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Comparative Analysis of Smart City Mission and AMRUT Scheme in the Context of Sustainable Development: A Case Study of Pune City, India

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Abstract

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India's rapid urbanization has intensified the challenges of managing sustainable urban growth, particularly in major metropolitan centers. Pune, a fast-growing city in western India known for its industrial, educational, and technological significance, exemplifies these pressures as it struggles to balance expanding populations with limited infrastructure capacities. In response, the Government of India has introduced national programs such as the Smart Cities Mission (SCM) and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) to promote sustainable, efficient, and citizen-centric urban development. This study presents a comparative analysis of SCM and AMRUT in the context of Pune, evaluating their planning frameworks, implementation strategies, and contributions to sustainable development. By examining specific initiatives undertaken under each program—ranging from technological innovation to infrastructure improvement—the research highlights their respective strengths, limitations, and long-term implications. The paper concludes by assessing Pune's trajectory toward sustainability and outlining key opportunities for future urban development.

Keywords: Smart Cities Mission; AMRUT Scheme; Sustainable Urban Development; Pune City; Urban Infrastructure.

1. Introduction

The growing need of Smart city and Infrastructure facilities with the sustainable urban development has been increased. For the same, Government is launching various infrastructure development schemes such as Smart City Mission and AMRUT scheme to develop cities in a sustainable manner. This study shows the comparative analysis of both the schemes in different parameters so we can find out which scheme is more beneficial in the chosen case study area and find out the key problems the schemes are currently facing and to give the potential solutions to the same.

1.1 Aim and Objective

The aim is to analyse sustainability aspect of Smart city mission and AMRUT scheme in comparison with the help of case study of Pune city.

The objectives are

- 1) To study the sustainable aspects of Smart city Mission and AMRUT scheme.
- 2) To analyze the sustainable parameters of the scheme.
- 3) To study Smart cities Mission and AMRUT schemes in the context of Pune city.
- 4) To find out the key problems in the schemes.
- 5) To recommend the solutions for the key problems of the schemes and to give solutions for the same.

1.2 Literature review

1.2.1 Smart City Mission

Smart Cities Mission was launched by the Hon' Prime Minister on 25 June, 2015. The main objective of the Mission is to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions'. The Mission aims to drive economic growth and improve quality of life through comprehensive work on social, economic, physical and institutional pillars of the city. The focus is on sustainable and inclusive development by creation of replicable models which act as lighthouses to other aspiring cities. 100 cities have been selected to be developed as Smart Cities through a two-stage competition.

The Smart City Mission is an urban renewal and retrofitting program by the Government of India with the mission to develop 100 cities all over the country making them citizen friendly and sustainable. The Union Ministry of Urban

Development is responsible for implementing the mission in collaboration with the state governments of the respective cities. The mission is intended to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

The Mission is operated as a Centrally Sponsored Scheme. Central Government will give financial support to the extent of Rs. 48,000 crores over 5 years i.e., on an average Rs.100 crore per city per year. An equal amount on a matching basis is to be provided by the State/ULB. Additional resources are to be raised through convergence, from ULBs' own funds, grants under Finance Commission, innovative finance mechanisms such as Municipal Bonds, other government programs and borrowings. Emphasis has been given on the participation of private sector through Public Private Partnerships (PPP). Citizens' aspirations were captured in the Smart City Proposals (SCPs) prepared by the selected cities. Aggregated at the national level, these proposals contained more than 5,000 projects worth over Rs. 2,00,000 crores, of which 45 percent is to be funded through Mission grants, 21 percent through convergence, 21 percent through PPP and rest from other sources.

1.2.2 AMRUT Scheme

AMRUT (Atal Mission for Rejuvenation and Urban Transformation) is a flagship scheme of the Government of India launched in 2015. The scheme aims to ensure that every household in urban areas has access to basic services such as water supply, sewerage, urban transport, and other amenities.

It also seeks to improve the quality of life in urban areas by ensuring that citizens have access to adequate green spaces and recreational facilities. The scheme is implemented by the Ministry of Housing and Urban Affairs. The components of the AMRUT consist of capacity building, reform implementation, water supply, sewerage and septage management, storm water drainage, urban transport and development of green spaces and parks. During the process of planning, the Urban Local Bodies (ULBs) will strive to include some smart features in the physical infrastructure components.

