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- Manuscripts in English should use British spelling and typographical conventions.
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CONTENTS

Nagarlok, Vol. 55, Issue 4, October-December, 2023

<i>Articles</i>	<i>Pages</i>
Market-led Housing Redevelopment Practices in Indian Metropolitan Cities: Insights from Pune	1-19
<i>Shruti Vaishampayan and Sanjukta Bhaduri</i>	
Shifting Paradigms in The Wake of Real Estate Regulation: A Case of Ahmedabad	20-37
<i>Bageshree Yeolekar Kadam</i>	
Urban Mobility Initiatives Towards Passengers' Transportation in India	38-50
<i>Ajitha S.</i>	
Water-Use Efficiency in Higher Education Institutions (HEI): A Conceptual Framework	51-75
<i>Shomit Dilip Bade and Nikhil Ranjan Mandal</i>	
Performance Assessment System of Sanitation Services in Urban Areas of Amritsar District	76-96
<i>Ritu Raj Kaur, Gursharan Kaur, Rawal Singh Aulakh, Sakshi Sahini, Ravi Inder Singh and Prabhnoor Singh</i>	
Performance Assessment of Urban Sanitation Services in India: An Alternate Perspective	97-120
<i>N.R. Mandal and Gaurav Vaidya</i>	
The Factors Influencing the Delivery of Digital Public Services - A Systematic Literature Review	121-136
<i>Santulan Chaubey, Kritika Mathur and Dinesh Taneja</i>	
BOOK REVIEW	137-138

Market-led Housing Redevelopment Practices in Indian Metropolitan Cities: Insights from Pune

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Shruti Vaishampayan^{1*} and Sanjukta Bhaduri²

Abstract

Market-led redevelopment of private housing, particularly Cooperative Housing Societies and Bungalows (single family detached houses), is emerging as a popular form of redevelopment in inner-city neighbourhoods of Indian metropolitan cities. Enabling policies of the State governments and local authorities encourage redevelopment of housing stock of more than 30 years of age for optimum utilization of serviced urban land and existing infrastructure in inner cities. High land values in inner cities combined with policy incentives such as increased floor space index (FSI) create business opportunities for private real estate developers resulting in extensive redevelopment of private housing societies carried out in joint partnership with housing cooperatives – bringing substantial changes in residential neighbourhoods. Through an in-depth literature review, field observations, and detailed interviews with 18 experts (architectural/ legal/ financial consultants specializing in redevelopment, re-developers, and members of redeveloped housing cooperatives), this paper presents a critical examination of housing redevelopment policies and practices in Pune, India highlighting potential gentrification implications of this emerging form of redevelopment.

Keywords

Urban Renewal, Residential redevelopment, Rent gap, Floor Area Ratio, Gentrification Regeneration.

Introduction

In Indian metropolitan cities, the inner-city neighbourhoods are typically built-out completely with uniform low-rise, low Floor Space Index (FSI). Properties in inner-city

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neighbourhoods are highly priced due to their advantageous locations as they are well developed with social infrastructure such as education, health, shopping, entertainment, open spaces, and amenities within walking distance. While new areas on the periphery of the city are developed with greenfield housing, the housing stock in central and inner cities becomes older with structural issues and lacks modern amenities such as elevators, adequate parking spaces, security systems and modern architectural style that suits the modern lifestyle. Moreover, there are built-environment problems such as narrow roads, fire safety, traffic congestion on streets, pollution and compromised quality of life in central cities. Indian government programmes increasingly advocate policies of urban renewal and redevelopment to improve the built environment, upgrade infrastructure, and maximise the use of available urban space via densification in previously serviced parts of the city (Dhote K K et al., 2013). Urban renewal is a complete and integrated vision and action leading to the resolution of urban issues and improvement in the physical, economic, social, and environmental circumstances of a place (Roberts et al., 2000), whereas redevelopment is a strategy used for renewal which includes demolishing built-structures and re-building the premises (Kulshrestha, 2018). Important national programmes in India that include renewal/ redevelopment components are noted in Table 1.

Table 1: National Programmes in India including Renewal/Redevelopment Component

Schemes	Year	Components of Renewal/ Redevelopment
Jawaharlal Nehru National Urban Renewal Mission (JN-NURM)	2005	Focus on infrastructure upgradation in cities
National Urban Housing and Habitat Policy	2007	In-situ slum upgradation and slum redevelopment
Rajiv Awas Yojana (Slum Free India)	2011	Slum redevelopment
Pilgrimage Rejuvenation and Spiritual Augmentation Drive	2014	Renewal of identified pilgrimage centres, redevelopment of railway stations
Pradhan Mantri Awas Yojana (PMAY)	2015	Slum redevelopment in cities
Smart Cities Mission	2015	Area Based Development through Retrofitting (500 acre/ 200 hectare) and Redevelopment (for area of 50 acre/ 20 hectare) in inner city areas
Heritage City Development and Augmentation Yojana (HRI-DAY)	2015	Renewal of identified heritage precincts in select cities

Schemes	Year	Components of Renewal/ Redevelopment
State Schemes for Slum Redevelopment (Maharashtra, Gujarat, Rajasthan)	Varying	Slum redevelopment

Source: Compiled by authors (Kulshrestha, 2018).

Based on the national programmes and state policies, various Indian metropolitan cities with million-plus population have initiated urban renewal and redevelopment projects as noted in Table 2.

Table 2: Prominent Examples of Urban Redevelopment Efforts in India

City	Policy	Redevelopment Projects
Delhi (Capital)	Master Plan of Delhi (2001) for designated Walled City as special area	Shahjahanabad (Walled City), Karol Bagh, Urban Villages, Slum and JJ Clusters, East Kidwai Nagar, Sarojini Nagar, Srinivaspuri, Ramakrishna Puram, Netaji Nagar and Mohammadpur, Heritage areas redevelopment such as Lutyen's Bungalow Zone, Connaught Place, Humayun's Tomb Complex
Mumbai	Cluster Redevelopment Policy, 2009	Bhendi Bazaar, Textile Mill Area Development, Dharavi Redevelopment
Kolkata	Development Control Regulations (DCR)	Central Area Redevelopment, Kumartuli Area Redevelopment
Indore		Slum Networking Indore City
Ahmedabad		Sabarmati Riverfront Development, CBD Redevelopment
Pune		Old residential redevelopment in inner city

Source: Compiled by authors (Kulshrestha, 2018).

Incentives in the form of Floor Space Index (FSI)/ Floor Area Ratio (FAR) and Transferable Development Rights (TDR) are used to make renewal/redevelopment projects financially viable for the developers in order to increase private participation (Shenvi & Slangen, 2018). The landmark programme 'Smart Cities Mission' in India encourages the use of additional FAR policy by municipal authorities to stimulate urban redevelopment (Ministry of Urban Development, 2015). The Value Capture Finance Policy (Ministry of Urban Development, 2017b) and National Transit Oriented Development (TOD) Policy (Ministry of Urban Development, 2017a) recommend allowing higher or additional FSI at a premium (payment) based on land values along the proposed metro rail corridors in metropolitan cities exploiting the increased land

values due to increased accessibility to generate revenue for funding-intensive metro rail projects. Since the inner-city neighbourhoods are built out, this encourages higher density residential re-development along the metro routes. These incentives encourage redevelopment of private residential buildings in inner cities.

Rent Gap and Financialization of Real Estate

Real estate development in cities has now become a factor pushing the new urban economies (Lees, 2012; Smith, 2017). Neoliberal models of governance and role of policy, specifically policies regarding redevelopment, need special attention (Lees, 2012). Disinvestment and economic decline in inner city neighbourhoods attract re-investment by the relatively high-income middle-class ‘gentrifiers’ along with developers, builders, landlords, residential finance agencies, real estate agents and tenants (Smith, 1997; Wyly & Hammel, 1999). Widened rent gaps are exploited for ‘higher or better use’ by the developers, governments and citizens as they invest in built environment, housing and infrastructure (Rutland, 2010; Shin, 2009b; Shin & Kim, 2016). The ‘rent gap’ becomes the driving force of gentrification (Smith, 1987). In light of neoliberalism, gentrification forms a new global urban strategy used by the governments worldwide (Smith, 2007).

The ‘financialization’ theory emphasizes the role of financial real estate capital available in market for such redevelopments, the supporting economic regulations and the comparable value of property as an asset with other market instruments. Cities are ‘commodified’ to attract capital and ‘creative class’ in the wake of neoliberalism and entrepreneurial urban governance (Clark & Farahani, 2016; Rutland, 2010). Neoliberalism or “governance through and by the market” (Weber, 2012) influences policies where governments ensure that built environment can respond to investment in real estate (Wang, 2011). The 74th Constitutional Amendment Act (CAA), 1992 in India has decentralized eighteen functions including urban planning entrusted to cities for which revenue needs to be generated at local level (Mahadevia et al., 2014). Growing need of cities to mobilize their own finance is increasingly becoming evident (Shenvi & Slangen, 2018). Development charges from redevelopments, higher property taxes paid to the urban local bodies, other ‘value capture finance’ options such as premium or paid FAR make substantial part of local revenue.

Redevelopment and Gentrification

The concept of gentrification has evolved since it was first noted in 1964 by Glass as a process of class succession and (direct) displacement. Gentrification may be defined as the “commodification of space accompanying land use changes in such a way that it produces indirect/direct/ physical/ symbolic dis-placement of existing users and owners by more affluent groups” (Shin et al., 2016). The association of property-led new-build redevelopment and gentrification has been particularly explored in many studies in the East (Ha, 2004; He & Wu, 2007; Shin, 2007, 2009a; Wu, 2004, 2016; Wu & He, 2005). Literature notes ‘new-build’ and ‘luxury housing’ as new emerging forms

of gentrification (Lees & Davidson, 2010; Slater et al., 2004a). The inherent patterns in the way gentrification is observed in each context are noteworthy. It has been noted that 'elites' make investments in real estate in the Global South as the secondary avenue of capital investment (Lees, 2019). Researchers however, warn that it is important to find out what are the local deviations from larger patterns of gentrification observed worldwide (Hackworth, 2019; Ley & Teo, 2020; López-Morales, 2015; Shin et al., 2016) adding that research in the world other than the North should be more exploratory and unstructured in smaller non-global cities (Lees et al., 2015; Slater et al., 2004b).

Built-Environment and Socio-Economic Implications

Literature notes both the positive and negative implications of gentrification which alter neighbourhood liveability. Positive implications include cleaner streets, less crime and public art projects (Zukin, 2016); improved amenities and public infrastructure, increased property values, increased local tax base and revenues, healthy social mix, and reduction in sprawl (Atkinson, 2002; Chatterjee, 2013; Freeman, 2005). Negative implications that accompany the physical and social upgrading in neighbourhoods include lack/loss of affordable housing, changes to local service networks, increased costs of resources such as cheap vegetables and convenience shopping, and loss of social diversity making the neighbourhoods expensive and exclusive (Atkinson, 2002; Davidson, 2008; Freeman & Schuetz, 2016; Uduku, 1999).

Displacement has been a key concern of gentrification (Atkinson et al., 2011; Doshi, 2015; Uitermark & Loopmans, 2013; Vandergrift, 2006; Zuk et al., 2018). Along with direct displacement, indirect displacement due to displacement pressure, and exclusionary displacement - lower income groups being unable to buy or rent properties in these neighbourhoods - are both noted in literature as newer types of displacement (Marcuse, 1985; Rérat et al., 2009). All over the globe, researchers have noted the phenomenon of spatial segregation of minorities from inner to outer cities which is a result of state policies allowing for more real estate reinvestment in the city popularly through urban renewal or redevelopment (Kadi & Ronald, 2014; Lees, 2019) which is questionable in the discourse of 'social justice' (Ferrari, 2012; Lai et al., 2018). A growing disconnect with the changing neighbourhoods due to 'new-build' redevelopments was noted along the river Thames, London in long-term residents of the neighbourhoods (Davidson & Lees, 2005). Since the incoming residents or gentrifiers do not feel associated with the neighbourhood, social cohesion of the neighbourhood may be threatened. Existing residents may feel left out or excluded in a variety of ways even though they are not physically displaced (Liu et al., 2017).

Redevelopment of slums is a well-researched form of redevelopment in Indian context (Desai, 2012; Roy, 2005; Ursula Rao, 2016); however private residential redevelopment and its built environment and socio-economic impacts is comparatively under-explored in research. This study is an original contribution to the existing discourse highlighting this particular research gap. The objective of this study is to understand the typology, locations, various enabling policies, practices and potential gentrification related implications on the built-environment and socio-economy of

inner-city neighbourhoods in an exploratory manner in the selected case study of Pune City.

Materials and Methods

The causes and potential implications of urban residential redevelopment are identified through an extensive literature review in this study. Further the nuanced understanding of the policies and practices of redevelopment is gained through field observations, in-depth structured interviews with experts, and secondary data collection and spatial mapping of redevelopment projects in the study area since 2018. The detailed methodology followed in this study is presented in Figure 1.

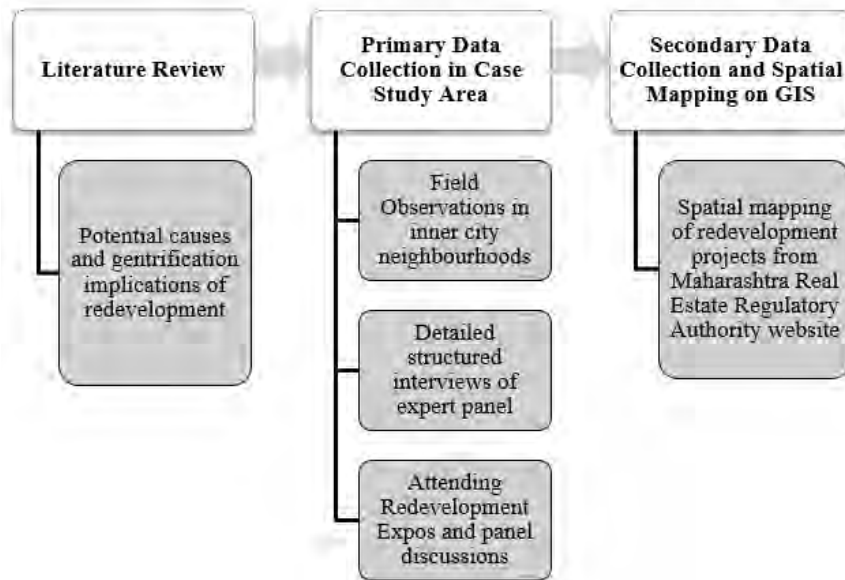


Figure 1: Research methodology adopted in this study.

Source: Illustration by authors

Case Study – Pune City

Pune, the second largest city in Maharashtra is located 150 kms away from Mumbai. It is well known for its IT, Biotech, Automobile industry as well as several reputed education and public institutions of national importance. It is a metropolitan city spread over land area of 340.45 sq km with a population of 3.51 million in 2011 as per official Census of India. The total population of the greater Pune region adding up the neighbouring city is 5.4 million making it the 8th largest agglomeration in the country (Krishnamurthy et al., 2016).

Field Observations

Through a reconnaissance survey of Pune city, the popular neighbourhoods with high concentration of ongoing or completed redevelopment projects were identified.

(Figure 2) shows a typical redevelopment in inner city neighbourhoods. The authors also attended three Redevelopment Expos (open promotional events) being conducted by re-developers during December 2021 to showcase completed projects. Panel discussions with various stakeholders of the process including architects, legal and financial advisors were conducted at the expos.



Figure 2: a, b Redevelopment in progress - a common sight in inner city neighbourhoods of Pune, b-Typical post-redevelopment buildings.

Source: Documentation by authors during field observations.

Secondary Data Collection and Mapping

In order to understand the number of projects and preferred locations of redevelopment, twenty commonly observed popular re-developers with high number of projects were identified from field observations and various advertisement hoardings from the city. These names were further confirmed during the interviews with experts and from the websites of developer firms. Recent redevelopment projects were retrieved from the official website of the Real Estate Regulatory Authority of Maharashtra State formed in 2016 (Maharashtra Real Estate Regulatory Authority, n.d.).

Expert Interviews

Eighteen (18) Interviews with various redevelopment experts including consultants as well as Cooperative Housing Society (CHS) members were conducted over three months between March and May 2022 in hybrid mode (via online or physical meetings as suitable to the interviewee) to understand the basic practices and procedures of residential redevelopment in Pune City. An interview questionnaire was designed to understand the following aspects: Typology of commonly observed residential redevelopment, Legislative framework, Mode of redevelopment, Age of buildings opting for redevelopment, Number of projects, Locations, Driving factors, Aspects governing technical/ legal/ financial feasibility of redevelopment projects, Stakeholders or actors of the process, Procedure adopted, and Implications of redevelopment. A total of 13 interviews (Table 3) of expert professional consultants who are practicing in the field of residential redevelopment in Pune City were conducted. Additionally, 5 members of CHS with completed redevelopments were interviewed to understand their experience of undergoing the process of redevelopment. The interviews took an

average of an hour each. All the interviews were recorded in the form of a structured questionnaire which was filled during the interview.

Table 3: Profile of Panel of Experts

Expert profile	(N)
Category	
Architectural consultants	4
Legal consultants	3
Financial consultant	1
Developers	4
Chairman, District CHS federation	1
Committee members of redeveloped CHS	5
Experience (no of years)	
5-10	-
11-20	8
21-30	3
More than 30	7

Source: Author's own

Results and Discussion

Typology of residential redevelopment

The most common typology of private residential buildings in Pune is that of 'housing cooperatives'. A cooperative housing society formed under the Maharashtra Cooperative Societies Act, 1960, governed by a Cooperatives Commissioner and Registrar, is a legal body of elected members in a multi-family housing responsible for upkeep and maintenance of the common areas of the building premises (*Commissioner for Cooperation and Registrar, Cooperative Societies (CC and RCS) Maharashtra State, Pune, n.d.*). All owners or "members" of the cooperative are shareholders of the cooperative. According to the expert redevelopment consultants, that the market-led redevelopment of the cooperative housing societies is the most commonly observed form of the private residential redevelopment. It was noted by the interviewees that the other emerging type of redevelopment in the inner city is single family detached bungalows converting to multi-family housing cooperatives where plot size is more than 1000 sq m. The residential buildings are redeveloped for the same residential land use but in a more intensive form; however, in some cases the land use changes from residential to mixed use or commercial depending on plot location and is mainly observed on plots abutting major roads. A typical redevelopment of a housing cooperative involves bringing down the old low-rise structure and constructing a new 7-11 storey high building which includes some additional flats for open market sale. The architect-consultants noted that the redeveloped buildings are equipped with an elevator, security system, adequate parking, and similar amenities.

Legislative Framework

The architecture and legal consultants noted the following as legislative framework applicable for redevelopments.

Unified Development Control and Promotion Regulations for Maharashtra State (UDPCR 2020)

The uniform development control rules of the Maharashtra State allow higher Floor Space Index (FSI), alternatively expressed as Floor Area Ratio – FAR, for certain uses including redevelopment in various categories such as public or institutional housing, old/ dilapidated/dangerous buildings, multi-family housing, rent-controlled buildings, slums, and existing private residential buildings more than 30 years old. Other than the types mentioned above, an “Urban Renewal Scheme” is a scheme for redevelopment of a cluster or group of buildings and structures over a minimum plot area of 4000 sqm in core city area and 10000 sqm in other parts of the city which may have a mix of the above types. The category of existing private residential buildings more than 30 years old (the focus of this study) typically includes redevelopment of cooperative housing societies, apartments, and bungalows. The permissible or allowable FSI in any (re-) development is dependent on ‘Width of Access Road’. In addition to the basic FSI, higher FSI is allowable on payment of premium, i.e. at prices 60% of government valuation rates for residential plots. Unified DPCR Maharashtra State (2020) gives details on permissible and additional FSI as follows:

Table 4: Permissible FSI as per road width

Sr. No.	Road Width in m	Basic FSI	For all municipal corporations in Maharashtra		
			FSI on payment of premium	Maximum permissible Transferable Development Rights (TDR) loading	Maximum permissible built up area FSI
1	Less than 9 m	1.10	–	–	1.10
2	More than 9 m up to 12 m	1.10	0.50	0.40	2.00
3	More than 12 m up to 15 m	1.10	0.50	0.65	2.25
4	More than 15 m up to 24 m	1.10	0.50	0.90	2.50
5	More than 24 m up to 30 m	1.10	0.50	1.15	2.75
6	More than 30 m	1.10	0.50	1.40	3.00

Source: UDPCR (2020), Maharashtra State

With the permissible FSI as per the table 4, the policy further encourages redevelopment of private residential buildings more than 30 years old with relaxations in the marginal distance to lesser than 6 m for height of building up to 45 m – making redevelopment of smaller plots having area less than 1000 sqm feasible.

In case of redevelopment of multi-family housing, FSI allowed for redevelopment is 10% additional on the FSI, TDR, premium FSI etc. consumed in the existing building, subject to maximum as per Table 5. However, in case of existing buildings having smaller housing units for economically weaker section or low-income group, 10% incentive FSI or 10 sqm built-up area per tenement, whichever is more, is allowed. All tenements in redeveloped buildings must be of minimum carpet area of 27.87 sqm and any additional FSI needed is allowable without any premium.

Transit Oriented Development (TOD) zone regulations

In tune with the national TOD policy (2017) from the Ministry of Urban Development, the Maharashtra TOD zone policy defines a TOD zone of Metro Rail/ Rail Transit or BRTS as an area of 500 m radius from each metro rail station. There is higher FSI allowable in the TOD zone as per two conditions, namely road width and plot size. The maximum permissible FSI is 4 as per Table 5.

Table 5: Permissible FSI in TOD Zone (Metro Influence Zone)

S. No.	Road Width in m	Min. Plot Area in sqm	Maximum permissible FSI
1	More than 9 m up to 12 m	Below 1000	2.00
2	More than 12 m up to 18 m	1000 and above	2.50
3	More than 18 m up to 24 m	2000 and above	3.00
4	More than 24 m up to 30 m	3000 and above	3.50
5	More than 30 m	4000 and above	4.00

Source: TOD Zone Policy (2019), Maharashtra State

Redevelopment of Cooperative Housing Societies – Guidelines (2009, revised 2019)

The directives under Section 79(A) of Maharashtra Co-operative Societies Act 1960 regarding redevelopment of buildings of Co-operative Housing Societies (CHS) in 2009 recognised that the number of redevelopments in urban areas in Maharashtra are increasing. The guidelines, revised in 2019, laid down a detailed procedure emphasizing important steps to be undertaken by society including conducting a special general body meeting, resolve to redevelop with consent of at least 51% members, appointment of an architectural or project management consultant for preparation of a feasibility report, invitation of tenders, scrutiny of bids received and selection of developer and development agreement with the developer.

As mentioned by the Chairman of Pune District Co-Operative Housing Societies and Apartments Federation – “The state has over 2,00,000 cooperative housing societies, of which at least 30% are more than 30 years old which have a potential for redevelopment.”

Mode of redevelopment

The experts mentioned that the preferred mode of redevelopment of CHS is in joint partnership with a re-developer. A Development Agreement is signed by the CHS with the developer firm. The developer retains all the existing members of the society and offers additional area for each housing unit for free to upgrade the area of the house. The existing residents can buy more area at lower than market sale price in the neighbourhood to upgrade their own residential units in size. In return, the developer can make use of the FSI permissible on the plot as per applicable regulations to build additional housing units for sale in open market at the market prices. The project cost plus profit is recovered through the sale of additional units at market prices. The other less opted mode of redevelopment is self-redevelopment in which the housing cooperative itself becomes a promoter and executes the redevelopment through appointing redevelopment consultants and a contractor. The CHS committee members noted that the developer brings mainly the financial strength to execute the project and the marketing expertise which is a challenge to the CHS as a promoter. It was noted by the CHS members that developers are selected on the basis of their offers (how much area will be additionally given for each housing unit). The other aspects such as track record of timely completion of earlier projects, reputation, how much rent paid during the construction time, etc. are some of important considerations by the CHS.

Age of buildings opting for redevelopment

The UDPCR of Maharashtra State, 2020 and Maharashtra Cooperative Societies Bye Laws, 2014 require buildings of age more than 30 years to conduct a structural audit every 3 years from an empanelled structural engineer and every 5 years for buildings between 15 to 30 years of age. Although life of RCC buildings is more than 60 years as per the Indian Standard Code 456, structural damages may be caused due to non-maintenance and this becomes one of the prime reasons for redevelopment. However; UDPCR of Maharashtra State (2020) classifies buildings of 30 years of age as “old” and fit for redevelopment. The re-developers mentioned that buildings as young as 25 years of age have started opting for redevelopment given other driving factors discussed in the subsequent sections.

Number of redevelopment projects and locations

The interviewees mentioned popular locations of redevelopment projects as inner-city neighbourhoods developed in 1980s, namely Kothrud, Deccan, Karve Nagar, Sahkar Nagar, Mukund Nagar, etc. The same was confirmed by using secondary data and mapping it spatially in ArcGIS software. The total number of redevelopment projects registered post-2018 retrieved from MahaRERA official website (Maharashtra Real Estate Regulatory Authority, n.d.) were as high as 175 despite Covid-19 impact on real estate industry. Spatial mapping as per geolocations shows that all of these projects are concentrated in inner city areas (figure 3) – the planning area for old Development Plan of Pune in 1987. The residential building stock in these locations was originally constructed in 1980s – now more than 30 years old and thus ‘ripe for redevelopment’.

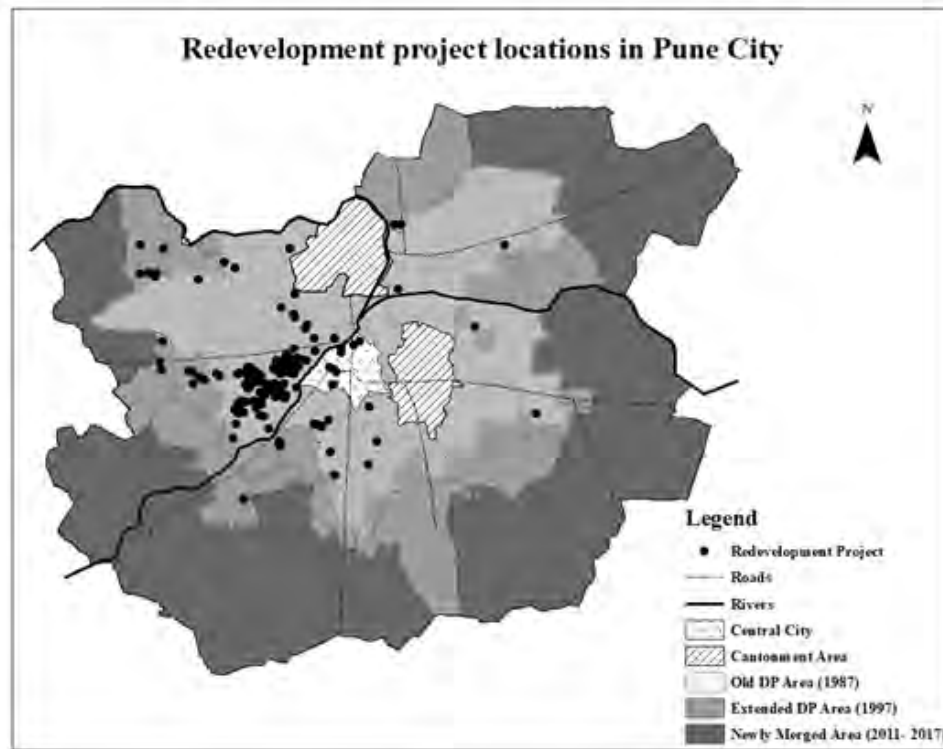


Figure 3: Redevelopment projects (N=175) in Pune City registered between 2018-2022

Driving factors

Increased FSI, especially along TOD zones is a major driving factor due to which redevelopment becomes feasible for the re-developer as open market sale tenements can be built with additional FSI. The re-developers mentioned that lack of amenities, lack of parking, and upgradation of housing unit due to increase in area at less than market rates are major driving factors for the members of Cooperative Housing Society or bungalow owners.

One of the architect-consultants mentioned –“*Apart from new amenities and improved lifestyle, increase in property value due to upgradation without the owners being displaced from the advantageous inner-city locations equipped with amenities and infrastructure is a major driving factor.*”

Stakeholders or actors of the process and procedure adopted

The following are the main stakeholders or actors of redevelopment (Figure 4). The typical process as understood by the interviews is mapped in Figure 5 highlighting each stakeholder involved in the respective stage. The Commissioner/ Registrar of cooperatives is a body which oversees the entire process through guidelines.

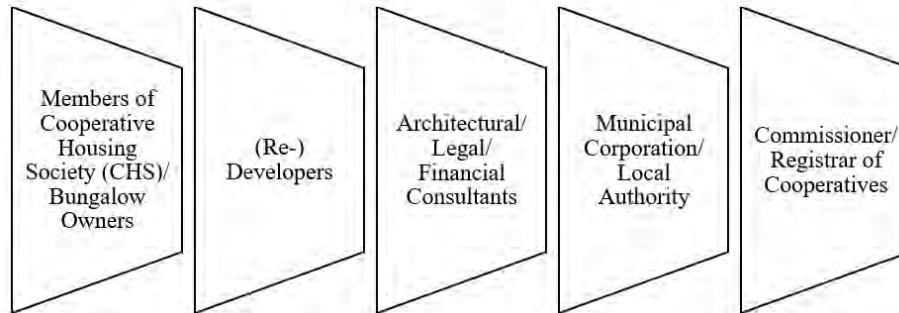


Figure 4: Various actors of the redevelopment process

Source: Illustration by authors

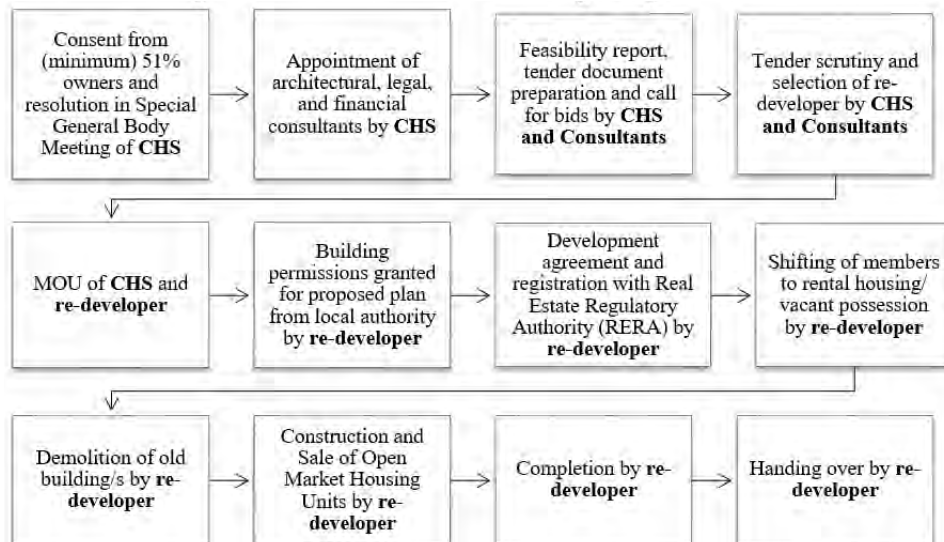


Figure 5: Typical redevelopment process

Source: Illustration by authors

Aspects governing project technical/ legal/ financial feasibility

Important aspects governing the technical feasibility according to the re-developers include the plot size and permissible FSI as per the legislative framework (Figure 5). The developers noted that the common plot sizes are 5000 to 10000 sq ft (465-930 sq m) in size. Clear title, no dues or litigations, consent from at least 51% members of the CHS are important aspects governing legal feasibility. Although the guidelines mention consent from 51% members as mandatory, the re-developers prefer that 100% consent is obtained for project feasibility. The financial feasibility is governed by the sale price of the open market housing units in the location.

