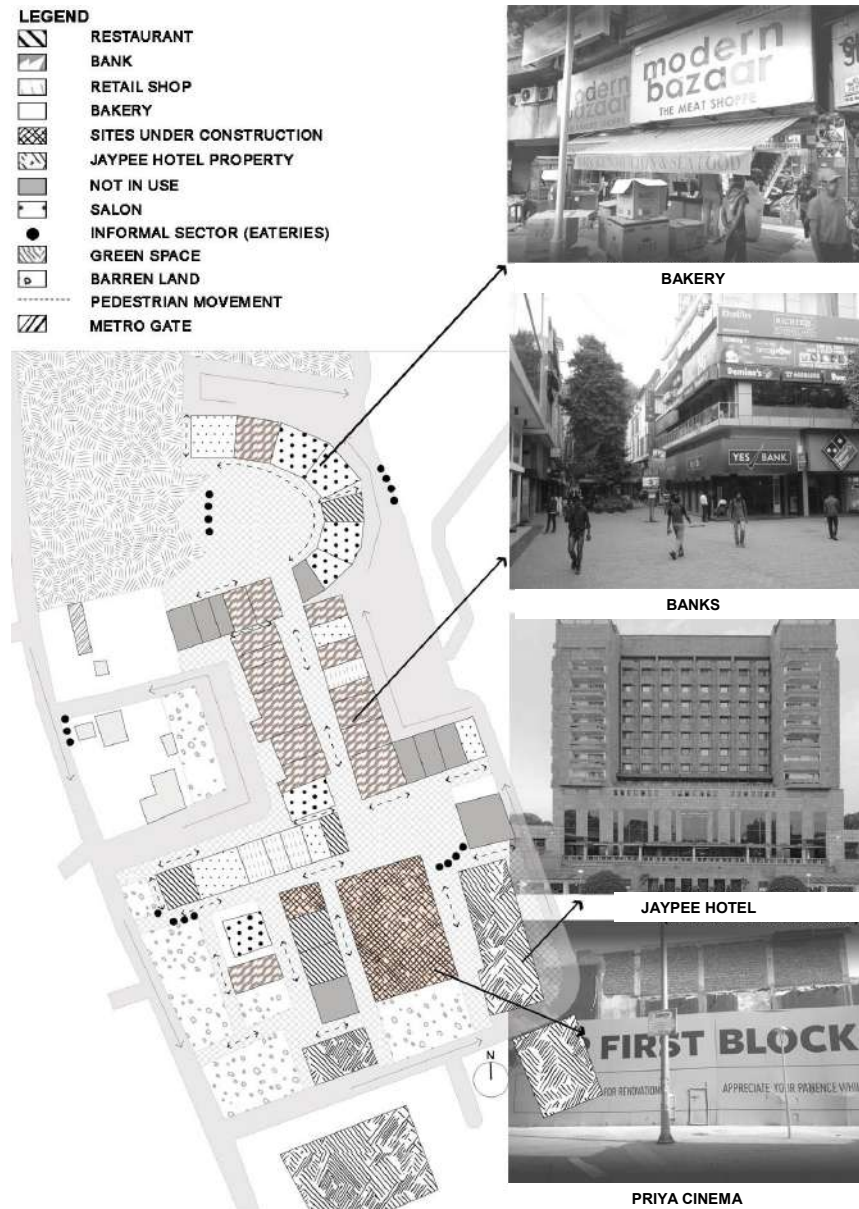
Nearest metro station to the district centre is Vasant Vihar metro station, which is at distance of just 700m. Thus, the centre is easily accessible by metro and vehicles (See Fig. 3).

Sense of Safety from Traffic

Sense of Safety in Pedestrian Crossing Affected by Traffic: The whole District Centre has been planned as a complete pedestrianised zone. Thus, for moving from one place to another, one doesn't have to cross the vehicular traffic. Also, the district centre has been planned on a plinth of about 900mm. Thus, it is safe in terms of pedestrian crossings affected by traffic.

Sense of Safety in Walking on the Sidewalk Affected by Traffic: As the District Centre is planned as a complete pedestrianised zone.

Figure 3: Priya Complex



Source: Based on Author's study.



sidewalks or open spaces for pedestrian mobility are designed in such a way that built form surrounds it. Built form also acts as a barrier between the parking spaces and the spaces allocated for pedestrian mobility. In other words, parking spaces are not directly visible from the spaces for pedestrian mobility.