It is the first focused national water Mission, which was launched in 500 cities and covered 60% of the urban population. The first state to submit State Annual Action Plan under the AMRUT scheme was Rajasthan. Various other schemes like Swachh Bharat Mission, Housing for All 2022 and the local state schemes related to water supply, sewerage and infrastructure can also be linked to the AMRUT scheme.

1.3 Parameters considered for analysis:

1. Solid Waste Management
2. Water Supply Management
3. Sewerage and Sanitation
4. Storm Water Drainage
5. Pollution

2. The Study area

Study area selected for evaluation is Pune city. Study area comprises of boundary under the jurisdiction of PMC. Pune has emerged as a prominent location for manufacturing industries, and has now been recognized as the information technology hub and education hub of the country. The city is spread over an area of 243.26 sq.km with a population of over 3 million. The rapid growth of the city has transformed from its character as Pensioner's city to Educational – Administrative Center and now to a bustling economic center. The city is famous as the Oxford of the East and the cultural capital of Maharashtra. Pune is also one of the most renowned places among tourists coming to Maharashtra. The educational institutions, presence of a number of industries and branches of virtually every array have made Pune a prosperous city.

2.1 Demography

The city has a population of 3,124,458; while 5,057,709 people reside in the Pune Urban Agglomeration as of the 2011 census. The latter was c. 4,485,000 in 2005. According to the Pune Municipal Corporation (PMC), 40% of the population lived in slums in 2001. Since Pune is a major industrial metropolis, it has attracted migrants from all parts of India. The number of people migrating to Pune rose from 43,900 in 2001 to 88,200 in 2005. The sharp increase in population during the decade 1991–2001 led to the absorption of 38 fringe villages into the city. The top five source areas of migrants are Karnataka, Uttar Pradesh, Andhra Pradesh, Gujarat, and Rajasthan. The Sindhis in the city are mostly refugees and their descendants, who came to the area after the partition of India in 1947.

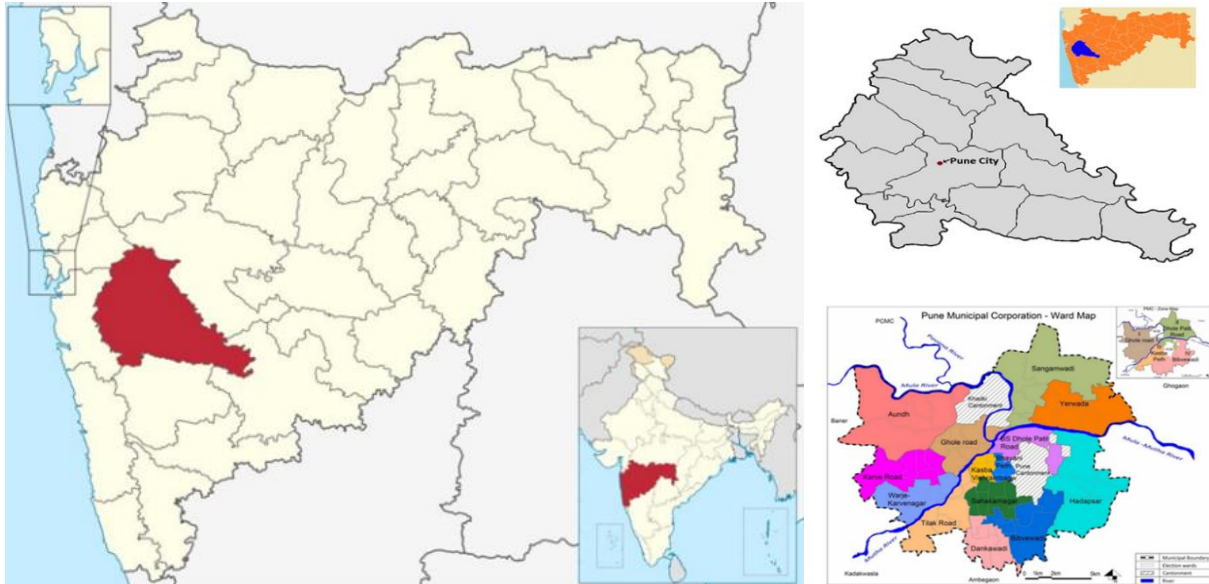


Figure 1. Map showing Maharashtra in context of India.

