

URBAN REJUVENATION

Transition to a

**SMART & SUSTAINABLE
FUTURE**





TITLE**Urban Rejuvenation: Transition to a Smart & Sustainable Future****YEAR**

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AUTHORS

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Foreword



Urban Rejuvenation: Transition to a Smart and Sustainable Future

As India aspires to become a \$5 trillion economy with urban areas fuelling over 75% of its economic growth, we fully support the government's bold and new initiative for smart and sustainable urbanization.

Urban areas produce close to 60% of India's GDP and this is estimated to rise beyond 70% by 2030. India's growth story is unfolding in all its cities ranging from mega city regions to small towns. Considering India's growing urban footprint, with more than 40% of its population expected to live in cities by 2030, it is critical to manage urbanization well and achieve the full potential on three important fronts of liveability, economic-ability, and sustainability.

Smart cities strive to generate more impact and outcomes from fewer resources, hence the vision to drive economic growth and improve the quality of life by harnessing technology with smart outcomes is apt. U.S. companies have been at the forefront in offering smart solutions to meet these objectives. The report provides insights and best practices on how we can achieve the well-articulated objectives towards urban rejuvenation and a sustainable future for citizens.

Ranjana Khanna
Director General CEO
AMCHAM

TABLE OF CONTENTS

EXECUTIVE SUMMARY	8
1. URBAN INDIA: ENGINE OF SOCIO-ECONOMIC GROWTH	10
1.1. India's Urban renewal Program	12
2. SMART CITY MISSION: MODERNIZING CITY ADMINISTRATION & SCAPE CIVIC DELIVERY LAND	15
2.1. SMART Cities Mission: Mission for Urban Transformation	16
a. Area-based Development (ABD)	17
b. Pan-city Development	17
2.2. SMART Cities Journey So Far: Transforming Urban Development	17
a. Smart Cities Mission 1.0	19
b. Mode of implementation of various projects in SMART Cities	20
c. "Value Capture" a key component of Smart city projects	21
3. KEY GOVERNMENTAL PROJECTS EXECUTED BY SMART CITIES	22
3.1. ICT Services	22
3.1.1. ICT services in Urban Administration	23
a. Integrated Command and Control Centre (ICCC)	23
b. Usage in Smart Governance	24
c. Usage in Integrated Traffic Management System	25
d. Usage in Smart Environment	26
e. Smart Governance - GIS Based Property Assessment	26
3.1.2. Citizen Engagement Services	27
3.1.3. Public Service & Governance	28
a. G2G (Government-to-Government)	28
b. G2C (Government-to-Citizen)	29
3.1.4. Public Health	31
3.3. Public Safety and Security	33
3.4. URBAN CONNECTIVITY	37
3.2.1. Sustainable Living and Regional Connectivity – Air Connectivity	37
3.2.2. Railway Station Redevelopment for Urban Rejuvenation	38
3.2.3. Urban Sustainable Public Transit System	38

TABLE OF CONTENTS CONT....

4.	VALUE CAPTURE- DATA DRIVEN GOVERNANCE & CIVIC-TECH ECOSYSTEM	40
4.1.	Data Driven Governance: National Urban Digital Mission	40
a.	India Urban Data Exchange	41
b.	SmartCode Platform	41
4.2.	Emergence of Civic Tech Eco-System	41
4.3.	Civic-Tech applications in India	42
5.	SUSTAINABLE URBAN DEVELOPMENT THROUGH INNOVATIVE FINANCING SOLUTIONS	43
5.1.	Developing Innovative Financing Models for Sustainable Growth	44
a.	Raising Revenue from Internal Resources for Infrastructure Development	44
b.	Augmentation of Municipal Revenue through Asset Optimization	46
c.	Capital Market Based Financing - Tapping External resources to develop Capital Intensive Infrastructure Projects	47
6.	SMART CITY – A FUTURE PERSPECTIVE FOR URBAN TRANSFORMATION	49
6.1.	Technology Solutions – Essential for Urban Transformation	50
a.	Ensuring Standardization and Interoperability	50
b.	Develop Network Sharing Infrastructure	50
6.2.	Public Private Partnership for Urban Rejuvenation	51
6.3.	Financial Sustainability for Bond Market	51
6.4.	Asset Monetization – To Make Smart City SPVs Self Sustainable	51
6.5.	Developing Effective Procurement Process – Define Standardize Procedures	51
6.6.	Sustainable Transportation – Mass Transport System & Electric Vehicle for Sustainable Future	52
7.	References	53
8.	Bibliography	54



EXECUTIVE SUMMARY

In the past few decades, India's bold economic reforms have led to steady investments and growth, offering citizens better opportunities and quality of life. Although the Indian economy has been resilient, the key challenge is to sustain this momentum. Global urban population is expected to increase to 68% by 2050 from 55% in 2018, while India's is projected to increase to 54% in 2050 from 34% in 2018¹. Cities in India have increasingly become large Centres of economic resurgence and a reliable means to enhance livelihoods. Developing urban infrastructure, improving connectivity among cities and developing infrastructure that caters to the needs of all citizens is the need of the hour.

The growth of India's urban population, however, has not been accompanied with commensurate increase in urban infrastructure and modernization of service delivery capabilities. Cities in India face a range of challenges to meet the demand and supply gaps in urban regions. Lack of capacity building at municipal level in areas such as water management, waste treatment, transportation, healthcare etc. results in certain gaps during service delivery. Considering these challenges, Government of India has undertaken Urban Rejuvenation program to develop urban infrastructure that can support future growth and develop economic activities.

The Smart Cities Mission was launched to transform urban regions, cities in India that incorporate information and communication technologies to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs. In the five rounds of selection, 100 cities were chosen by a committee of experts. Proposals consisted of existing service levels, institutional capacities, past track records.

Since the launch of the Mission, 5,151 projects worth more than ₹2 lakh crores are at various stages of implementation in the 100 cities. Of the total proposed projects, 5,924 projects (115% by number) worth ₹1,78,500 crore (87% by value) have been tendered so far, work orders have been issued for 5,236 projects (101% by number) worth ₹1,46,125 crore (71% by value). 2,665 projects (52% by number) worth ₹45,080 crore (22% by value) have also been fully completed and are operational (as on 23 June 2021)².

In the last few decades, urban cities have witnessed several changes in urban planning owing to technological advancements in the form of Information and Communication Technology (ICT). Globally, the total spend on technologies in smart cities is estimated to be USD 124 bn in 2020, a rise in 18.9% over 2019³. Resilient energy



and infrastructure (driven mainly by smart grids) represent the top spent 33%, followed by data-driven public safety and intelligent transportation systems at 18% and 14% of overall spending respectively³. Following the footsteps of global smart cities, various smart city administrations in India have adopted innovative solutions to address civic problems and provide ease of service delivery. Chapter 3 delves into some case studies to highlight effectiveness of introducing tech-based solutions to improve service delivery as also support public health and public safety in urban region.

The Government of India is also keen to bring in a complete paradigm shift in the urban outlook by undertaking large scale connectivity projects in various parts of the country. These connectivity projects are envisaged with a view to improve intercity as well as regional connectivity. This also creates multi-modal connectivity for a city with a modern outlook that also supports 'Walk-To-Work Concept' outlined by the Smart Cities Mission. Railway station redevelopment, air connectivity and sustainable urban transport system may support in the economic development of the cities as also augment regional development in order to support urbanization in the connected regions.

Upgrading and rejuvenating urban infrastructure is a humongous task and it requires financing

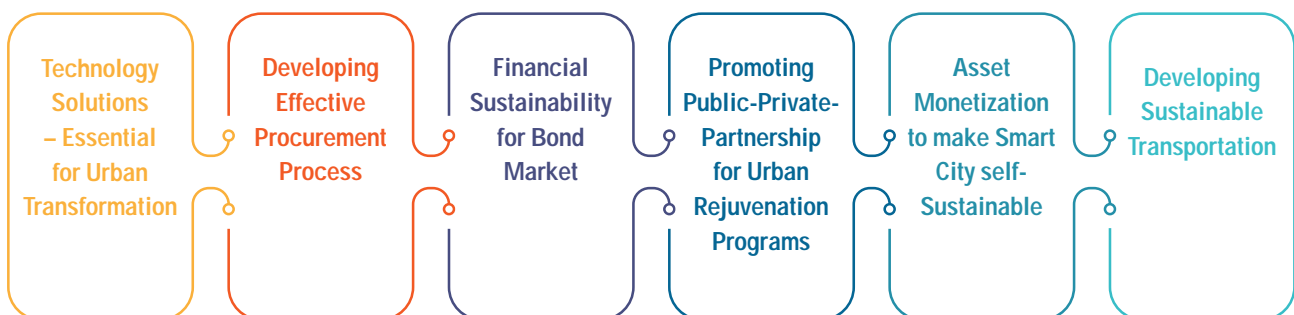
from various sources. In order to support such developmental work, the Government provided policy support and allowed various mechanism for generating finances to carry out developmental work.

To further strengthen the urban centres, the Central Government launched the National Urban Digital Mission (NUDM), with an aim to create a digital infrastructure for Indian cities. This collaborative urban data exchange platform is developed to support partnership model in urban rejuvenation program.

Smart Cities Mission has also supported start-up eco-system to flourish particularly in civic development programs. Civic tech has emerged as a promising approach to address service delivery challenges, and today we are witnessing start-ups capitalizing on the potential of technology and data to improve governance, empower citizens, and drive social impact.

While the Government has provided thrust towards urban rejuvenation with programs like the Smart Cities Mission and AMRUT. But dedicated efforts will be required by all stakeholders to maintain balance between inclusive and sustainable changes in urban regions in India. Such an environment will require a sustained long-term effort from both State and Central Government.

Future Ready for Sustainable Urban Transformation





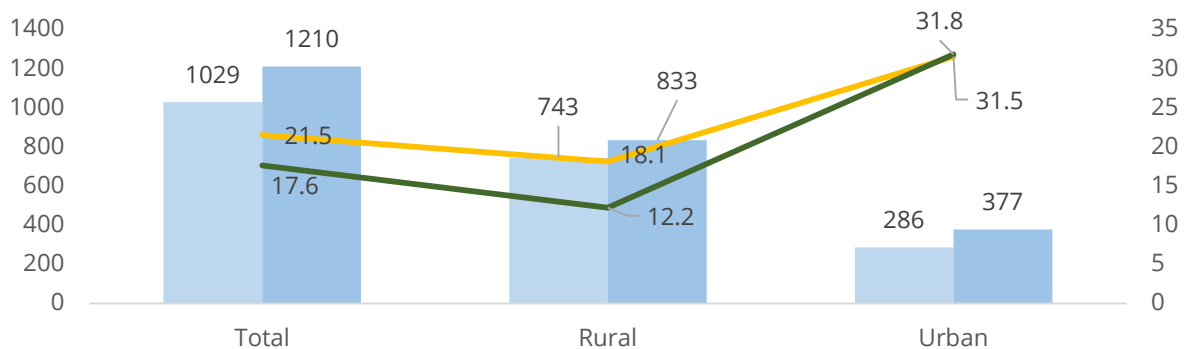
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URBAN INDIA: ENGINE OF SOCIO-ECONOMIC GROWTH

In the past few decades, Governments across the world are facing complex sets of decision making on investing in urban infrastructure. According to the World Bank, in 2018, globally 4.19 bn people lived in urban areas which is expected to reach 7 bn by 2050^{4,5}. In India, as per the latest available census of India of 2011, urban population is 377.1 mn, accounting for 31% share⁶. Although

census definition for urban area is restrictive compared to definitions used by the World Bank, an agglomeration index developed by the World Bank puts the share of India's population living in areas with urban like region at 55.3% in 2010⁷. This is due to hidden urbanization on the peripheries of major cities.

Urbanization in India



Legend:
■ Persons in Million 2001
■ Persons in Million 2011
— Decade-wise Growth in Population % 1991-2001
— Decade-wise Growth in Population % 2001-2011

Source: Census of India 2011



Urbanization catalyzes the growth yet causing socio-economic imbalance

Urbanization is an important catalyst in making cities more prosperous and countries more developed. However, the current rate of urbanization is not encouraging as it causes socio-economic imbalances, especially in the developing countries such as India. This is creating social and spatial challenges which are evident in cities with affluent communities on one hand and large slum areas on the other.

Further, India’s Urban Centres are consistently demanding attention in the developmental discourse in India as well as in policy and priority setting, driven by the increasing concentration of population as well as economic activity in urban

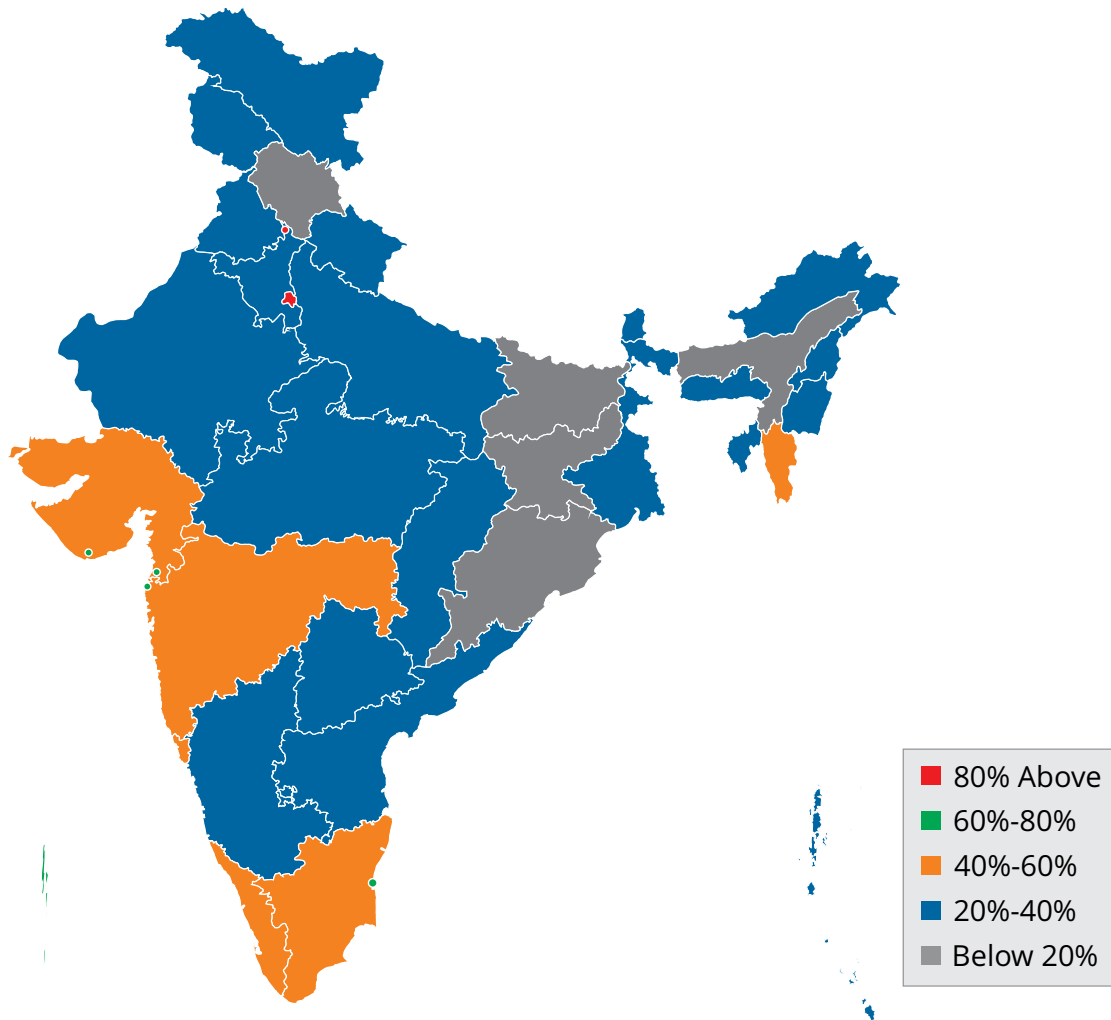
areas. The urban sociological landscape comprises of people from wide economic spectrum-privileged to the underprivileged, along with the middle and lower middle-class strata, engaged in various economic activities driving the city’s economy. As per National Institute of Urban Affairs, around two thirds of India’s economic output is located in its urban centres. These urban cities will create ~70 percent of net new jobs between now and 2030⁸. With increasing population densities and changing employment patterns, rural settlements adjacent to larger cities are now being categorized as ‘urban area’ as per the criteria adopted by India’s census office.