Sense of Security from Crime

Existence of others: People can be seen around the amphitheatre and near restaurants. Comparatively, a smaller number of people are seen near banks. Also, as one moves towards the edges the complex, the footfall decreases. Particularly, near barren lands and sites under construction. Some of the sidewalks are in dilapidated form, affecting the footfall in the surrounding spaces. Thus, one may feel unsafe in those spaces.

Night visibility: Street lights have been installed in some parts of the complex, particularly in spaces which are used as entries to the complex.

However, lighting is absent in spaces adjacent to construction sites and barren lands or buildings which are not being used.

Most of the shops have been shut down because of the loss they were facing. No lamps have been installed in spaces adjacent to such shops, which further reduces the footfall in those areas. It can be noticed that the people do not feel safe to visit the complex after it is dark.

Comfort

Sidewalk Level of Service and Continuity: Most of the spaces inside the complex are under construction. Thus, sidewalks and open spaces are broken or in dilapidated state. This poses problems particularly for elderly pedestrians. Along with this, these also include stairs at certain places, which further affects pedestrian mobility.

Microclimatic condition: There are colonnaded sidewalks at some places for pedestrian mobility which provide a shaded pathway. However, these are absent in other spaces. No such elements can be seen in the complex which are installed in order to make the microclimatic conditions comfortable for pedestrians. Vegetation is absent in most of the spaces. colonnaded sidewalks can be seen at certain places, but that too in dilapidated stage.

Street furniture: Street furniture is appropriately placed at regular intervals in spaces with maximum footfall. It can be said, that the amount and distance of street furniture works efficiently for the complex.

Convenience

Accessibility: The District Centre has great accessibility from metro station and vehicular traffic. Parking lots have been provided adjacent to the complex. Along with this, ramps, connecting parking lots to the complex, have been constructed to facilitate pedestrian mobility especially for physically handicapped and elderly people.

However, it was seen, that during monsoons, parking lots were choked with water, restricting people's movements. This posed excessive problems this year.

Along with this, since the complex is built on high plinth, elderly people and physically disabled experience problems in mobility. Some of the entries are just 2.5 m wide, which appear uncomfortable to many.

Adjoining activity: As one enters from the main road, one would find, some small and very old retail shops on one side and a chain of restaurants on the other. On moving further, luxurious restaurants can also be seen. The complex also comprises of certain confectionaries and some very popular book stores.

Surveys show, the complex used to consist of some popular brands and food chains, like Adidas, Reebok, Choko La, etc. But after malls came up (e.g. Malls in Vasant Kunj and Saket), most of the popular stores rolled down shutters and shifted to other places.

Surveys also say, current shops are also running in loss since the past several years.

The legendary Priya cinema that used to screen Hollywood movies in the old days, is among the first ventures of PVR to open in the city. It was one of the most vital attractions of the Priya complex. The cinema is under renovation since the last few years.

Sidewalk effective width: Most of the sidewalks are colonnaded and have a width of about 2.5 m. along with this, a 6m wide open space has also been provided adjacent to these sidewalks. The effective widths are enough to cater the number of pedestrians the space encounters.

Visual Interest

Planned public spaces: Large public spaces have been planned inside the complex. One amphitheatre has also been constructed recently. These open spaces consist of street furniture and some informal sectors of eateries. Thus, these are used as spaces to relax, socialise and look around the passers-by.



Visual attractiveness: In terms of visual attractiveness, sidewalks and open spaces appear well maintained and clean. However, due to ongoing construction at certain places, the surrounding spaces appear in dilapidated form making the area unpleasant. Green spaces also lack green cover and thus, slowly converted into dump areas. Dead ends of sidewalks are rarely visited; hence those spaces also lack maintenance and over time become unpleasant.

Analysis (Case Study: Priya Complex)

1. **Sense of security from traffic:** In terms of safety of pedestrian mobility from traffic, Priya complex seems safe, as the complex is constructed on a plinth, restricting vehicular movement inside the complex. Thus, the whole complex is pedestrianised, giving a sense of security for pedestrian mobility.
2. **Sense of security from crime:** People are seen in very few parts of the complex. Thus, one may feel unsafe while walking inside the district centre. Along with this, lighting is provided only in open spaces which are used as entries to the complex. Other spaces near the edges of the complex are not visible after it gets dark, which further restricts pedestrian mobility in the surrounding spaces.
3. **Comfort:** According to the footfall in the complex, width of the sidewalks, appears comfortable and these are also clean and well-maintained, enhancing pedestrian mobility. These are covered with colonnades, which provide a shaded path. Thus, pedestrians feel comfortable walking even in harsh climatic conditions. Street furniture is also present in similar spaces further enhancing the pedestrian mobility in those spaces.