As one of the re-developers noted – *“Redevelopment is feasible where sale price is minimum INR 1,00,000/- per sq m.”*

Potential implications on socio-economy, built environment and property prices

The CHS committee members emphasized that there are significant changes in the built environment and plot and building level post re-development such as increase in the number of families, increase in number of floors, modern amenities such as CCTV, security, mechanised parking, etc. The re-developers noted mostly the positive impacts such as increased property value, modern architectural aesthetics, amenities and improved lifestyle. The CHS members further noted that the upgradation corresponds to increased property tax (as the property is considered new registration) and maintenance charges which may be a burden on retired senior citizens. Architect-consultants mentioned that most of the redevelopment projects are observed to have a minimum size of 2-Bedroom and most 3-4 Bedroom flats for open market sale. The new housing units are sold at INR 130000 – 210000 per sq m (2022 prices) as per locations – driving the property prices in the neighbourhoods upward. One of the CHS committee members noted that large housing units post re-development and shops in such premises in case of mixed-use premises, fetch higher rents thereby displacing small convenience shopping. Densification of the inner city is a cause of concern for residents since it means strain on physical and social infrastructure such as water supply, public gardens, playgrounds and so on.

One of the CHS committee member remarked – *“After redevelopment, many new families have been added into the neighbourhood. As many buildings around me are re-developing, this area is starting to feel congested. I am scared that municipal services will soon be inadequate.”*

CHS members also noted that the neighbourhoods felt like large construction sites with disruption and air/noise pollution. They also mentioned that there is pressure of redevelopment on residents in non-redeveloped buildings in a rapidly transforming neighbourhood. They further noted that developers, sometimes backed by local political parties, approach CHS with offers to redevelop their premises. Although all the original owners are retained in the redeveloped premises, they may face indirect pressure to move out due to influx of higher income population in housing units meant for open market sale.

An interviewee from the redeveloped building mentioned – *“My new neighbours will have expensive cars. I use a small car and live a very down-to-earth kind of lifestyle. I think I will not be able to fit in. I plan to sell my new upgraded flat and relocate to farther suburban areas where lifestyle is more affordable.”*

Other observations of the CHS members included that many owners have also started looking at redevelopment as a profitable opportunity. They observed that old flats for resale in the vicinity have increased in value due to potential redevelopment

opportunities. Another concern noted by architect-consultants is the environmental impacts such as loss of trees and urban heat island effect due to increased paving.

Conclusion

Preliminary research in the case of Pune shows that State and the municipalities encourage market-led residential redevelopment by providing incentives through development control regulations. Additional FSI is used to attract private investment to redevelop residential buildings of age more than 30 years in inner cities, which proves profitable for private developers owing to the rent gap. The entrepreneurial city exploits the rent gap and successfully earns revenue in the form of additional/premium FSI charges and development charges payable by the redevelopers. Various stakeholders of the process have brought out concerns through these interviews around this plot-by-plot urban upgrading, including strain on existing neighbourhood infrastructure due to densification, pressure to move away from the neighbourhood due to the neighbourhood becoming expensive, socio-economic characteristics of new incoming population, and reduced neighbourhood liveability. Both the causes and implications noted by the interviewees corroborate with the findings of a Delphi survey conducted by authors Vaishampayan, S., & Bhaduri, S. (2022). Research in other parts of the world provides insights into how urban redevelopment has given rise to gentrification. There are striking similarities in which gentrification theories apply in the context of residential redevelopment in India and other parts of the world. This paper presents nuances of the current policy framework, residential redevelopment processes and practices in the case of Pune, Maharashtra and establishes market-led redevelopment of private residential buildings as one of the emerging redevelopment typologies having noteworthy gentrification implications. It further highlights that there is a need for in-depth empirical research of this plot-by-plot gentrification to provide informed inputs for future redevelopment policies to balance competing social interests.

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Shifting Paradigms in The Wake of Real Estate Regulation: A Case of Ahmedabad

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Abstract

The Government of India passed the Real Estate (Regulation and Development) Act (RERA), 2016 which is a milestone legislation enacted to preserve buyers' interests by ensuring openness, citizen-centricity, accountability, and financial discipline for seamless real estate transactions. It is a known fact that the act has momentarily enhanced the real estate market situation. Yet, stricter enforcement is required. This study embarks upon an empirical approach to explore the effects of the RERA on stakeholders in the real estate market of Ahmedabad city in India.

Keywords

Real Estate Regulation Act (RERA), Home buyers, Developers, Stakeholders, Real Estate market.

Introduction

The development of India's infrastructure is currently being greatly aided by the real estate and construction industries. India's enormous population and rapid urbanisation have put great pressure on the real estate market. With the liberalisation of the economy, the demand for commercial and residential space increased along with the expansion of business opportunities and labour migration. Thus, although the real estate market continued to see phenomenal success, there have been several significant problems impeding its expansion.

Past studies suggest that 16 per cent of the active projects in Maharashtra that are registered with the Real Estate Regulatory Authority (RERA) accounting for 31.2 per cent of the built-up area are litigated. A high rate of litigation in real estate developments could be a cause for concern and delay in project completion also leading to a rise in construction costs.

In 2016, the Maharashtra state government formed RERA under the Real Estate (Regulation and Development) Act in response to home buyers' concerns about

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excessive costs and uncertainties pertaining to the timely completion of real estate projects. (Gandhi, Tandel, Tabarrok, & Shamika, 2021). According to the law, all ongoing and new projects in Maharashtra with a plot size greater than 500 square metres or more than eight flats are required to register with RERA. It is also known that along with the RERA, the Real Estate Appellate Tribunal (REAT) was also established as an appellate tribunal with the mission to resolve consumer grievances of home buyers who have long complained that the transactions in the real estate industry are unfair and favour developers; while the industry was monopolised and encountered several issues with building handover, transactions, approvals, builder requirements, poor construction quality, etc. According to a study, the only state to timely notify the real estate rules and then implement them state-wide by May 1st, 2017, was Maharashtra. Later, the notice of real estate regulations by many other states came under scrutiny for perceived dilution of central standards in a rushed effort to implement RERA at the last minute (Patil & Bagul, 2019).

“The Indian Real Estate Sector (RES) was unregulated prior to the passage of the Act, which has several provisions aimed at protecting the interest of consumers by tightening fraudulent practices of promoters/developers” (Kumar, Chawla, & Mohanty, 2018). With the unscrupulous actions of a few developers around the nation, several issues with purchasing properties in residential and commercial locations emerged. Delays in project approval, dispute resolution, project completion, and other long-standing demands of the stakeholders involved in the project are only a few of them. In response to this situation, the Real Estate (Regulation & Development) Act, 2016 was passed by the Indian government. The government thus created a wealth of new chances for the real estate and construction sectors to thrive with this change and to benefit all the stakeholders, particularly safeguarding the interests of end users by making the developers more accountable. It is observed that since the formation of RERA (Real Estate Regulation and Development Act) and Goods and Service Tax (GST), there has been a noteworthy change in the land business in India, as purchasers began to become more and more cognizant before investing in the real estate market. (Srivastava & Bisaria, 2018). However, since the enactment of RERA 2016, the developers got affected since they could neither compromise on the construction quality nor use the assets as a ‘cash cow’ which was a mundane affair earlier.

Additionally, because of the Act’s prerequisite for the developers to set aside 70 per cent of any amount generated from a project, the developers started particularly facing the debt impact. Also, after the enforcement of RERA, getting project clearances became more challenging. The policy provisions and mandatory disclosures by Real Estate Agents are the key to success in implementing the strategy on a large scale (Virdi & Singh, 2016). Therefore, the need to understand end-user purchase patterns for real estate assets was felt. The thrust of this research was to examine the effects of RERA on the real estate industry, examine public perceptions, identify any challenges that promoters or developers may have encountered as a result of RERA, and assess those challenges in order to find solutions. The scope of the study is limited to the city of Ahmedabad in Gujarat, India and hence comes under the purview of Gujarat State

RERA, often known as ‘GujRERA’. The study revolves around mapping of opinions of different ‘GujRERA’ stakeholders, including promoters and consumers.

Review of Literature

A major source of literature was the original Act itself while, there is very limited relevant academic literature reporting the impacts of the Real Estate (Regulation & Development) Act, (RERA) 2016.

The literature revealed that it required exhaustive deliberations to add more strength and purpose to RERA. Moreover, in its present state, it is so limited in its scope that at best it can affect only an extremely limited section of the property market and at worst it would exist as just another regulation which would inadeptly aid further delay in project launch and completion, at the same time increasing procedural delays (Shah, 2016). On the other hand, the RERA 2016 intends to increase transparency and accountability in the real estate sector and provides mechanisms to facilitate and regulate the transactions in commercial as well as residential projects, while ensuring timely project completion by the promoters. However, this would happen only if there was an efficient implementation by the state government (Ali, 2016). It was stated that RERA will enhance consumer protection by enabling timely delivery and increasing consumer confidence (JLL & Khaitan & co., 2016). A study on the impact of litigations on the Real estate Market of India through the Mumbai case, demonstrates that 27.3 per cent of the projects in Mumbai and 42.9 per cent of the built-up space in the city was under litigation in the year 2021, and further estimates that the litigated projects got delayed by about 20 per cent than non-litigated projects till completion, leading to an average increase in the total cost of construction by about 30 per cent (Gandhi, Tandel, Tabarrok, & Shamika, 2021). It is a known fact that litigation is an outcome of deficient regulation of property rights in ongoing projects, and hence the role of RERA becomes very prominent here.

RERA ought to hold government agencies more liable for establishing time-bound approval processes and enforcing fines for non-compliance. Since 70 per cent of the funds have to be maintained in a separate account, this could cause short-term cash flow problems, but long-term benefits include revived end-user confidence and interest. The study also highlighted that, as the developers hunt for equity rather than structured loans to finance land purchases, their cost of capital will indicate an increase, implying that the builders can’t sell houses before receiving all the necessary project clearances. However, consumers’ perceptions, attitudes, and intentions vary within regions, and real estate agents also have challenges in comprehending consumer thought processes and influencing consumer buying decisions. Real estate agents’ policies and disclosures are crucial for the strategy’s successful large-scale implementation. Few scholars highlighted lack of consumer consciousness as a significant weakness and suggested that consumers need to be made aware of ownership plans, payment options, governmental regulations, and sustainability; while real estate agents may act as a

social marketing link capable of being leveraged to create behavioural interventions, encouraging transparency, law and sustainability (Virdi & Singh, 2016).

According to few studies on the pre-RERA and post-RERA scenarios, the real estate industry was fragmented. However, with the introduction of RERA 2016, developers were mandated not just to have an escrow account with 70 per cent of the received funds allocated to the concerned project, but also to register for GST on any revenue above Rs 25 lakh.

Further a single blanket rate under GST at 12 per cent needed to be charged from purchasers while abolishing VAT, stamp obligation and enrolment charges before the completion of the project. As a benefit, the developers now became entitled to take the tax credit, upon input purchases and pass on benefits to purchasers. Although, real estate specialists estimated that asset costs will spike post-RERA, GST ought to cut down the costs of properties as contemplated by tax experts (Srivastava & Bisaria, 2018). One of the authors who researched literature to capture the immediate reaction to the implementation of RERA in 2016, concluded that the number of drawbacks is much lower than the strong support for RERA among all stakeholders and that the real estate market is anticipated to be highly regulated in the years to come, while both buyers and sellers will receive value for their money and goods (Tupsakhare & Khadilkar, 2020). Other authors have stated that the Act has the potential to protect buyers in multidimensional aspects (Nithyakarpagam, Mathiraj, & Karthick, 2021). The authors also state that promoters and builders are now held liable for work and structural defects in a project for up to 5 years. According to Clause 14 (3) of the Real Estate Act, promoters and builders are required to repair or fix any faults brought to their attention by a buyer up to and within 5 years of the date of ownership, without charging any additional fees to the buyers. In the event of the problem not getting resolved within 30 days of being brought to the attention of the project proponents or upon their failure or refusal to conduct repairs or comply, the buyers are entitled to compensation under the Act.

Figure 1 represents the issues highlighted in a report published by KPMG India. It also states that smaller players may struggle to thrive if they lack strong financial and operational capabilities, which could lead to consolidation. Also, since much time will be spent on settling minor details before the project launch, the launch time may be extended (KPMG-NAREDCO, 2017). Other distinctions that emerged, mentioned that under the previous rule, buyers were required to pay fees regardless of the property's stage of development. A buyer was required to pay the VAT, stamp duty, and enrolment fees in instalments while purchasing a property that was still under construction. Whereas the VAT and other charges did not apply to properties purchased after consummation, the stamp duty and enrolment fees applied and varied from state to state.

However, it would benefit developers if RERA held the government agencies more liable for establishing time-bound approval processes and enforcing fines for non-compliance. Although the government eliminated the GST fee on affordable

homes, research states that the current land registration system is a major challenge that requires a repository to maintain land titles. Nonetheless, it also appeared that government policies, reforms and legislations regarding urban development may be introduced to improve the global inflow of funds and promote the growth of the sector.

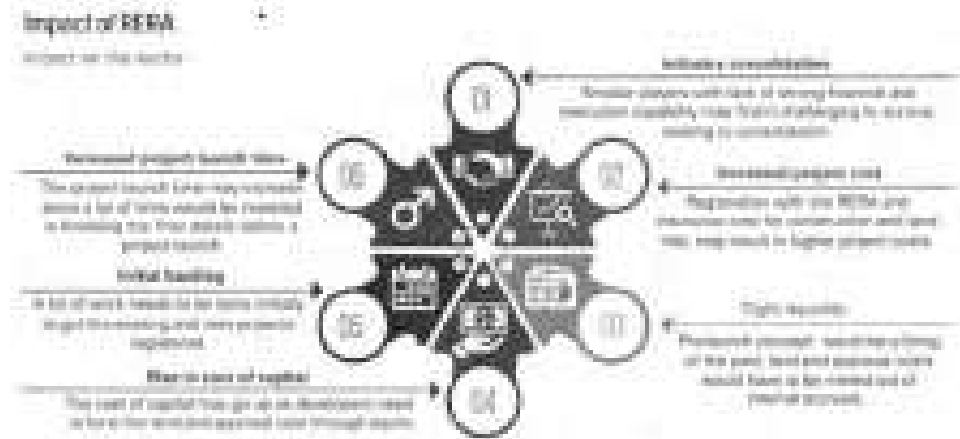


Figure 1: KPMG India's analysis, 2017

Source: KPMG-NAREDCO, 2017

RERA 2016 as regulated by the (Ministry of Law and Justice (Legislative Department), (25th March, 2016) regulates and portrays the following features:

1. Real estate projects must first be registered with the Real Estate Regulatory Authority
2. Application for registration of real estate projects, including business information, information about already-launched projects, copies of permissions and sanctioned designs, information about sale agreements, a stage-by-stage timeline for project completion, and many additional proforma are necessary for the registration process. The grant for registration is conveyed to promoters within thirty days from application
3. If there is no default on the part of the promoter, Section 6 of The Real Estate (Regulation and Development) Act, 2016 permits the extension of registration of a real estate project that was initially granted under Section 3 of the Act through an application made by the promoter on the grounds of force majeure
4. Revocation of Registration in case of default on the part of the promoter after thirty days' notice
5. Obligation of Authority consequent upon the lapse of or on the revocation of registration
6. Real estate agents' licensing and its suspension for violations
7. Specifies the roles, obligations, and responsibilities of promoters and real estate agents

8. Adherence to sanctioned plans and project specifications by the promoter
9. Return of funds and compensation if the property allocation is not completed
10. Rights, Duties and Obligations of Allottees
11. Functions of Authority for promotion of the real estate sector
12. Measures for advocacy and awareness
13. Authority Functionalities
14. Authority to request information, carry out investigations, and issue temporary orders
15. Interest or penalty reimbursement
16. Establishment and defining functions of the Central Advisory Council.
17. Creating the Real Estate Appellate Tribunal, mediating disputes, and outlining its authority
18. Defining offences, penalties and adjudication
19. Finance, accounts, audits and reports
20. Powers of Government to make rules

With this background, the paper probed around the following areas: (i) Difficulties of consumers and promoters of real estate under the new system (ii) Challenges in implementation of the provisions and regulations of the RERA 2016 (iii) Impacts on promoters and factors involved in implementation of RERA 2016 (iv) Customer perceptions and RERA awareness (v) Developer-perceptions on GujRERA

Methodology, Data Analysis and Findings

The study was conducted to gain an understanding of the perplexed sentiments among the major stakeholder groups - the promoters and home-buyers, regarding the Real Estate (regulation and development) Act (RERA) 2016 further identifying the discrepancies in its implementation. The research was conducted three stages, involving a perception study, stakeholder surveys with purposive sampling for each stakeholder group, followed by structured interviews of developers. Data was analysed from the outcomes thus obtained, which led to drawing conclusions and recommendations. It was found that the RERA would only sustain those developers in the long run who had a strong track record with a committed business prospectus and will need to improve project execution skills, to ensure that all project commitments are met promptly. It was found that the consumers needed to fully understand the Act and its contents to form informed opinions.

The data identification, data collection, and data analysis phases of this study were done through a descriptive and exploratory approach. The study was divided into three phases.

Phase I: This phase involved defining the study area, objectives, and scope of research. All accessible information including legislative documents, information from research papers, journals, books, and annual business handbooks on RERA and related themes etc. were reviewed.

Phase II: The data were collected using qualitative and quantitative surveys. The primary themes that arose from personal interviews with the respondents constituted the basis for the survey that of benefactors and promoters carried out with their responses captured on a five-point Likert scale, leading to a quantitative analysis.

Phase III: Data was collected via structured interviews conducted in two stages, beginning with a qualitative survey of the respondents followed by a poll. The interviews revealed a wide range of challenges and obstacles as a result of the Act's implementation. The qualitative survey was conducted using descriptive research methods, and pertinent issues and themes were identified after reviewing the responses.

A purposive sampling approach was used in the selection of respondents, from Ahmedabad in Gujarat. As a benchmark, a minimum work experience of more than two years was considered necessary for respondent developers to identify the effects of RERA on the real estate market, both the pre and post-implementation. The following standards were established while choosing respondent developers and all four requirements were viewed as necessary.

Criterion 1: Have two or more projects registered with RERA

Criterion 2: Have more than two years of experience in the real estate sector

Criterion 3: Have thorough knowledge and comprehension of the subject

Criterion 4: Being located in Ahmedabad city

The following standards were established while choosing the respondent home buyers (Complying with at least one of the three criteria was considered compulsory). Here, the term homebuyer is used to represent aspirant buyers of all the assets offered by the real estate market.

Criterion 1: Willing homebuyer

Criterion 2: Already a homebuyer post-RERA

Criterion 3: Having a sound knowledge and understanding of the subject

Purposive sampling was used in the primary survey, followed by a personal structured interview and different sets of questions, tailored to respective stakeholder categories created to assess the impact of the themes represented in Figure 2, identified based on the analysis of the primary qualitative survey. Similarly, categorically separate polls were conducted.

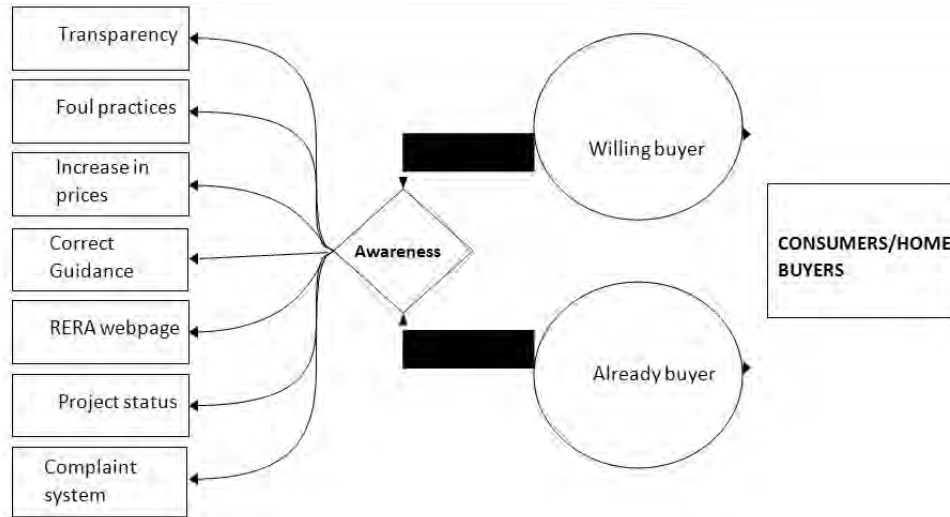


Figure 2: Thematic Representation of Parameters for Home Buyer-Survey

Source: Author's own

GujRERA report 2019 had stated that there were total 2,88,901 units offered for sale in the Ahmedabad district of Gujarat region. Hence, the population size for the consumer survey was taken to be 2,88,901. The sample size was calculated at a 95 per cent confidence level with a margin of error equal to 5 per cent, and an eligible population proportion of 93 per cent of the population.

Thus, the appropriate sample size in this case for the consumer survey was 101, representative of the population. Two main categories of consumers were considered (i) Those who have already bought/booked property and, (ii) Those who were willing to buy one. The following approach was used for calculating the sample size of the developers. According to GujRERA website, there were 2,230 registered projects under RERA in Ahmedabad region at the time of this research and 915 developers registered with the Ahmedabad Urban Development Authority, which is assumed to be representative of the list of developers in Ahmedabad Municipal Corporation. Next, the sample size was calculated for the developer population size of 915, using a sample size calculator at 95 per cent confidence level at (+/-) 8 per cent margin of error. The sample size thus derived was 28, which in this case is the representative sample of the developer population size for our study. Yet 30 developers were surveyed keeping in view more accuracy that was ensured by additional samples taken. The survey form was created based on a five-point Likert scale approach, with the questions being asked under the themes as represented in Figure 3.

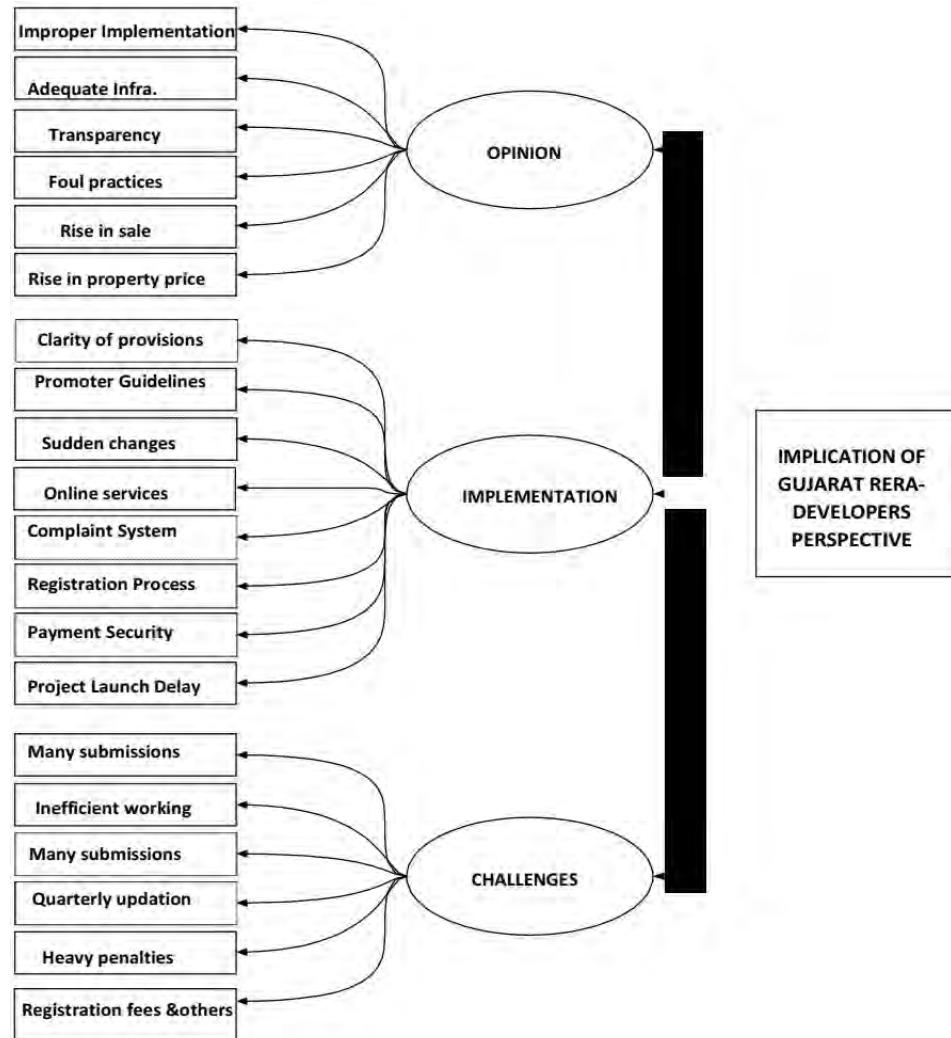


Figure 3: Thematic representation of Developer's survey

Source: Author's own

Further, general sentiments amongst developers and their broad opinions on RERA were analysed based on parameters as represented in Figure 4 and their results were obtained on a five-point Likert scale. According to the analysis, 47 per cent of developers approved of the rise in home prices after RERA, compared to 40 per cent who disapproved and 13 per cent who had a split opinion. When asked about the increase in sales following RERA, 53 per cent of developers had a split opinion, 10 per cent agreed, and 37 per cent disagreed. With regards to the likelihood of fraudulent practices occurring after RERA, 80 per cent of developers disagreed, 17 per cent strongly disagreed, and 3 per cent still thought it was a possibility. Although seventy-three per cent promoters agreed that there is transparency following RERA, 23 per cent

had split opinions while 3 per cent disagreed. When asked about the effectiveness of the GujRERA, 70 per cent developers only partially agreed, 17 per cent agreed with the statement, and 13 per cent disagreed. Fifty per cent of the promoters agreed with the proposition regarding GujRERA's proper implementation. Further, according to the analysis as represented in Figure 4, forty-seven per cent of the developers approved of the rise in home prices after RERA, compared to 40 per cent who disapproved and 13 per cent who had a split opinion. When asked about the increase in sales following RERA, 53 per cent had a split opinion, 10 per cent agreed, and 37 per cent disagreed. Regarding the likelihood of fraudulent practices occurring after RERA, 80 per cent of promoters disagreed, 17 per cent strongly disagreed, and 3 per cent still thought it was a possibility. Whereas 73 per cent promoters agreed that there is transparency following RERA, 23 per cent only partially agreed and 3 per cent disagreed. When asked about the effectiveness of the GujRERA, 70 per cent of developers agreed just partially, 17 per cent agreed and the remaining 13 per cent disagreed. Overall, 50 per cent of developers agreed with the proposition regarding GujRERA's proper implementation. Next, certain questions were oriented towards gaining a perspective on the implementation of RERA, and it was found that although GujRERA is strongly considered to have a user-friendly mechanism by 57 per cent of the promoters, 23 per cent of them simply disagreed 20 per cent somewhat agreed, whereas 20 per cent had a partial opinion. Concerning the sufficiency of infrastructure, 3 per cent of the promoters slightly agreed, 53 per cent disagreed, 10 per cent strongly disagreed, and 3 per cent claimed there is not enough infrastructure and staff. Regarding the security of payments made through GujRERA, 67 per cent of the developers strongly agreed with 20 per cent more somewhat agreeing, as opposed to 7 per cent who disagreed, 3 per cent who demonstrated a partial agreement, and a residual 3 per cent who strongly disagreed.

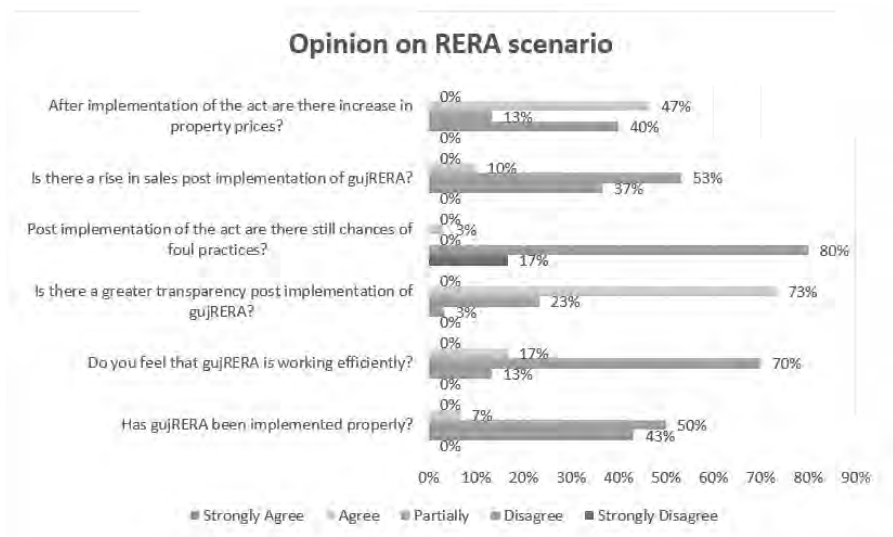


Figure 4: Developer poll on overall RERA scenario

Source: Author's own

Figure 5 represents responses recorded to understand the developer perspective regarding the implementation of RERA. On a five-point Likert scale, 37 per cent strongly opposed, 37 per cent disagreed, 20 per cent somewhat, 3 per cent agreed, and 3 per cent strongly agreed upon 'prompt resolution for complaints' and 'proper complaint mechanism' under GujRERA. When asked if the internet services of GujRERA functioned properly, 57 per cent developers partially agreed, 27 per cent strongly objected, along with 13 per cent agreeing to an extent and 3 per cent who were very positive about it; the remaining 27 per cent promoters simply disagreed. Figure 6 represents responses recorded to understand the challenges the developers faced regarding the compliance process of projects under RERA.

Most Developers stated that there were abrupt modifications to the registration format and system by GujRERA to which 7 per cent strongly agreed, 37 per cent developers simply agreed, while 33 per cent had a split opinion and 23 per cent disagreed based on their experience. Developers opined differently regarding whether precise instructions were presented to promoters by GujRERA, with 33 per cent agreeing, 20 per cent displaying a split opinion, while 33 per cent disagreeing and 13 per cent strongly disagreeing to the poll.