Number of Urban Centres in India

Type of Towns	2001	2011	Addition
Statutory Towns	3799	4041	242
Census Towns	1362	3892	2530
Urban Agglomerations	384	474	90
Outgrowths	962	981	19
Metropolitan Cities	35	52	17

Source: NILIA-SHLC. *Making Cities Work-Policies and Programmes in India, 2019*

Urbanization in India 2011: State Wise Pattern



Source: Census 2011
Map not to scale

Further, urban India significantly contributes to the socio-economic indicators and therefore, to meet India's aspirations as a nation, it is imperative to improve the quality of living for India's urban dwellers as well as enhance their access to better living conditions. Globally, cities have grown organically without adequate prior planning and one of the challenges faced by India's urban administration is to retrofit features such as water supply & sanitation, sustainable transportation systems, power grids onto layouts and patterns that have often grown in an unplanned manner in the past.

1.1. India's Urban renewal Program

The pace of urbanization in India started to accelerate after the liberalization of the economy.

As per the estimates in 2010, 300 million Indians were living in towns and cities, underserved by utilities, with inadequate housing, and burgeoning traffic. It is estimated that in next 25 years, another 300-400 million people will be added to Indian towns and cities⁹. If such a large scale influx of people are not managed well then the inevitable increase in India's urban population will place enormous stress on the existing system.

The Eleventh Plan noted that the contribution of the urban sector to India's GDP, which grew from 29 per cent in 1950-51 to the present 62-63 per cent is expected to increase to 70-75 per cent by 2030. It is envisioned that Indian cities will be the engines of economic growth over the next two decades and the realization of an ambitious goal of 9-10 per cent growth in GDP depends



fundamentally on making Indian cities more habitable, inclusive, bankable, and competitive⁹.

Government support to make cities habitable

The Eleventh Five Year Plan included several schemes to promote an orderly and sustainable process of urbanization, which could support growth and inclusive development in urban areas. In 2005, Government of India launched Jawaharlal Nehru National Urban Renewal Mission (JNNURM) to improve urban infrastructure and tackle future

population rise in the urban region for selected cities with population more than 1 million.

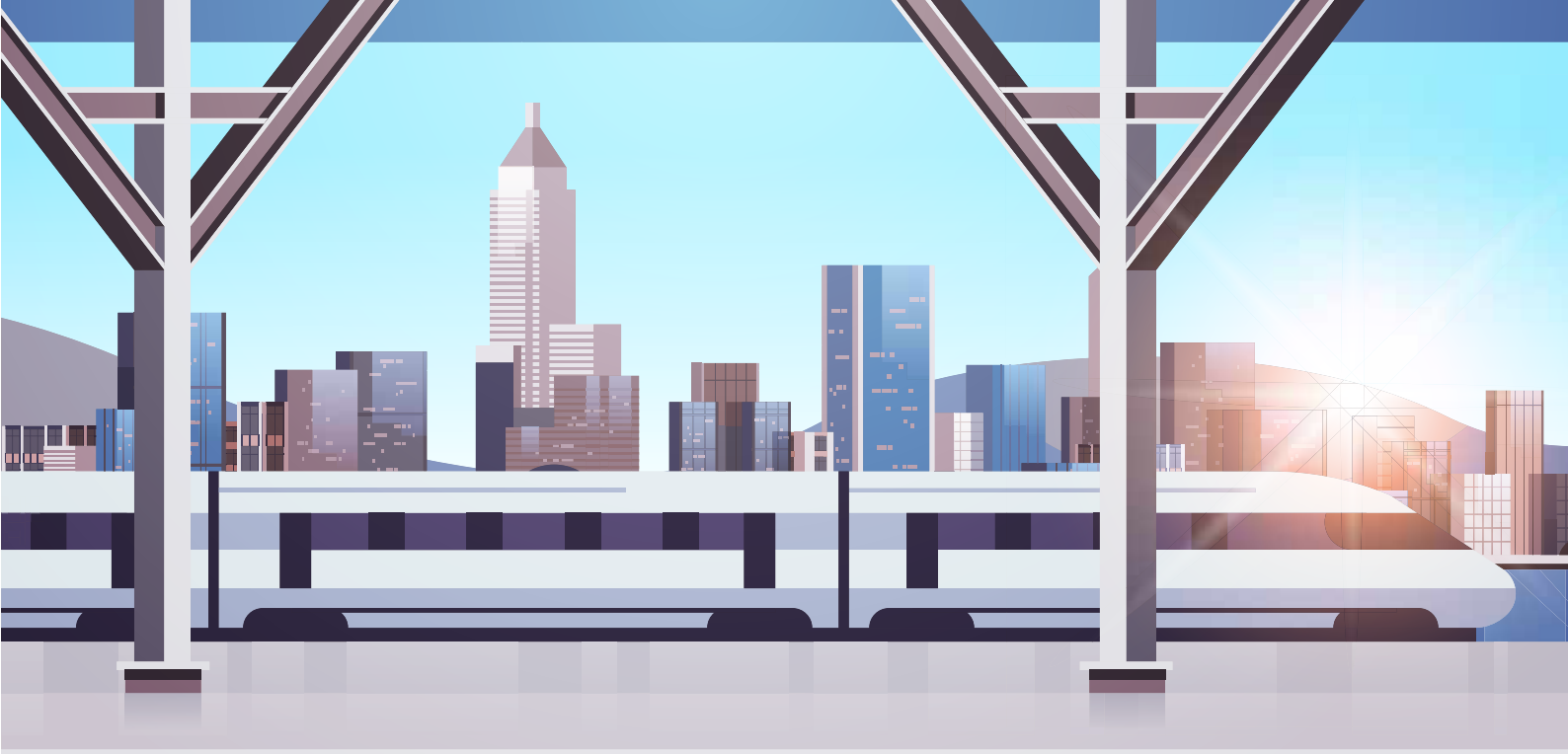
In 2015, Government of India launched 2 programs for the improvement of urban infrastructure – Atal Mission for Rejuvenation and Urban Transformation (AMRUT) & SMART Cities Mission. AMRUT program is being implemented in cities identified based on a selection criterion, where as SMART Cities Mission is being implemented in cities selected through a competition.

Central Government Urban Renewal Program

	JNNURM	AMRUT	Smart City
Program	City Renewal scheme launched in 2005	Successor to JNNURM for the creation of infrastructure that has a direct link to the provision of better services to citizens	To promote cities that provide core infrastructure, sustainable environment, good quality of life through implementation of Smart solutions.
Mode of Implementation	<ul style="list-style-type: none"> ✓ Centrally Sponsored Scheme with varying contribution from State Governments ✓ 63 cities were identified. Highly populated and state capitals 	<ul style="list-style-type: none"> ✓ Centrally Sponsored Scheme ✓ 500 Cities filtered based on various criteria of population, capital cities, heritage cities, cities from hill states/islands/tourist destinations 	<ul style="list-style-type: none"> ✓ Centrally Sponsored Scheme with equal contribution from state government ✓ 100 Cities selected through 'City Challenge' competition mode.
Objectives	To improve the quality of life and infrastructure through integrated development of infrastructure services, dispersed urbanization, urban renewal with physical and social intervention	Providing basic civic amenities like water supply, sewerage, urban mobility, parks to improve the quality of life for all	To drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology that leads to smart outcomes
Strategies	<ul style="list-style-type: none"> ✓ Preparing city development plan ✓ Preparing Projects ✓ Release & leveraging funds ✓ Incorporating private sector efficiencies 	<ul style="list-style-type: none"> ✓ Urban reforms ✓ Capacity building ✓ Project monitoring ✓ Complete all projects 	<ul style="list-style-type: none"> ✓ Pan city Initiative ✓ Smart solutions ✓ Area based Development ✓ Retrofitting ✓ Redevelopment & Greenfield Areas

	JNNURM	AMRUT	Smart City
Focus Areas	<ul style="list-style-type: none"> ✓ Reform linked planning & infrastructure development ✓ Planning for peri-urban areas, outgrowths & urban corridors ✓ Focus on liveability & social security ✓ Focus on capacity building 	<ul style="list-style-type: none"> ✓ Financial incentives to reforms ✓ Work order only after all clearances are obtained ✓ Scope of increasing fund outreach by linking with other schemes 	<ul style="list-style-type: none"> ✓ Define city specific smart measures ✓ Focus on citizen participation ✓ Development of new urban financing concepts ✓ Adoption of smart solutions for infrastructure development
Coverage	<ul style="list-style-type: none"> ✓ Cities with 1 million+ population as per 2001 census ✓ State capitals and other cities of religious/historic and tourist importance 	<ul style="list-style-type: none"> ✓ All cities & towns with 1 Lakh+ population ✓ All capital cities/town of states/UTs ✓ All cities/towns classified as Heritage city under HRIDAY scheme ✓ 10 cities from hill states, islands and tourist destinations 	<ul style="list-style-type: none"> ✓ Cities which cleared two stage selection process





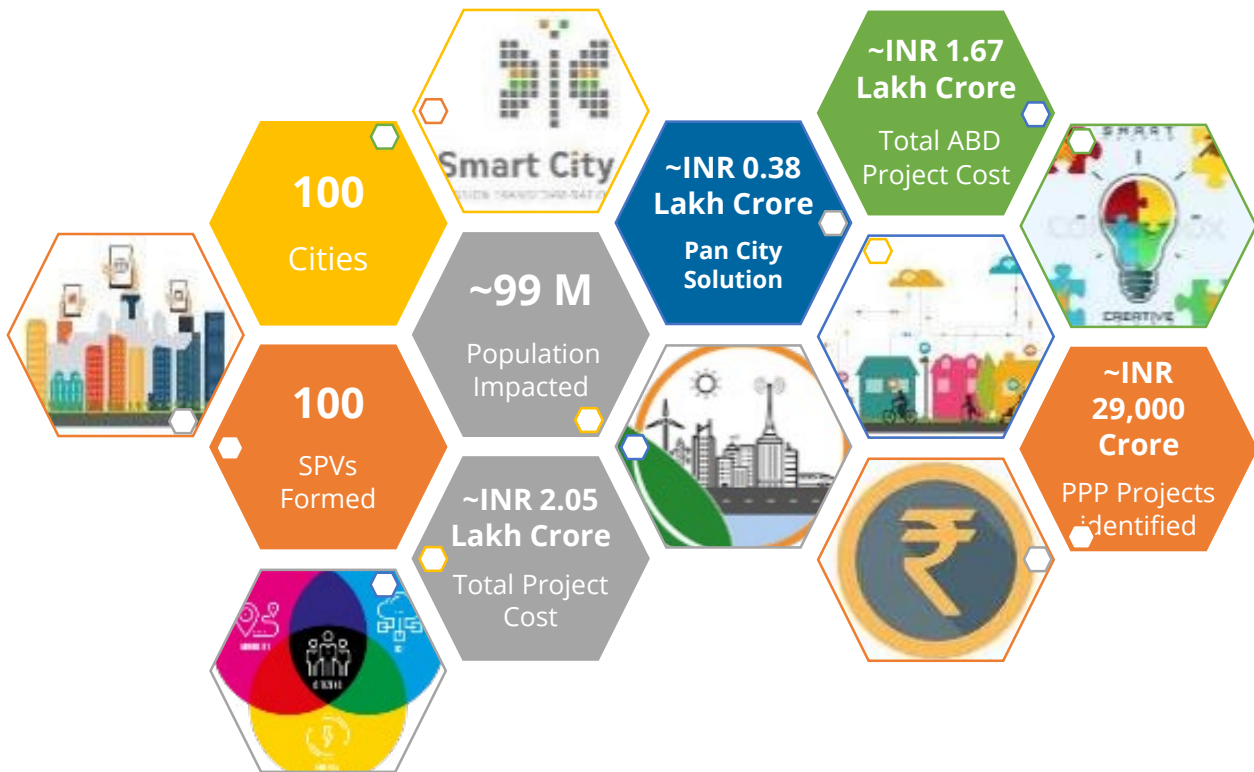
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SMART CITY MISSION: MODERNIZING CITY ADMINISTRATION & CIVIC DELIVERY LANDSCAPE

As India is at an inflection point of rising urban population, developing globally competitive cities is critical to the country's economic growth & development. Government of India's Smart City Mission, under the aegis of Ministry of Urban Development, envisaged inclusive development of cities by promoting creation and augmentation of core infrastructure elements and robust IT connectivity and digitalization.



Smart Cities Mission - Highlights



Source: Smart Cities Mission

2.1. SMART Cities Mission: Mission for Urban Transformation

Smart Cities Mission was launched to transform urban in India that incorporate information and communication technologies to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs. The overarching aim of a mission is to enhance the quality of living for its citizens through smart technology.

To implement the smart cities program, the Government convened a national competition wherein a standard template was circulated among these cities to encourage them to submit Smart City Proposals (SCPs). SCPs of these cities were then appraised according to the parameters set for

these processes, the extent of citizen participation, and the smartness and cost-effectiveness of the solution proposed.

In the five rounds of selection 100 cities were chosen by a committee of experts. Proposals consisted of existing service levels, institutional capacities, past track records. Under the mission, the Government of India provides ₹500 Cr. over a period of five years and respective state government also provides ₹500 Cr¹⁰.

The range of budgets for the top 99 cities vary between a little over INR 500 Crore (Kavarati, Lakshwadeep) to almost INR 6000 Crore (Chandigarh).

Classification of 100 selected Smart Cities

9 Cities	44 Cities	17 Cities	20 Cities	10 Cities
4 million and more Population	1 – 4 million Population	Population Less than 1 million	0.5 – 1 million Population	Cities of religious importance

Source: www.mohua.gov.in

Smart cities mission guidelines required each city to identify two strategic components for smart city development:

a) Area-based Development (ABD):

Under ABD, cities have proposed projects related to redeveloping neighborhoods, city centres or business districts; creating public spaces; and, retrofitting infrastructure, such as for sanitation and water supply.

Classification of ABD projects

INR 1.134 Lakh Crore	INR 0.105 Lakh Crore	INR 0.43Lakh Crore
Retrofitting Projects	Redevelopment Projects	Greenfield Projects

Source: MOHUA

b) Pan-city Development:

Pan-city development initiatives include application of the selected smart solution(s) to the existing city-

wide infrastructure. Application of smart solutions involve the use of technology, information and data to make infrastructure and services better. Smart cities mission guidelines provided a set of 24 smart city features and suggestive smart solutions that each city is supposed to implement.

Smart Cities Mission focused primarily on 'Area Based Development' where the mission incentivized cities to focus the bulk of their funding on a small portion of the city. This allows city administration to create identity-based development that reinvigorate redevelopment of the city centre.

2.2. SMART Cities Journey So Far: Transforming Urban Development

Smart cities were selected in 4 rounds over period 2016-2018. Considering city selection at different timelines, on an average the Mission has completed 4 years of implementation.