The scenario is not similar for other parts of the complex. Street furniture is not present in all the parts of the complex. Sidewalks near construction sites are encroached and in dilapidated state. These pose problems for many pedestrians particularly elderly people and physically disabled.

4. **Convenience:** Accessibility to the complex seems convenient for people both by vehicles and metro. The complex is at a distance of about 40m only, from Vasant Kunj metro station. Along with this, parking lots have been provided near entries to the complex. However, at some entries, ramps have not been provided, posing problems for elderly people and physically disabled. The complex is designed near residential spaces; thus, it is at a walkable distance from many residences.

However, during these monsoons, parking lots were choked with water, which made them unusable and posed problems for many.

The complex lacks facilities which people need in their daily lives. Since, most of the stores and activities have been shut down inside the district centre, it affects pedestrian mobility in the space.

5. **Visual Interest:** It can be noticed that open spaces work as welcoming areas and as a social space for people. However, much has not been done in order to enhance the visual attractiveness of the space. Walls are in dilapidated states, green spaces are not maintained and cleaning is not done on regular basis.

COMPARATIVE ANALYSIS AND CONCLUSION

Comparative Analysis

Sl. No.	Indicators	Janakpuri District Centre	Netaji Subhash Place	Priya Complex	Inference
1.	Sense of security from traffic	- Designed on a high plinth which restricts vehicular traffic from entering into the complex. - It is accessed by flights of steps from each side, posing difficulties for elderly people and physically disabled.	- Designed in such a way that vehicular traffic is allowed to run along the periphery of each block. - Due to absence of pedestrian crossings vehicular pedestrian conflicts are created between each block. Thus, it enhances the chances of accidents at these junctions. - Sidewalks are safe as green belts are developed on the periphery to bifurcate roads and sidewalks.	- Designed on a high plinth which restricts vehicular traffic from entering into the complex. - It is accessed by flights of steps and is also facilitated by ramps to make mobility for elderly people and physically handicapped, easier.	- The complex can be designed on a plinth to make the whole space pedestrianised and free from vehicular traffic. - If sidewalks and roads are on the same level, green belts can be developed in order to bifurcate the same and create a sense of safety for pedestrians.



2.	Sense of security from crime	• Spaces with lighting facilities in working conditions for night visibility, are mostly visited by people and are safe from crime.	• Most of the spaces stay lively, thus, safe for pedestrian mobility. • Lighting facilities, such as lamp posts have been installed in the whole complex, however, not in working conditions, which restricts pedestrian mobility in the space.	• Very few people can be seen in the complex especially, in spaces adjacent to barren lands and closed shops. These are unsafe for pedestrian mobility. • Lamps have been installed at the entry points, which facilitate pedestrian mobility.	• Lighting facilities such as street lamps, can be installed to improve night visibility • Sidewalks should be developed and enhanced in areas with high pedestrian traffic.
3.	Comfort	• Sidewalks are clean, and well maintained. • Colonnades protect pedestrians against harsh climatic conditions. • Sidewalks are 2.1 m wide, enough to cater the pedestrian traffic in the space. • However, there are some sidewalks which are encroached and have dead ends, restricting pedestrian mobility in the surrounding spaces.	• Sidewalks are more than 3 m wide, enough to cater to the footfall of the space. • Sidewalks consists of many ups and downs thus, uncomfortable for many particularly elderly people and physically disabled. • Encroachment also hampers pedestrian mobility and make the sidewalks uncomfortable to walk on. • Street furniture is placed in spaces with high pedestrian traffic.	• Since many years, most parts of the complex are under construction or renovation. Thus, spaces are in dilapidated stages. This affects particularly elderly people and physically disabled. • Street furniture has been placed in open spaces at regular intervals in spaces with high pedestrian traffic.	• Sidewalks should be clean, well maintained and continuous, i.e. should not have ups and downs. • Colonnades can be provided to protect pedestrians from harsh climatic conditions • Sidewalks should be wide enough to cater to the pedestrian traffic of the space. Min width is 1.8 m. • Street furniture should be placed in spaces with high pedestrian traffic.