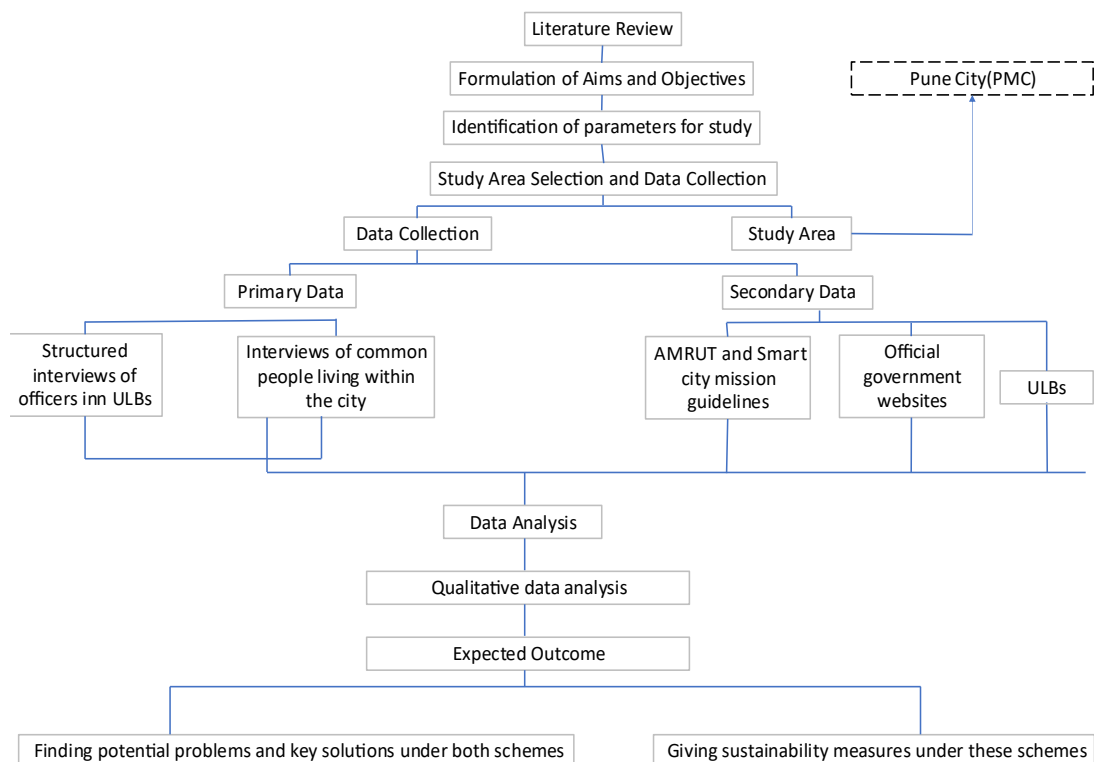
Figure 2. Map showing Pune city in Maharashtra.

Figure 3. Ward Map - Pune Municipal Corporation (Inset Map – PMC Zone Map).

2.2 Materials and Methods

The study adopts existing literature review and data collection from Stakeholders and Primary household surveys. The literature review will be carried out to understand concept of Smart City Mission and AMRUT scheme with different sustainable parameters. It is also carried out in order to understand, the work which is being done in this both schemes in Pune city. The data collection from Stakeholders is completed via ULB's by collecting official Government records and also the opinions of the officials who works on the schemes. The primary survey will be carried out to collect the data from various households about chosen parameters.