Smart Cities Challenge Round	No. of Smart Cities Selected	Proposed Investment (INR Cr)	Implementation Timelines								
			FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	
Round 1	20	48,064	26-Jan-16								
Fast Track	13	29,795 .		23-May-17							
Round 2	27	53,903		20-Sep-17							
Round 3	30	57,393			23-Jan-17						
Round 4	10	13,862			18-Jan-18						

Source: Smart Cities Mission

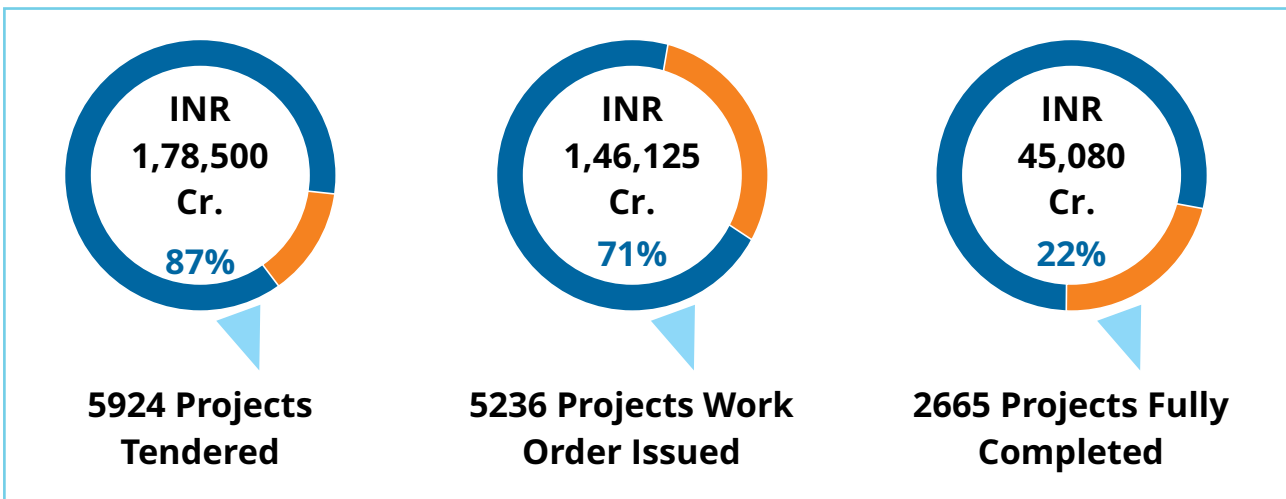
Special Purpose Vehicle (SPVs) to drive the implementation

Implementation of the mission is done by a Special Purpose Vehicle (SPV) set up at city level under the Companies' Act, 2013 and promoted by the State/ UT and the Urban Local Body (ULB) jointly with 50:50 equity shareholding. Over the last 6 years, all selected smart cities have started implementation of projects with the help of selected Project Management Consultants (PMCs).

Financial Progress:

Since the launch of the Mission, 5,151 projects worth more than ₹2 lakh crores are at various stages of implementation in the 100 cities. Of the total proposed projects, 5,924 projects (115% by number) worth ₹1,78,500 crore (87% by value) have been tendered so far, work orders have been issued for 5,236 projects (101% by number) worth ₹1,46,125 crore (71% by value). 2,665 projects (52% by number) worth ₹45,080 crore (22% by value) have also been fully completed and are operational (as on 23 June 2021)².

Status of Project Progress Under Smart Cities Mission (% Of Total Project Cost)



Source: Ministry of Housing & Urban Affairs (MOHUA), As on June 23, 2021

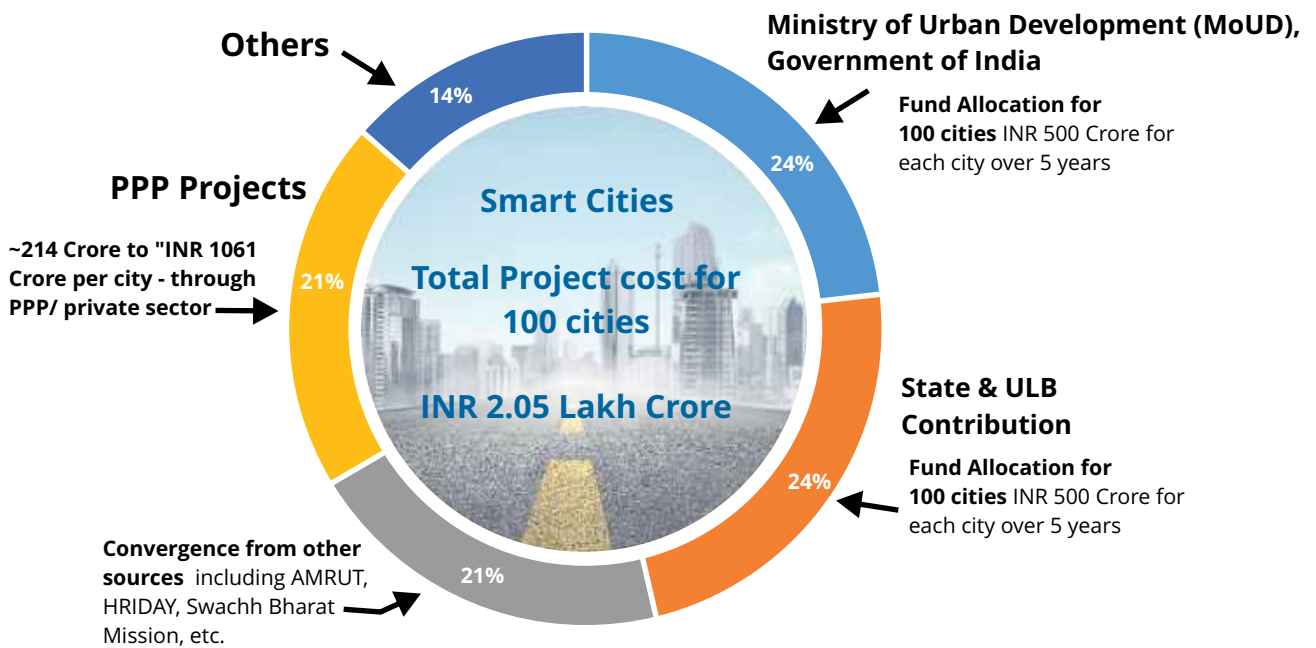
Emphasis on Private Sector Partnership

Smart Cities Mission provisions a sum of INR 1,000 crore (contributed by the Government of India as well as the State Government/ UT Administration on a 50:50 basis). In the case of shortfall of funds, it was expected that Smart Cities would resort to one or more of the following options: funds from other allied schemes, borrowings, Public Private Partnerships (PPP)¹⁰.



Funding Model for SMART CITIES

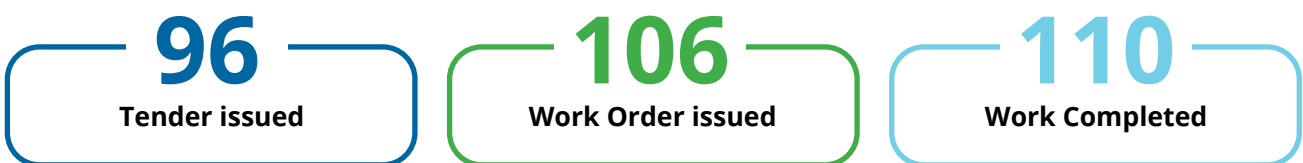
Classification of 100 selected Smart Cities



Source: MOHUA

Public sector participation in infrastructure development plays an important role, particularly in the development of Smart Cities which requires large funds for undertaking urban transformation. Private sector partnership can play an important role in operation of assets. This brings efficiency in operation and improves service delivery. In last 6 years of Smart Cities Mission, various projects were

identified for the development under PPP model. 212 PPP projects worth INR 24,964 crore have been completed. These projects are located across 57 cities. These projects belong to various sectors including water supply, solid waste management, urban transportation, energy management, social infrastructure delivery, municipal service delivery etc¹¹.



Source: MOHUA, As on December 31, 2020

a. Smart Cities Mission 1.0

The Smart Cities Mission 1.0, now in its final lap, has leveraged data and information to underline new learnings that can be replicated both within and outside the smart city. This will benefit similar smart cities across the country. When COVID-19 affected the entire world, causing widespread disruption in economies and healthcare services, India was no exception. The cities with wider adoption of smart technologies were able to better respond to civic challenges posed due to COVID.

Many of the Indian smart cities used the Integrated Command and Control Centre (ICCC) as Covid-19 War Rooms to plan and manage their pandemic response strategies. The mission has seen major upturn in the fund utilization during the post lockdown period, showcasing active interest in faster adoption of smart city solutions.

To further strengthen the urban centres, the Central Government launched the National Urban



Digital Mission (NUDM), with an aim to create a digital infrastructure for the Indian cities. The mission aims to compliment Government of India's flagship programs and is a step forward to institutionalize a citizen-centric approach to urban governance and service delivery in cities by the year 2022, and across all the towns and cities of the country by 2024. Also, to better connect with people on the Smart Cities Mission and to make it easier for Urban Local Bodies (ULBs) and citizens to access resources related to their work, the Smart Cities Mission website 2.0 was launched to serve as a single stop for all initiatives.

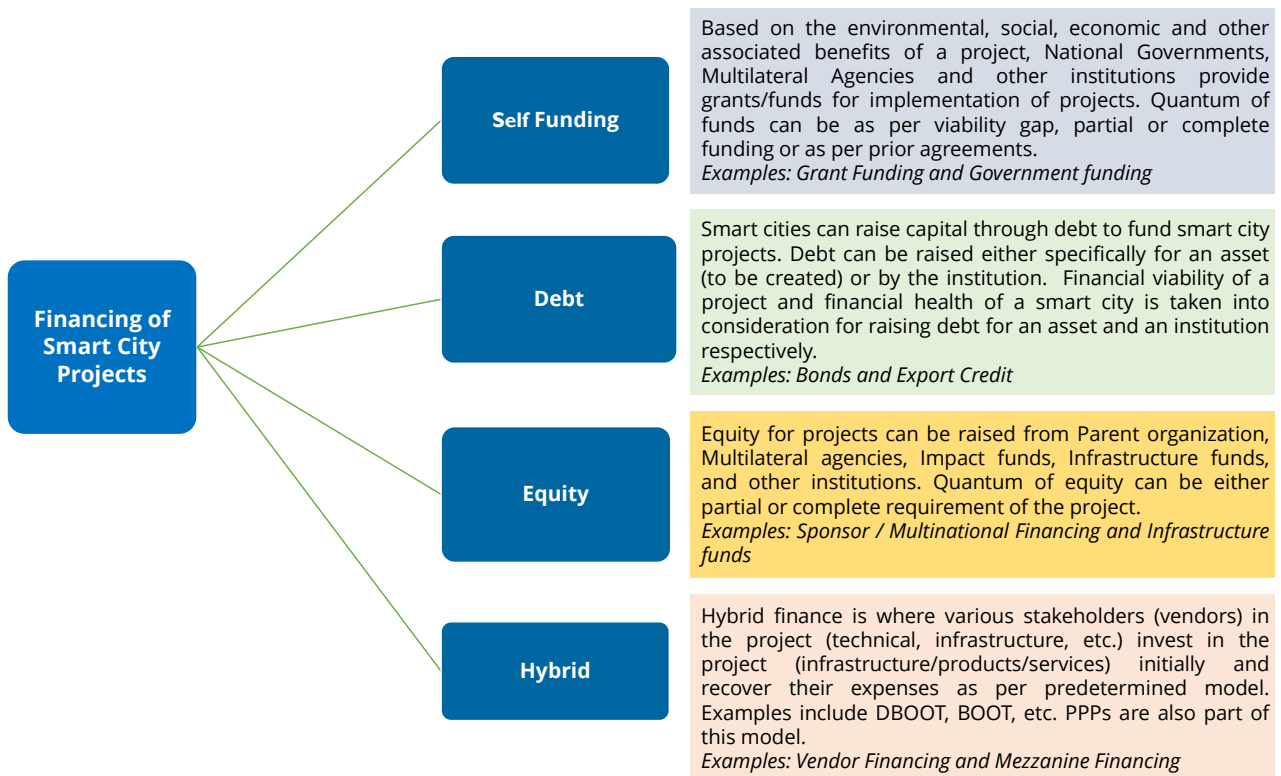
b. Model to implement various projects in SMART Cities

To meet the objectives of the smart cities, it is imperative for the Smart City Corporations to undertake developmental projects and services in accordance with the objectives. These developmental projects can be implemented through various models from fully funded projects by smart city corporation to Public-Private

Partnership (PPP) projects. As these projects are capital intensive and time consuming, the risk of execution of these projects is significant. Some of popular implementation models in PPP¹² are Management contract (private partner shares minimal risks with public sector), lease contract (private partner take operating and collection risks) and BoT contracts (private partners take investment and financing risks), among other. While PPP projects in India have seen less success, these projects run by private partners will give an opportunity for private sector to innovate in type of financing such as Hybrid Annuity Models (HAM) and Viability Gap Funding (VGF) where execution risk and time to implement the project are dealt separately to add viability to the project depending on project size and scale.

An important step after procurement is arranging finances for the project. The type of financing activities also depends on the type of procurement process employed by the smart city. The following figure illustrates, key financing options available for smart cities.

Types of financing models Smart Cities employ



Source: Deloitte

c. “Value Capture” a key component of Smart city projects

Smart City Corporations after building an asset for its citizens, need to capture value from the asset (public infrastructure or service project) which it created. The value capture mechanism is currently utilized in ICT service projects. The further sections of the report will detail out key projects such as

ICT services and urban connectivity implemented in various smart cities. The later part of the report will elaborate on “Value Capture” mechanism employed by smart city and innovative financing mechanisms smart city may employ.





3

KEY GOVERNMENTAL PROJECTS EXECUTED BY SMART CITIES

Smart cities have majorly executed projects in improving the operational efficiency through ICT services and Urban connectivity projects.

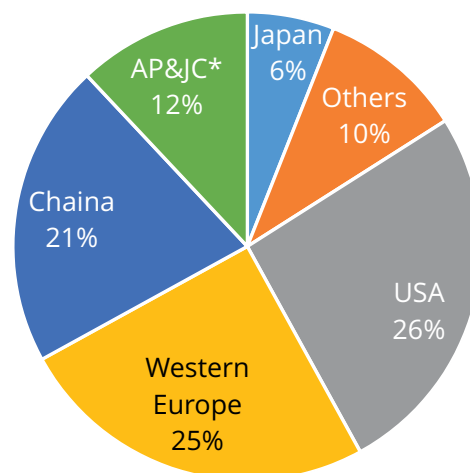
3.1 ICT Services

In the last few decades, urban cities have witnessed several changes in urban planning owing to the technological advancement in the form of **Information and Communication Technology (ICT)**. ICT services help urban administrators and planners to improve the quality of life and create liveable communities while promoting planned development.

Globally, the total spend on technologies in smart cities is estimated to be USD 124 billion in 2020, a rise in 18.9% over 2019. Resilient energy and infrastructure (driven mainly by smart grids) represent the top spent in terms of use cases contributing to 33%, followed by data-driven public safety and intelligent transportation systems at 18% and 14% of overall spending respectively³. The top 100 cities investing in smart initiatives in

2019 represented around 29% of global spending and in the year 2020, Singapore, Tokyo, New York City and London remained the top four cities and are estimated to spend more than USD 1 billion in

Top Region spending on technologies in smart cities



Source: IDC Worldwide Smart Cities Spending Guide – Use Case Forecast 2021



the year. On a regional basis, the United States, Western Europe, and China will account for more than 70% of global smart cities spending throughout the forecast³.

Though the total spending on technologies could not be estimated in actual numbers, it is surveyed that 80% of civic agencies allocate less than 1% of their budgets to ICT³.

With the introduction of the Smart Cities Mission, several city administrations have adopted various

innovative solutions to address civic problems and provide ease of service delivery. Several Indian cities like Delhi, Mumbai, Chennai, Bengaluru, Hyderabad, Ahmedabad, Mangalore, Kanpur, Surat and Coimbatore have already begun deploying smart technologies for urban administration and also to improve public service and governance. ICT technologies are being implemented to seek feedback from citizens in order to improve service delivery and also to support public health and public safety in urban regions.