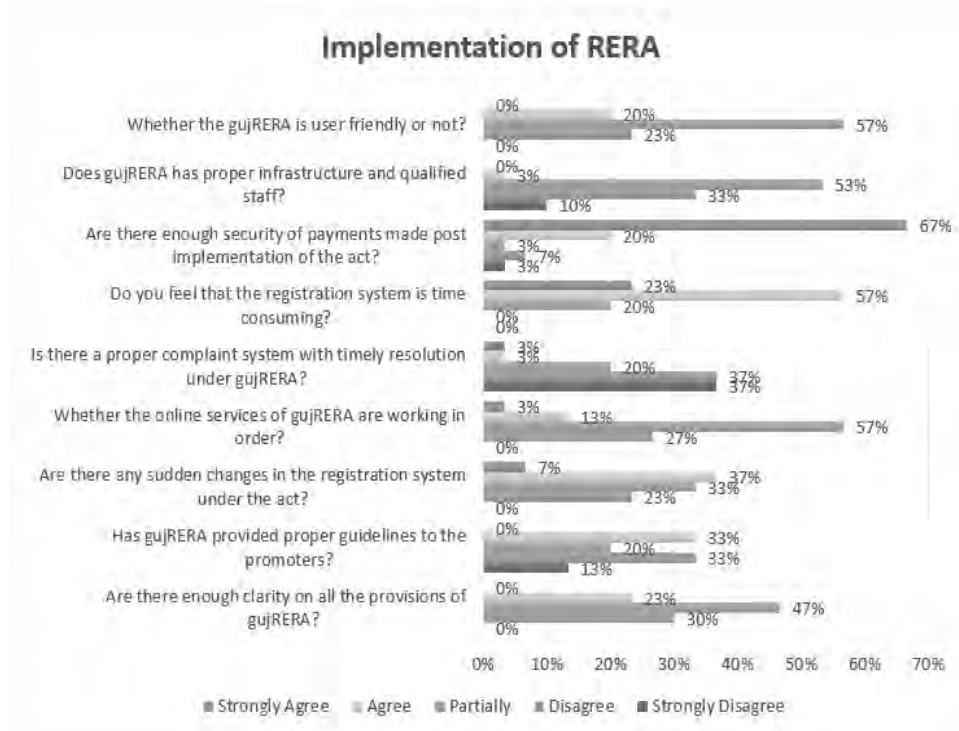


Figure 5: Developer poll on Effective Implementation of RERA

Source: Author's own

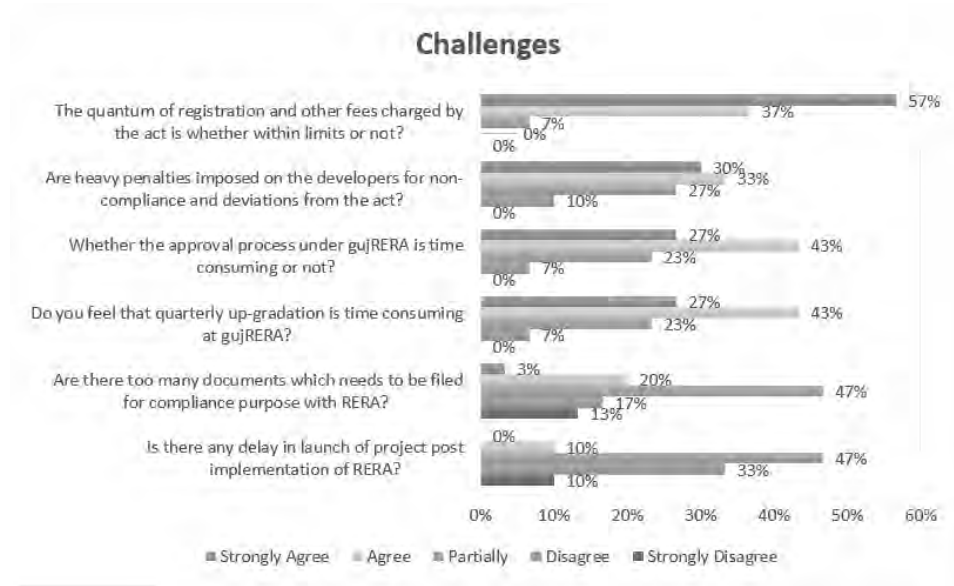


Figure 6: Developer Perspective on challenges faced in the RERA regime

Source: Author's own

Parallely, the primary responses from home buyers who visited booking offices at several active projects in Ahmedabad for inquiries or other purposes, were gathered. The data was taken from seven different categories of ongoing real estate projects outside their booking offices in Ahmedabad. This method was adopted in order to gather precise, impartial data. Table 1 lists the details of these active projects across various categories.

Table 1: Active Projects in Ahmedabad for Consumer base

S. No.	Project name	RERA Reg. No.	Project Type
1.	Savvy Strata	PR/GJ/AHMEDABAD/AHMEDABAD CITY/AUDA/RAA01242/080118	Residential/Group Housing
2.	Surya Kutir	PR/GJ/AHMEDABAD/AHMEDABAD CITY/AUDA/RAA00723/EX1/061018	Residential/Group Housing
3.	Blossom Oasis	PR/GJ/AHMEDABAD/AHMEDABAD CITY/Others/MAA04756/280119	Mixed-use Development
4.	Vedanta	PR/GJ/AHMEDABAD/AHMEDABAD CITY/AUDA/CAA04286/071218	Commercial

S. No.	Project name	RERA Reg. No.	Project Type
5.	Takshashila East End (Block A)	PR/GJ/AHMEDABAD/AHMEDABAD CITY/AUDA/MAA02367/130418	Mixed Development
6.	Aaditya Heights	PR/GJ/AHMEDABAD/AHMEDABAD CITY/AUDA/MAA00770/201117	Mixed Development
7.	Devashray Arcade	PR/GJ/AHMEDABAD/AHMEDABAD CITY/AUDA/CAA01656/EX1/070219	Commercial

Source: Author's own

As far as the consumers were concerned, the qualitative investigation revealed that they were generally unaware of the RERA Act and its advantages. Hence a questionnaire survey of one hundred and one respondents was conducted to gauge their level of awareness. As previously mentioned, the main idea was getting information from the end-users most exposed to RERA. Hence the respondents were identified from the footfall at booking offices of active projects in Ahmedabad. The responses were divided into the following groups for analysis: (i) Already a buyer (ii) Willing buyer. This was done to learn how both categories viewed and understood RERA differently. It was revealed that 60 of them had purchased a real estate asset while 40 were prospective buyers.

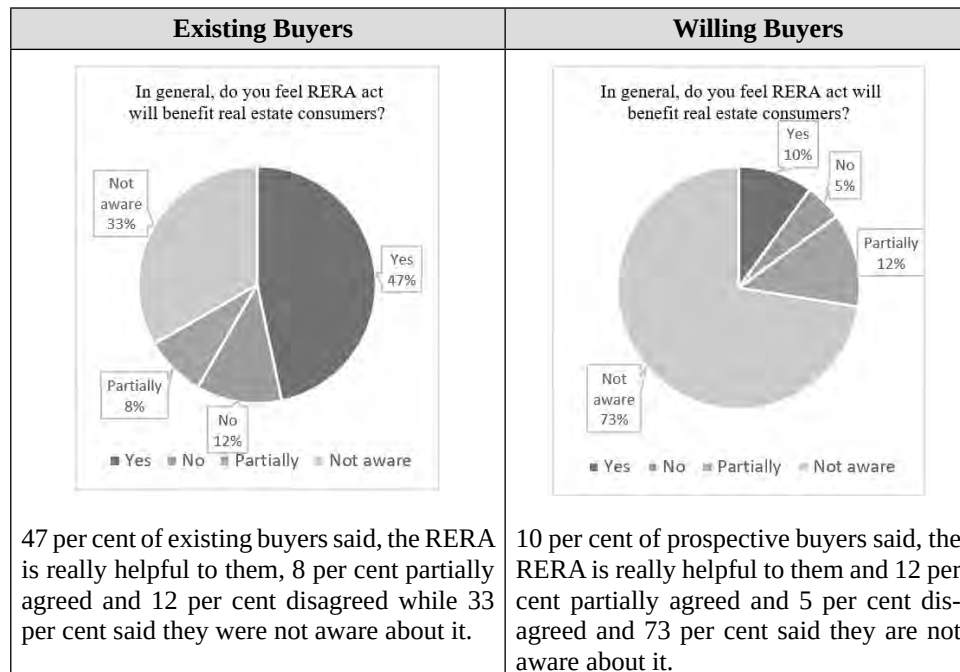


Figure 7: Consumer-survey graphical representation

Source: Author's own

Figure 7 graphically represents the buyers sentiments regarding the usefulness of RERA. It indicates that while the Existing Buyers were more aware of the provisions of the Act from which nearly 47% of the buyers found it beneficial, nearly 73% of the Willing Buyers were negligent of the Act's provisions. Also, as seen in Figure 8, 90% Existing Buyers find the ESCROW Account clause of the Act beneficial and have more clarity regarding the Act thus, with only 30% of the Willing Buyers having information of it.

The introduction of RERA has brought up transparency in Ahmedabad's real estate market as 57 per cent of the consumers agreed to the fact. However, the RERA and demonetization have also led to increase in property prices as confirmed by 73 per cent of people. Yet, the legislation has also made sure that developers do not engage in unethical behaviour because 55 per cent of respondents indicated the same. The consumer group continues to be underinformed. It can be seen that 55 per cent of the populace is unaware of the Act's complaint procedure, whereas 43 per cent have never visited the RERA website. Yet, the consumer group considers RERA to be beneficial. Similarly, 47 per cent of respondents displayed willingness to utilize the consumer complaint portal citing its advantages. The answer to the question of whether or not the clause requiring a refund of the purchase price plus interest in the event of project delay, advantageously received a clear majority of 100 per cent. Hence it is fair to conclude that the Act would ultimately benefit consumers although they may be unaware of its provisions.

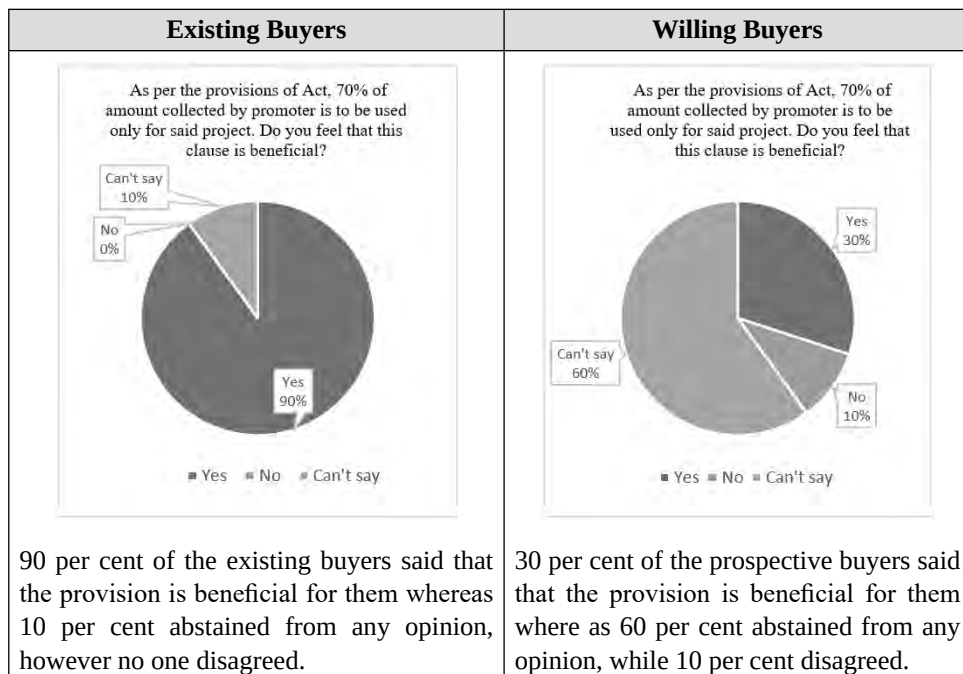


Figure 8: Consumer part-survey graphical representation

Source: Author's own

Initial research has revealed that consumers lack even the most fundamental RERA Act related awareness. Since timely delivery and high-quality are the primary concerns of real estate buyers, those who were aware of the situation saw a favourable outcome. While the government must focus on broadening its public awareness, it is predicted that the level of awareness will rise only over some time, helping to ease the tension between homebuyers and developers.

Certain notable shortcomings include the GujRERA website's malfunction as a major concern, and the biggest challenges and issues that people have to deal with are either directly or indirectly related to it. Officials are required to consider this matter on priority for a seamless user experience. Nevertheless, for the regulatory body's various components to operate effectively, more infrastructure needs to be provided. Given the significance and contribution of the RERA and the need for its improvement, the transitional challenges should also be considered, thereby ensuring long-term compliance and commitment by developers.

With declining of new project launches as a side-effect of this Act, there will be lesser supply, reducing mushrooming of projects and over-competitiveness. Homebuyers who previously just considered pricing will find themselves in a better position to evaluate the projects based on their brand value, product quality, location etc. Even so, the Act's provisions should be reviewed to determine whether any revisions are necessary to avoid the issues that are currently being faced. This will help safeguard the stakeholders' interests impartially.

Discussion and Conclusion

Despite the passing of considerable period post the implementation of RERA, few challenges were observed specifically as an outcome of the survey of the stakeholders. In order to increase transparency in project marketing and execution, the Act made it mandatory for all commercial and residential real estate projects with land sizes of over 500 square metres, or eight apartments, to register with the Real Estate Regulatory Authority (RERA). Therefore, the Act aided in the reduction of fraud by requiring builders to obtain all necessary approvals before they could market or sell any properties, thereby restricting their free will and amassing of investors' money in absence of concrete approvals and clear land titles. This also demanded for mandatory disclosure of all information including plans, layouts, project site with clearly defined property boundaries, carpet area, number and size of garages, etc. and compliance to clear title of land thus avoiding further ambiguities for buyers, but challenging developers to gain clear title from each of the original owners of the land whose name appeared in the 7/12 extract of the land parcel. Although, this meant a reduction of fraud, it also took away the flexibility of the promising developers to 'soft launch' a project while simultaneously obtaining land titles and approvals, which implied delays in the project launch until all the approvals and sanctions were through. A mandate for developers before starting of sale was the ESCROW account, the funds of which only 30 per cent can be appropriated, with the remaining 70 per cent to be utilised for the

same project, thus ensuring security to investor's money and discouraging the land banks that used to be pooled by developers before RERA to flinch multiple projects simultaneously. However, for the developers, this meant a challenge in terms of losing their flexibility of the funds thus received.

Earlier, sale agreements were drafted in a way that home buyers were penalized for any default in payments towards their booked property, but equivalent defaults by promoters were not penalized. However, to maintain equality and protect buyers from various fines and costs, promoters and homebuyers must now engage in a standard model sale agreement in accordance with RERA regulations. Further, it is known that under RERA, the promoter is not permitted to charge the buyer with an amount exceeding 10 per cent of the project cost, as an 'advance' or 'application fee' without first entering into a written agreement for sale with that person and registering it. This wiped off the amount that developers used to charge in cash to their buyers, without which they would not enter into an agreement with the intending buyer. This greatly resolved the issues of the struggling home buyers.

The RERA also imposed penalties on developers in cases of providing misleading information to the buyers and hence it became challenging for developers to make project specifications very clear in their information brochures and agreements. Further, failure to meet the project completion deadlines meant heavy penalties for developers. Sometimes the delays could be due to increased land conversion, acquisition or documentation period. The flip side for buyers however is that RERA has allowed developers to amend the project completion dates thereby re-setting the schedule of completion and avoiding future penalties by paying a nominal fee, while the investors may continue to remain at loss. Nevertheless, modifications in the sanctioned layouts can be effected under RERA by the consent of only 2/3rd of the majority of the buyers, which overlooks the rights of the 1/3rd investors who may have precisely invested for specific project layouts and amenities, thereby risking their investments to the mercy of non-inclusive amendments post a re-sanction.

It is a known fact that a large portion of the affordable segment residential real estate market has been driven by petty property agents in the sales and rentals segment. The mandatory registration of agents under RERA not only attracts fees but also makes the agents accountable, which has affected the business of petty agents who either rely only on bigger players or build capacity to function as mainstream agents for RERA registered properties.

RERA has an established and sound grievance redressal mechanism under its state real estate regulating agency and expect conflict resolution within 60 days. If the stakeholders disagree with the RERA's ruling, they have 60 days to submit a complaint to the Appellate Tribunal. Even after that, if no resolution is reached, they may file a complaint with the High Court or Supreme Court. Despite this mechanism, many buyers remain unaware of the provisions or are seen opting for a parallel resolution through the Consumer Forum. Such challenges need to be redressed through review and to be improved over time.

RERA 2016 is unquestionably a step in the right direction towards resolving the problems associated with delayed project delivery and completion. This Act has the potential to drive an increase in real estate investments in the industry.

However, it is important to realise that this legislation demands rigid conformity in the approval procedure at present, posing challenges to the developers. New project launches have slowed down by the industry's transition to RERA, and developers now need more working cash. Although the passage of this act has received encouraging feedback from developers, they see government compliance as a major hurdle. While small developers who own land parcels in the city are looking forward to joint ventures with big developers to overcome some of the stringent provisions, most developers are currently focused on completing the ongoing projects and have postponed upcoming projects for later. This situation may call for a reconsideration of the situation of small developers. In its present form, RERA will only sustain those developers in the long run who have a strong track record, a clear and committed business prospectus and capacity to scale-up project execution skills. It is observed that after the establishment of the state Real Estate Regulatory Authority and the Real Estate Appellate Tribunal, the stakeholders, no longer have to resort to alternative consumer forums or civil courts for the resolution of complaints involving the purchase of real estate. Since the Act majorly focuses on consumers, their opinions are important. It is time that consumers must fully understand the Act and its contents to be able to make informed investment choices.

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Urban Mobility Initiatives Towards Passengers' Transportation in India

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Abstract

The urban population of India is expected to surge from 450 million to 800 million people over the next two decades. This transformation will pose unprecedented challenges for India's burgeoning cities and towns, particularly in the realm of transportation. The escalating global demand for energy is primarily propelled by transportation, currently the largest energy consumer in developed nations and the fastest-growing sector in most developing countries. As major sources of Green House Gas (GHG) emissions, cities in Asia and the Pacific seek low-carbon development. India has aligned its policies with the 2030 targets to curb GHG emissions by ensuring sustainability in all areas of development, particularly in the transportation sector. This paper examines some of the green mobility initiatives undertaken by the Government of India for accelerating the shift towards adopting cleaner fuels, enhancing fuel efficiency and promoting a shift to public and eco-friendly modes of transportation with the aim of delivering improved urban sustainability and create less congested cities with lower levels of air pollution and more efficient travel options.

Keywords

Urban Governance, Transportation, Sustainability, Green Mobility.

Introduction

It is estimated that by the time India completes 100 years of Independence, half of India's population would be urban. Evidently, urban development that is orderly and sustainable is critical for national well-being and the achievement of the country's economic potential and larger livelihood opportunities. It is noteworthy that the Mayoral Summit of the Urban 20 Engagement Group under India's presidency of the G20¹ (Group of Twenty) brought a developing nations' perspective to the global narrative on urban development. The Summit emphasised the need for an action-oriented agenda to ensure sustainable and equitable urban development in alignment with the 2030 Agenda for Sustainable Development². The G20 comprises the world's most developed economies and emerging ones, which together account for more than

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80 per cent of global GDP, 75 per cent of international trade, and 60 per cent of the global population.

Urban transport infrastructure forms the framework of the urban form, and mobility flows have emerged as a critical dynamic in the rapidly urbanizing Indian cities (Amin et al., 2013). Even if urban mobility in Indian cities is increasing, accessing places, activities, and services is becoming more and more costly, time-consuming, and uncomfortable. According to Pucher et al., (2005), current urban mobility levels are really creating a crisis that is already causing high levels of traffic deaths, pollution, and congestion. This crisis will ultimately result in an unfavorable accessibility scenario. The mobility issues faced by the impoverished are particularly concerning, as more than 25 per cent of India's urban population lives below the poverty line (C Rangarajan et al., 2014).

Statement of the Problem

Due to the considerable increase in travel demand caused by growing urbanisation, urban transit is starting to pose a substantial difficulty. The majority of Indian cities are not designed in accordance with planning guidelines or standards. The fact that land allocation for highways appears to be typically insufficient is more apparent in this instance. The Ministry of Road Transport and Highways, Government of India, has released figures showing that during the past ten years, the number of motor vehicles in India has grown at an annual pace of about 10 per cent. The primary cause of all of these, in addition to insufficient transport infrastructure and its inefficient utilization, is the current imbalance in modal split. The last several years have seen a sharp rise in demand, which public transport systems in cities have not been able to meet. Cities cannot afford to serve solely private automobiles, and it must be widely acknowledged that policies should be created to encourage public transportation, especially the bus system while decreasing the demand for individualized kinds of transportation. If public transit is to be a major part of a city's daily life, a lot of work has to be done.

The extreme need for parking spots in metropolitan areas leads to a number of parking-related problems, including environmental risks, unequal supply and demand, and traffic congestion. Moreover, the Indian metropolis is facing a transportation issue due to its tremendous economic and demographic expansion. India suffers from chaotic scenarios including congested sidewalks, illegal parking, and other criminal activities due to inadequate monitoring, which are caused by poor parking management and regulation. In Surat, on-street parking blocks about 60 per cent of the road length, whereas just 14 per cent of the road length in Delhi is utilised for on-street parking. Because on-street parking is either free or less expensive than off-street parking, it is encouraged in a perverse way.

Pollution has a direct impact on human and planetary health. Majority of our cities worldwide experience severe air quality issues, which have drawn more attention in the last ten years. The increase in urban population and the resulting changes in land use due to the growing urban areas are the key contributing factors to the air quality

issues. The Central Pollution Control Board's (CPCB) categorisation of air quality is used to assess the level of air pollution in Indian cities. The amount and intensity of pollution varies greatly throughout 180 Indian cities, according to data on air quality that is currently accessible (Kamyotra et al., 2012). If the levels of the criterion pollutants (PM10 and NO2) are more than 1.5 times, the city is classified as seriously contaminated.

One of the most common cause of mortality in Indian cities is air pollution. In Indian cities, air pollution causes over 6,20,000 premature deaths annually (Chowdhury. S, 2013). Cardiovascular conditions are the cause of premature air pollution mortality. Attempts to control air quality have received conflicting feedback for more than ten years. The situation is becoming worse in some cities, while in metro areas where pollution control measures have been implemented, pollution levels have either stabilized or decreased. The "livability" of Indian cities is being significantly jeopardized by toxic air and its health impacts.

Research Questions

Following are the research questions

1. What are various problems in transportation to be addressed under urban scenario?
2. What would be the future course of actions to be taken to make zero congestion, zero pollution and zero fatality as part of a sustainable transportation system?
3. What are the specific strategies on sustainable urban transportation system?

Objectives of the Study

1. To identify the issues and challenges in the transportation system of urban India.
2. To identify the best practices for the sustainable transport system in India.
3. To scrutinize the broad parameters of sustainable transport systems and overall strategies adopted by the Government of India.

Urban Transportation Process in Indian Cities

Metro Rail Networks

The introduction of the Mass Rapid Transit System (MRTS), including the Delhi Metro, aimed to decrease Green House Gas (GHG) emissions per passenger-kilometer. This initiative was designed to enhance the efficiency of travel within the city, making it faster, more affordable, and energy-efficient, ultimately leading to a reduction in carbon emissions. According to the United Nations Environment Programme (2014), the improvements made to the Metro system were implemented to minimize the usage of less energy-efficient and more polluting forms of transportation in the city, such as buses, taxis, passenger cars, motorcycles, and motorized rickshaws. India's metro rail systems, with 16 operational systems across 15 cities, notably Delhi Metro as the largest, have become vital sustainable urban transportation solutions. Established in

2002, Delhi Metro covers 391 km, comprising 12 lines and 286 stations, significantly reducing traffic congestion, pollution, and accidents in Delhi-NCR, serving over 2.6 million daily passengers. As of March 2023, India has 859 kilometers (534 miles) of operational metro lines and 16 systems.

The Delhi Metro Rail Corporation (DMRC) is a trailblazer in sustainability, incorporating low greenhouse gas-emitting rolling stock cars to minimize energy consumption. The metro's quiet operation reduces noise pollution. The green foliage adorning the tracks, solar panels empowering the stations, and the efficient LED lights illuminating the tunnels all collaborate to create an eco-friendly environment. In addition, energy-efficient LED lighting has been installed across all Delhi Metro stations, depots, and residential complexes to encourage the use of environment-friendly technologies in all spheres of its functioning. Delhi Metro became the first metro or railroad project in the world to be registered by the UN under its Clean Development Mechanism³ (CDM) in 2007, sinking with the SDGs in 2015. DMRC engaged in three energy efficiency projects registered with the Gold Standard Foundation, generating ₹19.5 crore from the sale of 3.55 million carbon credits between 2012 and 2018. Their pioneering regenerative braking technology, a global first, earned carbon credits by capturing and efficiently reusing energy from braking processes, exemplifying their dedication to sustainability.

DMRC's sustainable initiatives include replacing air conditioning systems, incorporating solar power, water conservation, waste management, and last-mile connectivity options. DMRC has also adopted the ISO 50001 Energy Management System and invested in last-mile connectivity solutions such as e-cycles, e-scooters, and e-rickshaws. Committed to SDGs in 2015, DMRC contributes to Clean Water and Sanitation (SDG 6) and Climate Action (SDG 13). It stands as India's largest and busiest metro network, earning global recognition as the world's first green metro, reducing 6,30,000 tonnes of pollution annually through carbon credits and innovative measures.

Water Metro

Kochi, a rapidly urbanizing coastal city in South India, launched the Kochi Water Metro project in 2021 which was officially inaugurated on 25 April 2023 by the Honorable Prime Minister. KWM operates electric-hybrid ferries providing affordable waterway connectivity from locales in the mainland to other islands spread over the backwaters. The project is expected to lessen carbon emissions by 44,000 tonnes every year, making it a sustainable and eco-friendly form of transport. The Kochi Water Metro stands as a pioneering example in Asia, being the first integrated water transport system of its scale. This system comprises 78 battery-powered electric hybrid boats that link Kochi's 10 island communities to the mainland. The direct waterway connectivity to the mainland is also aimed at attracting tourists which would in turn improve the socio-economic condition of the islanders, most of whom rely on tourism for a livelihood. The electric hybrid ferries that are friendly to both children and differently-abled persons have won

the Gussies Boat Award in 2022. It is seamlessly integrated with the Kochi metro and acts as a feeder service to the riverside suburbs, bridging gaps in limited transport accessibility.

The Water Metro, currently plies in two popular routes, attracted a ridership of 2 lakh commuters in the first three weeks since its launch in February 2021, pointing to an urgent need to revive Kochi's waterways to build more sustainable transport. The Kochi Water Metro demonstrates that investments in efficient and accessible public transport systems will foster sustainable urban environments. Strengthening public transportation not only curtails individual vehicular usage but also promotes communal mobility, thereby reducing traffic congestion and lowering overall emissions.

Road Transport (Electric Vehicles)

"India faces the dual challenge of accelerating its transition to a low-emissions road transport sector while meeting the surge in private mobility demand and steady increase in freight activity linked to a growing, urbanizing, and rapidly developing population" (IEA & NITI Aayog). Road transport accounts for 12% of India's energy-related CO₂ emissions and is projected to double by 2050. As per the International Energy Agency's (IEA) Stated Policy Scenario (STEPS), CO₂ emissions will peak in the 2040s but remain high due to growing private car usage, expanding truck fleet, and reliance on gasoline and diesel.

Electrification stands as a fundamental component of India's plan to decarbonize its transportation sector. As the fourth-largest car manufacturer globally, India views Electric Vehicles (EVs) as a significant potential source of economic growth and exports. The country has implemented two major national initiatives to facilitate the electrification of road transport. The Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme offers purchase incentives and support for charging infrastructure until 20, while the Production-Linked Incentive (PLI) schemes provide incentives for manufacturing across various sectors. These national programmes are complemented by several state-level policies, collectively promoting the widespread adoption of electric vehicles in India. "Policy measures such as low-emission zones, stringent fuel economy standards or zero-emission vehicle (ZEV) requirements can further accelerate EV deployment" (IEA & NITI Aayog, 2023).

"India has stepped up international collaboration and engagement and benefitted from a number of initiatives such as the Clean Energy Ministerial Electric Vehicle Initiative, the Climate Group (EV100), Zero Emission Vehicle Transition Council (ZEVTC) International Assistance Taskforce and the First Movers Coalition" (NITI Aayog, 2023).

Another initiative is the nationwide "Go Electric" Campaign to raise awareness about the advantages of e-mobility, EV charging infrastructure, and electric cooking that will help to reduce import dependence, ushering in a cleaner and greener future, while also enhancing confidence among Electric Vehicle manufacturers.

India introduced the National Electric Bus Programme (NEBP) in 2022 with the goal of deploying 50,000 new electric buses nationwide by 2027, in a phased manner. Recently, the e-bus service was launched in Srinagar with a fleet of 100 battery-operated vehicles as part of a broader integrated sustainable, and cleaner public transport for the city. The zero-emission buses are indigenously built on a next-gen architecture, equipped with the latest features, and powered by advanced battery systems. They are designed to decongest the city and provide eco-friendly, noiseless and emission-free greener mobility solutions that align with the geographical terrain of the region.

Enhancing Energy-efficient and High-Speed Rail Connectivity (Train 18)

Experts estimate that the global electrification of railways could cut carbon emissions by 0.1-0.7 giga tons, saving \$723-\$3,300 billion. India which has the world's rail network, electrified 61,508 Route Km up to December ,2023 which is 93.83 % of the total Broad Gauge route (65,556 RKM) of Indian Railways. During the calendar year 2023, Indian Railways has achieved 6,577 Route Kilometers of electrification and reduced diesel reliance significantly with a focus on net zero emissions by 2030. Vande Bharat trains, a fine instance of 'Make in India⁴', have come a long way from their debut in 2019. The train is named after the country's national slogan "Vande Mataram" and was designed and manufactured by the Integral Coach Factory in Chennai, India. Dubbed as Train 18 during the development phase, it is the first self-propelled train designed for long-distance inter-city travel. Vande Bharat trains are India's first semi-high-speed trains, designed to operate at speeds up to 160 kmph. The aerodynamic design helps the train reach 0-100 kmph in just 52 seconds, whereas other trains in the world take up to 60 seconds. This allows for faster travel times and improved connectivity between cities. Vande Bharat trains, powered by electric multiple units (EMU), offer energy-efficient and sustainable travel, reducing travel time by 25%-45% and conserving up to 30% of electrical energy. These indigenously made trains utilize Integrated Circuits, functioning like 'computers on wheels,' contributing significantly to reducing the railways' carbon footprint. The upcoming Vande Bharat Express 2.0 includes advanced safety features, including the indigenous Train Collision Avoidance System (ATP) – known as KAVACH, marking a pivotal step in safe and sustainable railway development.