		• Street furniture has been placed in open spaces at regular intervals in spaces with high pedestrian traffic.			
4.	Convenience	• Located near residential area and, consists of activities which are required by people on daily basis such as convenience store. • Accessible by metro (1.6km away) and vehicles. • Placed on a high plinth. Flights of steps have been provided posing difficulties for physically handicapped and elderly people.	• Parking lots have been provided at the periphery of each block. Thus, easy access from vehicles.	• Located near residential area and consists of activities which are required by people on daily basis such as convenience store. • Accessible by metro (700 m away) and vehicles. • Placed on a high plinth, which can be accessed by flights of steps and ramps.	• The district should be easily accessible from residential spaces. • It should consist of activities which are required by people on daily basis such as convenience store. • Should be easily accessible by all pedestrians.
5.	Visual attractiveness	• Open spaces have been planned in entry spaces. • These aren't maintained on regular basis. Due to which, green spaces get converted to barren lands or dump areas.	• Open spaces are planned for each block separately. These work as welcoming areas for each. • However, open spaces with green belts, trees for shading, street furniture to relax and some	• A smaller number of open spaces are planned in the complex. These are used particularly for informal sectors and seating around them. • The space is not visually attractive, as they are	• Entry spaces can be facilitated by open spaces. • These can be enhanced by street furniture to relax, green belts and trees for shading and sculptures or decorative elements to



		• It may also result in the formation of dead ends in sidewalks. • Walls appear in dilapidated stages, which restrict pedestrian mobility in the surrounding spaces.	sculptures to make the space more interesting are more frequently visited by pedestrians • Building façade in dilapidated stages restricts pedestrian mobility.	surrounded by barren lands and dilapidated building facades. • Because of low maintenance, dead ends are formed on the sidewalks, further reducing the footfall in the space.	make the space more interesting. • Building facades and sidewalks should be maintained on regular basis.
--	--	---	--	--	---

Design Recommendations:

- In parking spaces, where sidewalks and roads are on the same level, green belts can be developed in order to bifurcate the same and create a sense of safety for pedestrians.
- Lighting facilities such as street lamps, should be installed in the whole complex to enhance night visibility.
- Sidewalks should be clean, well maintained and continuous, i.e. should not have ups and downs and should not be encroached.
- Colonnades can be provided to protect pedestrians from harsh climatic conditions.
- Sidewalks should have a minimum width of 1.8m in every space.
- Street furniture should be placed in spaces with high pedestrian traffic.
- Ramps of minimum width of 1 m and slope of 1:15 needs to be provided at each entry space, to make the complex accessible to elderly people and physically disabled.
- Some entries from parking lots to the complex are 2.5 m wide. These can be widened to make them more inviting. This will make the space visually more attractive.
- Some green spaces can be made accessible to people and can be used as a park. This will make the space livelier and will enhance the usability of the space.

- Activities which are required by people on daily basis such as convenience store, book stores, chemists should also be set up.
- Should be easily accessible by all pedestrians including physically disabled and elderly people.
- Open spaces can be enhanced by providing green belts or trees near seating spaces. This will improve the visual attractiveness of the space. Decorative elements such as sculptures can also be installed to make the space more interesting.
- Small fountains can also be installed in these open spaces in order to enhance the visual attractiveness of the space. Along with that, it will also alter the microclimatic conditions of the surrounding spaces and will make the space more comfortable for pedestrian mobility.
- Informal activities can be proposed at the edges of the complex or at spaces which are currently deserted because of closed shops in its surroundings. Informal sector will attract people to those spaces, and make it livelier.
- Since, many spaces in the complex are under construction or renovation. thus, these sites can be covered with a fabric, in order to hide the unattractive view of construction sites to pedestrians. Facades similar to that of the surroundings can also be printed or painted on the fabric, so as to integrate it with the background.
- A space can be allocated near the construction sites, for the construction equipments, so that, it doesn't hinder the pedestrian mobility.
- Facade of built forms needs to be maintained on regular basis, as it hugely affects the attractiveness of the space.
- Dump areas should be rehabilitated in order to avoid the smell and unpleasant view.
- This year during monsoons, people faced problems due to choked parking lots. Hence, drainage system should be improved in order to avoid such issues.