- 1 Cities structure digital solutions with an unprecedented volume of data points to optimize existing administration process
- 2 Citizen engagement and citizen feedback is an essential tool for improving urban service delivery and governance. City administrations are adopting Innovative methods for citizen engagement services
- 3 The public sector bodies are rapidly implementing digital transformation strategies to improve their engagement with citizens, deliver better public services, cut costs and more recently, assist them in dealing with the COVID-19 pandemic
- 4 Cities have implemented ICT based solutions to offer affordable doctor consultation, reasonable priced medicines and affordable diagnostics
- 5 With the integration of smart citizen centre services with the safety and security infrastructure, the city would ensure sustainable economic growth

3.1.1. ICT services in Urban Administration

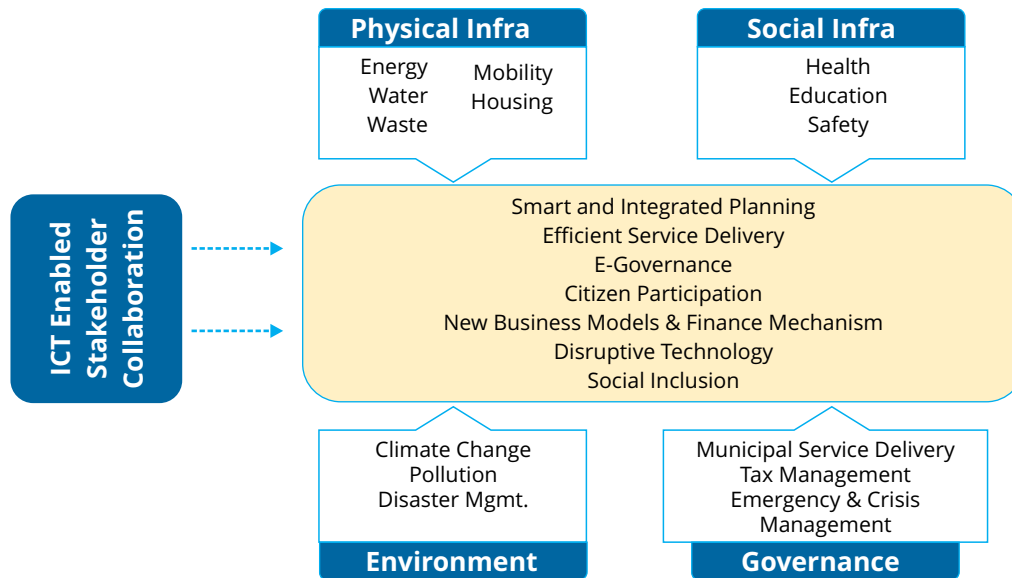
Smart Cities structure digital solutions with an unprecedented volume of data points to optimize existing administration process. We looked at key technological solutions implemented by cities for effective administration across the country.

a) Integrated Command and Control Centre (ICCC)

A Control Centre establishes an intensive framework where input from different functional

departments such as transport, water, fire, police, meteorology, e-governance, etc., can be integrated and investigated on a single platform, resulting in aggregated city-level information. Smart cities across the country have developed ICCC platforms to respond to real time events by processing exhaustive datasets.

COVID 19 pandemic has further demonstrated the true potential of ICCC as an effective tool for city management. ICCC have become strategic assets to city administrators to manage day to day operation as well as control crisis/disaster.



Source: Smart Cities Mission - Report on Safety, Environment, and Emergency Response, Exhibitions India Group, Infoholic Research, 2019

b. Usage in Smart Governance

Use of technology for facilitating and supporting enhanced decision making and planning for urban governance. It is associated with improving the service delivery and providing effective response in emergency and crisis management. Smart governance provides greater efficiency, community

leadership, mobile working and continuous improvement through innovation.

During COVID - 19 Pandemic, municipal administrations were able to react to the situation and able to handle the crisis. ICCC has played vital role in order to provide various inputs as also to support delivery of municipal services effectively.

Emergency & Crisis Management¹¹

Background

- ✓ In emergency & crisis situation, city administration finds it difficult to respond to the situation. This is mainly due to lack of real time information
- ✓ Wasting too many personnel in order to keep them on duty to get on spot information

Implementation

- ✓ Total 70 cities have developed and Integrated Command & Control System and acted as emergency war room to contain the spread of the Pandemic
- ✓ Data integration under single platform for insights facilitating decision making in crisis
- ✓ Partnership with various organizations to provide tech-based solutions. For example, Bhopal has partnered with HPE to develop ICCC COVID-19 tracking dashboard
- ✓ Key initiatives managed centrally in the ICCC includes real time patient tracking, online training centre, surveillance and dashboard, online medical consultation amongst others

Key Impact

- ✓ These initiatives have promoted transparency & accountability and increased efficiency and productivity in the public administration



c. Usage in Integrated Traffic Management System

Urban areas are complex places where mobility of passengers and freight is taking place. IoT based digital solutions can assist local administration in regulating traffic as also support in developing public transport system in a sustainable manner for achieving sustainable transit management system.

Integrated Traffic Management System integrates ICT ensuring easy commute for the people in the city. ITMS takes advantage of technologies such as the IoT and big data analytics to manage traffic and mobility, enhance transport infrastructure, and provide improved interfaces for transport services. Urban administration is improving traffic management system through various initiatives under smart city mission.

Smart Mobility – PMPML Command & Control Center¹³

Background

- ✓ The Pune Mahanagar Parivahan Mahamandal (PMPML) operates municipal transport services in the Pune Metropolitan Region. . The PMR is spread across 7,256.46 Sq Km.
- ✓ Bus operations in these regions involves planning and meticulous execution to provide effective bus services.

Implementation

- ✓ The Pune Mahanagar Parivahan Mahamandal (PMPML) Command and Control Centre is designed by NEC, Japan to provide PMPML the ability to control, monitor and maintain its bus operations and assets through a customized graphical interface. Central command control room to monitor driving quality and service
- ✓ Real-time tracking of buses by GPS
- ✓ Vehicle health monitoring system with intelligent kits and backend management system
- ✓ CCTV surveillance and panic buttons to improve security

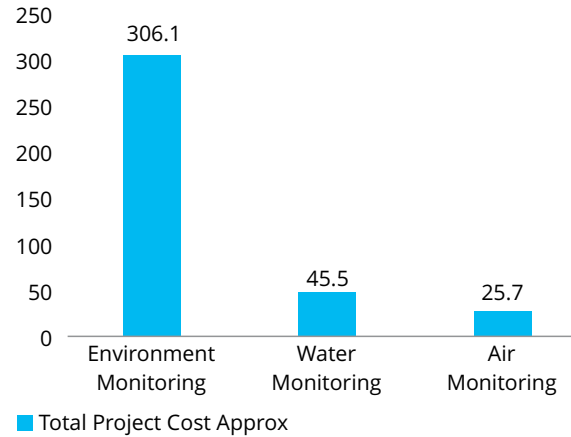
Key Impact

- ✓ Control centre enabled PMPML to achieve operational efficiency for its entire fleet of 2000+ buses across 365 routes.
- ✓ Command and Control Centre ensured faster decision making for traffic management, forecasting traffic conditions and volume.
- ✓ Intelligent asset management will optimize investments and save 10%-20% of the annual maintenance cost

d. Usage in air quality improvement

In line with global focus on improving environment, the government is focusing on clean environment projects under various programs. Improving air quality, providing clean water supply, uninterrupted power and reducing power consumption by creating awareness for energy solutions are priorities for urban administration. In improving air quality, the Government has installed 150 real-time air quality monitoring stations and 731 manual monitoring stations operational in 70 locations and the plan is to have 450 real-time air quality monitoring stations and 1,500 manual monitoring stations by 2024¹⁴.

Project for Environment Monitoring



Under Smart City mission, urban administrations have identified various projects for environment monitoring, water management, air monitoring.

Integrated Command and Control center-City Monitoring¹⁵

Background

- ✓ Clean environment is the need of the hour. Gurugram administration was facing problems of acute pollution as also no monitoring system.
- ✓ Effective administration of pollution was required as pollution was exceeding the critical level mark. A monitoring system was required that can detect high polluting regions and an effective management can bring down the pollution level.

Implementation

- ✓ The Gurugram Metropolitan Development Authority (GMDA) has partnered with Cisco to develop ICCC as the central hub and single source of information for all city operations.
- ✓ ICCC platform is linked with city backbone network that hosts CCTV and adaptive traffic management systems
- ✓ Development of IoT platform for automated security and data sharing across community infrastructure, applications and connected devices

Key Impact

- ✓ Single centralized platform for regularly air quality monitoring
- ✓ Improved traffic, public safety and waste management with AI/ML technology
- ✓ Efficient operational integration and coordination during emergency response

e. Smart Governance - GIS Based Property Assessment

Municipal revenue is largely dependent on the revenue collection from property tax to finance infrastructure projects and manage city operations. Lack of these funds can significantly impact the economic progress of the city. The potential of property tax has underutilized due to poor evaluation rates of properties and weaker

revenue collection process. Most city government face challenges to define methods for property evaluation, tracking revenue collections and record losses on exemptions. By developing a GIS based management system, the city governments can visually link all property-based data such as number of floors in each building, construction

area, locality, amongst others and thereby suggest applied tax calculation. An efficient GIS based tax assessment system has the ability to showcase information on tax payables and revenue collection. It can further trigger automatic notices

to taxpayers to clear their outstanding dues. The system can not only assist the city administrators in developing an efficient tax collection mechanism, but also reduces the need for physical visit to address issues and other assessment processes.

Surat City: GIS based Property Tax Management¹⁶	
Background	
<ul style="list-style-type: none"> ✓ Municipal revenue generation for Surat Municipal Corporation was limited and dependent on grant funds from state and central government. ✓ It is important to improve property tax collection which contributes more than 50% to municipal revenue from own sources. ✓ Effective policy regarding property tax collection and effective infrastructure development can improve revenue collection. 	
Implementation	
<ul style="list-style-type: none"> ✓ Surat Municipal Corporation has developed a Web based GIS system for better governance, improve operational efficiency and ease of interaction with citizens. ✓ Surat Municipal Corporation has awarded the project to Antrix Corporation and its partner Scanpoint Geomatics. Key features of the GIS based system are as under: ✓ Property Tax: Individual property is integrated with the property tax system. Information like owner name, property type, outstanding tax, etc are available for each property. Further the system also provides data on pending recovery after bill generation. ✓ Building Permission: Building plan approval system has been integrated with GIS application. ✓ Citizen Interface: It provides citizens access to plot search, building permission details, part-print generation, etc. 	
Key Impact	
<ul style="list-style-type: none"> ✓ The pilot project helped in identification of unassessed properties. ✓ Basis pilot project, the entire city was reassessed. The property tax recovery witnessed rise from INR 596 Cr to INR 717 Cr without increasing tax. ✓ Information for all public plots are demarcated for various purposes ✓ Citizen can check the development permissions, legality and ownership prior to purchasing property 	

3.1.2. Citizen Engagement Services¹⁷

With the launch of Smart Cities Mission in 2015, the mission has always focused on citizen centricity. During the selection process of Smart Cities, feedback and ideas were taken from the citizens towards defining the vision and plan for each city through focused engagement and interaction. This also ensured their proactive participation and cooperation for implementation.

The COVID-19 pandemic has compelled civic bodies to consider alternate methods to provide

essential services to its citizens. Applications like 'Citizen Mobile' has helped in reaching the doorstep of citizens without stepping out-of-home, where the citizens' requirements were centrally managed through the Smart City ICCC platform. The field level officers were provided with a workforce mobile app equipped with an automated communication platform to mobilize civic staff as and where required, thus optimizing the workforce on the field and reducing their exposure risk.

Agra Smart City: Smart Feedback Technology for Citizens Interaction¹⁸

Background

- ✓ COVID-19 Pandemic has changed peoples lives forever. Lockdowns and staying at home also impacted medical local medical services.
- ✓ Citizens were clueless about symptoms and effective medication of COVID-19 which resulted in confusion amongst citizens.
- ✓ Effective communication channel required through which citizens can consult with medical staff and clarify their doubts.

Implementation

- ✓ **Agra Smart City** in partnership with Gaia, a SaaS company has launched a tele-video consultation service that encourage citizen participation with the city administration.
- ✓ During COVID-19 crisis, Gaia has built a platform using Microsoft's cloud computing service Azure that enables citizens to provide information on real time basis about their health risk and help city administration track responses by pin code locations to take preventive action
- ✓ This data that the citizens feed about their symptoms, travel and contact history is stored in Azure, which then provides a real-time report about the daily situation as well as trends observed in the city.

Key Impact

- ✓ The platform also allowed citizens make appointment with medical professional and get online prescriptions downloaded.
- ✓ Agra Smart City was able to contain spread of COVID-19 pandemic and experts panel also appreciated efforts of Agra Smart City and this effective system.

3.1.3. Public Service & Governance

Public sector bodies are rapidly implementing digital transformation strategies to improve their engagement with citizens, deliver better public services, cut costs and more recently, assist them in dealing with the COVID-19 pandemic. By adopting best practices, digital transformation strategies offer enormous opportunities to improve efficiency, overhaul ageing legacy IT infrastructures, and even explore new models to best serve the needs of citizens in an increasingly online world . The four basic models with regards to ICT-enabled governance can be summarized as follows:

a. G2G (Government-to-Government)

G2G is the electronic sharing of data between / among the government and the goal of G2G is to support e-government initiatives by improving communication, data access and data sharing, thereby reducing IT costs. This helps the government offices to be more efficient and streamline procedures, allowing citizens to access information over the Internet.



G2G- Lakshadweep Administration – Promoting Transparency and Accountability^{19,20,21}

Background

- ✓ The administration of Lakshadweep, the group of 36 islands with nearly one lakh population was facing issues with delays and pendency in the government departments. thus resulting in delay in service
- ✓ This was resulting in delayed execution of projects and services

Implementation

- ✓ The administration has implemented G2G projects like EverAlert, Electricity inventory management system.
- ✓ **eOffice:** Implemented in 14 departments in Kavaratti, the capital of the UT has witnessed paperless office where the heads of department and higher officials can work on files even if they are outside the office or Lakhadweep
- ✓ **eTender-GepNIC** - Vendors / contractors are registered and can participate from any part of the world at any time. Digital signatures were used by departments and vendors for signing
- ✓ **EverAlert** - An online application system designed, developed and maintained by the Department of Medical and Health Services to facilitate the process of indent, procurement and monitoring of availability of medicines in the hospitals, community health centers and primary health centers in UT

Key Impact

- ✓ These initiatives have promoted transparency & accountability and increased efficiency and productivity in the public administration. Implementation of eTender-GepNIC of 665 tenders worth Rs 205 Cr in the year 2018-19.
- ✓ Implementation of eTender-GepNIC of 665 tenders worth Rs 205 Cr in the year 2018-19.

b. G2C (Government-to-Citizen)

Government to citizen services refer to interactions between Government and its citizens in order to offer support for services like land searches,

vehicle ownership searches, license application etc. Streamling these services is essential component of smart city mission.

Tamil Nadu E-Government Portal for Services to Citizen Online²²

Background

- ✓ Citizen of Tamil Nadu were facing challenges in availing the services from the government offices where they must follow up from department to department.
- ✓ This has become complex, tedious and time consuming.