The semi-high-speed Vande Bharat trains have now established a vital connection between 11 states (Rajasthan, Gujarat, Bihar, Jharkhand, West Bengal, Odisha, Tamil Nadu, Andhra Pradesh, Telangana, Karnataka and Kerala) across the nation. Vande Bharat has transformed the train travel experience for the common middle-class commuter with refined design aesthetics, more comfortable seating arrangements, strategically positioned charging sockets, and demonstrated significantly reduced transit duration, reflecting advancements in both visual appeal and operational efficiency within the realm of modern railway transportation. All coaches are equipped with automatic doors, GPS-based audio-visual passenger information systems, and board hotspot Wi-Fi for entertainment. The train also boasts bio-vacuum-type toilets and dual-mode lighting, providing both general and personal illumination. Out of its 16

air-conditioned coaches, two are designated as executive class and the train includes facilities for passengers with disabilities. However, the sleeper facility is not available in the current versions.

Speed, Safety and Service are the hallmarks of Vande Bharat trains. The impact of this train, matching global standards of performance, safety and passenger comfort and yet costing less than half of global prices, has the potential to be a game changer in the global rail business. “This train has been introduced to upgrade maintenance technologies and methodologies and achieve improvement in productivity and performance of all Railway assets and manpower in which inter-alia would cover reliability, availability, utilization and efficiency” (PIB). Indian Railways’ data shows Vande Bharat trains are favored by 56% of youth and working-class passengers, with 27.5% aged 25-34 and 28.6% between 35-49. These trains impact airfare dynamics, compelling competitive pricing on certain routes. Managing demand and optimizing occupancy remains a challenge, necessitating strategic planning.

“A growing body of research focuses on changing mobility patterns (in terms of time and space), changes in the experience of travel, and changes in the perceptions of travel costs due to the interaction between old and new technologies for overcoming distance. ICTs are gradually becoming embedded within the transport system, enabling flexibility, multitasking, and an increase in human activities” (Galit Cohen-Blankshtain & Orit Rotem-Mindali, 2016). Train 18’s development quality and reliability highlight India’s achievement in creating a product that aligns with global standards, bolstering the Make in India (25 September 2014) initiative and offering a cost-effective alternative to expensive bullet trains. The experience underscores the importance of supporting indigenous technologies and removing obstacles to foster the growth of homegrown innovations in India’s technological landscape.

The upcoming Vande Bharat 3 (VB3) trainset will introduce sleeper coaches and offer AC-1, AC-2, and AC-3 classes. Expected to reach a maximum speed of 180 km/h and designed to last 35 years, VB3 aims for energy efficiency and enhanced passenger amenities. The fourth-generation Vande Bharat trains (VB4) plan to achieve a higher speed of 200 km/h, featuring lightweight aluminum alloy coaches, individual power sockets, zero discharge toilets, and wheelchair accessibility. Half of the VB4 trainsets will incorporate tilting train technology, a first in India, with the inaugural service set for 2026.

Namo Bharat, (20 October 2023) India’s inaugural semi-high-speed regional rail service, previously known as RapidX, represents a pioneering effort in high-speed regional connectivity. The Regional Rapid Transit System (RRTS) is an advanced regional transportation network designed to enhance intercity travel by offering frequent services. Namoo Bharat trains are expected to achieve an average speed of 100 kilometers per hour, surpassing the speeds of conventional metro and passenger trains within the Indian Railways network. Within eighteen months, India is slated to have the world’s second-largest operational urban transport metro system, surpassing even the United States in scale.

On the price point, the Vande Bharat Express ticket price is higher than other super-fast trains and targeted at passengers who are willing to pay a premium for a faster and more comfortable journey. Trials are now on for the Vande Sadharan, a sleeper class train that is designed to be more affordable than the Vande Bharat Express train, for passengers who are looking for a more affordable option and similar traveling experience offered by the Vande Bharat trains.

Non-Motorized Transport

Transportation significantly impacts the ecosystem, making clean transportation essential for a safe environment and quality of life. Non-motorized transport (NMT), encompassing engine-free travel forms, is crucial for short commutes and constitutes a significant share of urban travel. Despite the growing global reliance on private vehicles for safety and comfort, cycling and walking offer active, healthy, and social commuting alternatives. Urban sprawl and low-density land use in big cities threaten pedestrian and cycling-friendly urban design, leading to increased reliance on private transport. Smaller cities face a higher risk of losing NMT shares without infrastructure investment or formal public transport alternatives, emphasizing the need for sustainable urban planning.

Public Bike Sharing (PBS) is transforming urban mobility in India, promoting inclusive, safe, and sustainable urban development in line with the Sustainable Agenda for Urban Development 2030 and SDGs. Cities like Delhi, Bengaluru, and Chandigarh have seen a rise in bike-sharing platforms, allowing users to bypass traffic congestion, reduce air pollution, and enhance weekend outings. PBS offers first-mile and connectivity, eliminating the need for multiple transport changes, and making commuting more convenient and eco-friendly.

Research Methodology and Work Plan

The study is based on both primary and secondary data sources. The primary data was collected using structured questionnaires from 75 focused passengers and 25 executives at the implementation level. The Convenience sampling method was used to select the samples.

Descriptive Research is used for the study. Three focused social groups which students, homemakers, and employees residing in urban premises were taken. The Passengers and administrative executives in Trivandrum and Kochi. A structured questionnaire was used to collect data from normal passengers and an interview method was used for collecting data from executives. The passengers familiar with urban public transportation and executives associated with municipal administration for more than one year were selected. Convenience sampling method was used for focused groups and Snowball Sampling for executives.

The secondary data were collected from newspapers, books, magazines, websites and expert journals.

Discussions

Equitable urban development that fosters shared prosperity must include sustainable transportation. In order to optimize synergies, promote interconnection, and improve functioning through multimodal mobility solutions, Indian cities must integrate land use planning and urban transportation systems thoroughly.

1. Transportation Mode Using the Urban Sector

From Table 1, it is clear that the majority (32 per cent) of the respondents prefer metro rail, 25 per cent prefer EV bus, and driving alone is preferred by 18 per cent of respondents. Water metro and non-motor pool preference for rest of the others. This shows that we prefer sustainable transport practices.

Table 1: Transportation Mode

Mode	No. of Respondents	Percentage
Drive alone	18	18
Metro-Rail	32	32
Water- Metro	16	16
EV Bus	25	25
Non Motor Pool	9	9

Source: Primary data

2. Priority of Problems associated with Urban Transportation

From Table 2, it is clear that traffic congestion is the first problem addressed by the respondents. The parking issues come second while the polluting emissions of gases with multiple problems come as a third priority. Road accidents get the fourth position.

Table 2: Priority of Problem

Variables	Weightage	Rank
Traffic congestion	323	1
Parking issues	320	2
CO ₂ Emissions	312	3
Road accidents	222	4

Source: Primary data

The study proves that traffic congestion, parking issues, CO₂ emissions, and road accidents are the major challenges of urban transportation. This should be addressed and find solutions in the best possible ways.

3. Reasons for Air Pollution in Urban Space with Reference to Transportation

From Table 3 it is clear that most of the respondents' opine is that hydrocarbon-fueled vehicles are causing pollution than other fueled ones. Unawareness of

proper vehicle maintenance also causes pollution to a greater extent. Some of the respondents suggested that strict policies need to be implemented.

Table 3: Air pollution Factor

Factors	No. of Respondents	Percentage
Fuel Usage	42	42
No Proper Maintenance	38	38
Govt. Policies	20	20

Source: Primary data

4. Reasons of Traffic Congestion in Urban Areas

Table 4 depicts that most of the respondents have conveyed that unauthorized roadside parking is the main reason for the traffic congestion in cities and the width of the road is less to accommodate huge vehicle population. Proper signaling is needed to solve these problems.

Table 4: Traffic Congestion in Urban Areas

Reasons	No. of Respondents	Percentage
Roadside parking	55	55
Road width	30	30
Signaling	15	15

Source: Primary data

5. Respondents Rating for Mitigating Zero Emission in Cities

From Table 5 it can be observed that the respondents rate lengthening the metro rail network. Emissions can be reduced by increasing EV bus services in the city circle. Avoiding drive-alone patterns can reduce traffic congestion as well as emissions. Respondents suggest non-motor-friendly tracks for cyclists and pedestrians. This leads to strategic planning on urban transportation system.

Table 5: Respondents Rating for Mitigating Zero Emission in Cities

Strategies	Weight	Rank
Lengthen Rail Network	383	1
Increase EV bus services	368	2
Lower drive-alone pattern	339	3
Non-Motor Friendly Tracks	295	4

Source: Primary data

Conclusion

In the face of India's rapid urbanisation, managing the complexities of urban public transport, particularly in the railways sector, presents a formidable challenge. As cities

expand, transportation systems become integral facilitators of urban growth. However, the escalating demand for mobility has resulted in heightened emissions, exacerbating the issue of climate change. In response, India has demonstrated commendable initiatives in the form of energy-efficient practices and emission-reduction strategies within the transport industry. The implementation of green technologies, such as energy-efficient transport systems, electric vehicles, multi-level parking, and public bike-sharing programmes underscores India's dedication to creating sustainable urban mobility solutions. As India endeavours to balance its urbanisation aspirations with environmental sustainability, continued investments in green technologies, coupled with strategic governance reforms, will be pivotal. Considering the diversities and unique challenges faced by Indian cities, these green initiatives in the transport sector must be seamlessly integrated with a broader spectrum of urban planning factors. Improving last-mile connectivity, enhancing walkability, creating abundant green spaces and green cover, ensuring accessibility for the elderly and disabled, and establishing safe, inclusive spaces are all vital components of creating truly sustainable urban environments. The synergy of these efforts would not only mitigate emissions and promote energy efficiency but also help to mould cities that are vibrant, livable, and environmentally conscious, catering to the diverse needs of their residents. Integrating these elements cohesively is essential for crafting a holistic and enduring urban landscape in India.

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Endnotes

- 1 The G20 is made up of 19 countries and the EU. The 19 countries are Argentina, Australia, Brazil, Canada, China, Germany, France, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, the Russian Federation, Saudi Arabia, South Africa, Türkiye, the UK, and the US (G20 New Delhi Summit).
- 2 Adopted unanimously in 2015 by all UN Member States, the 2030 Agenda for Sustainable Development (2030 Agenda) with its 17 Sustainable Development Goals (SDGs), 169 targets, and 231 unique indicators shaped the direction of global and national development policies, and offered new entry points and opportunities for bridging the divide between human rights and development. It serves as the overall framework to guide global and national development action (ohchr.org)
- 3 CDM is a mechanism established under the UNFCCC (The United Nations Framework Convention on Climate Change) to promote sustainable development in developing countries while reducing greenhouse gas emissions.
- 4 “Make in India” is a major national program designed by the Government of India, inaugurated in 2014, to facilitate investment, foster innovation, enhance skill development, protect intellectual property, and build best-in-class manufacturing infrastructure to put the country on the path of self-reliance.

Water-Use Efficiency in Higher Education Institutions (HEI): A Conceptual Framework

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Abstract

Sustainable Development Goal number six has the target to achieve water use efficiency across all sectors by 2030 along with other of its targets. The Higher Education Institution (HEI) campuses are usually a smaller version of urban settlements akin to townships containing a variety of building uses, a large number of people using the campus, and diverse and complex activities. Owing to which they require large quantities of water for their daily operations which exerts huge pressure on water resources. In the recent past, the development and application of water sustainability frameworks have been very helpful as they provided an array of information such as assessment, description, communication, depicting trends and predicting the future. The objective of this research is to develop a framework for assessing the efficiency of water consumption of HEI campuses. This paper discusses the stages of framework preparation. It initially identifies the criteria for the selection of an initial set of components, indicators, and sub-indicators to develop the conceptual framework and refines the conceptual framework to the final framework using an expert opinion survey method. The purpose is to provide a better perception of water use efficiency in HEI campuses and it is believed that successful efforts to conserve water at an HEI level can become a model for the urban areas.

Keywords

Campus Sustainability, Water Use Efficiency, Water Sustainability Frameworks, Higher Education Institutions, Expert Opinion Survey.

Introduction

One of the most essential resources for human civilization and life on earth is water. Human beings cannot survive without water, even for a few days. It is imperative to sustainably use water resources for current and future utilization by humans and other life forms on Earth. "Natural resources are being significantly depleted and

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ecosystems are being affected as a result of climate change, which has detrimental effects on human life and global ramifications” (Ridoutt & Pfister, 2010; Rockström et al., 2009). “Climate change has altered every aspect of the global water cycle in recent decades, and hundreds of millions of people now routinely encounter hydrological circumstances that they had never experienced before” (Douville, 2021). “Four billion people are estimated to reside in regions with acute physical water scarcity lasting for at least one month each year” (Mekonnen & Hoekstra, 2016). “Rising water demand is going to exceed surface water availability by 2050 and it is already causing competition between cities, industries, and agricultural users. This competition is anticipated to persist in about a third of the world’s largest cities in the near future” (Garrick et al., 2019).

“Even though India is home to over 18% of the world’s population, it only has roughly 4% of the world’s freshwater water reserve” (Central Water Commission, 2022). “One of the 17 nations experiencing extremely high-water stress is India.” (Hofst et al., 2019). “India currently has 34% of its population living in urban areas, and between 2018 and 2050, it expects to add 416 million more urban residents, nearly doubling the size of its urban population” (UN DESA, 2012). The urban water crisis is a pressing issue in India and many cities are facing immense challenges to supply safe potable water to their residents. “Urbanisation is accelerating, putting further strain on already depleted and limited water supplies. Urban India needed 50,895 million litres of water per day (MLD) for home use in 2011, however only 26,107 MLD of water was delivered” (Dkhar & Ali, 2018). “In India, the amount of water available per person has decreased from 1816 cubic metres in 2001 to 1545 cubic metres in 2011 to 1486 cubic metres in 2021” (Ministry of Jal Shakti, 2021). “The largest cause of water body pollution in India comes from the disposal of domestic sewage from cities and towns, and according to actually used treatment capacity, only 28% of the total sewage generated is treated” (CPCB, 2021). “The municipal corporation of Mumbai announced a 10% water supply decrease for its residents as well as a 15% cut in delivery time during the summer months. Similarly, other cities including Jaipur, Nagpur, Bhatinda, and Lucknow have all begun water rationing” (Sengupta, 2018). “Indian cities mainly rely on groundwater, which meets around 50% of its water needs” (Patir, 2021). “Groundwater reserve is the favoured source of water due to its low cost, and its overexploitation is leading to stress” (Wyrwoll, 2012). “By 2030, groundwater is expected to run out in 21 Indian cities, including Delhi, Bengaluru, Hyderabad, and Chennai, affecting 100 million people” (NITI Aayog, 2018).

The urban areas comprise several different land-uses such as residential, commercial, public semi-public, institutional etc., and water sustainability indexes can be prepared for each of them. The higher education institutions that are part of institutional land use are unique in nature as they are characterised by large campus areas with multiple typologies of buildings, road networks, green and open areas and comparatively large numbers of students, faculty and staff population. “The majority of today’s higher education institutions (HEI) can have a significant negative impact on the environment, and some of them could even be considered small cities due to

their size, generating movement of vehicles, material consumption, and accentuated growth of complex activities” (Alshuwaikhat & Abubakar, 2008). The water demand for HEIs in India (as is the case for HEIs in other parts of the world) is high and very few practice water stewardship, therefore, a practice of measuring and reporting water sustainability must be instilled. It is important to note here that the HEI campus water sustainability falls under the ambit of HEI campus sustainability. The concept of HEI campus sustainability has been in existence for the last few decades to stimulate and encourage HEIs to collectively practice and promote environmental sustainability in their teaching, research and more importantly campus operations. This is evident through several regional and international declarations and charters, campus sustainability assessment tools (rankings and ratings) and other guidelines and measures developed by campus sustainability organizations. “The concept of campus sustainability is relatively budding in the Indian context” (Bantanur et al., 2015).

The literature review for HEI campus sustainability frameworks was undertaken. It was found that there exists a considerable number of such frameworks and that campus water sustainability is one of the components of such frameworks with other components being energy, campus transportation, waste management etc. A few of such HEI campus sustainability frameworks that were developed in different contexts are the Sustainability Tracking, Assessment and Rating System (AASHE STARS, 2019), University Sustainability Assessment Framework – UniSAF (Green Office Movement, 2023), UI Green Metric World University Ranking (University of Indonesia, 2022), Sustainable Institutions of India - Green Rankings (R. World Institutional Rankings, 2023). In the Indian context, the Ministry of Jal Shakti, Government of India, in the year 2019, developed a document titled *Jal Shakti Campus: A Water Conservation Action and Implementation Plan for HEIs in India* (MHRD, 2019). Further, a literature review was undertaken to determine whether HEIs in India have incorporated campus sustainability initiatives or not, and the extent of incorporation of such initiatives. The literature review revealed that several HEIs in India have incorporated campus sustainability initiatives, but, in different capacities. Also, many of these HEIs have been assigned rankings or ratings by the earlier mentioned frameworks, for example, the UI Green Metric (University of Indonesia, 2022), Sustainable Institutions of India - Green Rankings (R. World Institutional Rankings, 2023) etc. It is important to note here that, no specific frameworks exist to assess the water sustainability in HEI campuses.

In this context, the objective of this study is to develop a method of framework preparation for assessing the water use efficiency of HEI campuses. It involves the following two main steps:

1. The development of the conceptual framework.
2. The use of expert opinion survey to refine and finalize the conceptual framework to derive the final framework.

The following sections and sub-sections will discuss the above-mentioned two steps in detail.

Development of Conceptual Framework

The primary elements of the conceptual framework are the components, indicators and sub-indicators. To develop a conceptual framework a set of components, indicators and sub-indicators was identified and selected, this set was referred to as an initial set of components indicators, and sub-indicators. The identification of an initial set of components, indicators and sub-indicators is undertaken through an extensive literature review as was the case with several existing indicators such as the Water Poverty Index, West Java Water Sustainability Index, Composite Water Management Index etc. The development of a conceptual framework includes the following steps:

1. Development of theme of conceptual framework
2. Identification, and selection of an initial set of components and indicators

Theme of Conceptual Framework

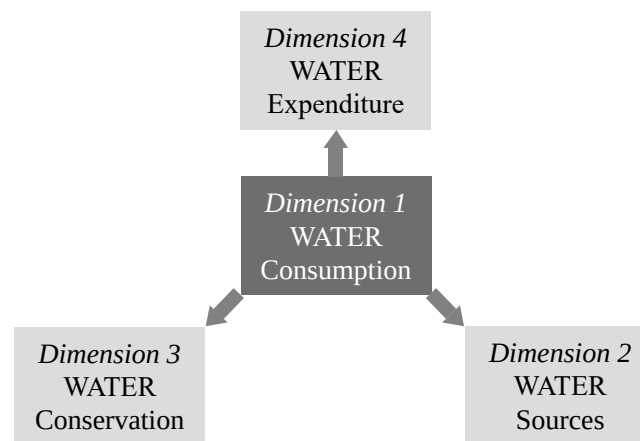


Figure 1: Thematic Dimensions of Water Use Efficiency

The theme of the framework to be developed is based on the aim, objective and research questions formulated for the study and based on the literature review undertaken, refer to Figure 1. The framework development was governed by a question, ‘What could be the dimensions of efficient water consumption within an HEI campus?’ The answer to this question led to the development of a framework theme, which has four dimensions with strong interlinkages. The first dimension is ‘Water Consumption’, which helps to assess the water consumption inside and outside of the buildings on HEI campuses, the second dimension is ‘Water Sources’, which helps to assess the source(s) of water for the HEI, the third dimension is ‘Water Conservation’, it helps to assess the extent of water conservation initiatives put in place within the campuses of HEIs and the fourth dimension is ‘Water Expenditure’ is to assess the cost incurred due to water consumption. The said four dimensions of the framework form the basis on which the conceptual framework was developed. The conceptual framework to be developed is indicator-based, therefore, it has a set of components,

indicators and sub-indicators conforming to the earlier discussed themes of conceptual framework. The following section discusses in detail the selection process of an initial set of components, indicators and sub-indicators.

Identification and Selection of Initial Set of Components, Indicators and Sub-indicators

The components, indicators and sub-indicators are the major parts of the conceptual framework. Their selection must be based on their relevance to the study as it is imperative in developing an appropriate conceptual framework. Thus, based on the theme of the framework, five components for the conceptual framework were finalised they are: 'Indoor Water Use', 'Outdoor Water Use', 'Water Sources', 'Water Conservation' and 'Water Expenditure'. They are depicted in Table 1:

Table 1: Selection of Components for the Framework

Themes of the Framework	Components (Cs) of Framework
Water Consumption	Indoor Water Use
	Outdoor Water Use
Water Sources	Water Sources
Water Conservation	Water Conservation
Water Expenditure	Water Expenditure

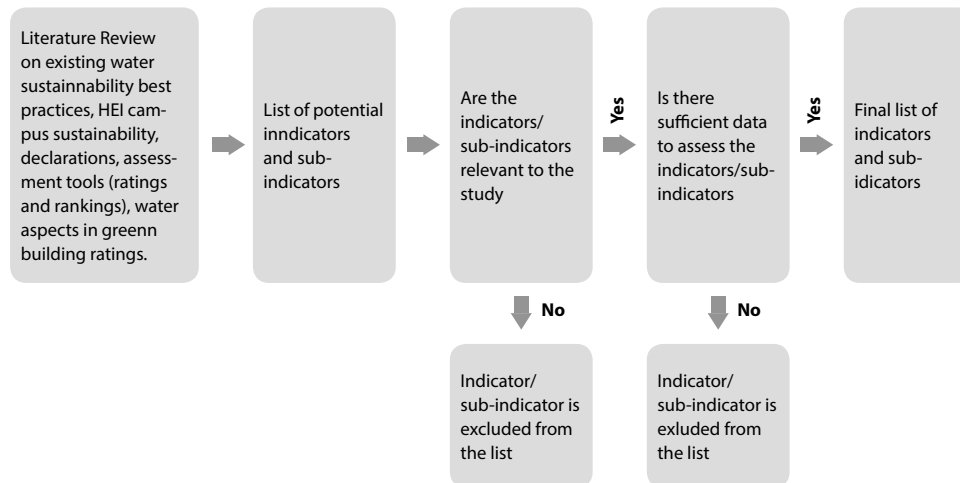


Figure 2: Illustrates the process adopted for the identification and selection of indicators and sub-indicators for the conceptual framework

1. The first step was the identification and listing of potential indicators and sub-indicators based on the literature review.
2. The second step was to ascertain if identified indicators and sub-indicators were relevant to the study, if they were found to be relevant then they were retained, otherwise they were discarded from the list.

3. The third step was to ascertain whether there was sufficient data available for the identified indicators and sub-indicators, again, based on the availability of sufficient data for them, they were retained, otherwise, they were discarded.

The literature review on HEI campus sustainability assessment tools, declarations, and green building rating systems was assessed to derive their ‘water criteria’, using the process as depicted in Figure 1 & 2. The water criteria from assessment tools (rankings and ratings) are depicted in Table 2 the water criteria from campus sustainability declarations are depicted in Table 3 and the water criteria from the green rating system are depicted in Table 4. The literature review on existing water sustainability best practices in residential, institutional, commercial, and office buildings was undertaken to extract the water use efficiency measures, actions, and best management practices depicted in Table 5.

Table 2: HEI Campus Sustainability Assessment Tools (Ratings and Rankings) and their Water Criteria

Campus Sustainability Assessment Tool	Water Criteria
Sustainability Tracking, Assessment & Rating System – STARS (AASHE STARS, 2019)	Stormwater, Water Consumption
UN Sustainable Campus Framework (Patton et al., 2020)	Water Use, Rainwater Management
College Sustainability Report Card (Sustainable Endowments Institute, 2011)	Mainly water conservation, though mentions stormwater management
State of the Campus Environment (McIntosh et al., 2001)	Water Conservation
IGBC Green Campus Rating System (IGBC - CII, 2017)	Rainwater and Stormwater Harvesting, Water Use for Construction, Landscape Design, Irrigation System, Wastewater Treatment and Reuse, Water Metering
GRIHA Large Developments – LD (GRIHA, 2015)	Water and Wastewater, Self Sufficiency, Development Quality
Sustainability Leadership Scorecard (AUDE & EAUC, 2023)	Policy and Strategy, Stakeholder Engagement, Action Planning, Measurement, Communication, Training and Support, Implementation and Performance
Learning in Future Environments (LiFE) Framework (Charles Sturt University, 2021)	Consumption Measurement, Policy and Planning, Awareness
Sustainability Assessment Questionnaire-SAQ (ULSF, 2009)	Water Conservation: Water Efficient Toilets, Minimal Irrigation, Harvested Rainwater Use

Campus Sustainability Assessment Tool	Water Criteria
University Sustainability Assessment Framework – UniSAF (Green Office Movement, 2023)	Water Usage, Virtual Water Footprint, Recycled or Reuse of Water
UI Green Metric World University Ranking (University of Indonesia, 2022)	Water Conservation Program and Implementation, Water Recycling Program and Implementation, Water Efficient Appliance Use, Consumption of Treated Water, Water Pollution Control in the Campus
Sustainable Pathways Toolkit (Good Company, 2002)	Efficiency of Water Use
Sustainable Institutions of India - Green Rankings (R. World Institutional Rankings, 2023)	Water Use and Wastage, Awareness and Policy
Campus Sustainability Assessment Framework-CSAF (Cole, 2003)	Water Consumed, Storm and Grey Water Reuse, Leaking Fixtures, Water Metering, Pressure Testing for Leaks, Efficiency of Fixtures, On-site Wastewater Treatment, Stormwater Containment Collection

Table 3: Water Criteria in HEI Campus Sustainability Declarations

Campus Sustainability Declarations	Water Criteria
Talloires Declaration (Mayer et al., 1990)	Water pollution; destruction and depletion of water resources
Earth Summit Agenda 21 (United Nations, 1992)	Water quality & and quantity
CRE-COPERNICUS Charter (CRE-COPERNICUS, 1993)	Water conservation in HEI campus operation
Lüneburg Declaration (Lüneburg University, 2001)	Water is an important action theme
Lucerne Declaration (Reinfield & Schleicher, 2007)	Water resource efficiency
Bonn Declaration (WCESD-UNESCO, 2009)	Water is a priority issue and challenge
Lübeck Declaration (NGA, 2005)	
International Sustainable Campus Network ISCN - Global Universities Leaders Forum GULF: Sustainable Campus Charter (ISCN, 2012)	Efficient water consumption to minimize environmental impacts
Higher Education Sustainability Initiative – HESI (UN DESA, 2012)	Efficient water use

Table 4: Green Building Rating Systems and their Water Criteria

Green Building Rating Tool	Water Criteria
LEED: Existing Buildings Operation and Maintenance (USGBC, 2022)	Stormwater, Efficiency
LEED: New Construction and Major Renovations (USGBC, 2022)	Stormwater, Efficiency
Sustainable Sites Initiative (GBCI'S, 2014)	Quality, Quantity
BREEAM-International/UK New Construction: Residential and Commercial (BREEAM, 2020)	Water Consumption, Water Monitoring, Water Leak Detection, Water Efficient Equipment
BREEAM-International/UK In-Use: Residential and Commercial (BREEAM, 2020)	Commercial- [Water Monitoring, Water efficient equipment: toilets; Water efficient equipment: urinals; Water efficient equipment: hand washing basins; Water efficient equipment: showers; Water efficient equipment: white goods; Leak detection system; Leak Prevention; Isolation Valves; Reducing utility-supplied water consumption]. Residential- [Water Monitoring, Water efficient equipment: toilets; Water efficient equipment: hand washing basins; Water efficient equipment: showers and bath; Water efficient equipment: appliances; Leak detection system; Leak Prevention; Isolation Valves; Reducing utility-supplied water consumption]
BREEAM-UK Communities (BREEAM, 2021)	Water Strategy; Water Pollution; Rainwater Harvesting
CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) for Building New Construction (CASBEE - JSBC, 2014)	Water Pollution and Consumption

Green Building Rating Tool	Water Criteria
DGNB – New Construction of Buildings (DGNB, 2021)	Potable water demand and wastewater volume, External Works, Integration into Infrastructure
DGNB-Existing Buildings (DGNB, 2020)	Management: Plan (Target Agreement), (Water Stress); Do (Collecting data on water); Check (Data analysis), (Implementation of improvement measures); Act (Measures for optimizing operation). Performance: Evaluation of Performance (Target achievement), (Closed water cycle)
DGNB-Urban Districts (DGNB, 2020)	Reduction of drinking water consumption, District water balance, Retention or throttling of rainwater, Design integration of the water infrastructure into the open space concept
Green Globes – New Construction (GBI, 2021)	Water Efficiency
Green Globes – Existing Buildings (GBI, 2021)	Water Efficiency
Pearl Building Rating System-PBRS (ADUPC, 2018)	Precious Water
SBTool (formerly GBTool)	Water Consumption: Potable Water, Stormwater and Greywater.
Indian Green Building Council - IGBC Green Building Rating System for Green Homes (IGBC-CII, 2019)	Water Conservation: Rainwater and Stormwater Harvesting, Water Efficient Plumbing Fixtures, Landscape Design, Irrigation System, Wastewater Treatment and Reuse, Water Metering.
Green Rating for Integrated Habitat Assessment (GRIHA, 2021)	Water Management: Water Demand Reduction, Wastewater Treatment, Rainwater Management, Water Quality and Self Sufficiency.

Table 5: Water Sustainability Best Practices, Actions, Measures from Literature

Literature Reviewed	Best Management Practices/Actions/Measures
Around forty case examples were reviewed to study the different actions, best practices and measures incorporated to ensure efficient water use and water sustainability in University Buildings, School Buildings, Office Buildings, Commercial Buildings, and Residential Buildings. These actions, best practices and measures were categorised as mentioned in the adjacent column.	Water Efficient Plumbing Fixtures (Taps, Showers, Urinals, WC's etc.)
	Water Efficient Equipment (HVAC, Coolers)
	Water Efficiency in Landscaping (Irrigation Systems like sprinklers, drip etc., Xeriscaping)
	Alternative Water Sources (Treated Wastewater Reuse, Rooftop Rainwater and Stormwater Harvesting and Use)
	Plumbing Infrastructure Maintenance (Pipe Network, Faucets, Equipment etc.)
	User Sensitization/Awareness Programs
	Water Audits and Management

Selection of Initial Set of Components, Indicators and Sub-indicators

After the identification of indicators and sub-indicators through literature review, they were selected using the selection process depicted in Figure 1& 2. The following Table 6 depicts the selection process of the identified indicators and sub-indicators by assessing their relevance for the study and availability of data.