BIBLIOGRAPHY

1. Abley Steve, Turner, S., & Singh Rohit (2011). 'Predicting walkability', Retrieved from http://www.hardingconsultants.co.nz/ipenz2011/downloads/Abley__Steve.pdf



2. Adkins Arlie, Dill Jennifer, Luhr Gretchen, Neal Margaret (2012). 'Unpacking Walkability: Testing the Influence of Urban Design Features on Perceptions of Walking Environment Attractiveness', *Journal of Urban Design*, Vol. 17. No. 4, 499-510.
3. Alfonzo Mariela A. (2005). 'To Walk or Not to Walk? The Hierarchy of Walking Needs', *Environment and Behavior*, November, Sage Publications.
4. Barker Laura (2012). 'Exploring the Relationship Between Walkability and the Built Environment: A Case Study of Three Intersections in Seattle's University District', *Master of Urban Planning*, University of Washington.
5. Clifton Kelly J., Handy Susan L. (2001). 'Qualitative Methods in Travel Behaviour Research', *International Conference on Transport Survey Quality and Innovation Kruger National Park, South Africa*, August 5-10.
6. Djukic Aleksandra, Vlastos Thanos, Joklova Viera (2019). 'Liveable Public Open Space- From Flaneur to Cyborg, C. Smaniotto Costa et al. (Eds.): Cyber Parks, LNCS, 11380, pp, 38-49.
7. Emery James, Crump Carolyn (2003). 'Reliability and Validity of Two Instruments Designed to Assess the Walking and Bicycling Suitability of Sidewalks and Roads' *American Journal of health Promotion*, 10.4278/0890.1171.18.1.38.
8. *Federal Highway Administration Course on Bicycle and pedestrian Transportation, Walkways, Sidewalks & Public Spaces*, Lesson 13, Internet Edition.
9. Galanis Athanasios, Eliou Nikolaos (2011). 'Evaluation of the pedestrian infrastructure using walkability indicators', *wseas Transactions on Environment and Development*, Issue 12, Volume 7, 385-87.
10. Handy Susan, Cao Xinyu, Mokhtarian Patricia (2005). 'Correlation or causality between the built environment and travel behavior? Evidence from Northern California', *Transportation Research*, Part D 10, 427-444.
11. Huang Jing (2012). 'Walkability in Public Space, an alley-oriented study towards pedestrian friendly', *Urban Design in China & Europe*.
12. Jacobs Jane (1961). *The Death and Life of Great American Cities*, New York, Vintage Books.
13. Kelly C.E., Tight M.R., Hodgson F.C., Page M.W. (2011). 'A comparison of three methods for assessing the walkability of the pedestrian environment', *Journal of Transport Geography*, Elsevier, 19, 1500-1508.
14. Mehta Vikas (2008). 'Walkable streets: pedestrian behavior, perceptions and attitudes', *Journal of Urbanism*, Vol. 1, No. 3, 217-2456
15. Mian Jasmine, Caird Jeff (2017). 'Conspicuity of Pedestrians at Night: How to Maximise Visibility and Safety' *Journal of Transport & Health*.
16. Moayedi Farzaneh, Zakaria Rozana, Bigah Yeoh, Mustafar Mushairry, Puan Che Othman, Irina Safitri Zind, Klufallah Mustafa (2013). 'Conceptualising the Indicators of Walkability for Sustainable Transportation', *Jurnal Teknologi*, October.

17. Monteiro Paulo Jorge (2012). 'Pedestrian Accessibility and Attractiveness Indicators for Walkability Assessment', *técnicolisboa*, Dutobro (in Portuguese)
18. Montgomery, John (1998). 'Making a City: Urbanity, Vitality and Urban Design', *Journal of Urban Design*, Volume 3, 93-116.
19. Newman Oscar (1972). 'Creating Defensible Space', Centre for Urban Policy Research, Rutgers University.
20. Osman, D. (2016). 'A Tale of a Sidewalk; the Conflict of Its Presence and Usage in the Streets of Cairo'. *European Journal of Sustainable Development*, 5, 2, 1-12
21. Osman Dalia Abdel Moneim (2018). 'A Place to Meet: The Art of Making the City's Street', *European Journal of Sustainable Development*, 7(1), 33.
22. Park, S. (2008). 'Defining, Measuring, and Evaluating Path Walkability, and Testing Its Impacts on Transit Users', *Mode Choice and Walking Distance to the Station*. University of California, VC TC Dissertation No. 150.
23. Rapoport, A. (1990). 'History and precedent in environmental design', New York and London : Plenum, Press.
24. Seamon David (1980). 'Body-subject, time-space routines, and place-ballets', Research Gate, January.
25. Shaaban Khaled (2019). 'Assessing Sidewalk and Corridor Walkability in Developing Countries', *Sustainability*, 11, 3865
26. Soria Julio, Talavera Rubén (2013). 'Pedestrian Mobility Environments: Definition, Evaluation and Prospects, *Joint AESOP - ACSP Congress, Planning for resilient cities and regions*, at Dublin (Ireland), July.
27. Southworth Micheal (2005). 'Designing the Walkable City', *Journal of Urban Planning & Development*, December , Vol. 131, Issue 4.
28. Zacharias John (2001). Pedestrian Behavior Pedestrian Behavior and Perception in Urban Walking Environments, *Journal of Planning Literature*, August, Sage Publications.
29. Zacharias, J. (2001). 'Pedestrian Behavior and Perception in Urban Walking Environments', *Journal of Planning Literature*, 16(1): 3-18.