Implementation

- ✓ In this regard, Tamil Nadu Government has launched online service centers called e-Sevai centers with an aim to provide ease of services in urban centres and even in the remotest of villages.
- ✓ TN e-Sevai implemented by the Tamil Nadu e-Government Agencies (TNeGA) was launched with the objective of providing unified access to e-Services of different Government Departments on a common platform across the State.
- ✓ e-Sevai centres are run by agencies like Primary Agricultural Co-operative Societies (PACCS), Village Poverty Reduction Committee (VPRC), Tamil Nadu Arasu Cable TV Corporation Ltd (TACTV), International Fund for Agriculture Development (IFAD) and Village Level Entrepreneurs (VLEs).

Key Impact

- ✓ Currently TN e-Sevai are offering 150 government services including certificates for birth, death, nativity, residence, community, migration, caste, family, property tax and others.
- ✓ TN e-Sevai manages to set up 12,000 e-Sevai centres with 13000 counters spread all over the State processing more than 10 million individual service requests each year.

Payment from Citizen to Local Government Common Payment Card System – Bhubaneswar²³

Background

- ✓ Bhubaneswar is the largest city in Odisha and is a center of economic and religious importance in Eastern India.
- ✓ The World Bank ranked Bhubaneswar as the best place to do business in India during 2014
- ✓ To coincide with trend and to avail the benefits of cashless economic transactions, Bhubaneswar is aspiring to shift towards digital payment systems

Implementation

- ✓ Bhubaneswar is taking up a Common Payment Card System (CPCS) for the city
- ✓ This system intends to provide a safe digital mode of economic transactions to the citizen and reducing their dependence on cash for transactions
- ✓ The intervention for CPCS will include developing, commissioning, operating and maintaining a digital payment eco-system through smart cards, mobile wallets, etc. for the city

Key Impact

- ✓ 325 PoS (Point of Sale) machines to be maintained at a grid of 500 meter in the city.
- ✓ This system is expected to provide an ecosystem in the city for digital payment of government fees & taxes, utility bills, transit charges, parking and other services charges.



Mastercard – Building a Sustainable Payment Ecosystem²⁴

Mastercard, a global payment technology company, through its collaborative and connected approach to urban development has successfully worked with 150 global cities for building a sustainable payment ecosystem towards government's smart city initiative.

Mastercard is focused on making cities more connected, efficient & inclusive by enabling payments, insights and partnerships that benefit residents, visitors and local businesses.



Advancing Efficient Mobility: Connecting People & Places

- ✓ Mastercard is working with 100+ cities around the world including London, New York, Singapore, Sydney and Mexico City to enable contactless and mobile payments for the cities' transit systems.
- ✓ As the trend toward mobility as a service continues, our vision is that a single mode of payment lets people get from A to B in the easiest possible way, regardless of the mode of transport, public, private or shared.

Advancing Inclusive Communities: Building a Digital Identity

- ✓ By enabling wages and social benefits to be paid out electronically, cities allow citizens to build up a financial identity. National ID and other multi-function cards are powerful ways to combine receiving and making payments for citizens with and without bank accounts with an ID for access to transit, education and other public services.
- ✓ Mastercard has partnered with over 60 governments globally to deliver more than 1,600 scalable cashless programs in various cities and communities around the world. In the Middle East and Africa, we have joined forces with public institutions on solutions that link a government identity with payments and enable people to become financially included on a massive scale.

Advancing Connected Commerce: Empowering Entrepreneurship

- ✓ Mastercard is helping to expand the acceptance of electronic payments for small and micro businesses. It had set a global goal to enable and grow 40 million small merchants and micro-entrepreneurs until 2020.
- ✓ Masterpass QR, available in eight countries in Africa and Asia, is a new electronic payment option that lets customers pay for goods and services from their mobile phones by scanning a QR code displayed at a store's checkout.

Advancing Smart City Planning: Harnessing Data for Development

- ✓ Once payments in urban environments are digitized, data insights help city governments understand and connect with their citizens better.
- ✓ Mastercard is working with tourism boards across different geographies to analyze inbound tourism spend behavior and to facilitate more targeted Marketing campaigns leveraging the Priceless Cities platforms.

3.1.4. Public Health

India is currently experiencing an epidemiological transition, with continued vector borne communicable diseases, ageing population coupled with non-communicable diseases like – cancer, diabetes and heart diseases and nutritional disorders. The health policy makers have

identified this phenomenon as 'double burden of diseases'. However, it has been observed that the disease burden in cities differs when compared to rural regions and is continuing to change. Pathologies such as cholera, TB, dengue, H1N1 are still prevalent in urban India which has been compounded by diseases related to



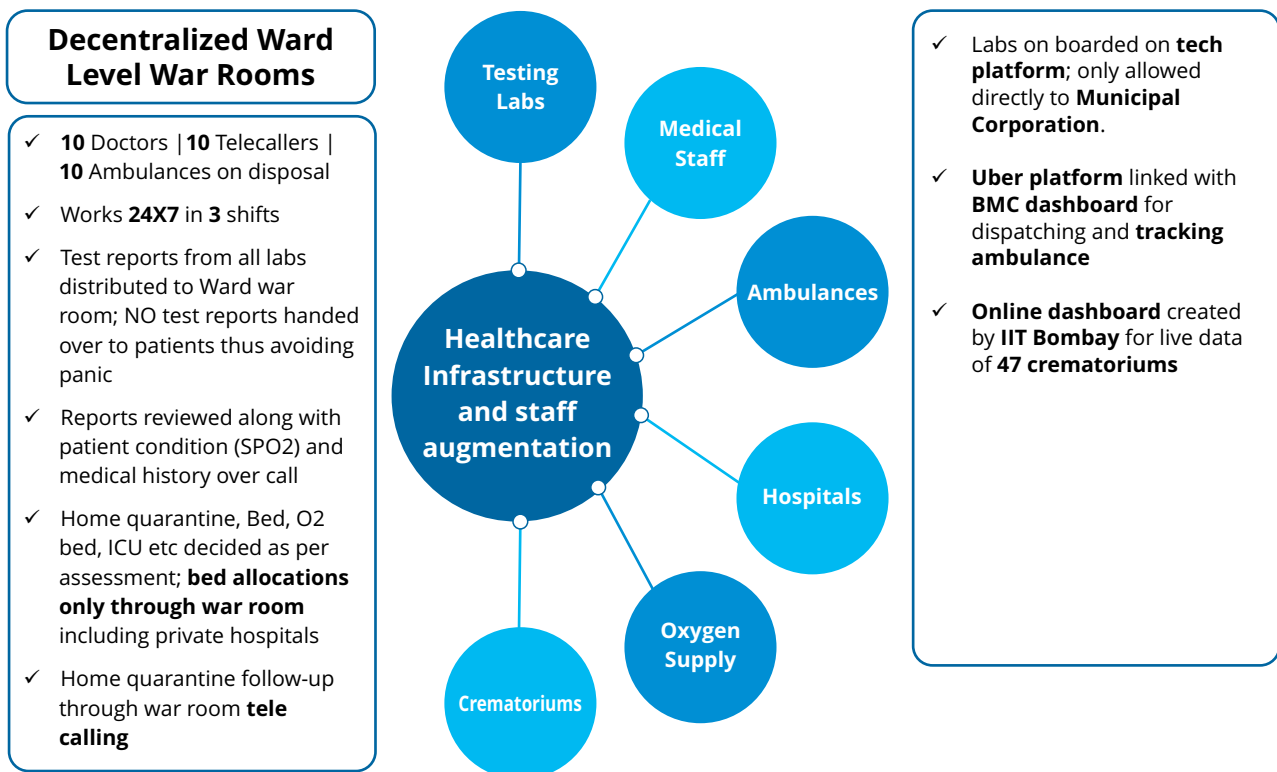
exposure pollutants in air, water and food. The novel coronavirus have also added to the diseases burden, especially because of their spread in megacities, resulting from inter-city travel or rural-urban and urban-urban migration.

In this regard, the Smart Cities Mission plays a pivotal role in providing a sustainable urban environment for its citizens through application of 'smart solutions'. The selected smart cities are advised to implement smart health strategies within their respective geographies. During the span of five years, various cities have implemented ICT based solutions which offer affordable doctor consultations, better accessibility and low-cost

diagnostics. Additionally, in order to improve health, data governance and management, certain cities have digitized health records using smart health cards and implemented advanced data analytics software. During the surge of COVID 19 cases, 45 smart cities transformed their Integrated Command and Control Centre into COVID war rooms. These hi-tech installations became the nerve centre for operations to contain the spread of the COVID-19 pandemic. They coordinated among multiple agencies, monitored quarantine facilities, track health of patients, ensured social distancing through drones and pushed awareness messages through the helplines.

Agile models adopted by City Governments for COVID management

Organized information flow – Mumbai City Model



Source: Articles in media- DNA, Times of India, Hindustan Times, Mint

The COVID-19 pandemic has brought a paradigm shift in the way healthcare sector was perceived. Along with the medical infrastructure, medical service delivery has been considered critical and particularly in second wave, technological intervention for service delivery played an important role. The Mumbai model was widely recognized and appreciated for successfully containing ill effects of the Pandemic.

Smart cities have started undertaking technological support to improve public healthcare system and service delivery. This includes use of electronic medium to connect to doctors and health workers and also for developing e-consultation facilities in the city area. Data management for medical records is another important area that requires attention and smart city programs can also play an important role in medical data creation and management of the available data.

Agra Smart City-e-Doctor Seva^{25,26}

Background

- ✓ Medical services during lockdown was a problem. There was lack of information available on the disease as also various misconceptions were running around.
- ✓ It was important to create a system for through which right information can be successfully provided as also create medical delivery service that can be expanded immediately

Implementation

- ✓ The project has been implemented by Agra Smart City in collaboration with its PPP partner Azael Manufacturing. Key features of the project include:
 - Web/Mobile app-based appointment of doctors
 - Tele/Video consultation with doctor
 - Patients can upload test reports and download prescription from website/app. Home delivery of prescribed medicines on request from the Smart Health Centre-Pharmacy

Key Impact

- ✓ Effective diagnosis of non-critical ailments from remote location
- ✓ The initiative witnessed consultation of ~100-130 patients daily per center in 2 operational centers

Kochi E-Health Solution²⁷

Background

Kochin Smart Mission Ltd adopted e-Health solution. The key objective of this project is to optimize inventory management and ensure timely availability of medicines, equipment and hospital beds

Implementation

- ✓ The project has been developed and implemented by Kerala State Health Department (KSHD).
- ✓ This is a cloud-based e-health solution which rely on high-speed multi-protocol label switching (MPLS) connectivity as every transaction is stored in cloud-based State Date Centre.
- ✓ PMU for e-Health at State level is responsible for the operation of this project.

Key Impact

- ✓ The solution integrates all departments and government hospitals into an efficient hospital information and management system.
- ✓ It has lowered the cost of operations as the doctor able perform lot their functions digitally.

3.3 Public Safety and Security

City security and safety is pivotal for overall development. High crime rate is an impediment to a country's growth and development. Crime fuels vicious cycles resulting unemployment and economic downturns. Thus, a smart city must

prioritize initiatives towards ensuring safety and security of its citizens. With the integration of smart citizen centric services with robust safety and security infrastructure, the city would ensure sustainable economic growth. Key safety and

security solutions implemented in smart cities are highlighted in the following section.

Remote FIR centres: Kiosks/systems to help citizens lodge a First Information Report (FIR) remotely, irrespective of the location of the jurisdiction where the crime has occurred in the city. Bengaluru is the first city in the country to launch such a service for its citizens.

CCTV surveillance: IP based outdoor security cameras across the city with video surveillance data being stored and analyzed at command and control centres.

Intelligent Management Solution: It monitors and records intelligence from devices and networks which are connected and allows seamless flow of exhaustive information which further assists in prediction and analysis.

Community volunteer networks platform:
Social media platform to collaborate with local communities for safety and security issues.

Panic buttons in public places: It allows citizens to trigger police alert in an emergency.

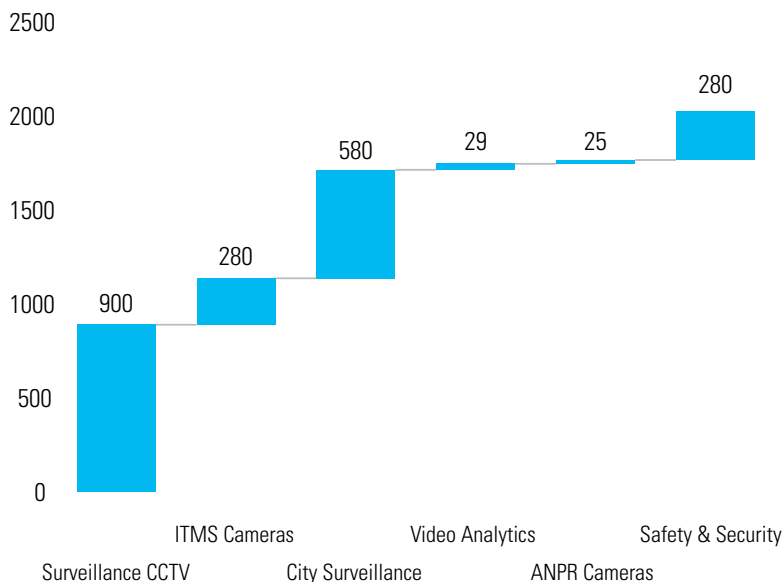
Video Analytics: Video analytics triggered by street cameras help in real time detection of potential threat. It further performs the task of real time event detection and post event analysis thereby increasing the efficiency of surveillance systems.

Integrated response and emergency services: Collaborative response platform to address emergency.

Predictive policing: Cities can analyze data generated from resources such as drones, wearable cameras, amongst others to identify hotspots for crime and accordingly deploy more police effectively. Kochi has developed Drone Surveillance. Whereas, Vellore is deploying automatic facial recognition from Criminal database and behavioral monitoring.

Crowd Management: Cities can analyze the reason for crowd formation as well as predict their movements and actions. At large gatherings like festivals, events, etc., city administrators can use a combination of crowd management technologies to improve the overall experience while ensuring attendees and safety of their citizens.

Project for Safety & Surveillance (INR Crore)



More than
₹2,100 crore has
been allocated
for city **safety**
& **surveillance**
related
activities

Source: Smart Cities Mission; Value of projects identified by various Smart Cities

Ahmedabad: City Surveillance²⁸

Background

- ✓ Under the Smart City Mission, safety and security is a key component and Ahmedabad has planned for a technology-based surveillance system to make Ahmedabad a safe city
- ✓ The intervention is aimed at implementing a holistic and integrated surveillance system across the city.
- ✓ The city planned to extend its existing network of 300+ web enabled cameras to ~7000.

Implementation

- ✓ Ahmedabad Smart city has partnered with Qognify and Dell EMC OEM for the video management solution that can accommodate thousands of additional security cameras..
- ✓ The Video Management solution has capability of video recording with centralized control. Further the solution comes with storage capacity, scalability and security.

Key Impact

- ✓ The solution has transformed the video management technology to effectively manage thousands of high definition cameras
- ✓ Supported city administrators to detect criminal activities and investigations
- ✓ Continuous monitoring of important municipal assets. Monitoring suspicious activities for protecting life and property

Hewlett Packard Enterprise – Making Dehradun City Smarter²⁹

Background

- ✓ **Hewlett Packard Enterprise (HPE)** worked under the guidance of **Dehradun Smart City Limited (DSCL)**.

Implementation

- ✓ City Administration today has a bird's eye view of entire city administration at the click of a button.
- ✓ Be it E Governance applications, traffic management operations or enhancing the safety aspects of the city, DSCL along with HPE identified technology as an enabler to fulfil the vision of Smart City in true sense.
- ✓ The various infrastructure amenities shall help the citizens in experiencing a new way of life with environmental monitoring systems keeping a check on the environment quality and helping in other public health measures.
- ✓ For the purpose of effective investigation and proactive policing, around 500 City Surveillance cameras have been set up at over 200 locations of the city to provide a bird's eye view of the city.