2.3 Methodology:



3. Data Analysis:

3.1 Basic Comparison Between Schemes On Various Parameters:

1. India has launched two flagship schemes to drive urban transformation and economic growth – The “Smart Cities Mission” and the “Atal Mission for Rejuvenation and Urban Transformation (AMRUT)”. The focus on creating better cities is a welcome development, at a time when India’s urban population is expected to increase to 600 million by 2030, from 400 million today.
2. The “Smart Cities Mission” will cover 100 cities with the objective of promoting area-based urban development initiatives that are replicable. The key focus of the Smart Cities Mission is to provide a decent quality of life to citizens through “Smart” solutions, enabled by technology applications, while maintaining a clean and sustainable environment.
3. The “Atal Mission for Rejuvenation and Urban Transformation (AMRUT)” will cover 500 cities. AMRUT seeks to provide basic services (e. g. water supply, sewerage, urban transport) to improve the quality life for all, especially the poor and the disadvantaged.
4. While the Smart Cities Mission looks to promote innovative practices for sustainable urban development, AMRUT focuses on the basic services needed in urban areas such as water supply, sewerage, urban transport. Both these missions have been designed based on learning’s emerging from the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the previous urban development scheme administered during 2007-2014.

3.2 Why These Schemes Needed?

1. Providing basic services (e.g., water supply, sewerage, urban transport) to households and build amenities in cities which will improve the quality of life for all, especially the poor and the disadvantaged is a national priority.
The Amrut and SCM schemes are needed to improve the quality of life in Indian cities. The Amrut scheme focuses on providing basic infrastructure such as water supply, sewerage, urban transport, and green spaces, while the SCM scheme focuses on improving the governance of cities by strengthening the capacity of urban local bodies and introducing reforms in urban planning and management. Both schemes are essential for the development of Indian cities and for improving the quality of life of its citizens.
2. Learning from the earlier mission have shown that infrastructure creation should have a direct impact on the real needs of people, such as providing taps and toilets connections to all households.
3. Both AMRUT, SCM and SBM-urban, HRIDAY missions launched by Central Government with aims to improve basic services and infrastructure provisions in Indian cities and towns.

3.3 Funding and Selection Process:

Smart City Mission	AMRUT scheme
Funding- Each smart city, selected through a city challenge competition, would get Central assistance of Rs. 100 crore per year for five years. A total of Rs 48,000 crore would be spent on creating 100 smart cities across India.	Funding- A total of RS 50,000 crore has been allocated for this scheme which will be utilized to provide a total of 2 crore houses will be built for the urban poor. Under the scheme, central government will provide assistance of Rs 1-2.3 lakh for every house
SELECTION PROCESS- The 100 smart cities will be selected on the basis of a city challenge competition. In the first stage, each state and Union Territory will give a score to their cities on the basis of four parameters, including existing service levels, institutional systems and capacities, self-financing and past track records. States will nominate top cities based on the scores. The 100 cities will then prepare smart city plans, which will be evaluated again.	SELECTION PROCESS- For AMRUT as well, states have been asked to recommend cities which can be included under this scheme. Under AMRUT, funds will be allocated in view of the urban population and number of cities/towns in each state/UT.

3.4 Mission-Wise Guidelines:

Smart city Mission	AMRUT scheme
Mission-wise guidelines- Central assistance to be used only for infrastructure projects which have larger public benefit. 1. Minimum area norm for retrofitting is 500 acres; for redevelopment-50 acres; for green field projects-250 acres. This will be 50 per cent for North-Eastern and Himalayan states. 2. Benchmarks to be achieved include: 10 per cent of energy needs to be met from renewable sources, 80 per cent of building construction to be green and 35 per cent of housing in green field projects to be for economically weaker sections. 3. Special Purpose Vehicles to be set up for implementation of smart city plans with 50:50 equity of States and urban local bodies.	Mission-wise guidelines- No projects without availability of land and all necessary clearances shall be included in the Mission by States/UTs. 1. States shall transfer funds to urban local bodies within 7 days of transfer by central government and no diversion of funds to be made failing which penal interest would be charged besides taking other adverse action by the center. 2. Provision for incentivizing reforms by earmarking 10 per cent of annual allocation to be given to good performers at the end of each year. 3. For water supply, sewerage, storm water drains and urban transport, center's share to be in the range of one-third of project cost to 50 per cent. States to mobilize the balance with its own share being not less than 20 per cent.