Table 6: Flowchart for Process Identification and Selection of Potential Components, Indicators and Sub-indicators

Step 1	Step 2	Step 3	Step 4	Result
Water Criteria/ Actions/Water Management Best Practices	Converting to relevant Indicators/Sub- indicators	Relevancy to Framework	Data Availability	Finalized Indicators/ Sub-indicators for Conceptual Framework
Native Species of Vegetation	Use of Indigenous Plants and Vegetation	Yes	Yes	Use of Indigenous Plants and Vegetation
Use of Roof Gardens or Green Roofs	-	No	Yes	-

Step 1	Step 2	Step 3	Step 4	Result
Water Criteria/ Actions/Water Management Best Practices	Converting to relevant Indicators/Sub- indicators	Relevancy to Framework	Data Availability	Finalized Indicators/ Sub-indicators for Conceptual Framework
Low-flow plumbing fixtures	Use of Water Efficient Plumbing Fixtures	Yes	Yes	Use of Water Efficient Plumbing Fixtures
Grey water reclamation	Treated Wastewater Reuse	Yes	Yes	Treated Wastewater Reuse
Rainwater harvesting	Harvested Rainwater (Rooftop + Storm-water)	Yes	Yes	Harvested Rainwater (Rooftop + Storm-water)
Pressure reduction valves (high rises)	-	No	Yes	-
Insulate piping (hot water pipes)	-	No	Yes	-
Identifying and fixing leaks	Indoor/Outdoor Leakage Maintenance	Yes	Yes	Indoor/Outdoor Leakage Maintenance
Rain sensor on irrigation	Water Efficient Plant Watering	Yes	Yes	Water Efficient Plant Watering
Cooling tower water recovery	-	Yes	No	-
Educating and training staff towards saving water	Awareness Programs	Yes	Yes	Awareness Programs
Water use audits	Water use audits	Yes	Yes	Water use audits
Monitoring Water Consumption	Water Metering	Yes	Yes	Water Metering
Saving water through pressure management	-	No	Yes	-

Step 1	Step 2	Step 3	Step 4	Result
Water Criteria/ Actions/Water Management Best Practices	Converting to relevant Indicators/Sub- indicators	Relevancy to Framework	Data Availability	Finalized Indicators/ Sub-indicators for Conceptual Framework
Reuse of Swimming Pool Water	-	Yes	-	-
Development of a water management plan	-	-	-	-
Use of reclaimed water for irrigation and flushing	Treated Wastewater Reuse	Yes	Yes	Treated Wastewater Reuse
Stormwater runoff management	Harvested Rainwater (Rooftop + Storm-water)	Yes	Yes	Harvested Rainwater (Rooftop + Storm-water)
On Campus Sewage Treatment	Treated Wastewater Reuse	Yes	Yes	Treated Wastewater Reuse
Native Species of Vegetation	Indoor/Outdoor Leakage Maintenance	Yes	Yes	Indoor/Outdoor Leakage Maintenance
Water Efficient Cooling System	Indoor Ambient Air Temperature Maintenance Use	Yes	Yes	Indoor Ambient Air Temperature Maintenance Use
Water-Efficient Labs and Medical Equipment	Process/ Equipment Use	Yes	Yes	Process/Equipment Use
Rain Sensors for Irrigation	Water Efficient Plant Watering	Yes	Yes	Water Efficient Plant Watering
Prohibit Water Wastage Practices	Water Misuse	Yes	Yes	Water Misuse

The indicators and sub-indicators of components, ‘Water Sources’ and ‘Water Conservation’ were selected from Table 6 shown above. The indicators and sub-indicators for components, ‘Indoor Water Use’, ‘Outdoor Water Use’ and ‘Water Expenditure’, were constructed based on the understanding developed from the literature review. For instance, the indicators or sub-indicators of components, ‘Indoor

Water Use' were constructed to assess the water consumption of different activities inside the buildings on HEI campuses, e.g., Indicator - 'Water Use in Academic Buildings', Sub-Indicator - Drinking Use, Toilets Use, Floor Cleaning Use, Pantry Use. Similarly, the indicators or sub-indicators of the component, 'Outdoor Water Use' were constructed to assess the water consumption of activities outside the buildings on HEI campuses. e.g., Indicator – 'Water Use for Landscaping', Sub-Indicators – 'Water Tanks or Fountains', 'Lawn Area Watering', 'Plant or Trees Watering'. And, for the component, 'Water Expenditure', the indicators or sub-indicators were constructed to assess the monetary expenses incurred by the HEIs for continuing to follow unsustainable or sustainable water practices, e.g., Indicators – 'Expenditure on Water Supplied by ULB', Sub-Indicators – 'Expenditure on Awareness Campaign'.

After the identification and selection process of indicators or sub-indicators, each of the indicators or sub-indicators was assigned with appropriate 'Units of Measurements' based on their purpose and rationale. Therefore, the following conceptual framework depicted in Table 7 consisting of an initial set of components, indicators and sub-indicators with their units was developed.

Table 7: Conceptual Framework

S. No.	Component	Indicators	Sub-Indicators	Units
1	Indoor Water Usage	Water Use in Academic Buildings	Note 1: For the indicators that are non-residential, the following are the sub-indicators with their units: 1. Drinking Use - (lpcd) 2. Toilets Use - (lpcd) 3. Floor Cleaning Use - (lpcd) 4. Indoor Ambient Air Temperature Maintenance Use – (Litres/Min/Ton), 5. Pantry Use - (lpcd) (lpcd = litres/capita/day)	
		Water Use in Laboratory/ Workshops		
		Water Use in Library Buildings (Detached)		
		Water Use in Administrative Building		
		Water Use in Offices of Campus Maintenance/ Security and Utility Services		
		Water Use in Congregate Student Housing (Hostels) Water Use in Hostel Mess (Detached)	Note 2: For the residential indicators (hostels, faculty /staff residences, guest houses) following are the sub-indicators with their units: 1. Clothes Washing Use - (lpcd) 2. Drinking Use - (lpcd)	
		Water Use in Residences (Faculty and Staff)	3. Kitchen Use – (lpcd) 4. Toilets Use - (lpcd) 5. Floor Cleaning Use - (lpcd) 6. Indoor Ambient Air Temperature Maintenance Use – (Litres/Minute/Ton) (lpcd = litres/capita/day)	

S. No.	Component	Indicators	Sub-Indicators	Units
		Water Use in Playschools/ Crèche Buildings	Note 3: For the indicator 'Laboratory/ Workshop', the following are the sub-indicators with their units: 1. Process/Equipment Use (Litres/Use/Day) 2. Drinking Use - (lpcd) 3. Toilets Use - (lpcd) 4. Floor Cleaning Use - (lpcd) 5. Indoor Ambient Air Temperature Maintenance Use – (Litres/Min/Ton), 6. Pantry Use - (lpcd) (lpcd = litres/capita/day)	
		Water Use in Health Facilities		
		Water Use in Shopping and Amenities		
		Water Use in Restaurants/ Food Outlets		
		Water Use in Guest House		
		Water Use in Auditorium/ Open Air Theatre		
		Water Use in Sports Complexes		
		Water Use in Students Activity Centre		
		Water Use in Religious/ Spiritual Centre		
2	Outdoor Water Usage	Water Use in Landscaping	Water Use in Water Bodies	Litres
			Water Use in Lawn Area Watering	Litres/Day
			Water Use in Plant/ Trees Watering	
		Water Use in Vehicle Washing	-	
3		Use of Municipal Supply	Use of Potable Water	Litres/Day
			Use of Non-Potable Water	
		Use of On-Site Generated/ Alternate Sources of Water	Reuse of Treated Wastewater	
			Use of Harvested Rainwater (Rooftop + Storm-water)	Litres/Season
			Use of Groundwater	Litres/Day

S. No.	Component	Indicators	Sub-Indicators	Units
4	Water Conservation	Indoor Water Saving Techniques Used	Use of Water Efficient Plumbing Fixtures	Percentage
			Use of Water-Efficient Equipment	
			Use of Water-Efficient Appliances	
			Use of Waterless Urinals	
		Outdoor Water Saving Techniques Used	Use of Indigenous Plants and Vegetation	Percentage
			Use of Reduced Lawn Area	
			Water-Efficient Plant Watering	
			Use of Stormwater Harvesting	
			Use of Rooftop Rainwater Harvesting	
			Use of On-site Wastewater Treatment	
		Water Losses	Indoor Leakage Maintenance	Activity/Week
			Outdoor Leakage Maintenance	
			Misuse	-
5	Water Expenditure	Expenditure on Water Supplied by ULB	-	Rs./Year
		Expenditure on Water Infrastructure Maintenance	Water Plumbing Equipment and Fixtures	Rs./Sqm./Year
			Sewage Treatment Plant, Water Treatment Plant	Rs./Year
		Awareness Campaign	-	

Finalization of Conceptual Framework: Expert Opinion Survey

The development of the conceptual framework is followed by its refinement and finalization. The expert opinion survey technique was used to refine the conceptual

framework. The application process of the expert opinion survey technique includes the following steps:

1. the design of questionnaires
2. the identification of respondents
3. the distribution and collection of completed questionnaires
4. the analysis of survey responses

Design of Questionnaires

There were two rounds of expert opinion survey planned for this study, therefore questionnaires were designed for both rounds. In round one of the expert opinion surveys, the questionnaire was based on the conceptual framework. The questionnaire of an expert opinion survey round two was based on the modified conceptual framework after integrating the inputs from round one of the expert opinion surveys. For both rounds of the survey, respondents were asked whether they agreed or disagreed with the components, indicators, and sub-indicators. They were also allowed to add, modify, and change components, indicators and sub-indicators presented in the questionnaire.

Identification of Respondents

The identification of survey respondents for the expert opinion survey is one of the critical steps. In this case, the respondents identified were from four different categories: university faculty, university water engineers, independent researchers and water/environmental consultants. These categories are considered to represent respondents with expertise in the field of water management and being well-versed in institutional water management.

Distribution and Collection of Completed Questionnaire

The expert opinion survey questionnaires were distributed to selected respondents in both rounds of the questionnaire survey. Along with the questionnaire survey reference documents explaining the purpose and other necessary details of the survey, were provided. In total, two rounds of questionnaire distribution for expert opinion surveys were carried out. The first round of the expert opinion survey was an in-person meeting format, while the second round of the expert opinion survey was conducted online by using Google Form sent over email with the consent of the respondents.

Method for Analysis of the Respondents' Responses

In both rounds of the expert opinion survey, a seven-point Likert Scale was used to record the responses of the respondents. "The 7-point scale was selected as it provides more options for respondents to assess the relative importance among all indicators, compared to 5-point scales as a result, better accuracy for answers is expected" (Joshi et al., 2015; Taherdoost, 2019). For both the rounds of expert opinion survey, to analyse to responses, it was considered that a consensus is achieved if more than 67% of respondents agreed on the offered option. "The two-thirds percentage cut-off line has been used in several researches" (Alexandrov et al., 1996; Chang et al., 2009; Juwana, 2012; Lehmann et al., 2004).

Expert Opinion Survey-Round 1

The expert opinion survey was conducted in two rounds, for round one 20 to 25 respondents were targeted, the respondents identified from this group were university professors and university engineers finally, 22 respondents participated in the survey. Round one of the expert opinion surveys was an in-person meeting, held to provide in-depth detail about the undertaken research and, the survey questionnaire. The conclusions for round one is discussed below:

Conclusions of Round 1

The conceptual framework was altered based on the suggestions of round one. The following were the suggestions for round one:

- (a) The components of the conceptual framework were all agreed upon by the respondents, so there was no change was required.
- (b) For Component - Indoor Water Use:
 - The sub-indicator 'Indoor Ambient Air Temperature Maintenance Use' was suggested to be renamed as 'Water-based HVAC'
 - The sub-indicator 'Floor Cleaning Use' was suggested to be renamed as 'Building Maintenance Use'.
- (c) For Component - Outdoor Water Use:
 - The sub-indicators 'Outdoor Event', 'Washing Common Areas (Parking, Lobby, Terraces, Bus-Stops)' and 'Water for Construction' were suggested to be added
 - The indicator 'Water Use for Water Bodies' was suggested to be renamed as 'Water Use in Fountains/Tanks'
 - The sub-indicators 'Water Use for Lawn Watering', and 'Water Use for Plant/Trees Watering', were suggested to be clubbed into 'Water use for Landscape Area Watering'
- (d) For Component – Sources of Water:
 - It was suggested to rename the indicator 'Use of On-Site Generated/Alternate Sources of Water' to 'Alternate Sources of Water'
 - It was suggested that the sub-indicators 'Potable Water' and 'Non-Potable Water' be removed
- (e) For Component – Water Conservation:
 - The sub-indicators 'Use of Water Efficient Equipment', 'Water Efficient Appliances' and 'Use of Waterless Urinals' be removed
 - The sub-indicators 'Use of Reduced Lawn Area', 'Use of Stormwater Harvesting', 'Use of Rooftop Rainwater Harvesting' and 'Use of On-site Wastewater Treatment' be removed
- (f) For Component - Water Expenditure:
 - The suggested indicators to be added were 'Expenditure on Wastewater Treatment', 'Expenditure on Groundwater Extraction', and 'Expenditure on Water Audits'.

Therefore, after the suggested addition and deletion of the indicators and sub-indicators, the conceptual framework was revised. This revised framework was further refined in round two of the expert opinion survey.

Expert Opinion Survey-Round 2

In round two of the expert opinion survey, the survey questionnaire was distributed to 50 respondents, but only 40 of them responded to the survey. The number of respondents in round two was 15 for University Professors, 6 for University Water Managers, and 19 for Independent Researchers or Consultants. In this round also, the respondents were asked to note their approval on each of the components, indicators and sub-indicators, they were also permitted to include, alter, or delete any of the components, indicators and sub-indicators from the list wherever deemed necessary.

Conclusions of Round 2

Based on the results of round two, the conceptual framework was further refined into the final framework.

- (a) The components of the modified conceptual framework were all agreed upon by the respondents, so no change was required.
- (b) For Component - Outdoor Water Use:
 - The indicator 'Water Use for Outdoor Event', 'Water Use for Washing Common Areas', 'Water Use for Construction' and 'Water Use for Vehicle Washing' was suggested to be removed
 - It was suggested to rename the sub-indicator 'Water Use in Water Bodies' to 'Water Use in Tanks/Fountains'
- (c) For Component – Sources of Water:
 - It was also suggested that the indicator 'Groundwater' be added as an indicator and removed from the sub-indicator list.
- (d) For Component – Water Conservation:
 - It was suggested that 'Extent of Installation of Water Metering' be added as an indicator
 - It was suggested that 'Conducting Water Audits' and 'Water Awareness Program' be added as sub-indicators
 - It was suggested to rename 'Water Efficient Plant Watering' as 'Use of Water Efficient Irrigation Techniques'
 - It was suggested to remove the sub-indicator 'Water Misuse'
 - It was suggested to rename the sub-indicator 'Use of Indigenous Plants and Vegetation' to 'Use of Indigenous Vegetation'
- (e) For Component – Water Expenditure:
 - It was suggested to remove indicators 'Expenditure on Employed Manpower', 'Expenditure on Water Tankers'.
 - It was suggested to remove the sub-indicator 'Expenditure on Sewage Treatment and Water Treatment Plant'.

- It was suggested to add the indicator ‘Expenditure on Awareness Campaign’.

Therefore, after the suggested addition, deletion and modification of the components, indicators and sub-indicators, the conceptual framework was refined into the final framework as depicted in Table 8.

Table 8: Final Index Framework (After Expert Opinion Survey Round One and Round Two)

S.No.	Components	Indicators	Sub-Indicators and Units
1	Indoor Water Use	Water Use Academic Buildings	Note 1: For the indicators that are non-residential, the following are the sub-indicators with their units: 1. Drinking Use - (lpcd) 2. Toilets Use - (lpcd) 3. Building Maintenance Use - (lpcd) 4. Water based HVAC Use -(Litres/Minute/Ton), 5. Pantry Use - (lpcd) (lpcd = litres/capita/day)
		Water Use in Laboratory/ Workshops	
		Water Use in Library Buildings (Detached)	
		Water Use in Administrative Building	
		Water Use in Offices of Campus Maintenance/ Security and Utility Services	
		Water Use in Congregate Student Housing (student hostels)	
		Water Use in Hostel Mess (Detached)	
		Water Use in Residences (Faculty and Staff)	Note 2: For the residential indicators (hostels, faculty /staff residences, guest houses) following are the sub-indicators with their units: 1. Clothes Washing Use - (lpcd) 2. Drinking Use - (lpcd) 3. Kitchen Use – (lpcd) 4. Toilets Use - (lpcd) 5. Building Maintenance Use - (lpcd) 6. Water-based HVAC Use – (Litres/Minute/Ton) (lpcd = litres/capita/day)

S.No.	Components	Indicators	Sub-Indicators and Units	
		Water Use in Playschools/ Crèche Buildings		
		Water Use in Health Facilities		
		Water Use in Shopping and Amenities		
		Water Use in Restaurants/ Food Outlets		
		Water Use in Guest House		
		Auditorium/Open-Air Theatre		
		Water Use in Sports Complexes		
		Water Use in Students Activity Centre		
		Water Use in Religious/ Spiritual Centre		
2	Outdoor Water Use	Water Use in Landscaping	Water Use in Tanks/Fountains	litres/day
			Water Use in Landscaped Area Watering	litres/sqm/ day
3	Sources of Water	Municipal Supply	% Of total daily demand	
		Groundwater Extraction		
		Alternate Sources of Water	Reuse of Treated Wastewater	% of to- tal treated wastewater generated
			Use of Harvested Rainwater (Roof- top + Stormwater)	% Of total daily demand
4	Water Con- servation	Indoor Water Saving methods used at the point of use	Use of Water Efficient Plumbing Fixtures (Taps, Showers, Faucets)	% Of total plumbing fixtures
		Outdoor Water Saving methods used at the point of use	Use of Indigenous Vegetation	% of total areas planted with indige- nous/native vegetation

S.No.	Components	Indicators	Sub-Indicators and Units	
			Use of Water-Ef- ficient Irrigation Techniques	% of the total garden and or landscape area irrigated using wa- ter-efficient irrigation system
		Methods used for reduc- ing Water Losses	Use of Indoor Leakage Mainte- nance	No. of times/ Week
			Use of Outdoor Leakage Mainte- nance	
			Conducting Aware- ness Programs	No. of Times/ Year
			Conducting Water Audits	No. of Times/ Year
		Extent of Installation Water Meter		
5	Water Ex- penditure	Expenditure on Municipal Water Supply		Rs. /Capita/ Year
		Expenditure on Groundwater Extraction		
		Expenditure on Water Infrastructure Operation and Maintenance	Expenditure on Water Plumbing Equipment and Fixtures	
		Expenditure on Awareness Campaign		
		Expenditure on Wastewater Treatment		
		Expenditure on Water Audits		

Conclusions

The paper discusses the initial stages of the development of the conceptual framework and finalisation of the conceptual framework to arrive at a final framework that can be used to assess water use efficiency in higher education institutions. There are several existing HEI campus sustainability frameworks such as Sustainability Tracking,

Assessment and Rating System (AASHE STARS, 2019), University Sustainability Assessment Framework – UniSAF (Green Office Movement, 2023), UI Green Metric World University Ranking (University of Indonesia, 2022) etc. The existing frameworks focus on different dimensions of HEI campus sustainability such as energy, waste management, campus transportation etc. including the water aspect (in brief), while this framework specifically focuses on water sustainability aspects of HEI campuses in detailed manner. The Ministry of Jal Shakti, Government of India has developed a Jal Shakti Campus: A Water Conservation Action and Implementation Plan for HEIs. The main difference between the developed framework and the ‘Jal Shakti Campus’ is that the latter provides actions and guidelines for water conservation but there is no discussion on measuring the extent of water sustainability achieved. The developed framework is an assessment framework to assess the level of water sustainability in HEI campuses. The application of this framework will help the HEI decision-makers and authorities to make informed decisions ensuring water stewardship on HEI campuses. The framework also can assess the efficiency of water usage across a cross-section of groups of consumers (students, faculty and staff) within an HEI. The adoption of these frameworks by different HEIs can instil a practice of measuring and reporting water sustainability in HEI campuses and this practice can help induce a healthy competition between HEIs to perform better towards achieving and maintaining water stewardship on their campuses.

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Performance Assessment System of Sanitation Services in Urban Areas of Amritsar District

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Abstract

The urban areas are considered as growth engines and attract lot of economic development resulting in expansion of urbanisable areas of cities and towns. The rapid urbanisation of these settlements has burdened the service delivery of different sectors such as water, wastewater, solid waste, housing, public transport, etc. The increased pressure on urban areas has resulted in a lack of infrastructure services below the standards wherever they are present. To keep a check on the same, service level benchmarks are established by Ministry of Housing and Urban Affairs erstwhile Ministry of Urban Development. The present research paper discusses sanitation benchmarking through performance assessment system for sanitation services in the towns and the cities of the Amritsar district. A comparative assessment has been made to view the situation in the larger city and small towns. It has been analysed that the larger city has a better financial position than small towns. Thereby the larger cities have comparatively better sanitation facilities.

Keywords

Sanitation Benchmarking, Access to toilets, wastewater, Service Level Benchmarks, Faecal Sludge and Septage Management

Introduction

The urban sector is one of the critical growth drivers for the country's economy to flourish, resulting in population concentration over the limited urban spaces. In India, the population residing in urban areas is increasing. It is estimated that the urban population will increase to 50 per cent by 2050 from 32 per cent in 2014 (UN, 2014).

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However, a lack of essential services can hinder the growth and development of the nation. The concentrated population in urban areas and services below standards are major obstacles for city administrations. The lack of sanitation services also impacts the health of its residents. As per WHO, 88 per cent of diarrhea issues among children are linked to the inadequacy of sanitation infrastructure (WHO, 2017; Augsburg, 2018).

A key challenge in the sanitation sector is inclusiveness in the entire process, from the provision of toilets to network services, collection efficiency, and quantity and quality of treatment. The sanitation conditions in terms of piped sewers decrease with the size of the city. Class I cities have maximum connectivity through the piped sewer, accounting for up to 70 per cent, class II towns 38 per cent, class III towns 22 per cent, class IV towns 15 per cent, Class V towns and below have less than 10 per cent connectivity (Hui, 2019). Different cities are tackling these issues through different ways and means, such as centralised collection and treatment; and decentralized collection and treatment. However, most cities lack the desired coverage, and even the progress of providing the desired infrastructure is quite slow.

In India, toilet facilities are present in many cities, but the quality and access to the collection, treatment, and reuse services are limited or missing (TERI, 2017). Regarding wastewater management, at the national level, as per the NSS report of 2019, 96.2 per cent of urban households have access to toilets facilities compared to 81.4 per cent in 2011 (Census, 2011). Access to the toilet has gained momentum with the Swachh Bharat Mission of the Government of India, which focuses on open defecation free cities and towns. However, the constructed toilets do not have a connection to the sewer lines. In 2019, only 39 per cent of urban households connected to the sewerage network, which was earlier 32.7 per cent in 2011, i.e., only a slight improvement over nine years. Most households' toilets are connected to septic tanks accounting for 48.9 per cent of total households. However, at the treatment level, figures are further lower; only 51 per cent of the treated wastewater is collected from the sewerage network (Bharat, 2020).

The remaining wastewater goes untreated, thus raising an alarming concern. Disposing wastewater in open drains or land without treatment becomes a breeding ground for the diseases (Augsburg, 2018). Improving access to toilets has no significant impact on health issues, especially child diarrhea, until other sources of fecal contamination, such as poor collection and disposal without treatment, are adequately eliminated (WHO, 2018; Bauza, 2020). To keep a check on the same various monitorable targets have been fixed internationally and nationally. The Sustainable Developments Goals (SDGs) have set targets to be achieved by 2030. Goal 6 aims to 'ensure availability and sustainable management of water and sanitation for all, which has set six targets. Similarly, a joint monitoring programme by WHO and UNICEF, 'Water Supply, Sanitation and Hygiene (WASH)', monitors the global WASH progress.

At the national level, to monitor the performance of the services at the city level, Ministry of Housing and Urban Affairs erstwhile Ministry of Urban Development has framed service level benchmarks (SLB) for the service deliveries targeting the standards

to be achieved in different services. The benchmarks are for water supply, sewage management, solid waste management, and stormwater drainage. The benchmarks set against identified indicator assess the status of service delivery and also help the local authorities to track record their progress. These indicators are comprehensive and cover the status of a given city from coverage of toilets to treatment of sewage and efficiency of cost recovery. Therefore, these have been used to evaluate the performance of sanitation service delivery in urban areas of Amritsar District. The paper assesses, evaluates and compares the cities and towns of the Amritsar district based on service level benchmarks for wastewater management established by the Ministry of Housing and Urban Affairs. It also identifies the key issues and challenges these cities face and ways to overcome them.

Cities and Towns of Amritsar District

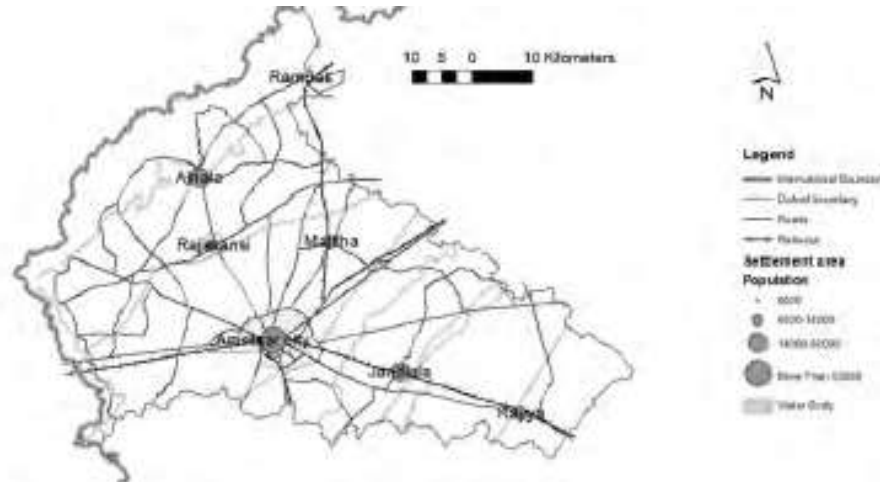
Amritsar district is the second most populated district of Punjab state and spreads over 2,683 sq. km with 2.49 million persons (Statistical Abstract, 2016). The area under cities and towns in the district accounts for 8.2 per cent of the total district area. However, 53.58 per cent of the population resides in these urban areas, including statutory and census towns. The district is the third most urbanized district in the state after Ludhiana and Mohali (SAS Nagar), accounting for 59.16 per cent and 54.76 per cent urban population respectively.

The district has one Municipal Corporation, three Municipal Councils, and three Nagar Panchayats among the seven statutory towns (As per Census of India, towns with a municipality, corporation, cantonment board or notified town area committee are statutory towns). More than fifty per cent of the population resides in seven statutory towns Map 1. Amritsar city alone accounts for 87.64 per cent of the district's total urban population Table 1. The urban population in the district is rising exponentially at a compounded annual growth rate of 2 per cent, which is higher than the state average of 1.34 per cent (Mahey, 2016).

Table 1: Population of Statutory City/Towns of Amritsar District, 2011

Sl. No.	City/Town	Statutory Classification	Population
1	Amritsar City	Municipal Corporation	11,69,637
2	Jandiala	Municipal Council	29,232
3	Majitha	Municipal Council	14,503
4	Ramdas	Municipal Council	6,398
5	Ajnala	Nagar Panchayat	21,107
6	Rayya	Nagar Panchayat	14,506
7	Raja Sansi	Nagar Panchayat	14,298
Total Population			12,69,681

Source: Census of India, 2011.



Map 1.1: Location and Population Size of Statutory City/ Towns of Amritsar District

Amritsar city is the district's critical economic and development centre among the existing towns and cities. Jandiala, in the vicinity of Amritsar city, has attracted population concentration, which is highest among the existing Municipal Councils and Nagar Panchayats. Ramdas is the smallest municipality in the district. All these municipalities account for 7.5 per cent of the total population. These towns are potential growth magnets in the district and will accommodate the significant rural migrated populations. The proportion of the population is going to increase in these urban areas significantly. However, access to basic amenities and services is limited in these towns, thus putting pressure on the central city. Therefore, the maximum concentration of the population is in Amritsar city.

Methodology

To assess the sanitation scenario in these urban areas, the towns and the city, the data had been compiled and collected from different sources such as the National Sample Survey report, Master Plan Amritsar, District Census Handbook, household tables of the Census of India, Reports of the Municipalities of the selected towns, Ministry of Housing and Urban Affairs, Punjab Municipal Infrastructure Development Company, Department of Local Government, Directorate of Environment and Climate Change, Punjab Pollution Control Board, and different research papers. After collecting the data from the selected towns, these towns were assessed for the service level benchmarks. The urban areas are further compared with the service level of the state and the nation considering the benchmarks set by the Ministry of Housing and Urban Affairs.

Service Level Benchmarks for Wastewater

The Government of India has adopted the service level performance parameters to be accepted as standards that are compared with the actual data. There are nine indicators covering aspects from access to service, network efficiency in collection, and the

treatment system's effectiveness in financial recovery, to assess the performance level of wastewater management. The indicators established for sewage management are tabulated in Table 2.

Table 2: Benchmarks for Sewage Management adopted by various Organisations

Sl. No.	Indicator	Benchmark	Supporting Schemes/ programme/ Organisation	Remarks
1	Coverage of toilets	100	Basic Services to the Urban Poor (BSUP), JnNURM, Integrated Low-Cost Sanitation (ILCS) scheme, Swachh Bharat Mission (Urban) Municipality.	Each household must have access to the toilet.
2	Coverage of sewage network services	100	JnNURM, SMART cities, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Heritage City Development and Augmentation Yojana (HRIDAY), Punjab Water Supply & Sewerage Board (PWSSB) (Planning and design), Municipality (implementation, O&M).	In many cities, a lack of sewerage network results in overflow into open drains, water bodies, and rivers. All the schemes do not cover entire urban areas due to a lack of municipal funds.
3	Efficiency in collecting sewage	100	Sewage Treatment Plants (STPs), Central Pollution Control Board (CPCB), Punjab Pollution Control Board (PPCB), Punjab Water Supply & Sewerage Board (Planning and design), Municipality (implementation, O&M).	In most urban settlements, wastewater is not conveyed to the treatment plants and ends in open drains due to the lack or absence of treatment facilities. Therefore cities need to have an effective network leading to treatment facilities.

Sl. No.	Indicator	Benchmark	Supporting Schemes/ programme/ Organisation	Remarks
4	Adequacy of capacity for sewage treatment	100	JnNURM Smart cities	Cities have inadequate capacities to treat wastewater.
5	Quality of treatment	100	PPCB	Wastewater is to be treated to the desired levels and discharged to the water bodies or should be reused.
6	Extent of recycling or reuse of sewage	20	Projects to be initiated by the Department of Soil & Water Conservation.	At least 20 per cent of the treated wastewater can be used for gardening or landscaping purposes.
7	Efficiency in the redressal of customer complaints	80	mSeva, Department of Local Government, Punjab.	Resolving the users' complaints within 24 hours or the next working day is crucial.
8	Extent of cost recovery in sewage management	100	Municipality	To make any service reliable, it needs to have some sort of cost recovery mechanism by the imposition of user charges, taxes, and fees.
9	Efficiency in the collection of sewage charges	90	Municipality	The taxes and user charges should be collected within the same financial year as possible; only 10 per cent can be delayed to the next financial year.