Key Impact

- ✓ Increased public safety and citizen confidence by leaps and bounds
- ✓ DSCL's Adaptive Traffic control system (ATCS) implemented by HPE helps the administration with improved traffic flow with the help of Light Detection and Ranging (LiDAR) remote sensing technology.
- ✓ It facilitates a green corridor for priority traffic tactile devices for differently abled citizens, online challan for red light and speed violation and vehicle category and count for city planning.
- ✓ With many other evolving unique applications of edge solutions as well as data center solutions Dehradun catapulted from a 99th rank in 2018 to a 9th rank in 2021.
- ✓ The testament of the smart city's progress is its number 1 rank among all the cities selected in round 3 of the Smart City Mission.

Honeywell – Empowering City Through Digital Platform³⁰

With more than 30 years' experience in supporting India's growth – by making commercial and industrial buildings safer, more secure, energy efficient, productive and connected – Honeywell also offers operational excellence in smart city and city surveillance projects with a broad technology solutions portfolio and global expertise.

Globally, Honeywell's smart city systems serve more than 75 cities worldwide, connect more than 100,000 IoT sensors and touch the lives of more than 90 million people. In India, Honeywell has been a strong partner to the Government's 100 Smart Cities Mission. It plays a defining role in the building of smart cities in India with a focus on people, process and technology. Honeywell has emerged as an established 'thought leader' with its dedicated team of subject matter experts who share knowledge around technology and policies. This team of experts shares best practices to better enable governments in building smart cities, which are aligned to India's demographics and ambition to provide ease of living to its citizens.

Since winning the first smart city project in Bhubaneswar in 2015, Honeywell has set up multiple city-wide surveillance systems across the country. Honeywell's IoT-enabled, city-scale command and control platform is a virtual, turnkey solution for city management with out-of-the-box intuitive applications for city-scale geographic information system-based incident management, workforce dispatch, citizen engagement and pre-integrated applications with analytics to help manage city services. Honeywell's Smart Cities IoT solution, called the Honeywell City Suite, can seamlessly aggregate information from traffic, environment, parking, emergency services, safety and security, and utilities – among other areas – in a single, unified view. Its technologies empower a city with solutions and actionable intelligence needed to be smarter, more resilient, and more sustainable, as well as help create a more productive citizen experience.

Today, Honeywell is engaged with several cities in India to make them smart and secure including Bhubaneswar, Aurangabad Industrial City - AURIC, Rajkot, Bareilly, multiple cities in Madhya Pradesh, and many more.

Honeywell continues to find ways to enhance its offerings in the Smart Cities space. Last year, it made a strategic investment in Trinity Mobility, allowing Honeywell to more fully partner with cities that are expanding their smart city deployments or integrating new systems. Trinity's capabilities complement Honeywell's technologies for smart cities and global expertise in delivering integrated solutions for mission critical systems.



3.4. Urban Connectivity

Sustainable mobility and transportation systems is integral to urban planning. The past decade saw several improvements in various modes of public transportation. Many cities have developed well-integrated bus transport and rapid transit systems such as metro and monorail. Transport networks are directed to increase urban and spatial quality, improving functioning of urban life and developing opportunities for regions served by them. Public transport networks have an outstanding role to ensure accessibility and reduction of traffic pollution and congestion, as well as provide opportunities for urban rejuvenation and revitalization.

To address the existing and future urban challenges, administration can play a major role in upgrading infrastructure and co-innovating with industry to develop solutions to connect transportation mode that supports regional connectivity.

3.2.1. Sustainable Living and Regional Connectivity – Air Connectivity

Airports are powerful agents of local economic development, attracting passenger traffic and service activities directly and indirectly linked to the airport ecosystem. Given the exponential rise in passenger traffic, airports are acting as urban microcosms and even prompting cities to develop around them.

Development of airports are interlinked to urban and regional land use, infrastructure planning and economic development. Airports attract large travelers, that improves economic activities in the city. Such improved economic activities support job creation and attract investments. Ease of connectivity improves social interactions between people and increased cooperation between cities. Such activities enable increased GDP.

Studies conducted by the Airport Council International Europe (ACI Europe) have established a correlation between development of airports and improved air connectivity with urban development. This has been elaborated in their 2015 report, which indicates that the total economic impact of European airports has been estimated about 4.1% of National GDP. Airports are becoming multi-dimensional functioning complexes, their effect on the surrounding region might be huge and considerable in different ways. Today's airports present themselves as large business and commercial magnets due to conceptual changes and reforms undertaken in recent decades. Economic activities are clustering near major airports because of the accessibility, speed, and ability of airports to provide new economy global supply chain and connecting to corporate customers nationally and internationally. The airport region provides a huge potential for cargo transport companies and manufacturers to develop a part of their business on the region in order to increase productivity and decrease the final cost of their products.

Nashik Airport – Bridging Connectivity Gap with The Smart City³¹

Background

- ✓ Nashik is connected to various parts of the State and other states by road and train. Air connectivity can provide the required impetus on its growing economic activities and provide support to its food processing industry.

Implementation

- ✓ Nashik city administration has provided bus connectivity between Nashik Airport and Nashik city center. This route will then be developed with multipurpose land use to expand city limits, which in turn improves economic activities
- ✓ Nashik is a food processing hub and largest producer of wine in India. Air connectivity assists in cargo services.

Key Impact

- ✓ Nashik Airport has received a nod from the Government of India setting up a Courier Terminal Hub.
- ✓ This is only the second courier terminal hub in Maharashtra and amongst 13 others in the Country.
- ✓ Cargo facilities were already enabled at Nashik airport



3.2.2. Railway Station Redevelopment for Urban Rejuvenation

Railway transport networks play a vital role in urban rejuvenation. The railway stations located in key cities are playing a central role by not only providing connectivity but also supporting urban

development models oriented towards public railway transport systems, which are considered more sustainable in addressing pollution and energy consumption.

Habibganj Railway Station Redevelopment – Turning the page for Urban Rejuvenation³²

Background

- ✓ Habibganj railway station to be developed to support passenger traffic at Bhopal railway station.
- ✓ Bhopal has developed in new locality with new commercial establishment were being developed near Habibganj.
- ✓ Hoshangabad Road is being developed as the commercial zone.

Implementation

- ✓ Habibganj station is the first railway station to be redeveloped through public private partnership mode under the station redevelopment program of Indian Railways.
- ✓ Total Estimated cost of works towards station redevelopment is Rs 100 Cr and estimated cost towards commercial development is approx. Rs 350. Cr. The lease for commercial development is for 45 years and license period for station O & M is for three years of construction followed by 5 years of O & M.
- ✓ Enhanced facility for passengers as well as support commercial development of land near railway station.

Key Impact

- ✓ Commercial activities are developed in proximity. 2 largest commercial malls are in 1 KM radius of Habibganj railway station.
- ✓ Support to commercial establishment through additional more than 17,000 SqMtr commercial space available for development.
- ✓ Redeveloped Habibganj station will improve its passenger handling capacity.

3.2.3. Urban Sustainable Public Transit System

Cities should respect nature, consider the urban ecological environment as an asset, integrate environmental issues into urban planning and administration, and accelerate the transition to sustainable development. They should promote the use of renewable energy sources and build low-carbon eco-cities. The most visible and frequently mentioned transport problem of a city is its deteriorating traffic congestion, and it is well known that high levels of congestion create significant impact on local and national GDP. Establishing a sustainable urban transport system requires a comprehensive and integrated

approach to policymaking and decision making, with the aim of developing affordable, economically viable, people-oriented and environment-friendly transport systems.

In India, city transport service is present in 34 million-plus cities. In 5 cities, state transport corporation operates city bus services. Mass Rapid Transport System was also developed to provide speed in city transportation and transform urban landscape. India has more than 200 KM of Metro network operating in 8 cities, under development in another 3 and more than two dozen projects are in planning stage.

Ahmedabad – Integrating Public Transport System³³

Background

- ✓ Ahmedabad has high density of personal vehicle dominated by two wheelers.
- ✓ Traffic situation is getting worse as population is increasing with increased economic development.
- ✓ City limits are expanding and decentralized development of economic activities.

Implementation

- ✓ Ahmedabad Municipal Corporation through its municipal transport system, introduced public bus service in 1948.
- ✓ AMC incorporated an SPV Janmarg Ltd. To run Bus Rapid Transport System (BRTS). Ahmedabad BRTS is the most successful BRTS in India.
- ✓ Government of Gujarat has undertaken mass rapid transport system and it is developing Metro services on 2 lines and connecting Gandhinagar with Ahmedabad through another Metro line.
- ✓ Janmarg Limited is converting its bus fleet into EV buses for which it has partnered with Ashok Leyland, TATA Motors to supply and operate EV buses on BRTS route.

Key Impact

- ✓ AMTC has more than 150 bus fleet and provides connectivity to non-connected areas.
- ✓ The appeal of the system has reached previously under-served social groups. Almost 40 per cent of commuters in the afternoon are women
- ✓ AMC is developing Last Mile Connectivity with E-Rickshaws.
- ✓ Metro rail is considered as the paradigm shift in public transportation as it shall allow Ahmedabad and Gandhinagar to be developed as Twin cities





4

VALUE CAPTURE- DATA DRIVEN GOVERNANCE & CIVIC-TECH ECOSYSTEM

To meet the challenges of unplanned urbanization, smart technologies are helping cities by enabling civic bodies deliver services efficiently and by offering a direct interface with citizens in a way that perhaps never existed before.

4.1. Data Driven Governance: National Urban Digital Mission

Rapid urbanization and its effect on the environment are interlinked. As demand for food, energy, water and land increases, unplanned urbanization poses a serious threat towards meeting the long-term Sustainable Development Goals (SDGs). The deteriorating air quality in the metro cities, the infrastructure led challenges in cities such as Gurugram & Mumbai, the gaps in service delivery among local authorities—all point to significant challenges in governance, while citizens' aspirations are growing dramatically.

To further strengthen the urban centres, the Central Government launched the National Urban Digital Mission (NUDM), with an aim to create a digital infrastructure for the Indian cities. The mission aims to complement the Government's flagship programs and is a step forward to institutionalize a citizen-centric approach to urban governance and service delivery in 2022 cities by the year 2022, and across all the towns and cities of the country by 2024³⁴.

NUDM will create a shared digital infrastructure that can consolidate and cross-leverage the various digital initiatives of the Ministry of Housing and Urban Affairs, enabling cities and towns across India to benefit from holistic and diverse forms of support, in keeping with their needs and local challenges.

NUDM is citizen-centric, ecosystem-driven, and principles-based in both design and implementation. NUDM has articulated a set of



governing principles, and inherits the technology design principles of the National Urban Innovation Stack (NUIS), whose strategy and approach were released by MoHUA in February 2019. The principles in turn give rise to standards, specifications, and certifications, across the three pillars of people, process, and platforms.

a. India Urban Data Exchange

Indian Urban Data Exchange (IUDX) is an open source software platform that facilitates secure and authenticated exchange of data amongst various data platforms, 3rd party applications, data producers and consumers, both within a city to begin with, and can be eventually scaled up across cities at a national level, in a uniform & seamless way. The platform provides full control to the data owners as to what data to share and with whom. Built-in accounting mechanisms will enable it to connect with payment gateways which will form the foundation for a data marketplace.

b. SmartCode Platform

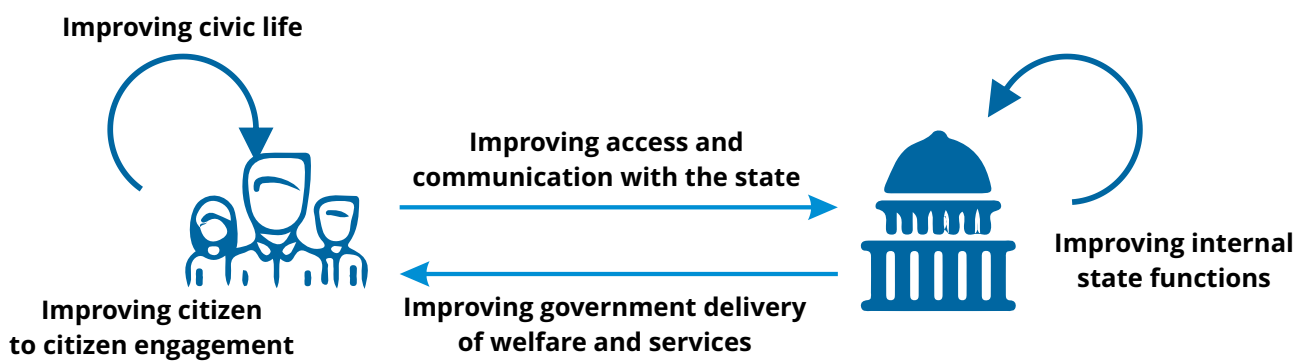
SmartCode is a platform that enables all ecosystem stakeholders to contribute to a repository of open-source code for various solutions and applications for urban governance. It is designed to address

the challenges that ULBs face in the development and deployment of digital applications to address urban challenges, by enabling cities to take advantage of existing codes and customizing them to suit local needs, rather than having to develop new solutions from scratch. As a repository of open-source software, the source code available on the platform will be free to use without any licensing or subscription fees, thus limiting costs to those involved with customizing the code and developing locally-relevant solutions.

4.2. Emergence of Civic Tech Eco-System

After a significant period of trial and error, civic authorities are realizing that smart city strategies start with people, not technology. Civic tech has emerged as a promising approach to address these issues, and today we are witnessing start-ups capitalizing on the potential of technology and data to improve governance, empower citizens, and drive social impact. According to CIIE-Village Capital and Omidyar Network report, Civic-Tech is defined as technologies empowering the citizens to engage and participate in governance; enabling governments to become more accessible, efficient and effective in delivering services to citizens.