3.5 Approach and Program Management:

Smart city Mission	AMRUT scheme
Area-based approach	Project based approach
A three-tier management structure has been proposed to manage the projects: 1. National level: An apex committee headed by the Secretary, MoUD and co-opted representatives from related ministries and organizations will review progress periodically. 2. State level: A High-Powered Steering Committee (HPSC) chaired by the Chief Secretary, and comprising of the Mayor and Municipal Commissioner from the Smart cities, State Mission Director for Smart Cities and co-opted members from relevant departments will review progress periodically. 3. City level: A Smart City Advisory Forum that will include the District Collector, Member of Parliament (MP), Member of State Legislative Assembly (MLA), Mayor, CEO of SPV, local youths, technical experts, Resident Welfare Associations (RWAs), NGOs, etc. will be convened by the CEO of the SPV to periodically review progress.	A three-tier management structure has been proposed to manage the projects: 1. National level: An apex committee headed by the Secretary, MoUD and co-opted representatives from related ministries and organizations will review progress periodically. 2. State level: A High-Powered Steering Committee (HPSC) chaired by the Chief Secretary, and consisting of the Mayor and Municipal Commissioner from the Smart Cities, the State Mission Director for Smart Cities and co-opted members from relevant departments will review progress periodically. 3. City level: The Urban Local Body (ULB)/ Municipal Commissioner will collaborate with all concerned stakeholders to ensure timely implementation of the projects.

3.6 24x7 Water Supply Project Under AMRUT Scheme:

3.6.1 Aim of Project:

1. Establish an equitable distribution of water
2. Identify and minimize water losses
3. Promote sustainable development
4. Provide a fair way to allocate costs
5. Improve system energy efficiency
6. Improve customer service level
7. Implement best management practices

3.6.2 The Main Objectives of The Project Are:

1. To ensure safe & equitable water supply to the entire population in Pune city for the next 30 years
2. To ensure the distribution of the water during the entire day (24x7 modality)
3. To reduce the level of water losses and Non-Revenue Water
4. To ensure the technical and economical sustainability of the water supply service.

3.6.3 Existing System vs Smart System:

	Existing System	New “SMART” Water Supply
Distribution Infrastructure	• No metering and volumetric measurement	• 100% consumer metering • Accountability for Water balance • Promotes transparency
Tariff and Incentives	• Fixed Tariff • No incentive for conservation	• Volumetric Tariff • Promotes conservation of water

3.6.4 Challenges In Present System:

1. Intermittent supply-wide variation of supply hours
2. Quantity of per capita supply varies substantially,
3. very low in North of Mula-Mutha River
4. Distribution network very old in many areas-high physical losses
5. High level of Non-Revenue Water (NRW)
6. Inadequate storage capacity (23%)
7. Reservoirs working as distribution reservoirs
8. and also feeding other SRs using distribution mains
9. Fast depletion of reservoirs, resulting in high peak factors and small number of supply hours
10. High Electricity consumption

3.6.5 Existing & Planned Water Treatment Plant:

1. In the proposed project with upgradation in all the Existing WTPs as well as proposed and under constructions WTPs are considered as follows:
2. Existing 9 Treatments Plants having a total treatment capacity of some 1263 MLD
3. Total additional plant planned & under Construction by PMC are of total treatment capacity of 1235 MLD.
4. In the proposed project the rationalization of the number of pumping stations has been achieved.
5. The effort is made to use the existing pump and transmission mains capacity to an advantage.
6. The new pumping systems are planned at 12 locations.

3.7 Study & Design:

- 1) Entire Water Supply Network on Latest Satellite Image
- 2) 243 sq.km area (GIS PLATFORM)
- 3) Population projection & Demand calculation
- 4) City divided in to 141 Water Supply Zones & 328 DMA's
- 5) Consumer Survey & Water Audit for more than 10,000 connections on Pilot basis
- 6) Hydraulic Modelling - 3500 KM pipe length
- 7) Proposed SMART Metering for all consumers
- 8) Leakage detection-Carried out for Bulk system for Two WTP's
- 9) Zone wise SCADA system planned for entire city

1. GIS mapping:

- a) Procurement of Satellite Imagery
- b) Creation of Base Map
- c) Field survey for network & land mark updating
- d) Geo-Spatial data integration
- e) Project Report
- f) Use of consumer data in Hydraulic modelling,