BOOK REVIEW

‘Housing and Community Planning - Design, Construction and Infrastructure’ by Sh A. K. Jain, 2020, Discovery Publishing House, New Delhi, p. 306.

Housing is an expression of human civilisation, community organisation and economic development. The subject of housing remains one of the outstanding ethical, economic, social and physical imperatives. Although, the governments have undertaken various social housing programmes, paradoxically the homeless and slum dwellers continue to grow. Jawaharlal Nehru at an international exhibition on low cost housing in 1953 stated that:

“House is not merely a place to take shelter from the rain or the cold or the sun. It is, or should be, an enlargement of one’s personality, and if human welfare is our objective, this is bound up with house. Indeed, changes in housing in other parts of the world have affected social revolutions, in the communities”.

It is often said that the slums and squatter settlements are the solutions rather than the problem. They manifest the housing process of the communities. However, there is a serious lack of shelter for the poor, while the policies disproportionately safeguard the elite segment of the society. As the power comes from the people, housing is as a socio-economic-political issue.

The book ‘Housing and Community Planning’ in its 13 chapters provides a comprehensive narrative, which begins with a global overview of the housing. It discusses various housing programmes and draws a distinction between affordable housing and adequate housing. The author gives particular attention to housing issues of special groups such as the elderly, disabled, homeless, migrants and transit workers, students and single women. The issues of social and physical infrastructure, construction technologies and building systems, rental housing, land and regulatory reforms have also been dwelt upon.

The author discusses various housing programmes, including the Pradhan Mantri Awas Yojana. According to the author, the housing should be inclusive, adequate, affordable and sustainable. As the poor live in slums and illegal colonies, it should provide security of tenure and legal protection against forced evictions and other threats. All housing units should have safe drinking water, sanitation, energy, heating, lighting, food storage and refuse disposal. It should be affordable, safe and accessible for the disadvantaged and marginalised groups. Housing should have a close linkage with livelihoods and employment,

health-care services, schools, childcare centres and other social facilities. It should relate to local culture, climate and sustainability. In-situ upgradation of slums is always preferred due to its linkages with the local communities and jobs, even with limited space. Existing housing, even in poor condition, serves the residents better by social connections and access to employment.

According to the author, housing for the poor has to be gender sensitive, community-led, participatory and based on the principle of equitable allocation of resources, space, land and services. For the poor, it is the ultimate cost of the house that matters. To this end, several approaches can be adopted, which include subsidies, loans and mandatory reservation of land, higher FAR/FSI and densities, evolutionary housing, low cost and participatory construction.

The author provides an incisive and practical conversation on housing and community planning. More than 174 visuals and flowing simple language make the book reader-friendly. The book *Housing and Community Planning* is a valuable addition in the literature on the subject.

JDS Sodhi
Fellow-Town Planner & Architect, New Delhi
Email: jds@sodhis.org
+91 9818130441

NOTES FOR CONTRIBUTORS

This is intended as a guide for authors submitting a manuscript to *NAGARLOK* and as an aid to the preparation of the final copy of accepted articles.

Manuscript

- Manuscript should be in MS Word format. This should include the name, email ID and the institutional affiliation of the author(s).
- Manuscripts in English should use British spelling and typographical conventions.

Articles

- There should be no line spaces between paragraphs.
- Notes should be listed at the end of the main text.
- Manuscripts should be typed in Times New Roman, font size 12, each page numbered.