Source: Handbook of Service Level Benchmarking, 2006, Ministry of Urban Development, Government of India

Existing Status of Sanitation Benchmarking in Statutory Towns and City

Amongst the statutory towns, Amritsar city is the only class I town in the district with a population of more than 1,00,000, two class III towns, i.e., Ajnala and Jandiala, and three with a population between 20,000 to 49,999 and Class IV towns (Rayya, Raja Sansi, and Majitha) with a population ranging from 10,000 to 19,999 and Ramdas is the only class V town. The service level benchmarks of all these towns have been covered in subsequent sections.

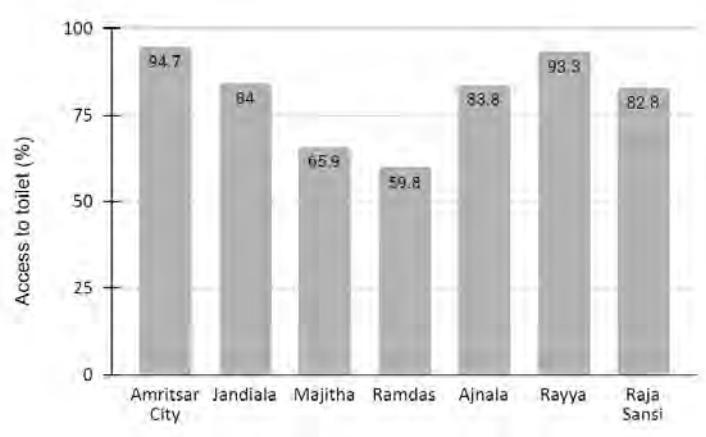


Figure 1: Coverage of Toilets

Coverage of Toilets

Amritsar city and Rayya town are the two distinct urban areas with a maximum percentage of households having access to toilets. The remaining population uses community toilets or defecates in the open, accounting for 5.3 per cent and 6.7 per cent in Amritsar city and Rayya, respectively. Jandiala, in the vicinity of Amritsar city, has comparatively better access to toilets than other towns such as Majitha, Ramdas, and Raja Sansi Table 3.

Table 3: Access to Toilet Facilities

City/Town	Total number of households	Access to toilet	Percentage
Amritsar City	2,38,682	2,26,078	94.7
Jandiala	5,609	4,709	84.0
Majitha	2,690	1,773	65.9
Ramdas	1,221	730	59.8
Ajnala	3,868	3,242	83.8
Rayya	2,890	2,696	93.3
Raja Sansi	2,721	2,252	82.8

Source: Census of India, 2011, HH 11-Tables on Houses, Household Amenities and Assets, the Registrar General & Census Commissioner, India

The performance of these urban areas is much below the state and the national average of 80.8 per cent and 77.6 per cent respectively (NSS, 2018). However, all these towns do not meet the set service level benchmark Figure 1. In all these urban areas, 93.7 per cent of the households have access to toilets. The coverage of toilets has increased because of several government schemes launched from time to time, such as Basic Services to the Urban Poor (BSUP), JnNURM, Integrated Low-Cost Sanitation (ILCS) scheme, and Swachh Bharat Mission (Urban).

Coverage of Sewage Network Services

Amritsar and Rayya towns have more than two-third households covered by sewerage network. Whereas in all the remaining towns, only a few households are connected by the sewage network. These towns heavily rely on on-site septic tanks accounting for almost 50 per cent of the households Table 2. The septic tanks have significant desludging challenges, especially the physical engagement for cleaning the tanks. To avoid this, the households construct oversized tanks which do not require cleaning for the next 40-50 years (Dasgupta, 2021). The industry's prefabricated septic tanks are unregulated and lack technical standards (Dasgupta, 2021).

Table 4: Coverage of Sewage Network and Septic Tanks

City/ Town	Cover- age of sewage network	per cent (A)	Septic tank	per cent (B)	A+B	Without Sewage services
Amritsar City	1,89,043	79.2	22,494	9.4	88.6	11.4
Jandiala	183	3.3	2,982	53.2	56.5	43.5
Majitha	252	9.4	977	36.3	45.7	54.3
Ramdas	209	17.1	487	39.9	57.0	43.0
Ajnala	69	1.8	2,857	73.9	75.7	24.3
Rayya	2,084	72.1	546	18.9	91.0	9.0
Raja Sansi	419	15.4	1,246	45.8	61.2	38.8

Source: Census of India, 2011, HH9 - Tables on Houses, Household Amenities and Assets, the Registrar General & Census Commissioner, India

Moreover, many septic tanks do not have access to desludging due to dense development in the core areas and retrofitting causes significant house disruption. However, due to the lack of periodic cleaning of these septic tanks, the wastewater flows directly into the drains, ultimately polluting the nearby water bodies or land.

The remaining one-third of the households in the remaining towns dispose of the wastewater directly into the drains.

None of the towns or the city meets the set target of 100 per cent coverage of the sewage network Figure 2. Amritsar, a metropolitan city, receives maximum grants under different government schemes, thus having maximum coverage. Under the centrally sponsored scheme JnNURM, Japan International Cooperation Agency (JICA) assisted the Amritsar Sewerage Project. Further, Rayya town got the project funded by the World Bank. However, due to the lack of funds and poor financial status, there is a lack of a systematic sewage collection system; thus, the towns are far below the target.

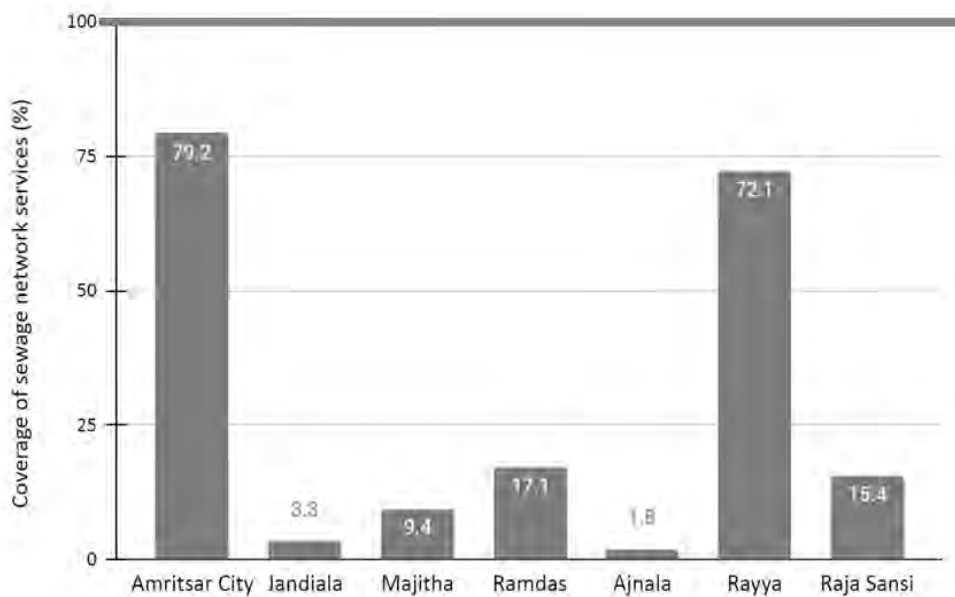


Figure 2: Comparative Sewage Network Coverage

Efficiency of Collection of Sewage

Amritsar city is connected to the sewage network, accounting for almost 80 per cent of the households and has a collection efficiency of 60 per cent. Jandiala and Ajnala, covering 56.5 per cent and 75.7 per cent of households, mainly covered through septic tanks, have a collection efficiency of 80 per cent Table 5. The septic tanks are cleaned periodically; the wastewater and the sludge are collected through the tankers. However, wastewater is disposed of without any treatment in these towns. However, despite having partial network coverage, the remaining towns fail in collection efficacy. In all towns except Amritsar city, the wastewater is disposed of directly into the nearby drains.

Table 5: Existing Service levels for Efficiency in Collection, Adequacy of Treatment Capacity and Quality of Treatment

City/Town	Efficiency in collection of sewage	Adequacy of capacity for treatment of sewage	Quality of treatment
Amritsar City	60	60	100
Jandiala	80	0	0
Majitha	0	0	0
Ramdas	0	0	0
Ajnala	80	0	0
Rayya	0	0	0
Raja Sansi	0	0	0

Source: Service Level Benchmarks in the State of Punjab, 2019. Notification no.5/177/2014(11)-1LG4/1978-A, Department of Local Government, Government of Punjab.

**Figure 3.** Disposal of Untreated Wastewater Through Open Drains in Towns of Amritsar District

Besides having most of the households connected with the network, Rayya town disposes of the wastewater into the Baba Bakala Drain from the main pumping station of 2.5 MLD capacity. Raja Sansi, Majitha, and Ramdas towns are disposing of the wastewater directly into nearby drains Figure 3. None of the district's urban areas matches the government's benchmarks Figure 4. The direct disposal of wastewater from septic tanks can result in the outbreak of diseases due to chemical and microbial contamination (Kookana, 2020).

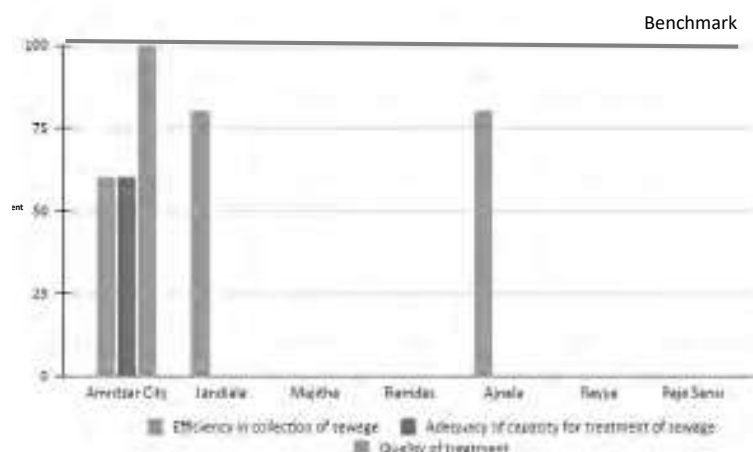


Figure 4: Comparative Efficiency in Collection, Adequacy of Treatment Capacity and Quality of Treatment

Source: Service Level Benchmarks in the State of Punjab, 2019. Notification no.5/177/2014(11)-1LG4/1978-A, Department of Local Government, Government of Punjab.

The poor management of septage has led to contamination of nearby water bodies and groundwater, posing a greater risk to the residents. To manage and treat the fecal sludge from the septic tanks, the Government of India has framed a policy on Fecal Sludge and Septage Management (FSSM) in 2017. The policy aims to provide safe and sustainable sanitation in which all households with septic tanks can be covered to collect and treat the sludge and septage into valuable by products.

In addition, most households in all the small urban areas except for Rayya rely on septic tanks due to the non-availability of the network. To overcome this issue, decentralised treatment plants are an option that is almost five times cheaper in capital cost and three times cheaper in annual operation and maintenance cost compared with the conventional centralised sewer system (Kookana, 2020). In addition, decentralized treatment plants support resource recovery (Sutherland, 2021).

Adequacy of Capacity for Treatment of Sewage

Amritsar city has a collection efficiency of 60 per cent and treats all the collected wastewater. Currently, there are three STPs in Amritsar, namely Amritsar (North) 85 MLD, Amritsar (South) 85 MLD, and Amritsar (Southeast Zone) 27.5 MLD accounting for a total capacity of 207.5 MLD. Due to a lack of funds and assistance through centrally-sponsored schemes, the small towns fail to achieve the set benchmarks. Thus, in the remaining towns, the wastewater is disposed of in open drains without any treatment. Recently, the state government has proposed 6 STPs in all these towns, which will be completed in the coming years by Punjab Water Supply and Sewerage Board Table 6.

Table 6: Proposed Sewage Treatment Plants

City/Town	Capacity of Proposed STP (MLD)	Year of Completion
Jandiala	5.0	-
Majitha	2.0	-
Ramdas	1.5	2022
Ajnala	4.0	2021
Rayya	3.5	-
Raja Sansi	2.0	2022

Source: Action Plan for Reuse of Treated Wastewater, 2020, Directorate of Environment and Climate Change, Department of Science, Technology, and Environment, Government of Punjab

However, the city does not meet the benchmark target of 100 per cent Figure 4. The city has received and, in the future, the city may receive funding through different schemes to augment the sewage network and treatment plant capacities. The small urban areas of the district are not even near the set benchmark. However, compared to the Punjab state, with 70 per cent installed treatment capacity in proportion to sewage generated in the urban areas, the urban areas of the district are far below the state average (PMIDC, 2019).

Quality of Treatment

As per the Department of Local Government data, wastewater treated in the STPs (only 60 per cent of the total wastewater) of the city achieves 100 per cent quality parameters. However, the 2019 report of the Monitoring Committee constituted by National Green Tribunal has reported that a considerable quantity of wastewater without treatment is discharged in the Naraingarh Distributory (PPCB, 2019). The reason for the lapse had been recorded as the failure of lifting pumps. The quality of treated wastewater for common effluent treatment plants is monitored by PPCB. In contrast, for the STP, only cameras are installed at the STP, thus not continuously monitoring the quality of the wastewater. At present, only operational monitoring of the STPs is done, which is held periodically. However, for a continuous check, online monitoring can help verify the STPs' compliance with the discharge standards.

The remaining towns dispose of the wastewater into the drains leading to pollution of surface and groundwater sources Figure 5. Such practices have led to eutrophication and contamination of water bodies. Various studies have mentioned that the open disposal of waste on land and in water bodies has led to an increase in faecal coliforms and nitrates in groundwater and an increase in COD and phosphorus in surface water bodies (Kookana, 2020; Singh, 2020). The disposal of wastewater in the open leads to various health impacts, such as intestinal worms and diarrhea, especially among children below five and is also a cause of water-borne diseases (Singh, 2020).



Figure 5: Disposal of Untreated Wastewater in Open Drains in Towns of the District

Extent of Recycling or Reuse of Sewage

Currently, no city or district dwells are reusing recycled sewage. Even at the state level, only 0.6 per cent of the wastewater is reused, whereas, at the national level, 1.1 per cent of the waste is reused (NSS, 2018). The established benchmark targets that at least 20 per cent of the treated wastewater should be reused. At the national level, the treated wastewater from urban areas can irrigate around three million ha of the area, almost three times the minor irrigation potential from surface water sources (Kookana,2020).

At the state level in 2017, the state government formulated the State Treated Waste Water Policy to reuse treated wastewater. Under the policy, the treated wastewater will be used for irrigation purposes. In light of the same, the state government prepared an Action Plan per the directions of the National Green Tribunal (NGT) for the Reuse of Treated Wastewater in 2020 by the Directorate of Environment and Climate Change, Department of Science, Technology, and Environment.

The action plan includes different projects covering all the existing and proposed STPs in the urban areas for the reuse of wastewater in agricultural fields. A total of approx. 1580 ha of command area has been identified for treated wastewater from all the STPs in the district Table 7. For the different projects to be undertaken for reuse purposes, the state government has made the Department of Soil & Water Conservation accountable for conducting the feasibility of all small and medium-scale STPs.

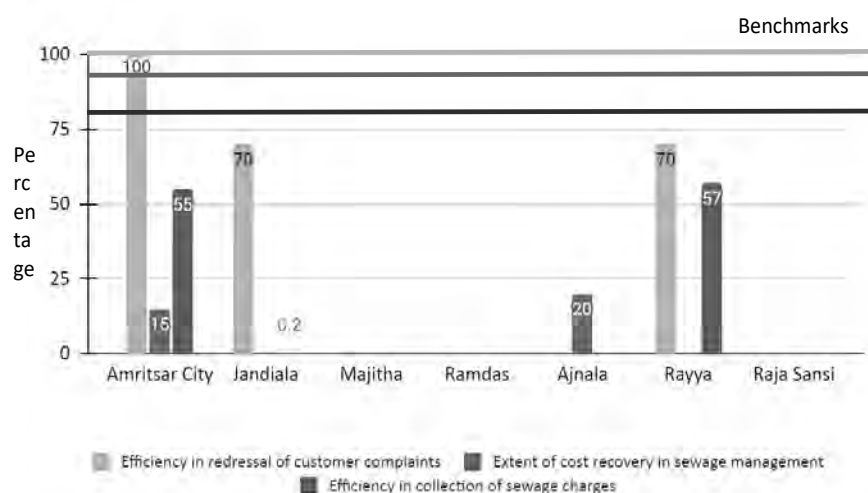
Table 7: Proposed Command Areas for Reuse of Treated Wastewater for Irrigation Purposes

City/Town	Approximate Command Area (ha)	Year
Amritsar City	1,017.5	2022
Jandiala	102.0	within 20 months from the date of completion
Majitha	74.0	within 20 months from the date of completion
Ramdas	56.0	2024
Ajnala	136.0	2023
Rayya	119.0	within 20 months from the date of completion
Raja Sansi	75.0	2024

Source: Action Plan for Reuse of Treated Wastewater, 2020, Directorate of Environment and Climate Change, Department of Science, Technology, and Environment, Government of Punjab

Efficiency in Redressal of Customer Complaints

Amritsar Municipal Corporation addresses customer complaints by achieving 100 per cent redressal, accomplishing the benchmark level of 80 per cent. Online portal mSeva under the Department of Local Government Punjab provides citizens with an easy-to-use interface to register complaints. Besides, Amritsar, Janadiala, and Rayya towns achieve up to 70 per cent nearing the benchmark (Local Government, 2019). However, none of the other towns meets the target benchmark of 80 per cent Figure 6.

**Figure 6:** Comparative Efficiency in Complaint Redressal, Extent of Cost Recovery and Efficiency in Collection of Sewage Charge in City/ Towns in Amritsar District, 2019

Extent of Cost Recovery in Sewage Management

As per the Department of Local Government data 2019, only two urban areas, Amritsar and Ajnala, collect sewage charges up to 15 per cent and 20 per cent, respectively Figure 6. At the same time, none of the urban areas could meet the target of 100 per cent. Due to the poor financial condition of the local bodies, the urban areas cannot meet the expenses. The local bodies rely heavily on the government's funds through different centrally and state-sponsored schemes or projects, grants, and funding in the form of loans. The smaller urban areas have limited financial resources; therefore, these urban areas cannot keep pace with the development of sanitation infrastructure.

Efficiency in the Collection of Sewage Charges

On an average, around 10 per cent of the total expenditure is on the operation and maintenance of the sewerage and sanitation facilities in the statutory towns. Amritsar and Rayya municipalities recover approximately 50 per cent of the expenditure Table 8. However, the benchmark set for collecting sewage charges is 90 per cent. These municipalities rely on grants and funds from different sources for the remaining amount, as mentioned in Table 9. However, Majitha, Ramdas, Ajnala, and Raja Sansi towns cannot collect the user charges for maintenance services and are in 100 per cent deficit.

Table 8: Annual Revenue Generation and Operation and Maintenance Expenditure for Sanitation Services in City/Towns in Amritsar District (2016-17)

City/Towns	User Charges (Revenue Collection (INR million))	O&M Expenditure (INR million)	% Deficit on Spending
Amritsar City	240.000	444.100	-46.0
Jandiala	0.022	11.893	-99.8
Majitha	0	1.449	-100.0
Ramdas	0	2.659	-100.0
Ajnala	0	7.094	-100.0
Rayya	0.807	1.410	-42.8
Raja Sansi	0	8.748	-100.0

Source: Budget Documents. 2016-17. Municipal Corporation: Amritsar, Municipal Councils: Jandiala, Majitha, Ramdas; Nagar panchayats: Ajnala, Rayya and Raja Sansi.

Amritsar city and Raja Sansi town have incurred maximum expenditure in the maintenance of sewerage services from the total incurred expenditure in comparison with other towns. Majitha and Rayya have spent the least, accounting for 1.4 per cent and 2.7 per cent, respectively.

Table 9: O & M Expenditure on Sewerage Services, 2016-2017 and Sources of Funding Other Than Municipalities Own Sources in City/ Towns in Amritsar District

City/Town	Total Expenditure of Municipality (INR million)	% of Expenditure Incurred in Maintenance of Sewerage Services	Additional Grants and Revenue Sources
Amritsar City	3,571.800	12.4	State assigned revenue, Octroi Compensation, Finance Commission Grants, JnNURM, SBM, SMART city, AMRUT, HRIDAY, Government Grants, HUDCO loan, JICA Loan
Jandiala	107.005	11.1	State assigned revenue, Octroi Compensation, Punjab Urban Mission Grants, Finance Commission Grants
Majitha	105.469	1.4	Octroi Compensation, Punjab Urban Mission Grants, Finance Commission Grants
Ramdas	29.248	9.1	Octroi Compensation, Punjab Urban Mission Grants, Finance Commission Grants
Ajnala	93.282	7.6	State assigned revenue, OCTroi Compensation, Finance Commission Grants
Rayya	52.181	2.7	State assigned revenue, Octroi Compensation, Punjab Urban Mission Grants, Finance Commission Grants
Raja Sansi	45.895	19.1	State assigned revenue, Octroi Compensation, Punjab Urban Mission Grants, Finance Commission Grants

Source: Budget Documents. 2016-17. Municipal Corporation: Amritsar, Municipal Councils: Jandiala, Majitha, Ramdas; Nagar panchayats: Ajnala, Rayya and Raja Sansi

None of the towns can meet the expenditure, so they rely on government funds. Except for Amritsar city, all the towns depend only on State Assigned Revenue, Octroi Compensation, Punjab Urban Mission Grants, and Finance Commission Grants. In contrast, major funding through different centrally-sponsored schemes is being fetched by Amritsar city. Being the second-largest metropolitan city and having religious importance in the state, the city is eligible for all major centrally-sponsored schemes. However, the smaller urban towns are not eligible for funding from the mentioned schemes.

Discussions and Findings

It has been found that small towns are worse off than urban areas compared to larger cities. These towns lack collection efficiency, treatment efficiency, and even recovery. However, these towns are potential areas that can be planned as counter magnets to the main city. Developing them in this light needs the immediate attention of the stakeholders, including the Central Government, State Government, and public infrastructure agencies.

The smaller urban areas have an important role to play in the prosperity of the nation. The infrastructure will help to decentralize the migratory population to these towns instead of overloading the larger cities. It will also improve the peoples' health and well-being and bring social and economic prosperity to them.

Inadequate sanitation also leads to diseases, whereas improved sanitation recuperates public health. However, due to the lack of network, collection efficiency and affordable treatment facilities, the urban population is at greater risk, especially in the vulnerable areas near the disposal facilities. The unsanitary disposal methods are a serious concern to be looked at by the administrative authorities.

Only Amritsar city has a wastewater treatment facility that occasionally fails due to maintenance issues and releases untreated wastewater into the nearby distributary. It pollutes the water bodies and is also a development failure resulting from the concerned authority's poor capacity. There is a need for continuous monitoring to avoid non-compliance with the technical standards of STPs. It is important to monitor the non-point sources of wastewater disposal of septic tanks by households on open land or water bodies. Proper regulations need to be imposed to standardise septic tanks.

The conventional centralised sewerage treatment facilities depend on a city-scale sewage network that often lacks in small urban settlements. These urban areas have predominantly septic tanks that can easily connect with decentralised treatment facilities and resource recoveries. However, still, the dominant approach for treatment is centralised treatment. The decentralised treatment facilities are safe, affordable, and cost-effective compared to centralised sewerage treatment.

Greywater, stormwater, and blackwater are all getting mixed into one network. It is the right time to rethink stormwater management through rainwater harvesting and

treating greywater for reuse for agricultural and industrial purposes. It will reduce the quantity of total wastewater requiring secondary and tertiary treatment.

Lack of finances is a major challenge in creating the infrastructure for small towns due to poor financial capacities. These municipalities collect a meagre amount of revenue through user charges, which is insufficient to meet the O&M expenditure. To address the issues, the government needs to extend support through the various Central and State-sponsored schemes especially focusing on small towns. In addition, Corporate Social Responsibility (CSR) Funds can be another way through which national and local sources of funds can be used to improve the sanitation sector.

Municipalities are spending 10 per cent of the total expenditure on O&M of sewage management. They are still unable to provide the requisite infrastructure, thus, showing the poor financial condition of the municipalities. The small urban areas are using drainage infrastructure for the discharge of wastewater. Therefore, it is important to have regulatory interventions along with financial support to improve the current situation.

The smaller urban areas lack sanitation infrastructure; however, the city with financial support through different centrally-sponsored schemes performs comparatively better than the smaller urban areas. Rayya town got its sewage network funded by the World Bank. In addition, the Swachh Bharat Mission has targeted the open defecation-free country, which has improved toilet access in all urban areas. Therefore, it is evident that subsidies and incentives can improvise the sanitation situation in smaller urban areas.

The programmes like AMRUT, SMART cities, and HRIDAY only focus on large cities. In the past, there have been schemes focusing on development of small and Medium-sized Towns. The schemes similar to the Integrated Development of Small and medium-sized towns (IDSMT) and the Urban Infrastructure Development Scheme for Small and Medium Towns Scheme (UIDSSMT), focusing on providing basic services, can be launched to fund the local government through grants. IDSMT was launched for integrated development and was operational from 1979-2005. In 2012, the idea was carried forward by the sub-mission of JnNURM, i.e. Urban Infrastructure Development Scheme for Small and Medium Towns Scheme (UIDSSMT).

It is important to assess the capacities of the municipalities to provide and meet the established benchmarks. For the same, validation of the capacities of the municipalities can be done, which will help ensure the municipalities' performance. It will also help the government understand the municipalities' potential performance.

Water-sensitive urban design is another way the urban areas are planned to allow maximum water reuse, most minor hindrances to the natural drains, and minimizing the impact on the water cycle. This can be adopted at the city, zonal, neighbourhood, institutional, and individual levels. It integrates sustainable water management, urban planning, and landscape design (Suresh, 2017).

Like the water-sensitive urban design, another circular economy concept addresses closing the water cycle loop, i.e. from the toilet to the resource. It also helps to meet the reuse target and makes the system self-sustaining. Several interventions are taking place worldwide in which toilet resources are being used as green energy as biogas, liquid, and solid fuel; agricultural products such as compost, fertilizers, and soil conditioners; reuse of water for agriculture and industrial operations (Toilet Board Coalition, 2016; Ddiba, 2016). The resource recovery from the wastewater can be an added financial incentive supported by subsidies (Diener, 2014; Mallory, 2020)

Conclusion

The sanitation status of the cities and towns of Amritsar district has shown that the progress, except for access to toilets, is far below the benchmark levels. Amritsar city, which has financial support through various centrally-sponsored schemes, is doing better than all towns. The ongoing SBM covers all towns; however, it only focuses on containment through coverage of toilets, but the remaining process, which requires the collection, transportation, treatment and reuse, is not addressed. The small urban towns lack sewerage networks and rely on onsite septic systems with no means of wastewater facilities, thus posing a serious health threat to the vulnerable community. Currently, the critical sanitation loop has many missing links, thus resulting in unsanitary practices adopted by households. Other Schemes such as AMRUT and SMART cities that emphasize sanitation management do not apply to small towns, thus making a complete void of financial support from the government. There is a need to support the smaller municipalities through centrally-sponsored schemes and by adopting other innovative ways of financing.

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Performance Assessment of Urban Sanitation Services in India: An Alternate Perspective

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Abstract

In the new millennia, improving sanitation services has become one of the main agenda of the governments, both in India and the global South. Within India, many initiatives and policies were introduced, e.g., a sub-component within the JnNURM (Jawaharlal Nehru Urban Renewal Mission), National Urban Sanitation Policy and Swachh Bharat Mission (Clean India Mission) at Central government level to ensure improved urban sanitation service delivery. Performance Assessment Frameworks (PAFs) were introduced in India with Service-level Benchmarking, Swachh Survekshan (Cleanliness Surveys), etc. for monitoring the performance of sanitation services.

This research aims to study different PAFs, adopted within India and other countries, in order to re-identify indicators, whether already included or not in Indian PAFs on the basis of their applicability in Indian context. It has been observed that the existing PAFs in Indian context have been developed with the perspective of 'Efficiency of Services' only, whereas this research article is an attempt to revise the existing PAFs with the perspective of 'Societal Outcomes' to prepare a more holistic and result-oriented PAFs.

Keywords

Assessment, Efficiency, Performance, Sanitation Services, Societal Outcomes.

Introduction

Sanitation services and their management in India and in countries of global South remained poorly addressed until the late 20th century. In the new millennia, improving sanitation practices and stopping open defecation became one of the main agenda of the governments, both within India and in the global South. There are multiple benefits to households having access to sanitation facilities, for example, toilets and safe containment of liquid waste add value to the dwellings, which can serve as a collateral for a loan or be sold if required, increasing a household's ability to borrow or acquire

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other assets. Secondly, toilets play a crucial role in improvement of family health, which has a great value in maintaining productivity of a household. Thirdly, toilets increase intangible benefits as a utility, such as status, comfort and even marriage prospects for grooms-to-be (Augsburg et al, 2020). Access to safe sanitation for the poor is a key factor in improving public health and economic productivity and is therefore, an essential component of any effort to alleviate poverty.

During the United Nations Summit in 2000, the member nations pledged to 'provide access to safe & basic sanitation to whole humanity by year 2015' under the umbrella of 'Millennium Development Goals – 2015' (UN Water, 2005). However, even after a number of attempts, the situation did not improve much, as 2.4 billion people still did not have basic sanitation facilities world-wide (WHO, 2016). This led UN to revisit its vision, and accordingly "Sustainable Development Goals" were launched at UN Summit in New York on September 25, 2015 and Goal-6 was adopted 'to ensure availability and sustainable management of sanitation for all' (UNEP 2020). Citizens of developing and under-developed countries do require improved sanitation but these nations lack the resources to obtain or maintain access to toilets and sanitation system as a whole. Such deprivation is responsible for their 'behavior change', which also triggers a deficiency in mindset that fails to capture contextual factors affecting sanitation access (Van Riper et al, 2021). Therefore, countries around the world, especially Global South are making mammoth efforts to achieve SDG Goal-6 by focusing on mitigating the deficit between sanitation infrastructure and service delivery. At the same time, to ensure the results of efforts made for improvement of sanitation scenario, International agencies like, World Health Organization, UNICEF, World Bank, etc.(WSP, 2006; SEAWUN et al, 2007; GWOPA et al, 2009; IB-NET, 2014; IWA et al, 2014, etc.) under the umbrella of UN and government agencies of different countries introduced number of monitoring and performance assessment frameworks (SLB, 2010; Swachch Survekshan 2017-2021, etc.) to review the condition of sanitation service delivery from time- to- time.