2. Consumer survey:

- a) Map each house and consumer in GIS
- b) Carry out house to house survey
- c) Collect information related to No. of inhabitants,
- d) Water requirement, Income, Connection size etc.
- e) Attach database of each house to GIS
- f) Find out the unregistered/illegal connections

3. Leakage detection and new management:

- a) Survey of bulk system to pinpoint visible leaks
- b) Plug visible leaks
- c) Estimation of losses by means of simultaneous
- d) inflow-outflow measurements
- e) Ranking of pipelines according to (Losses/Length)
- f) Sounding of valves and contact points
- g) Acoustic correlation to pinpoint leaks Use of ground microphone to confirm leak positions

4. DMA formation:

- a) Number of connections - 1000 to 2500
- b) Number of Closed valves to isolate the DMA - Minimum
- c) Number of meters to measure inflow to and outflow from the DMA — Fewer (Id
- d) Full Utilization of storage capacity of existing service reservoirs
- e) Ground level variation within the DMA — Minimum ante
- f) Pressure variation within DMA - Minimum ca — —
- g) Boundaries of DMA - Rivers, Drainage channels, Railways, Highways etc.

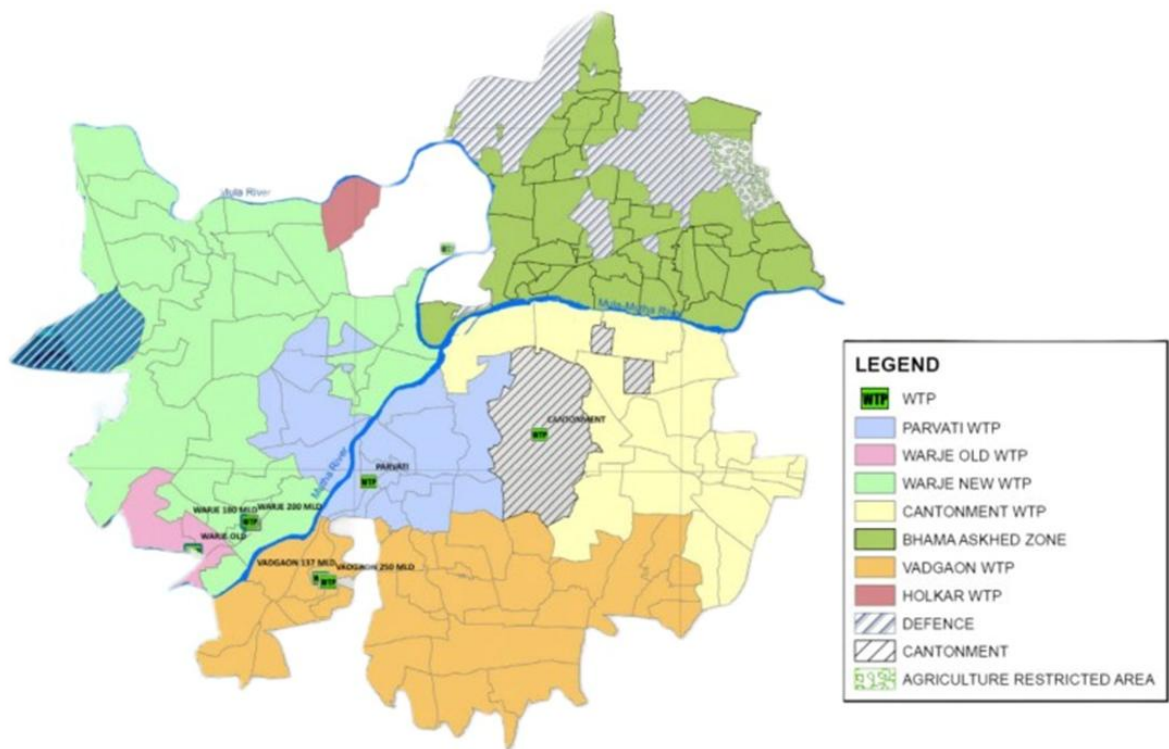


Figure 4. Map showing proposed WTP.