Punctuation and abbreviations

- Single quotation marks should be used to enclose actual quotes from other sources or for technical terms when they are first introduced. On subsequent mention of technical terms, no quotation marks should be used. Excessive use of quotation marks should be avoided.
- Double quotation marks are used to enclose quotes within text which is itself quoted.
- Latin abbreviations such as 'i.e.' or 'e.g.' are acceptable only in expressions within parentheses, as here: 'adjectives which collocate with fare (e.g. wholesome, simple, country) ...' Elsewhere, they should be replaced by their English equivalents, 'that is' or 'for example'. Italic should not be used for such abbreviations or for such common Latin expressions as 'ad hoc', et al., etc.
- Numbers up to 9 and vaguely expressed numbers should be spelled out in words. However, any numbers in a statistical context, precise numbers, units of measurement, and numbers above 100 should be stated in figures.

Table and figures

- Every table should be given a number and brief title or caption set above the body of the table and source at the bottom.
- Figures are also given a number and a caption, set below the figure.
- Avoid such expressions as 'In the following table ...', 'As can be seen in the figure above ...' In the printed version these elements may need to be repositioned due to constraints of page layout, always after the first mention of the Table or Figure number in the text.
- Source of figures should be given at the end of the table.

Text references

- Page references should be provided when reference is made to a specific passage in a book or article. These appear after the date of publication and are preceded by a colon and a single space: Jefferson (1996: 296 – 299) or Cowie (1999: 79).
- All works cited in the running text must be listed in the reference section at the end of the text.
- The reference section should include only those works that were cited in the text.
- Whenever possible, please give the full first names of authors and editors.

INDIAN INSTITUTE OF PUBLIC ADMINISTRATION NEW DELHI

INDIAN JOURNAL OF PUBLIC ADMINISTRATION

(Quarterly: published since January 1955)

Editor: MAHENDRA PRASAD SINGH



Yearly Subscription:

Individuals: (Inland) Rs. 425.00; (Abroad) \$120 or £48;

Single Copy: (Inland) Rs. 120.00; (Abroad) \$30 or £12;

Special Number: (Inland) Rs. 275.00; (Abroad) \$80 or £36

Institution/Library: (Inland) Rs. 700.00; (Abroad) \$ 240.00 or £ 96.00

Life Members of IIPA: Annual subscription: Rs.300.00; Single Copy Rs. 75.00;

Special Number Rs.200.00

IIPA NEWSLETTER

(Monthly recorder of national and international news of
public administration and allied matters since 1956)

Editor: Surendra Nath Tripathi, Director, IIPA

Yearly Subscription: India: Rs. 10.00; Abroad: \$ 4.00 or £ 2.00

DOCUMENTATION IN PUBLIC ADMINISTRATION

(Quarterly: Published since 1973)

Editor: Surendra Nath Tripathi, Director, IIPA, New Delhi

Assistant Editor: SUNITA GULATI, Dy. Librarian, IIPA, New Delhi

Yearly Subscription: India: Rs. 150.00; Abroad: \$ 60.00 or £ 24.00

NAGARLOK

(Urban Affairs Quarterly: Published since 1969)

Editor: Surendra Nath Tripathi, Director, IIPA, New Delhi

Assistant Editor: V.N. ALOK, Associate Professor in Urban Finance
IIPA, New Delhi

Yearly Subscription: India: Rs. 200.00.

लोक प्रशासन (अर्ध-वार्षिक)

सम्पादक: प्रो. एस. एन. मिश्र

वार्षिक शुल्क : आजीवन सदस्य-रु. 150, व्यक्तिगत ग्राहक-रु. 200, संस्थागत ग्राहक-रु. 300

सामान्य अंक : आजीवन सदस्य-रु. 75, व्यक्तिगत ग्राहक-रु. 100, संस्थागत ग्राहक-रु. 150

विशेषांक : आजीवन सदस्य-रु. 100, व्यक्तिगत ग्राहक-रु. 200, संस्थागत ग्राहक-रु. 200

Bank drafts/postal orders should be drawn only in favour of

"Director, Indian Institute of Public Administration"

Note: Subscribers are advised to secure safe delivery through Registered Post @ Rs. 100.00
per periodical.

For complete information about IIPA publications write to:

THE EDITOR

INDIAN INSTITUTE OF PUBLIC ADMINISTRATION

Indraprastha Estate, Ring Road, New Delhi-110 002 (India)