India is also making similar efforts to ensure access to improved sanitation for its citizens taking cues from the paradigms in vogue in the world. Ministry of Urban Development (MoUD), Government of India launched the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) in 2005 to address the need of urban infrastructure development, including the sanitation infrastructure. To ensure the prioritization of sanitation, the Ministry of Urban Development, Government of India further launched the National Urban Sanitation Policy (NUSP) in 2008. This policy highlighted numerous issues including a general lack of awareness with regards to sanitation, fragmented roles and responsibilities of stakeholders in the sanitation sector, including lack of focus on the un-served poor and limited sanitation technology choices. Government of India introduced first Performance Assessment Framework (PAF) to review and monitor the performance of sanitation services i.e., Service Level Benchmarking (SLB) in 2010, whereby cities were ranked on the basis of performance indicators listed in the SLB toolkit (Vaidya et al, 2019).

Government of India launched 'Swachch Bharat Mission' (SBM) (Clean India Mission) in 2014 to accelerate the efforts to achieve universal sanitation coverage and

to put the focus on sanitation to solve the problems of waste management in India. One of the main objectives of the project was to create sanitation facilities for all and provide access to toilet to every urban as well as rural family. The SBM led to improvement in overall 'Water, Sanitation and Hygiene' (WASH) practices. It was for the first time that 12 per cent allocation of any scheme budget was granted to focus on public awareness and public participation purpose only, which led to behavioral change in the people under the SBM (Sarkara et al, 2021). Further, a process to monitor and review these efforts and rank the urban settlements was introduced as 'Swachh Survekshan' (cleanliness survey) in 2016. In 2017, 'Swachh Survekshan Guidelines' were released which were further revised in the successive years (2018, 2019, 2020 and 2021). Apart from the 'Swachh Survekshan', few other PAFs were also introduced in India by independent research institutions (Centre for Water & Sanitation C-WAS of CEPT University, Ahmedabad: SAN-Benchmarking & City-wide sanitation approach, etc.) and Ministry of Urban Affairs, Government of India: Open Defecation Free (ODF) protocols, ODF+, ODF++ & Water Plus Protocols (Vaidya et al, 2019).

Need for Research

As per the report of UNICEF, around 597 million population of India were openly defecating till 2013-14 (UNICEF, 2015), whereas 2.4 billion world population didn't have access to sanitation in the same period of time (WHO, 2016). This indicated that out of total population of world under sanitation vulnerability, 25 per cent of the population was from India itself. Out of total 1.21 billion population of India, 42.6 per cent were residents of urban India (Census 2011). Out of total urban India, around 32 per cent residents didn't have access to improved sanitation till 2013-14 (UNICEF, 2015). Of these, 17.4 per cent population resided in slums in urban India (Census 2011). Even after a lot of efforts made by the governments, local authorities, institutions and NGOs till date, the current status of sanitation services in the country has not been able to attain the goals set in **National Urban Sanitation Policy (NUSP)** and Sustainable development Goals(SDGs). As compared to other sectors of infrastructure, there is a dearth of reliable, internationally comparable data for urban sanitation, including the cost and service efficiency aspects. In the absence of reliable data, the full cost of urban sanitation services is being underestimated and partially addressed (Sainati et al, 2020).

A sanitation service chain comprises the capture, storage, transfer, treatment, disposal as well as recycle and reuse of wastewater under the network based 'Sewerage System' and non-network based 'Onsite System'. But what if, the approach of performance review focuses mainly on the provisioning and processes of services rather than the desired outcome. The whole service chain of sanitation services from planning to development and management to sustenance is indispensable to offer good sanitation services. The governments or service providing agencies are always interested to achieve: 1) value for money against their investments and efforts and, 2) the high level of efficiency of services to offer quality of life to their citizens. But current practices of service-level assessment in urban sanitation are based on the perspective of 'Efficiency

of Services’, which primarily focus on the efficiency in bridging the infrastructure gaps and setting the targets to achieve the output for incurred investments, but does not focus on the actual gains to people and affirmative changes in their quality of life.

At this juncture, questions arise that why the existing PAFs are not able to help in achieving the expected results? How the perspectives of different stakeholders differ with respect to the existing performance assessment mechanisms of urban sanitation services? The existing PAFs are formulated to assess the achievements of infrastructure targets and thereby it may be said these have a perspective of efficiency. At the same time, large scale investments in sanitation infrastructure and its continued management is supposed to yield societal outcomes and societal capabilities. The perspective of societal outcomes is largely not included in the existing PAFs.

Hence, it is required to identify unaddressed aspects as well as inadequacy of parameters in Indian context under different perspectives to ascertain the standard levels of sanitation, cleanliness and hygiene, expected to be achieved by Indian Cities. This research attempts to re-structure the existing PAF’s indices by exploring the need of including the perspective of societal outcomes in the overall performance assessment process.

Research Approach

This research mainly focuses on sewage management aspect only, out of overall sanitation system. As elaborated in the earlier section, the approach adopted explores the possibility of including an alternative perspective to ensure societal gains and improvement in the quality of life of the people, i.e. with perspective of ‘Society Outcomes’.

Thus, this study revisits the existing PAFs with both perspectives in order to create a revised PAF that is more holistic. This will help to investigate how the existing PAFs may be better evaluated with the perspective of ‘Societal Outcome’, apart from conventional perspective of ‘Efficiency of Services’.

Capability Approach for Sanitation Service Delivery Assessment

The perspective of ‘Societal Outcomes’ is identified with improvement in capabilities of the citizens after providing improved public services. The ‘Capability Approach’ as elaborated by Sen & Nussbuaum’ explains how the change in quality of public services can impact the capability of individual and society, and ultimately respond to the main aim of a thriving and reasonable service delivery. If one reviews the performance of indicators of PAFs while keeping in mind the intention of positive change in capabilities of individuals and society, the results may reveal different outcomes from the perspective of ‘Societal Outcomes’. This may be different from the conventional approach of target achievement for infrastructure provisions with the perspective of ‘Efficiency of service’ (Allwine et al, 2014).

Process of Research

At first, ‘Nominal Group Technique’ was explored to conduct highly controlled expert opinion survey with the chosen domain experts from academics and research to select PAFs for review. 22 PAFs were selected for the review, out of which 9 PAFs were from India and the remaining 13 PAFs were from abroad. In this context, this study, has reviewed the documents in use in India and literature available on performance assessment for urban sanitation in selected other countries.

As outlined in the previous section, actual gain to the society as well as target achievement, two separate assessments were made for the existing PAFs. Accordingly two sets of experts’ opinion surveys were conducted under two different perspectives to find out the level of importance for the indicators of various selected PAFs within India and from abroad for urban sanitation services. One expert opinion survey was conducted with academicians and researchers with the perspective of ‘Societal Outcomes’ and another opinion survey was conducted with industry practitioners with the perspective of ‘Efficiency of Services’. Both had the aim to identify the set of indicators that require inclusion as part of a revision of existing PAFs in India. In both cases, opinion on importance and applicability in Indian context were sought.

Indicators were extracted from these various existing PAFs within India and from abroad and then these were sorted and checked for similarities. The similar ones were given a single code or identity and made as one. Identified indicators were then categorised into three overall conceptualised categories with sub- categories for each. Importance or relevance was sought from experts for these indicators in a Likert scale and the respondents were free to give suggestions as well.

Performance Assessment Frameworks (PAFs) from India and Abroad

The list of identified 22 PAFs, Indian (Table-1) and International (Table-2) are mentioned below:

Table 1: List of 9 identified Indian PAFs from Government and Research Organisations

S. No.	Documents
1	Improving Urban Services through Service level Benchmarking (2010), Ministry of Urban Development, Government of India. (Ref. 23)
2	Performance Measurement Framework for Urban Water and Sanitation, Vol I & Vol II (2010). CEPT University, India. (Ref. 36)
3	SAN –Benchmarks Citywide Sanitation Service Delivery, Including Onsite Sanitation (Framework and Indicators) – 2015 by PAS Project, CEPT University, India. (Ref. 26)

S. No.	Documents
4	Swachch Survekshan: A Guidebook for Urban Local Bodies (2017), Ministry of Housing and Urban Affairs (MoHUA), Government of India. (Ref. 42)
5	Swachch Survekshan Toolkit: A Guideline for Urban Local Bodies (2018), MoHUA, Government of India. (Ref. 23)
6	Swachch Survekshan Survey Toolkit (2019) and Swachch Bharat Mission (SBM) ODF, ODF+ & ODF++ Protocol and Toolkit (2019), MoHUA, Govt. of India. (Ref. 15, 44)
7	A Framework for Assessing Citywide Inclusive Sanitation (2019), Centre for Water and Sanitation (C-WAS), CEPT University, India. (Ref. 2, 52)
8	Swachch Survekshan Survey Toolkit (2020) and SBM Water Plus Protocol and Toolkit (2020), MoHUA, Govt. of India. (Ref. 43, 44)
9	Swachch Survekshan Survey Toolkit (2021), MoHUA, Government of India. (Ref. 44)

Source: As Reference Number mentioned with above PAF

Table 2: List of 13 identified International PAFs from Developed, Developing and Undeveloped Countries, UN & Other Organizations

S. No.	Documents
1	Urban Water Sector in South Asia: Benchmarking Performance (2006). Water and Sanitation Programme (WSP). (Ref. 48)
2	Data Book of Southeast Asian Water Utilities 2005 The Southeast Asian Water Utilities Network (SEAWUN) and Asian Development Bank (ADB). (2007) (Ref. 13).
3	Asian Sanitation Data Book – Achieving Sanitation For All (2008), Asian Development Bank (ADB). (Ref. 14)
4	The State of African Utilities: Performance Assessment and Benchmarking Report (2009). Global Water Operator's Partnerships Alliance–United Nations Human Settlements Programme (GWOPA/UN-Habitat), African Water Association (AfWA) and Water & Sanitation Program (WSP-Africa). (Ref. 45)
5	The Challenge of Extending And Sustaining Services (2012). UN-Water Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS), WHO. (Ref. 19)
6	German International Cooperation with Ukraine- Improvement of Municipal Services Performance; Water & Sanitation Module 3 – Performance Monitoring and Benchmarking (2012). GIZ and GFA Consulting Group, Ukraine. (Ref. 20)

S. No.	Documents
7	Canadian National Water & Wastewater Benchmarking Initiative (2013). AECOM, Canada.
8	The International Benchmarking Network (IB-Net) for Water and Sanitation Utilities Data book (2014). World Bank Group, Water and Sanitation Program (WSP). (Ref. 35)
9	Sanitation 21: A Planning Framework for Improving City-wide Sanitation Services (2014). IWA, Eawag-Sandec, GIZ. (Ref. 40)
10	Metadata on Suggested Indicators for Global Monitoring of the Sustainable Development Goal 6 on Water and Sanitation (2015). Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs), UN-Water. (Ref. 29)
11	WASH Post-2015: Proposed indicators for drinking water, sanitation and hygiene (2015). WHO / UNICEF Joint Monitoring Program (JMP). (Ref. 51)
12	Monitoring Water and Sanitation in the 2030 Agenda for Sustainable Development (2016). The Integrated Monitoring initiative (GEMI), UN-Water. (Ref. 30)
13	Performance Management for Water and Wastewater (2018). American Water Works Association (AWWA) Utility Benchmarking, USA. (Ref. 1)

Source: As Reference Number mentioned with above PAF

Identification of Indicators from PAFs from India and Abroad

The initiation of this research started with re-identifying indicators whether already included or not included in Indian PAFs considering applicability in Indian context for efficient delivery of urban sanitation services. Accordingly, process of elimination of repetition and similarity of extracted indicators were undertaken through coding. Total of 117 indicators were shortlisted out of 348 indicators from 22 PAFs from India and abroad at this stage after elimination of similarities in indicators. For the systematic assessment of both perspectives, all urban sanitation indicators from the national and international level PAFs were classified into three adopted conceptual categories of Service Delivery Assessment (SDA) framework based on their thematic groups, which is a concept of the life cycle mechanism of service delivery with categories of Enabling Services, Developing Services and Sustaining Services by covering the whole sanitation service chain, given by the Water Sanitation Programme and World Bank Organization (WSP – WBO) in 2015. Then, these identified indicators were distributed in nine thematic groups within three SDA categories Table 3. At the same time, based on the suggestions of the experts, 17 new indicators were also added in the list of tentative selected indicators, which resulted finally into total count of 134 identified indicators for the study.

Table 3: Service Delivery Assessment Framework of WSP-WB with SDA categories

SDA Category	S. No.	Sub-Heads of SDA Categories
Enabling Services	1	Policy
	2	Planning
	3	Budget
Developing Services	4	Expenditure/ Input
	5	Equity
	6	Service Output
Sustaining Services	7	Operation and Maintenance
	8	Expansion/ Capacity Building
	9	Outcomes

Sources: AMCOW Regional Synthesis Report 2011, 2. Regional Synthesis on SDA for East-Asia and the Pacific by World Bank 2015

Further, in order to ascertain usefulness, importance and applicability of Indicators in Indian context, expert opinion surveys were conducted using domain experts from academics, research and people from industry involved in policy, planning, design, execution and management of urban sanitation system.

Finalization of Tentative List of Indicators from selected PAFs

In the first expert opinion survey, the domain experts (i.e. academicians and researchers from India and abroad) were asked to rate the level of importance to the identified indicators with perspective of ‘societal outcomes’ in a 7-point Likert Scale, with ranges from ‘not important’ to ‘extremely important’. This means, experts rated the indicators by keeping in mind the associated capacity of indicators to offer the societal gains in the form of positive changes in quality of life of the people and society as a whole. Whereas, second expert opinion survey was conducted with industry practitioners from India only with perspective of ‘efficiency of services’ by focusing on provisioning of infrastructure and improvement of service in a 7-point Likert Scale again.

Listing of Tentative Selected Indicators based on the Evolution of PAFs

These indicators were further divided in four representative groups based on their evolution from India and abroad. First group ‘A’ portrays common indicators from ‘Indian and international PAFs’, a second group ‘B’ depicts indicators from India only, whereas third group ‘C’ represents only international indicators and fourth group is ‘D’ is the new indicator proposed to overcome gaps in all indentified PAFs in India and abroad, as mentioned below:

- A** Common Indicators from Indian and International PAFs
- B** Indicators from Indian PAFs only
- C** Indicators from International PAFs only
- D** Newly proposed Indicators

Findings of Research

- (a) Out of total 134 identified indicators, 117 were from 22 selected PAFs and rest 17 were newly proposed indicators.
- (b) While the initial list contained 117 identified indicators from all 22 PAFs of India and abroad, 65 indicators were selected from International PAFs and 37 indicators were selected from Indian PAFs, whereas 15 indicators were having common representation from PAFs of India and abroad.

Percentage representation of Identified 134 Indicators in four different Groups of PAFs based on their Evolution

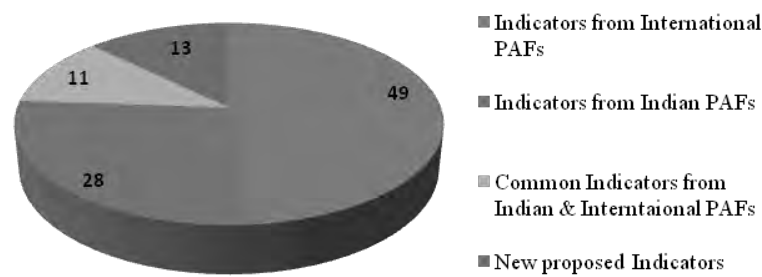


Figure 1: Group-wise representation of Identified Indicators based on their evolution

Source: Based on authors' study

Figure 1 clearly shows that majority of identified indicators which were from international PAFs have not been included in Indian context. Experts suggested few new indicators for addition in the list.

- c) Based on the results of expert opinion surveys, 91 indicators were chosen. The basis of such selection was indicators securing a higher level of importance (above scale-5 in 7-point Likert Scale), in both the rounds of opinion surveys with different perspectives as focus. This led to the development of a '**Revised Performance Assessment Framework (RPAF)**' Table-4 .

Table 4: 'Revised PAF' with final list of identified Indicators in Indian Context distributed in Sub-heads of SDA Categories along with the groups of PAFs based on their evolution

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
Policy	1	Provision of Laws/ rules for improvement in condition of sanitation (national/ state/ local level)	C

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	2	Do measures in-place for user fees and penal action to curb open defecation and urination	B
	3	Establishment of policy and strategy making system for improved sanitation (provision to prepare City Sanitation Plan/ master plan for sewage management Faecal Sludge and Septage Management (FSSM) Action Plan, etc.)	C
	4	Customer satisfaction review and performance review made public	C
	5	Provision of users charges and connection charges, defined as per Residential (Households), Commercial, Institutions, Establishments and Public areas at Urban Local Body level for sanitation services	D
	6	City/ Town level Policy on Waste Water reuse for city landscape, road washing, industrial use, agriculture, non-potable domestic use	D
Planning	1	Average water provided for sanitation needs per capita (estimation of water consumption per capita)	C
	2	City- level Planning to connect all (old and new) Households, Commercial Institutions, Establishments and Public area CTs/ PTs with a closed system (sewerage/ onsite system, etc.)	B
	3	Planning and procedures for community participation for sanitation management and building of Community Toilets (CTs) and Public Toilets (PTs)	A

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	4	Independent testing proposed against national sanitation service standards	C
	5	Consideration of load on sanitation facilities due to floating population in the city during planning and execution	C
	6	Vision period to achieve goals of existing sanitation plan	C
	7	Clarity on the role of various responsible agencies (Whether more than one agency is involved for collection & transfer of WW)	B
	8	Clarity on the role of various responsible agencies (Whether more than one agency is involved in treatment & disposal of WW)	B
	9	Provision of demand based desludging of septic tanks by ULBs from public and private agencies	C
Budget	1	Financial Viability of sanitation services	C
	2	Resource allocation – (staff, finance, machines etc.)	C
	3	Amount of sanitation related official development assistance (ODA) that is part of a government coordinated spending plan	C
	4	Assessment of alternative financial sources and strategies to address needs of capital investment	C
	5	Provision of Budget for new connection charges and defining per connection users charges (HHs/ Commercial units etc.)	C
	6	Provision of any incentive and subsidy strategy to connect people with improved sanitation system	D

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	7	Short- term and long- term investment strategy for sanitation infrastructure and service improvement	D
	8	Provision of sector specific financial mechanism in ULBs (separate budget and planning for sanitation)	D
	9	Earmarking of budget for sanitation services to urban poor (EWS group)	D
Input/ Expenditure	1	Overall Coverage of Toilets (through individual, shared and community toilets)	A
	2	Coverage of individual toilets facilities at HH Level	A
	3	Coverage of Community Toilets & Public Toilets (sanitation facilities in educational Institutes, health centres and commercial centres, etc.)	C
	4	Coverage of Individual HHs with sewerage network services (for sewage with and without sullage)	A
	5	Coverage of Individual HHs with FSSM (Onsite) system for sanitation services	B
	6	Percentage of HHs connected to individual Septic tank	B
	7	Scientific disposal of untreated and residue sewage/ septage	D
	8	Volume of septage/ sludge transported to and disposed in designated locations with scientific measures	C
	9	Percentage availability of onsite toilet facility ensured in construction sites with safe disposal of faecal sludge	B
	10	Action taken by city (issued and notified fine) against persons/ desludging operators dumping untreated faecal sludge in drains/ open areas	B

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	11	Percentage of HHs not releasing sewage directly in natural drains and open spaces (with or without sullage)	D
	12	Overall Coverage for sanitation services (with sewerage and FSSM Onsite system)	B
	13	ICT/ Mobile App/ Social Media based monitoring mechanism to monitor open defecation/ urination/ littering in the City	C
	14	Do Public toilets uploaded as SBM toilet on Google map in the city?	B
	15	Number of septage sucking machines per 1000 septic tanks	C
	16	Percentage Estimated HHs Population dependent on shared sanitation facilities (shared toilets, community toilets)	C
Equity	1	Access to affordable sewerage services to Economically Weaker Section (within the dwelling/ walkable distance)	A
	2	Availability and service conditions of Community Toilets/ Public Toilets in slums / disadvantaged areas	C
	3	Safety, security and welfare provisions for all sanitary workers	C
	4	Provision of Llw income assistance program OR low income billing assistance	C
	5	Percentage HHs with partial access to toilet facility (only for females or elderly)	D
Service Output	1	Collection efficiency of sewerage network	A

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	2	Extent of cost recovery in WW management (Operating cost coverage ratio – OCCR/ Percentage recovery of Operations and Maintenance (O&M) cost to service provider agency)	A
	3	Extent of recycling and reuse of treated WW of sewerage system	A
	4	Extent of recycling and reuse of treated septage (from septic tanks)	B
	5	Overall Waste Water collection efficiency	A
	6	Efficiency in collection of sewage related user charges	A
	7	Efficiency in redressal of customer complaints (Customer/ technical service)	A
	8	Collection efficiency of septage from septic tanks	B
	9	Operational efficiency of STP (Out of total capacity, and actual operation in practice)	C
	10	Extent of recycling and reuse of overall treated WW (from sewerage system, Faecal Sludge and Septage Management (FSSM) onsite system, industry effluents, storm water system, etc.)	C
	11	Extent of users/ public contribution in the O&M of CTs/PTs	C
	12	Percentage of CT/PTs completed Vs Target	B
Operation & Maintenance	1	Adequacy of capacity of STP in case of sewerage system (Capacity Ratio of STP)	C
	2	Adequacy of capacity of FSTP (STP for Faecal sludge & septage) in absence of sewerage system	B

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	3	Do ULBs have private sector participation in O&M of STP (with PPP or any other model)	B
	4	ICT- based monitoring of community toilets and public toilets	B
	5	Operation efficiency for O&M (staff & equipment availability)	C
	6	Staff productivity for O&M (by skills, availability of equipments, work place environment, etc.)	C
	7	Rate of BOD discharged to the environment per capita	C
	8	Managing O&M implications through decentralised sanitation management and wastewater treatment	C
	9	Percentage compliance with specific secondary and tertiary treatment standards	C
	10	Desludging operators registered and being monitored	B
	11	Adequacy of capacity of WW treatment Plants in combined sewerage system (sewage with storm water, etc.)	A
	12	Unplanned/ emergency maintenance readiness for sanitation Infrastructure	C
	13	Total personnel per 1000 population for Operation & Maintenance of sanitation services	C
	14	Does ULB addresses environmental-friendly disposal practices as controlling measures	D
Expansion & Capacity Building	1	Training and skill development efforts (management/ technical/ O&M)	C
	2	Provision of emergency response readiness training	C

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	3	Desludging operators (staff) trained on safety issues, registered with ULB and being monitored by ULB	B
	4	Institution involved in sanitation services (Public/ Private)	C
	5	Coordination training to the agencies involved in the management of sanitation services (if more than one agency for the clarity on role and responsibility, easy communication etc.)	D
Outcomes	1	Percentage of HHs (expected to) not practicing open defecation	A
	2	Quality of WW treatment in separate sewerage system (Sewage + Sullage)	A
	3	Quality of septage treatment in absence of sewerage system	B
	4	Percentage of households ,not openly defecating in slums	B
	5	Quality of water source if used for WW disposal (impact of pollution due to WW on good ambient water quality)	C
	6	Percentage population using improved sanitation facilities over last 3 years (tap, flush and electric bulb in operational toilets)	B
	7	Quality of WW treatment in combined sewerage system (including sewage, septage and storm water)	B
	8	Sanitation related disease reported	C
	9	System Reliability with sufficient capacity	C
	10	Vector-borne/ water-borne (WASH listed) diseases outbreak due to poor sanitation scenario	C

Sub-heads of SDA Categories	Sl. No.	List of identified Indicators	Group based on evolution
	11	Percentage of effluents (industrial sewage) from cottage industries and workshops releasing into open drains	D
	12	Use of existing sanitation facility at HH level (remaining not using due to water scarcity, unhygienic condition of community toilets, or other socio-cultural reasons, etc.)	D
	13	NGT Order compliances for safe disposal of sewage by state governments and ULBs	D
	14	Acceptance of treated WW for reuse	D
	15	Review of complaints of poor workmanships during maintenance and repairs	D

Source: Based on various indicator adopted from various PAFs and other associated references.

- d) Out of 91 indicators of the revised PAF, developed on the basis of the responses from both expert opinion surveys, 14 indicators were from both PAFs of India and abroad (i.e. from group-A), 39 indicators were from International PAFs only (group-C), 22 indicators were from Indian PAFs only (group-B), and rest 16 indicators are newly proposed (group-D).

Percentage representation of selected 91 Indicators in proposed Revised PAF based on expert's opinion

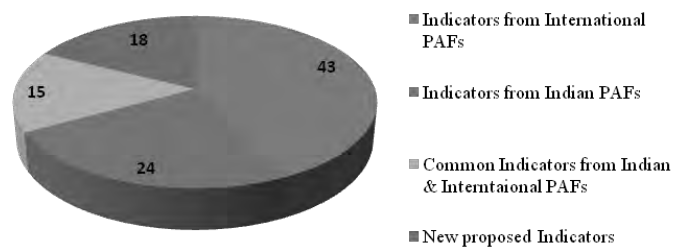


Figure 2: Group-wise representation of selected Indicators in Revised PAF

Source: Based on authors' study

Figure 2 clearly shows that opinion survey favours a altogether different list of indicators as a majority of selected indicators in revised PAF were from international PAFs. Second

largest share of indicators were from Indian PAFs indicating a convergence of choice between the decision-makers for the existing PAFs and the pool of expert respondents. It is also important to note that the share of common indicators between International PAFs and Indian existing PAF is relatively small (15% or 14 out of 91) reflecting a very small share of commonality or convergence of choice. This convergence choice is even less than the respondents' newly proposed indicators reflecting a large divergence of choice of indicators between the existing preference and the need for newer ones.

- e) Out of 91 indicators of the revised PAF above scale-5, 46 indicators received comparatively higher preference over other indicators with perspective of 'Societal outcomes' and 45 indicators received comparatively higher preference over other indicators with perspective of 'Efficiency of Services'
- f) Out of 22 indicators selected from Indian PAFs above scale-5, 15 indicators received comparatively higher preference with perspective of 'Societal outcomes' and 7 indicators received comparatively higher preference with perspective of 'Efficiency of Services'
- g) Out of 39 indicators selected from International PAFs above scale-5, 18 indicators received higher preference with perspective of 'Societal outcomes' and 21 indicators received higher preference with perspective of 'Efficiency of Services'
- h) Out of 14 common indicators selected from PAFs of India & Abroad above scale-5, 9 indicators received comparatively higher preference with perspective of 'Societal outcome' and 5 indicators received comparatively higher preference with perspective of 'Efficiency of Services'
- i) Out of 16 newly proposed indicators above scale-5, 4 indicators received comparatively higher preference with perspective of 'Societal outcome' and 12 indicators received comparatively higher preference with perspective of 'Efficiency of Services'

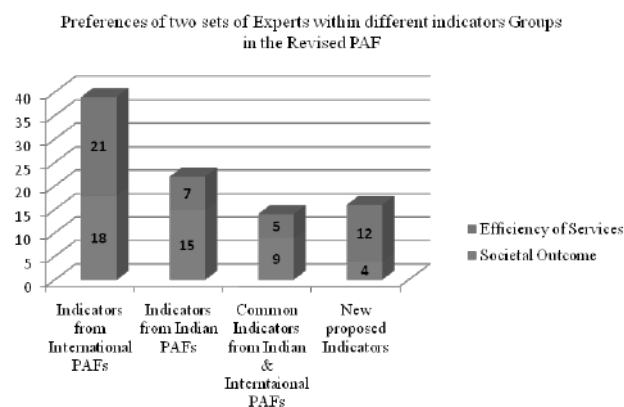


Figure 3: Preferences of both sets of experts within different indicator Groups in Revised PAF

Source: Based on authors' study

It is clearly revealed from Figure 3 that experts chose more indicators from International PAFs and new proposed indicators for ‘Efficiency of Services’ approach. Whereas experts chose more indicators from Indian PAFs and list of common indicators from both PAFs for ‘Societal Outcome’ approach. The opinion survey resulted in list of indicators that has an almost equal share of indicators important from both the perspectives.

- j) Assessment of responses with respect to SDA categories reveals that the perspective of ‘societal outcome’ has 13 indicators whereas perspective of ‘efficiency of services’ has 11 indicators out of total 24 indicators of ‘Enabling Services’ category. In ‘Developing Services’ category, out of total 33 indicators, the respective numbers are 17 and 16; whereas in ‘Sustaining Services’ category, out of total 34 indicators, the respective numbers are 16 and 18.



Figure 4: Preferences of both sets of experts within three SDA Categories in Revised PAF

Source: Based on authors' study

Conclusion and Way Forward

The current Swachh Survekshan (2021) conducted a survey on the basis of 10 indicators. Expert opinion surveys revealed a need for 91 indicators to holistically assess the sanitation scenario in urban settlements. Of these, 74 indicators were borrowed from the PAFs from India and abroad, and a total of 17 new indicators were proposed based on the suggestions of experts. It was evident from the literature review that the currently adopted performance assessment frameworks for urban sanitation were developed with a perspective of ‘Efficiency of Services’, focusing on meeting the infrastructural gaps, meeting and utilising financial and other resources, governance, and setting targets against the investment made on various sanitation systems and services. The framework of assessment did not consider the result or impact of unmet targets necessitating a revisit of the existing PAFs with an alternate perspective i.e.,

‘Societal Outcomes’ to ensure a holistic and better approach to evaluate the performance of the sanitation services.

Overall, these opinion surveys revealed the need to modify and expand the existing performance assessment framework with larger number of parameters / indicators. Within this expanded indicator list, it was observed that there was an almost equal distribution of efficiency and outcome related indicators (proxy indicators for outcome) which were 45 and 46 respectively in a total of 91 indicators. In the context of this study, the perspective of ‘societal outcomes’ was considered to be related with individual capability as well as long-term goals and social sustainability, whereas the perspective of ‘efficiency of services’ was considered to be relatively more associated with institutional capabilities followed by environmental capabilities. The two perspectives together address all the three paradigms of ‘societal capability’, i.e., individual, institutional and environmental capabilities.

This research contributes towards national, state and local policies in India regarding urban sanitation as the revisiting of performance assessment framework of the same (Swachh Survekshan) helped to identify coverage of issues as well as non-coverage of issues in the three categories of mechanisms of enabling, developing and sustaining the services (SDA categories). This research has also identified the scope of expansion in the number of indicators which are required to be included in performance evaluation of sanitation services in India combining two different perspectives. With this research, it is being realised that the modified PAF can help to make appropriate policy shifts and prioritization of financial outlays for improvement of urban sanitation services in different classes of towns with both perspectives; ‘societal outcomes’ and ‘efficiency of services’.

This work has resulted into revised framework of assessment but does not detail out how the same may be used for ranking of performance. This will require determination of relative importance of different indicators within a sub-group, relative importance of each sub-group of indicators (within category of indicators) and relative importance of the three categories of indicators (or in other words, relative importance of each indicator). Also this research has not attempted to actually determine societal outcomes; rather it has attempted to check which indicators reflect such outcomes as proxy indicators. Determination of societal outcomes arising out of the public expenditure is another scope of future research. Societal outcomes in this context may refer to individual and institutional capabilities and freedom.