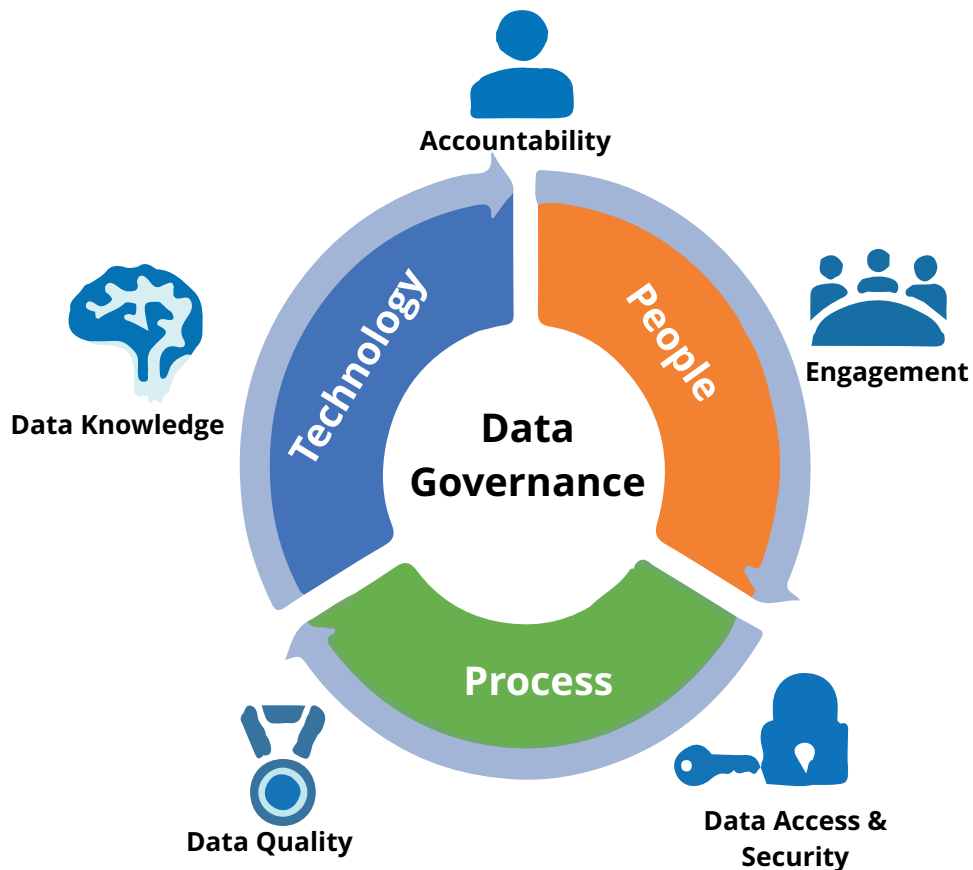
Defining Civic-Tech: Technology’s interception with Citizen Experience



Source: *The State of Civic Technology in India*, Aapti Institute

4.3. Civic-Tech applications in India:

Reforming Government services	Empowering citizen engagement
<p>Technologies augmenting and streamlining government's work by</p> <ul style="list-style-type: none"> ✓ Increasing quality, efficiency, and accessibility of civic services ✓ Helping governments collect, organize data and make informed decisions and proactive engagement with citizens 	<p>Technologies empowering Indian citizens through active Government-Citizen engagement by</p> <ul style="list-style-type: none"> ✓ Driving citizen participation in public decision-making processes and governance ✓ Empowering Citizens to engage with government more easily and with each other, around civic issues
<p>Sub – Sectors: Transportation, Water & Sanitation, Waste Management, Governance & Management Tools</p> <p>Representative Start up Landscape:</p> <p>ReCity, Recykal, Nepra, Karma Recycling, Banyan Nation, Waste Ventures, Citizengage, Faclon Labs, Drinkwell, NextDrop, Swajal, SaraPlast, Fluid Robotics, Samagra Revy Environment Solutions, ET Garage, Gaia, Transerve Technologies , Dimagi, Akara, EmpowerU, How India Lives</p>	<p>Sub – Sectors: Government & Citizen Engagement Tools</p> <p>Representative Start up Landscape:</p> <p>Haqdarshak, EasyGov, OnlineRTI, Right2Vote, CivilCops, Milaap, Civis, Contree, Reap Benefit</p>



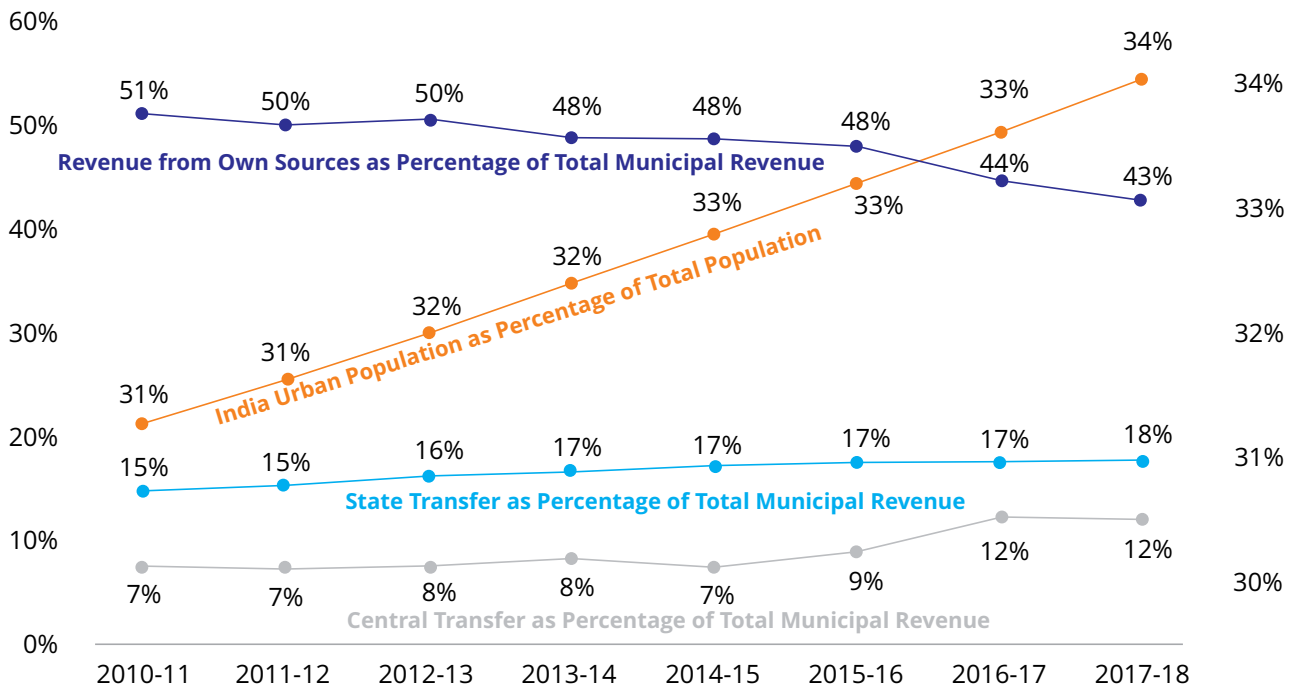
5

SUSTAINABLE URBAN DEVELOPMENT THROUGH INNOVATIVE FINANCING SOLUTIONS

There is a twin dilemma of “what constitutes adequate local government finances?” and “how to mobilize it?”. This is due to growing mismatch between their responsibilities and revenues. Municipal revenues and expenditures are in a state of decline and have not kept pace with the increasing needs of the urban Centres. Average revenue from own sources of Urban Local Bodies (ULBs) to total municipal revenue have declined from 50.92% in 2010-11 to 42.71% in 2017-18³⁵. Over a period of time the dependence on grants have gone up. But with increase in urban population, burden on ULBs have increased to provide basic infrastructure of transport, water, waste management, electricity, roads, etc. In such a scenario, it is crucial for ULBs to become financially sustainable to fulfill aspirations of the citizens and provide adequate basic infrastructure.



Figure: Municipal Revenue from Own Sources, Central & State Transfers and India Urban Population as percentage of Total Population¹²



Source: Indian Council for Research on International Economic Relations: State of Municipal Finance – A Study Prepared for Fifteenth Finance Commission; World Bank

5.1. Developing Innovative Financing Models for Sustainable Growth

Local governance in urban areas suffers from various financial and institutional constraints that adversely affect its service delivery efficiency. There are vertical and horizontal imbalances related to the fiscal health of ULBs which impact the growth of a city. The vertical imbalance needs to be achieved through reforms in the structure of fiscal federalism. Horizontal fiscal imbalance is a gap between revenue and expenditure of ULBs. In order to reduce horizontal imbalances and undertake growth-oriented infrastructure development, ULBs need to explore various internal and external resources to augment finances and undertake developmental projects for sustainable urbanization.

a. Raising Revenue from Internal Resources for Infrastructure Development

Urbanization and infrastructure demand go together. Rapid urbanization has led to increased demand for improved infrastructure and state-of-

the-art services in ULBs. It is imperative for ULBs to consider development of projects and land associated with it as a value creator. Infrastructure projects not only create value for the region, but it also provides an opportunity to create cascading impact on the locality that helps to recycle the value of already realized property/project.

Value Capital Finance

Value Capture Finance enables states and city governments to raise resources by tapping a share of increase in value of land and other properties, like buildings resulting from public investments and policy initiatives, in the identified area of influence. Appropriate tools can be deployed to capture a part of increment in value of land & buildings. Funds generated through this method can be used to develop projects for the public. This generates a cycle where value is created, captured, realized and recycled for further development.



Bandra Kurla Complex Land Auction in Mumbai³⁶

Background

- ✓ Bandra Kurla Complex (BKC) was created with an aim to develop an alternate central business district.
- ✓ Mumbai Metropolitan Region Development Authority (MMRDA) was appointed as the Special Planning Authority.
- ✓ MMRDA decided to adopt innovative models to raise funds for further development.

Implementation

- ✓ MMRDA reclaimed marshland near the Bandra Kurla road and channelized the Mithi River for the development and construction of Bandra Kurla Complex-a large office hub.
- ✓ MMRDA paid Rs. 956 crore over a period to the State government for 208 hectares of the land at BKC.
- ✓ The MMRDA adopted long-term leasing of land (over 80 years) to private developers and allowed them to conduct high-density development in the area to raise resources.
- ✓ MMRDA also adopted land auctioning tool to raise additional funds.
- ✓ The FSI of the land in Block G has been increased from 1 to 3 for residential and 2 to 4 for commercial purposes, thereby making an additional built-up area of 3.05 lakh sq. m. available for residential and 33.11 lakh square meter available for commercial purpose

Key Impact

- ✓ Capital values in BKC have witnessed an increase of more than 100% in the past few years
- ✓ MMRDA successfully raised Rs. 51 billion from merely 13 hectares of land in two auctions of 2006 and 2007.
- ✓ Over the past couple of decades, the price per square meter land has increased almost 20 times, which eventually raised rent amount

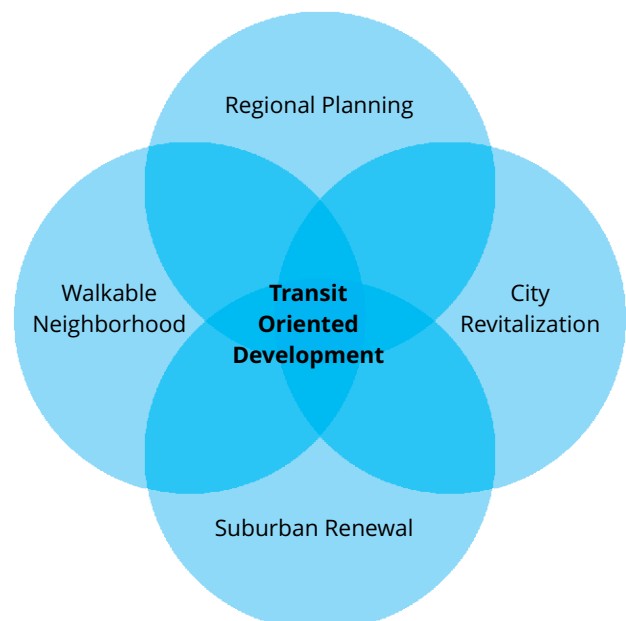
Transit Oriented Development

Transit Oriented Development (TOD) stands for creation of compact, walkable, pedestrian-oriented, mixed-use communities centred around high-quality transit systems. This makes it possible to live a lower-stress life without complete dependence on personal vehicle for mobility and helps to improve environment.

TOD is an effective tool to develop capital-intensive high-quality transit system and create value for the community nearby. TOD system allows local administration to change development programs around the transit system to create value and gradually captures the realized value.

Mass rapid transport projects are capital and maintenance intensive, they will not be financially sustainable by only depending on fare box revenues. The reach and scale of such mass rapid transport network would also lead to the rapid development of the city and wealth creation in the influence areas, whose benefits could be captured

through Transit Oriented Development initiative. TOD policy allows mixed use development in the influence region and this allows urban authorities to generate additional funds through taxes and services charges.



Transformative City Development through Bus Based TOD-Ahmedabad BRTS³⁷

Background

- ✓ Poor service and lack of comfort in municipal bus service system.
- ✓ No road space for pedestrians, cyclists and vendors and of on street parking.
- ✓ Core city areas was congested, mixed land-use plan with commercial and residential areas.
- ✓ More than 15% population of Ahmedabad were residing in slums.

Implementation

- ✓ Ahmedabad Development Plan was developed to establish a policy framework to imbibe the TOD principles to integrate the current gaps in land-use and housing with the expansion of transit infrastructure.
- ✓ The Urban authorities have defined intense development zones called Transit Oriented Zones about 200 m on both sides of the BRT corridor in the Development Plan.
- ✓ The special zones identified along the BRTS to have higher permissible FSI of 5.4 in CDB, 4.0 in the transit corridors and 1.8 (with chargeable FSI up to 2.25) in other parts of the city.

Key Impact

- ✓ Major slum redevelopment projects in Ahmedabad shifted the lower income households from the city center to the areas along the road in the periphery
- ✓ The number of slums has come down by 40% in 2014 as compared to 2011.
- ✓ Developed the Non-motorized transport system in the City
- ✓ Multi modal connectivity is being developed with metro and BRTS

b. Augmentation of Municipal Revenue through Asset Optimization

Effective development and management of public property resources play an important role in developing public trust in development programs. Effective management of public assets helps in providing improved services to locals as well as improve revenue for ULBs.

Asset Monetization:

Asset Recycling as a monetization method can help generate immediate revenue for ULBs while at the same time ensuring infrastructure improvement. This involves the sale or lease of a government owned asset to a private entity for infrastructure development or service delivery on behalf of or for the government entity. Such assets are typically unused or underutilized land or buildings, or assets. Asset recycling enables ULBs to receive additional revenue and shifts the operational burden to a private entity.



Vijayawada Municipal Corporation: Maintenance of Street Lighting through Private Service Providers³⁸

Background

- ✓ Vijayawada Municipal Corporation (VMC) was incurring an expenditure of Rs. 1 Crore every month towards energy bills.
- ✓ Out of this Rs. 60 Lakhs were spent towards street lighting only.
- ✓ To save energy and costs in street lighting by using private sector participation

Implementation

- ✓ VMC called bids for the Operation and Maintenance (O&M) and initial upgradation of control systems.
- ✓ The selected firm offered to take 92.7% as their share of savings towards cost of installations & maintenance of street lighting. Remaining 7.3% transferred to VMC.

Key Impact

- ✓ No extra amount to be paid by the VMC for the maintenance of street lighting
- ✓ An annual Savings of approx. Rs 12 lacs in Electricity charges and Rs 53 Lakhs in maintenance.

c. Capital Market Based Financing - Tapping External resources to develop Capital Intensive Infrastructure Projects

ULBs in India can access market-based financing for their infrastructure development needs. This includes financing alternatives such as municipal bonds, pooled financing etc. In order to raise funds from capital market, ULBs need to ensure credit worthiness. 485 ULBs across India have undergone credit rating study and 35 cities have acquired (A-) and above rating. In order to tap financing through Capital and Bond markets, investors would require ULBs to demonstrate sustained efforts towards finance reforms and optimal resource mobilization. There are following different options available for ULBs to raise funds through capital and bond markets.

Municipal Green Bond

Green Bonds are same as ordinary bond, except that the use of proceeds is identified by the obligator as being utilized for environmental benefits. The International Capital Markets Association (ICMA) guidelines note that the benefits listed while issuance of municipal green bond should be transparent and measurable. Issuer of municipal green bond should provide periodic disclosures on application of funds and review of Green status by third party agency is recommended.

As per IFC, a climate-aligned bond market universe is of USD 1.7 Tn. Whereas, Indian green bond issuance is of USD 10.89 Bn from 2012-2019. Ghaziabad has become India's first city to issue Green for an environmental sustainable project of wastewater reuse worth 150 Cr³⁹.

Pooled Financing

Small and medium sized ULBs do not have the ability to direct access domestic capital markets. In order to help small and medium ULBs to access the capital market, the Government of India introduced the concept of pooled financing. The State Governments of Tamil Nadu and Karnataka issued municipal bonds by pooling ULBs.