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The Factors Influencing the Delivery of Digital Public Services - A Systematic Literature Review

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Abstract

The digitalisation of public services in urban settings has made a paradigm shift in how citizens avail government services. The key factors impelling the citizens' intent to use public service, the government's commitment in providing public service, and the challenges faced in rendering efficient public services have all been covered in the study. The literature, a collection of qualitative and quantitative research methods, provides a deeper insight into the influencing elements responsible for adopting government services by the public. The influencing factors have been aggregated in this study into different categories. The study suggests that digital delivery of public service may fulfill the aspirations of the urban population provided that the service is helpful, easy to use, time-bound, transparent, accurate, and incur minimum transaction cost. The influencing factors for the government in providing efficient service include public pressure, international pressure, and disrupting technology. To provide efficient services, the government faces the challenges such as digital, social, and economic divide, availability, and accessibility of technology. It is observed that there are opportunities for the research in the field of Digital Delivery of Public Service by capturing the government's perspective, its design and technological innovations, and citizens' zest for improving service delivery.

Keywords

E-Governance, Public Digital Service Delivery, Digital Transformation, Delivery Channels, digital divides, Urbanisation.

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Introduction

E-governance initiatives such as digital public service delivery has played a vital role in urbanisation. It has brought the new agenda of good governance into the realm of possibility to plan, execute and monitor projects differently which is a key requirement for urbanisation. In the year 2005, the Government of India had also launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) which was aimed to reform urban areas. Under this program, all 65 Mission cities including state capitals, million-plus cities, and cities of historical importance, were required to adopt e-governance reforms.

Digital public service delivery supports urbanisation by increasing accessibility, improving efficiency, promoting transparency and accountability, facilitating data-driven decision-making, enabling citizen engagement, and aligning with smart city initiatives. By harnessing the power of digital technologies, cities can effectively manage the complexities of urban growth and provide efficient and citizen-centric public services. Requirements of public services for urban populations include property registration, income tax return, passport services, licenses to set up businesses, and so on.

Digital public service is a function of people, processes, and technology. It is defined as a citizen's engagement in using a government-provided facility (Seley, 1981). According to the Joinup, an entity of the European Commission working on digital public services and ICT-based solutions, public services are those government services beneficial to citizens or businesses or the government itself. These services are initiated on the request of stakeholders. Effective delivery of public service is the way to social uplift, inclusiveness, social justice, economic development, good governance, and empowerment of the citizens. Efficient provisioning of public service is the ultimate cause of the citizen's happiness (Agbozo & Medvedev, 2020), (Gumah & Aziabah, 2020). The citizens frame their opinion about the functioning of the government based on the effectiveness of public service delivery. Ultimately, the quality of the public service delivery harnesses the trust in the government (Mohamed, 2011).

Efficiency in delivering public service is on the agenda of governments working for the welfare of their citizens (Ali et al., 2020). According to Joinup, a public service, when delivered using a web application, mobile, email, machine to machine, and so forth, is termed a digital public service (Union, 2023). Public service delivery in digital mode inherits the advantages of efficient services anytime and anywhere to the public. (Mergel et al., 2019).

There are two types of service within digital public service delivery, as given below

1. Informative: These services are unidirectional information dissemination to the public, about the nature of the service, eligibility, fee, and process. Since the early days of electronic service delivery, websites have been the source of such information. It saves the multiple rounds of the offices to get the basic information about public service (Ramaprasad et al., 2016), (Shareef et al., 2011).

2. Transactional: These services include digital payment, online filling and submission of documents, and receiving the deliverables such as digital permission letters, certificates, and licenses. Examples of such activities are online filing of Income Tax, Service Tax Returns, and Passport application filing (Sharma et al., 2021). The frequency of availing these services by the citizens is less.

It has been observed that the private sector was quick to leverage the inherent benefits of digitalisation in terms of transactional speed, accuracy, interoperability, and capabilities of handling extensive data in the service sector. The organisations quickly shifted the paradigm and successfully transformed their business (Sanchez-Riofrio et al., 2021). The success of e-Commerce in providing goods and services to consumers at their doorstep in a time bound manner has set the delivery standards. The consumers of e-commerce platforms, expect the same efficiency from the digital delivery of public service (Garg, 2017) (Elapatha & Jehan, 2020).

It is evident that digitalising public service is necessary to deliver it digitally. Governments started computerising the existing process of public services to enhance internal efficiency by leveraging the benefits of digitisation. Digital public services pass through various levels of implementation before achieving maturity. For example, the government digitises the application form, but the processing of the application remains manual. In some cases, public service delivery in the form of certificates and licenses is also made in digital form. Process re-engineering is important for the efficient digital delivery of public service. Without which digitisation of public service and its delivery is merely a translation of manual processes into electronic ones. (Elapatha & Jehan, 2020; Pariso & Marino, 2020).

Technology plays a vital role as an enabler in the digitalisation of public service. Emerging technologies such as Artificial Intelligence and Machine Learning are being used to automate public service delivery. (Arsalan, 2019), in his study, asserted that online information on critical government functions such as procurement, budgeting, and controls enhances the citizens' satisfaction level with the government's functioning.

The adoption of digital public service delivery is increasing day- by- day. Research has been done on the implementation and challenges of digital public service delivery. This requires a thematic analysis of the literature available in this domain. A synthesis of the literature has been deliberated in this study on the factors influencing the citizen to adopt digital delivery of public service and the factors influencing the government for provisioning digital public service. The challenges before the government in the digitisation of public services are thematised in this study. The following section delineates the methodology used to review the research papers on digital public service.

Methodology

In management research, the literature review is one of the most prevailing methodologies to gather knowledge from relevant research papers, case studies, reports and books, ongoing discussions, and the researchers' deliberations on the subject. The Systematic Literature Review (SLR) method reduces the selection bias to an extent

because the literature is identified by using a query by providing search parameters on a database to get the result set (Kitchenham, 2004), (Tranfield et al., 2003). Therefore, the Systematic Literature Review (SLR) Method has been used to synthesise the literature on Digital Public Service.

E-Governance is a multidisciplinary area comprising of Public Administration, Management, Social Science, Information Technology, and Economics (Yildiz, 2013) and Digital delivery of public service is an integrated part of e-Governance. It is observed that phrases like Public Service, Citizen Service, and Government Services carry similar meanings in the literature. Therefore, the search criteria included possible combinations of the phrases. Research papers and case studies published after 2015 were identified to study contemporary findings.

Research papers were searched using the Scopus index as per the indicative query shown in Table 1.

Table 1: Portion of the query used to extract data from the Scopus database

Query Executed in Scopus
(TITLE-ABS-KEY (“public service delivery”) OR TITLE-ABS-KEY (“citizen service delivery”) OR TITLE-ABS-KEY (“citizen centric services”) OR TITLE-ABS-KEY (“government service delivery”) OR TITLE-ABS-KEY (“digital government service”) OR TITLE-ABS-KEY (“digital public service”) OR TITLE-ABS-KEY (“public service”) OR TITLE-ABS-KEY (“citizen service”) OR TITLE-ABS-KEY (“government service”))...

The research papers (n=40) have been extracted from 25 journals. The present collection of research papers covers divergent geographic areas, countries, big cities, municipalities, diverse cultures, and socioeconomic conditions. For example, Shareef (2016) has included Bangladesh, India, and the USA in his research paper to study the behaviour of the citizens on the adoption of SMS. Habibov (2019) included 29 post-communist countries in his study on analysing the effects of corruption. Kyriacou & Roca-Sagalés (2019) studied 30 countries to find the quality of public service and decentralisation. The research paper of Ingrams (2018) analyses the data obtained from Open Government Partnership (OGP), containing 50 countries with more than 1000 transparency initiatives. Most of the research papers took sample data from the residents living in urban areas, municipalities and towns.

To expand the horizon of literature review, the seminal research papers / government policies and relevant document mentioned in citation were also taken into the scope of the study to understand the context.

The next section presents the findings derived from the synthesis of the data found in the research papers.

Findings

The researchers have used quantitative and qualitative techniques in their research. Most of the surveys and interviews have been performed in the urban population. They

applied theoretical frameworks in their research to identify and test the influential factors in the delivery of the digital public services. This study aggregates them into one place. The synthesised information is further classified into three main categories as given below:

1. Theoretical frameworks are used to examine the influential factors in the digital delivery of public service.
2. Factors responsible for digital delivery of services
 - (a) Factors influencing government for provisioning the digital public service.
 - (b) Factors influencing the citizen to adopt digital delivery of public service.
3. Major challenges in the digital delivery of public services.

Theoretical frameworks used to examine the influential factors in digital delivery of public service

The factors influencing digital delivery of public services are examined by the researchers using various quantitative techniques. It is done by adopting and modifying the frameworks and theories primarily used to measure consumers' behavior in marketing research.

The factors used in the existing Information System and consumer behaviour theories, viz. Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Diffusion of Innovation (DoI), etc., were taken to study the adaptability of digital public service also. However, the researchers modified the existing theories by including relevant constructs such as trust in government, corruption, cyber threats, connectivity, etc., to meet the requirements and concerns in the e-Governance (Dwivedi et al., 2017; Kumar et al., 2017; Mensah et al., 2020; Shareef et al., 2011, 2016; Sharma et al., 2021).

A brief of the theories used by the authors are tabulated in Table 2 below:

Table 2: Theories used by The Researchers in Research Papers

S. No.	Theory	The outcome of Theory and influencing factors	The theory used in the Literature
1	Unified Theory of Acceptance and Use of Technology (UTAUT)	The adoption of technology in public service by the citizens is examined by analysing the following constructs - 1. Usefulness of digital public services 2. Efforts required to avail of the service 3. Recommendations of citizens on social media 4. Enabling infrastructure and facilities	(Abdulkareem & Ramli, 2021; Kamarudin et al., 2021; Kurfalı et al., 2017; Mensah, 2019; Mensah et al., 2020; Munyoka & Maharaj, 2017; Sharma et al., 2021; Venkatesh et al., 2003, 2012), (Virgiyanti et al., 2018)

S. No.	Theory	The outcome of Theory and influencing factors	The theory used in the Literature
	Modification in Unified Theory of Acceptance and Use of Technology (UTAUT2)	In addition to the above constructs, three more constructs were included to examine the intent of the citizens in the adoption of technology in public service Value addition in the service to motivate its use, Transaction cost, and Repeatedly availing service	(Alharbi et al., 2017; Kamarudin et al., 2021; Mensah et al., 2020)
2	Fountain's technology enactment framework	Determine the impact of adopting digital technologies in organisational architecture and its delivery mechanism.	(Mergel et al., 2019) (Meijer & Bekkers, 2015)
3	e-Government Adoption Model (GAM)	There are two categories of e-Government adoption 1. Static contents 2. Digital Transactions	(Alharbi et al., 2017)
4	Unified Model of Electronic Government Adoption (UMEGA)	To assess the e-Governance adoption by the citizens. The constructs are Attitude Behaviour Intension Effort Expectancy	(Mensah et al., 2020)

Factors responsible for digital delivery of services

As discussed in previous sections, Public, Process, and Technology are the three pillars of digitalising the public services. The government is a service provider and the citizens are the consumers of the services. The technology is an enabler in the delivery of digital services (Satyanarayana, 2004). The researchers have examined the factors influencing these pillars in digital delivery of public services. The factors influencing the adoption of digital delivery of public services may be divided into two sub-categories.

Factors influencing the citizen to adopt digital delivery of public service

Trust in the government: Empirical studies confirm that trust in the government has been a significant factor in digital service delivery. It is significantly responsible for the acceptance of public service by the citizens (Kurfalı et al., 2017), (Bin Musa et al., 2019; Mensah, 2019), (Alharbi et al., 2017), (Mensah et al., 2020). The responsiveness of the government enhances trust in the government. In addition, it is also found that faith in the government has a mediating effect between people using the service and actual usage of the service. (Kamarudin et al., 2021), (Guo et al., 2016). While examining

value congruence between the service provider, Boyd-Swan & Molina (2019) also found that trust factors work positively in the relationship between the service provider and the consumer. The author, using empirical methods, has established that human, ethical, professional and democratic values in administration enhance the overall cooperation between government and the public. Shareef (2011), in the e-Government adoption model, defined trust in terms of security and privacy safeguards taken by the government. The uncertainty in getting the public service is inversely proportional to the trust.

Usefulness of the service: Public judges the efficacy of the public service before availing of it. The government service should be helping the citizen in their lifestyle or providing specific value addition. Therefore, the efficacy of public service is an essential factor. Studies in different contexts support the observation that usefulness is an important factor in the minds of the users before availing of the service (Kurfalı et al., 2017), (Alharbi et al., 2017), (Dwivedi et al., 2017), (Kamarudin et al., 2021). However, the studies conducted on students in China and Citizens of Ghana show that the concept of the service's usefulness is not a major issue (Mensah et al., 2020) (Mensah, 2019). A study using qualitative methods by Kumar (2017) records mixed reactions to the usefulness of the services. For example, citizens do not find the contents of websites useful. However, online booking of rail tickets was found helpful by the citizens.

Efforts in accessing the services: In the digital mode of public service, efforts made to access the service are significant concerns in making up the mind to avail of the service. It points to the degree of ease of using the services. The study conducted by Kumar (2017), Liu (2020), and Dwivedi (2017) resulted in the agreement that the degree of ease in availing of the service is proportional to the likelihood of the public using the service. However, the literature also mentions that the ease factor is also dependent on other variables such as age group, gender, and education of the respondents (Kurfalı et al., 2017), (Mensah, 2019), (Alharbi et al., 2017), (Mensah et al., 2020), (Kamarudin et al., 2021).

The authors have also mentioned that the degree of ease may also be related to bridging the divides created by the system and the technology. For example, Lissitsa & Chachashvili-Bolotin, (2021) narrated the case of a single mother living in an American town, using a digital service. It was found that low-income single women in a city find it difficult to access digital services from the government. Similarly, Rasi (2022) has mentioned that old people generally have challenges in using digital services, but there are some exceptions where aged people are not only very active on social media but also have an example where a "103-year-old who painted artworks on the tablet". Therefore, it has emerged that the ease of using the technology promotes the usage of digital innovations in any age group.

Abdulkareem & Ramli (2021) developed a conceptual model by combining Information Service Success Model developed by Delone and Maclean and Public Value Theory. The authors used the conceptual model to understand the impact of the

accessibility of ICT in Nigeria. The study found that Information, Services, and their qualities are significant factors in the actual use of digital public services.

Social Influence: In the age of Social Media, people care about others' opinions. Therefore, it is a cause for the influence. In literature, Social Influence is considered an influencing factor in the citizens' behavioural approach to the adoption of public service. Most of the studies establishes that positive social influence will enhance the likeliness of using public service (Kurfalı et al., 2017), (Alharbi et al., 2017), (Dwivedi et al., 2017), (Kamarudin et al., 2021). Government-owned Social Media (GSM) is also a popular channel for providing digital public services in China. It is used for social interactions, disseminating information, think tanks, and using it across networks. In China, Government owned Social Media (GSM) has enhanced the trust in the government (Guo et al., 2016).

Before availing of the public service, they look for the opinion about the services from the users who have consumed the service and then make up its mind to use it (Kurfalı et al., 2017). Therefore, Social media influence results public pressure to get quality service from the government.

Facilities to access service: Kumar (2017), in his study, finds that the poor experience of the public in accessing public service hinders the benefits of digitalisation. It covers infrastructure such as hardware, software, Internet, and capacity building of the citizens to enable them to use digital services and multiple channels. The findings in the literature confirm that the availability of such facilities improves the likelihood of the public using digital public service (Kurfalı et al., 2017), (Mensah, 2019), (Alharbi et al., 2017), (Mensah et al., 2020), (Dwivedi et al., 2017), (Kamarudin et al., 2021).

The frequency of using a service: It is another indicator of adopting a government service (Kurfalı et al., 2017). Payment of utility bills, house tax, online railway/air tickets, goods and service tax and income tax are a few examples of multiple-frequency services. Frequent use of the services at the citizen level develop a habit of using digital public service delivery. However, many services such as birth, marriage, death, and home ownership provided only by the government are not frequent but critical to avail of other associated services.

Factors Influencing Government for Provisioning the Digital Public Service

Primarily, the government provides public services to its citizens to meet its social accountability. (Blair, 2018). However, in the age of digital transformation of government systems, additional factors also influence the government in the provisioning of digital public services. Some of the prominent factors influencing the government to provide digital public service are illustrated below.

Pressure from public: Mergel (2019) observed that internal factors, such as pressure from the public, businesses, and politicians force the government to improve quality of

public service. Hence, this pressurises the government to adopt technology an enabler of quality in providing digital services to bring efficiency in delivery.

The government too recognised that it is difficult to deliver quality public services without technological intervention. Highly efficient service delivery by the e-commerce companies to the citizens also enhanced the citizens' expectation from the government to deliver the services with similar efficiency (Bin Musa et al., 2019).

Technological Innovations: New technological innovation and their adoption by businesses in the field of e-Commerce forces the government to use similar technology in its own functions. Bhatnagar (2014) suggested that a diligent and astute use of Information and Communication Technology (ICT) may result in improved management of educational, social welfare, and health-related services. The study by Mergel (2019) confirms that the adoption of technology by the government has resulted in better service delivery and efficient process.

Now emerging technologies have enabled innovative thinking in providing a customised digital experience to the citizens. Villa-Nicholas & Sweeney (2020) demonstrated the use of artificial intelligence and machine learning by implementing the "Emma" chatbot on the United States Citizenship and Immigration Services (USCIS) website. It enhanced the reputation of the USCIS amongst the users of the services.

New Technical advancements in the domain of machine learning, information security, ubiquity, reduction in the cost of technology etc., are key factors influencing the government for implementing digital public service delivery.

Rachman & Napitupulu (2020) discuss the application LAPOR in Indonesia, which engages citizens through its website to participate in policy making or in registering grievances. The engagement of citizens using digital media is the indicator of the acceptance of e-Government.

International Developments: Ratings released by prominent international survey agencies keep the government working hard to improve the ranks. Adhering to the Sustainable Development Goals (SDGs), declared by the United Nations Development Programme (UNDP), is another reason for Governments to ensure the betterment of their citizens by promoting a good governance model (Malhotra, 2018), (Gumah & Aziabah, 2020), (Adjei-Bamfo et al., 2019).

Another hard pressing factor for the governments to work on public service delivery is the e-Governance Development Index (EGDI) prepared by the UN, where all member countries are ranked based on their performance in e-Governance. E-Government Development Index (EGDI) examines the following criteria - Online Service Index (OSI), Telecommunication Infrastructure Index (TII), and Human Capital Index (HCI) (*UN E-GOVERNMENT FINAL REPORT Web*, 2016). The country's bad rank put pressure on the government to improve the ranking by taking corrective measures in e-Governance adoption.

Major Challenges in the Digital Delivery of Public Services

There are many challenges in successfully implementing digital public service delivery projects. In the literature review, the following major challenges have been outlined by different authors.

Co-creation of the services: While developing digital public services, the primary stakeholder, the “Citizen,” is not included in the process. A group of experts generally decides to enable technology, and it is assumed that the public will adopt it in any case (Singh, 2013). In the absence of the co-creation process of public service, the government wastes resources by creating an insignificant service from the users’ perspective (Gumah & Aziabah, 2020). According to Blair (2018), consultation with the citizens when designing the public service improves the chances of its adoption because the stakeholder’s requirements are incorporated.

The citizens’ requirements should be captured at every stage of designing, developing, and implementing public services. For example, Osborne (2016) emphasises the co-creation importance and co-production of the services by using the phenomenological approach of capturing live experiences of the users in creating the services with professionals and with volunteers from the user side. Similar sentiments have been documented by Mergel (2019), where the author suggests that digital transformation should be taken as a “Comprehensive Organisational approach.” It must include external factors such as technology and citizens’ perceptions in framing the overall architecture of the digital delivery of public services. The author defines the digital transformation process as a continuous process that brings changes in the culture of an overall system, citizen satisfaction, and enhanced relationship between administration and citizens.

Digital Divide: Digital public service delivery is aimed at bridging the social and economic divide (Li et al., 2020); however, at the same time, a new challenge emerges in society because technology may introduce a digital divide. Prof. Amita Singh, (2013), in her book “A Critical Impulse to e-Governance in the Asia Pacific” raised the concern about technology driven digital divide in the process of developing a knowledge based society. There is possibility to have the cascading effects of digital divide on other divides such as socio-economical and rural-urban divides. Therefore, imparting computer literacy and skill development becomes critically important in mitigating digital divide in the society. The awareness camps may play a significant role in bridging digital divide, where information and process to avail the government schemes are explained to the villagers (Sharma et al., 2021). They should know how digital public services could be helpful in availing those public services using computers.

Diverse Geographical, economic and social systems: Countries having large geographic areas and diverse social systems may suffer from a sense of equality in providing public service. It is found that profit-making services are provided with more care and efficiency than those provided free of cost. The availability of the infrastructure

in different geo-locations also varies. (Li et al., 2020). The government uses a digital delivery mode to see if there is no gap or minimum gap in availing the services. Similarly, a study in Ghana using public service theory also points out a divide between the rural and urban populations in how service is provided to these populations (Gumah & Aziabah, 2020). Digital divide is significant due to disproportionate availability of infrastructure amongst urban, rural, geographic, socioeconomic ecosystem.

Connectivity: Shareef (2016) posits that connectivity, such as the Internet and networks, will boost citizens' opinions regarding effective and efficient government services. The availability of digital public service in ubiquitous mode impacts digital public service positively. Most of the reviewed research papers have indicated that without better connectivity, the entire provisioning of digital transformation is not adopted by the users, and therefore, there is no trust in the government. (Grant et al., 2011; Kurfali et al., 2017; Mensah, 2019; Rasi, 2022; Rowley, 2004; Venkatesh et al., 2012).

Data Security and Privacy: The risks involved in the virtual world have more enormous challenges apart from corruption, the Internet, and Digital Divide. Cyber cheaters look for exploits to break the system's securities, steal money and identity, and spread rumors on social media (Mensah et al., 2020). As the volume of data increases, there is a need to have a data governance model in the system to ensure data privacy and security. Wang (2019) argues that properly managed, analysed data using a data governance system enhances service quality as well as user satisfaction. At the same, it is prudent from the government side to run awareness programs to educate the users on the prevailing security practices, technical aspects of using digital services, and securing end-devices such as mobile phones, laptops, and desktops (Mensah et al., 2020), (Rasi, 2022).

Discussion

Literature review lead to the emerging of the themes. The study has yielded episteme of e-Governance and digital delivery of the public services. It is further summarised below.

The literature was reviewed to (1) capture citizens' perspectives on the influencing factors in availing of digital public service, (2) understanding the government's view on the compelling factors and (3) challenges in digitalising public service. It is observed that adoption of the public services is dependent on degree of usefulness, efforts in availing the service, availability of multiple options, transaction cost, facilitation, localisation and so on.

Technology adoption starts from bigger cities and then flows down to the medium and smaller towns. Therefore, citizens have a better exposure to latest equipment, Internet and enabling infrastructure. Early adoption of the technology helps in growing the business, ultimately resulting in the growth of the city (Sanchez-Riofrio et al., 2021). Generation Z¹ is born in the era where availability of information is just on the finger tips. They have easy access to laptops, mobiles, internet in the urban setup (Bhatnagar,

1 <https://www.investopedia.com/generation-z-gen-z-definition-5218554> accessed on 16-05-2023

2014). Therefore the cities have better chances in delivering the digital public services. However, the government is to compete with the quality of services of e-commerce companies to provide facilitating conditions, good user interface, minimum efforts in accessing public service to the urban users of public services.

It is evident that digital public service delivery has a positive impact on urban governance and decision making. The availability of real-time data and analytics enables evidence-based policy formulation and resource allocation. This data-driven approach enhances urban planning processes and contributes to more effective and sustainable urban development strategies.

During this literature review, various benefits of digital public service delivery in the context of urbanisation has been noticed. These include increased accessibility to government services, reduced administrative burdens, improved efficiency, enhanced transparency and accountability, and greater citizen engagement. The use of digital platforms allows urban residents to conveniently access and interact with public services, saving time and effort while increasing overall satisfaction.

Gaps Analysis

Technology is dynamic and gets obsolete quickly, so are the technology-based research papers. Each research provides a lead to another research, therefore, gaps are not in terms of finding the faults in the research but to take the research to the next level.

Most of the literature considers public services as one entity especially in using quantitative research methods. It provides a generic validation for the variables. The literature does not differentiate in e-government (licenses, certificates), social sector services (Old age pension, scholarships), Healthcare services, Transport service and so on.

Conclusion

This literature review aimed to understand the key elements responsible for adopting the digital delivery of public services to citizens in urban cities. The literature elucidates the factors influencing governments to deliver public services digitally. This study contributes to aggregating the perspectives of digital delivery of public service from the lenses of the citizens as the user, government in the service provider role. This paper provides a comprehensive overview of the existing knowledge and research surrounding digital public service delivery for residents/occupants/ visitors of urban areas. The reviewed literature indicates that digital technologies and platforms offer significant opportunities to improve service delivery, enhance governance processes, and promote sustainable urban development.

The literature review also acknowledges certain challenges and limitations associated with digital public service delivery. These include concerns regarding data privacy and security, the need for ongoing technical support and maintenance, and potential exclusion of marginalised groups. Addressing these challenges is crucial for ensuring the effective and inclusive implementation of digital initiatives.

During research work, it is an immense task to identify the research papers in the respective domains of interest. This literature review may support and motivate the researchers working on specialised topics on digital public service delivery from the stakeholders' perspective. Understanding service delivery architecture and data governance will lead to proactive governance. There is also scope for attempting meta-analysis from the various studies on one of the frameworks mentioned in this literature review. The findings underscore the need for continued research, collaboration, and policy support to harness the full potential of digital public service delivery in urban areas and create inclusive and citizen-centric cities for the future.

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BOOK REVIEW

Delhi- Old and New, A.K. Jain, Bookwell, Delhi, (www.bookwellindia.com)

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Delhi, a megacity of 20 million, is a symbol of India's heritage and modernity, and coexistence of the old and new. Its urban fabric is imprinted by many cultures of innumerable kingdoms. Delhi's tapestry is embellished with the annals of glorious cities that have risen and fallen here. The various cities of Delhi are the stamps of its several invaders and conquerors. Khilji's Siri, Tughluk's Tughlakabad, Jahanpanah, Ferozabad and Shahjahanabad are the reminders of Delhi's embattled past. Shahjahanabad was built along the river Yamuna, a 1370 km long river emanating from the Himalayas. Delhi's multi-cultural variety is a syncretic amalgamation of fine arts, cuisine, etiquettes, festivals, education, dance, drama, stories, crafts, poetry, and architecture.

A.K. Jain in his book *Delhi-Old and New* traces its unique and interesting historiography of last 2000 years. The author continues with a detailed panorama of modern Delhi. This journey started at the Delhi durbar held on 12th December 1911 at the Kingsway Camp, the emperor of the British Empire George V, proclaimed that the seat of the Government would be transferred from Calcutta to Delhi. The emperor expressed his desire that the planning and design of the Imperial Capital be considered with great deliberation and care. The Town Planning Committee, consisting of G.S.C. Swinton, Edwin Lutyens and J.A. Brodie, found the site for new Capital at Raisina, towards the South of Shahjahanabad, between the ridge and river Yamuna. After 20 years of building, the New Delhi was inaugurated in 1931.

In 1947, after the partition and Independence of India, Delhi witnessed one of the largest immigration of people in the human history and the enlargement of government functions. New colonies, buildings and work centres sprang up in all directions, without any overall plan. 36 Rehabilitation Colonies were set up with an emergency speed for settling the half million refugees who came to Delhi after the partition of the country in 1947. With a view to ensure planned developments of the National Capital, the Government of India in 1957 set up "Delhi Development Authority" for preventing poor laying out of land, haphazard erection of buildings or growth of substandard colonies, and ensuring development and expansion of Delhi according to proper planning.

The Delhi Master Plan was given statutory shape on September 1, 1962. It projected the requirements of 4.6 million (revised to 5.3 million) population in 1981. From the urbanised area of 42,700 acres in 1958-59, it enlarged the urbanisable limit to 1,10,500 acres, allocating 47,400 acres to housing, 25,000 acres to parks and open spaces, besides the land for industries, government offices, institutions, commercial uses, and for circulation. This was the beginning of the building of the ninth Delhi, covering an area of 1483 sq.km. Besides the planned areas, today it comprises about 367 villages, traditional old city (Shahjahanabad), and about 2,000 unauthorised colonies.

According to the author, A.K. Jain, with the aim to make Delhi a slum free city, 62 odd resettlement colonies have been developed for slum and JJ dwellers with about 2.50,000 plots. However, squatters have continued to grow, and still there are 1,100 JJ clusters with about 6 lakh households.

A positive outcome of planned development has been the abundant greenery, covering 19 per cent of land, as compared to 13.5 per cent in Bangalore, 9 per cent in Hyderabad, 7 per cent in Kolkata and 4 per cent in Mumbai. Delhi has a forest cover of 176.2 sq.km comprising the Northern Ridge (87 ha), Central Ridge (864 ha), South-Central Ridge (626 ha) and the Southern Ridge (6200 ha). It has 5 Biodiversity Parks, 4 Regional Parks, 111 District Parks and 16,000 local parks.

According to the author, Delhi has a rich tapestry of heritage buildings. The Archaeological Survey of India has declared 170 monuments in Delhi as protected. The DDA, MCD, NDMC and the State Archaeological Department have published the lists of Heritage Buildings. According to INTACH, (2020) there are 2264 unprotected and protected heritage structures in Delhi, besides Heritage Zones, Cultural Precincts and Archaeological Circuits. These include the Walled City of Shahjahanabad, Lutyens Bungalow Zone/ Central Vista, and Civil Lines Bungalow Area.

The cultural precincts are Nizamuddin, Humayun's Tomb Complex and Sunder Nursery, Mehrauli area-Shamsi Fort, Jahaj Mahal, Boali, Adam Khan Tomb, Qutab Minar Complex, Vijay Mandal - Begumpur - Sarai Shahji - Lal Gumbad, Safdarjung Tomb- Lodhi Garden, Trikona Park- Shahpur Jat- Tohfe Wala Gumbad, Asiad Village, Firoz Shah Tomb- Hauz Khas Village and Lake, Chirag Delhi- Khirki Mosque, Satpulla- Jahanpanah Forest and Chandni Chowk- Matia Mahal - Jama Masjid. The designated Archaeological Parks are at Mehrauli, Tughlaquabad, Sultan Garhi, Indraprastha and Northern Ridge.

This book *Delhi-Old and New* by A.K. Jain illustrates the evolution of Delhi, its history, flora and fauna, the river, the air, forests, parks and biodiversity. It also highlights the spatial and cultural asymmetries and incessant issues of environmental pollution and traffic. The book gives a clear perspective of the great city of Delhi. With more than 200 visuals, the book helps the readers to explore the Old and New Delhi.