Multi-Lateral Financing Institutions

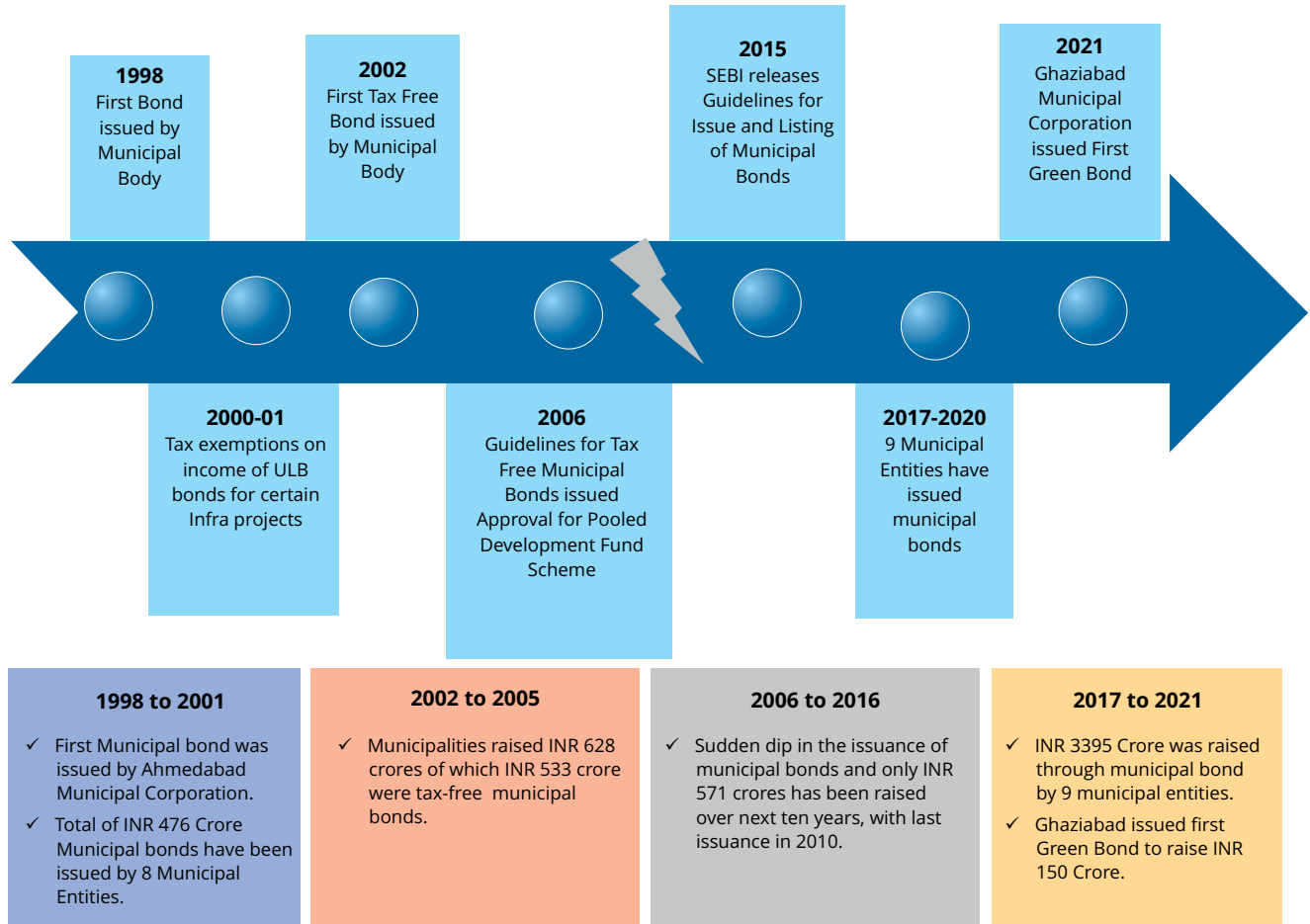
The Government of India through Mission guidelines assured to provide INR 500 crore over 5 years period to each Smart city. Similarly, respective state government will also match the amount provided by the Central Government. These funding will meet only part of the cost of Smart city projects. Smart cities have to leverage funds from financial institutions. Multi-Lateral Financing Institutions such as ADB, World Bank, KfW, JICA, etc. extend long-term soft finance for urban infrastructure projects. Asian Infrastructure Investment Bank (AIIB) also provide long term concessional finances to fund infrastructure projects.

There are two routes to avail World Bank/Asian Development Bank loan funding.

Municipal Bond:

Municipal Bonds allow municipal corporation to continuously assess its credit worthiness and

emphasis on improving its credit rating. This also helps in improving transparency and disclosures to increase investor confidence. In last 4 years 9 Municipal Corporations have issued municipal bonds to raise funds .





6

SMART CITY – A FUTURE PERSPECTIVE FOR URBAN TRANSFORMATION

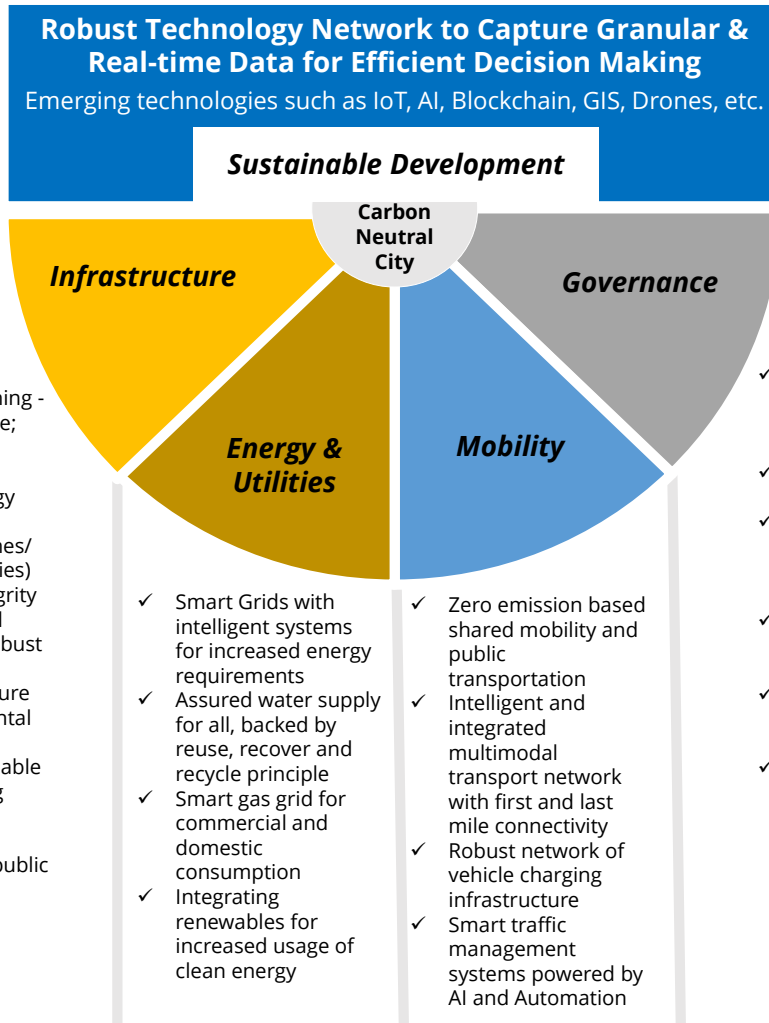
India's urban centres are starting to command more attention in the developmental discourse in policy and priority setting. This is driven by two related trends: an increasing concentration of population as well as economic activity in urban areas. The Government of India statistics also reveal that states with higher GDP have higher levels of urban population.

The past 6 years of Smart Cities Mission have transformed governance and service delivery along with improvement in project execution at local administration level. The role of ICCC war rooms

in fight against COVID-19 pandemic is a testimony to the evolved capabilities of the urban centres. It is important that the momentum created is accelerated further and is also extended to other cities.

The pillars of smart city need to continually evolve through specific, measurable, achievable, contemporary and time-bound initiatives. These will need to be backed by a robust technology infrastructure and with the underlying theme of sustainability and building carbon neutral cities.





6.1. Technology Solutions – Essential for Urban Transformation

Technology has already been proven to assist in the urban planning process. Through technology, urban planning teams can increase their productivity and help citizens to get more involved in the urban design process. Technology can be leveraged to build smarter cities through focus on developing communities and neighborhoods. In this way, cities become economically more sustainable, self-sufficient and provide more green space.

a. Ensuring Standardization and Interoperability:

Smart cities infrastructure projects are connected to various networks and consist of several applications and connectivity requirements. Hence, planning of connectivity solutions involve different technologies, depending on the application and the deployment environment. Standards for

interoperability can be identified that supports applications built by various infra service providers including Telecom Service Providers (TSPs), Internet Service Providers (ISPs), cable operators etc to optimize infra utilization.

b. Develop Network Sharing Infrastructure:

Defined standards for network specification can allow different cities to communicate with each other, transfer data and also support in case of an emergency. The Concept of Sister-Cities for Smart Cities development should be extended for the development of technology-based solutions which run on shared platform. This will support faster development of infrastructure in sister-cities and lower cost of development.

Standard Network specifications also helps in communication amongst various smart cities,

sharing best practices, developing case studies on success stories, conducting knowledge sessions and human resource development.

6.2. Public Private Partnership for Urban Rejuvenation

PPP is one of the major components under Smart Cities Mission, both in terms of project development and financing. Private sector participation has resulted in faster development of projects and improved service delivery, delivering great success in infrastructure projects.

Building on the success of PPP models in infrastructure projects, private sector can be roped in for key social infrastructure projects for efficiency and better service delivery. Urban India has seen many successes in water supply under the PPP model. The model may be extended for projects across water treatment, sewerage management, hospital management and education delivery through government schools.

6.3. Financial Sustainability for Bond Market

Municipal Bonds are a tool to finance municipal administration for infrastructure development in various parts of the world. In the last 5 years, 10 cities in India have raised funds through municipal bond issuance recent one being green municipal bonds by the Ghaziabad Municipal Corporation. The Government of India has also supported through monetary support to the issuer municipal corporation. However, state PSUs/institutions have mostly subscribed to these municipal bonds.

It is important to develop standards for preparation of municipal financial report and publish it in the public domain to improve transparency. Municipal Bond market needs support from State Governments in order to provide greater independence to municipal administrations. Municipal administrations should be encouraged to prepare local policies to improve municipal revenue generation.

Cities like Mumbai, Bangalore have created a robust policy for property tax collection, and it has one of the better collection efficiencies amongst all urban administrations. Also, as more autonomy

was provided to municipal administrations to tackle COVID-19 pandemic, similarly municipal administrations can be allowed to take charge over its administration and infrastructure development.

6.4. Asset Monetization – To Make Self Sustainable

The Union Budget 2021-22 observes that Monetization of Assets is one of the key pillars for enhanced and sustainable infrastructure financing in the country. It can unlock the potential of public investment in infrastructure and bring in the efficiencies of the private sector. The National Monetisation Pipeline is also an initiative in this regard.

Local administration should also monetize the assets - it could be physical infrastructure or virtual data generated through tech-based solutions. With the emergence of digital economy, private sector partnerships should be explored to monetize digital infrastructure. A process-driven approach for monetizing assets (physical & digital) could generate significant annuity revenues for the government.

6.5. Developing Effective Procurement Process – Define Standardized Procedures

One of the most important aspect of urban development by government authority is procurement of agencies for the desired development. It is observed that the procurement process accounts for highest time in project development phase and sometimes it delays the project execution. Regulatory bodies have issued guidelines for procurement of services by the government departments which also suggests that the process be streamlined.

Recently for Smart Cities Mission, a Model RFP for ICT/ICCC was released to expedite implementation of ICCC projects and build awareness on mission guidelines/ advisories, standards & best practices. This helped to harmonize various RFP clauses and terms & conditions, thereby creating a level playing field for all players. Going forward such Model RFP can be universally implemented in all smart city projects.



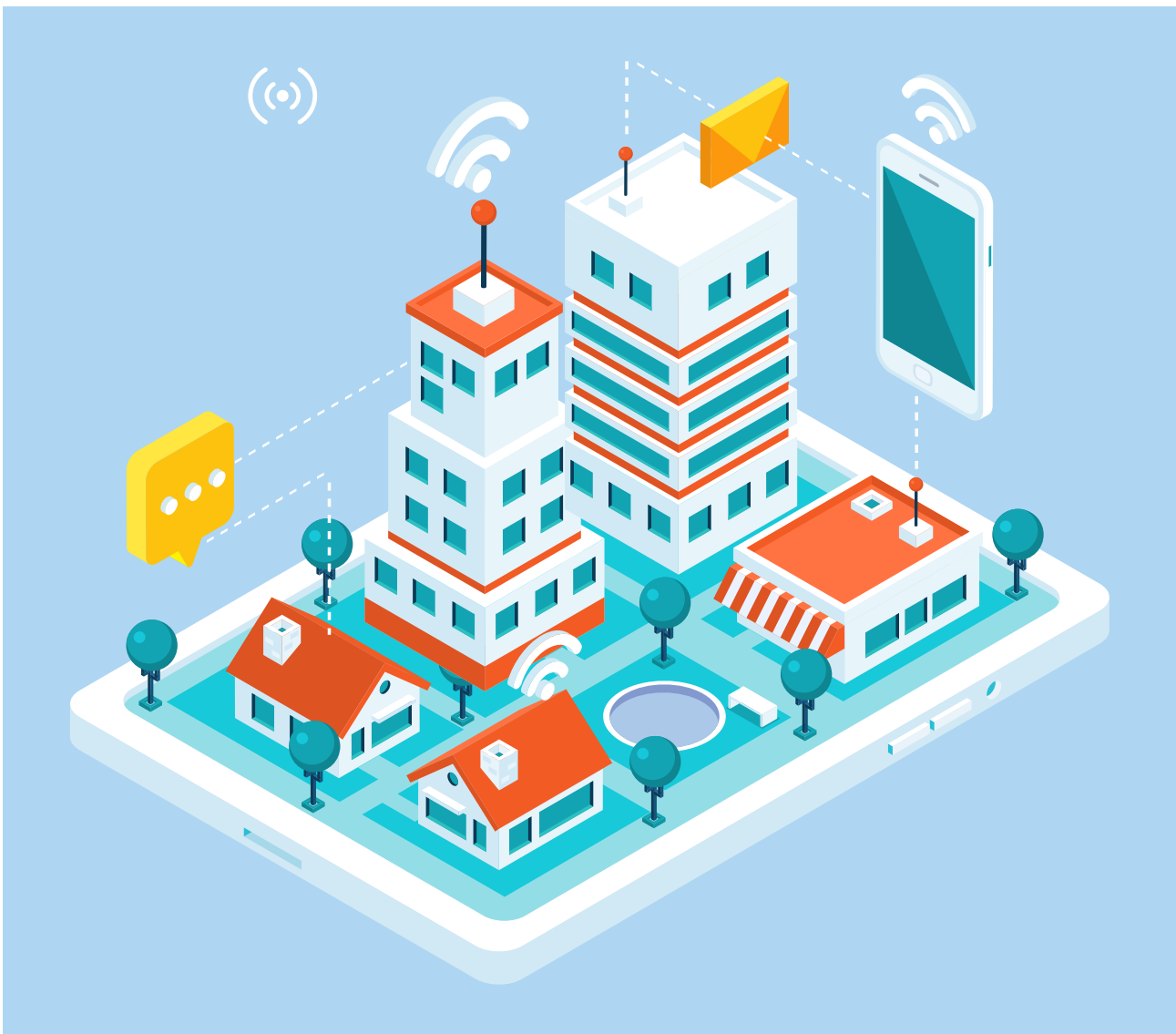
6.6. Sustainable Transportation – Mass Transport System & Electric Vehicle for Sustainable Future

Transition towards e-mobility will bring multiple environmental and economic benefits. These benefits foray from improved air quality, reduced dependence on imported fuel, improved utilization for electricity grid to the opportunity of emerging as a leader in a rapidly growing market. Many States have introduced dedicated EV adoption & manufacturing policies in order to support EV adoption. However, the transition at the local level is limited to transport undertakings.

It is important that at urban administration level, policy should be developed to encourage public

transport vehicles to be electrified. India is famous for its three-wheeler public transport fleets. At local administration level, separate efforts should be undertaken to support such transition. Simultaneously, development of supporting infrastructure is also important to encourage transition of private vehicles to electric.

Additionally, mass transit system should be integrated with multimodal transport network and clean mobility should be promoted for micro and last mile applications..



7

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