3.8 Gross Project Cost:

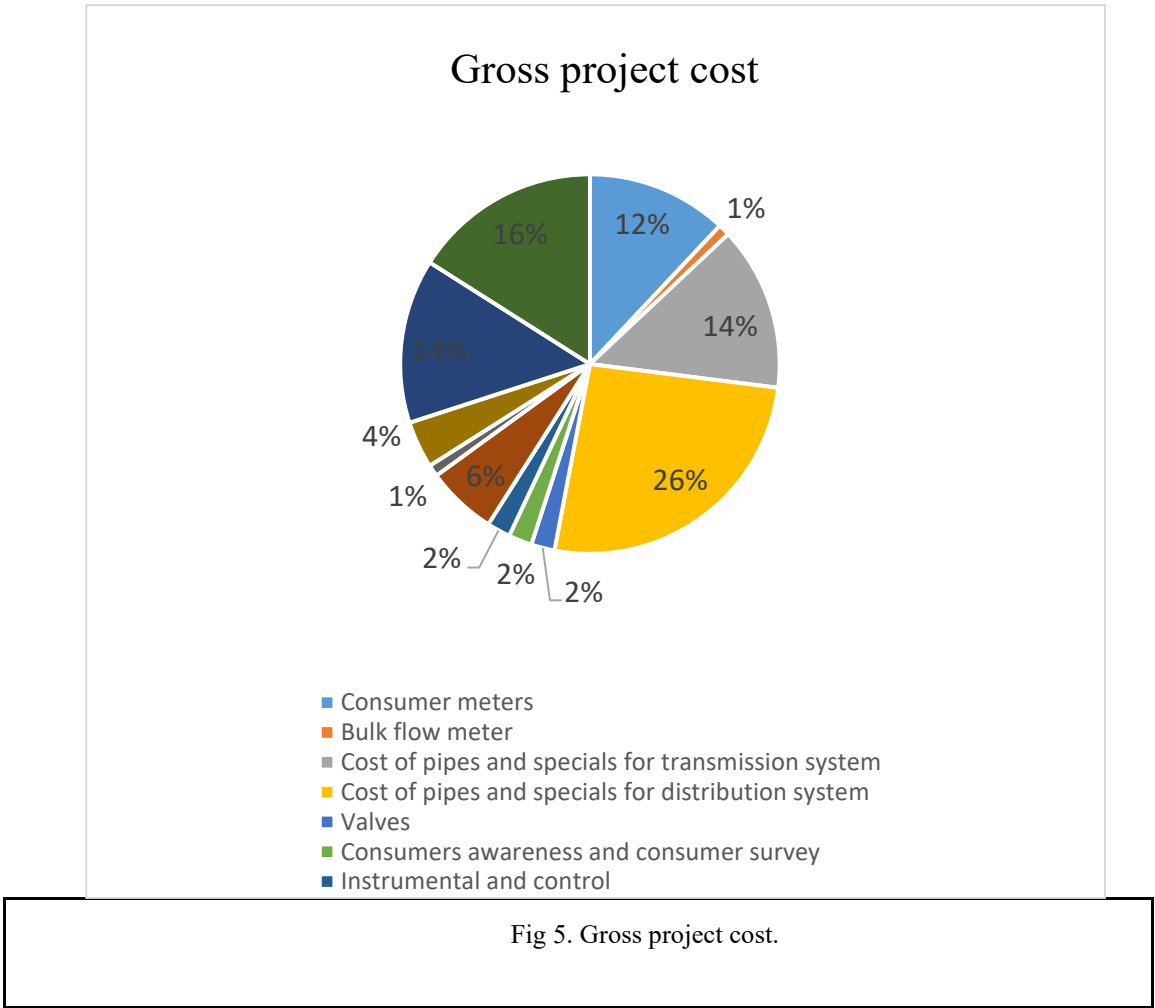


Table 4. Financing of project.	
Description	Total amount (in crore)
Outflows	
Capex	2819
IDC	494
Total outflow	3312
Inflows	
Government grants:	
Under AMRUT scheme	200
Under Smart city	299
Sub. Total	499
PMC contribution:	
Stand-alone contribution	249
Under AMRUT scheme	200
Under SMART city	100
Sub. total	549
Loan amount	2266
Total Inflow	3312

3.9 AMRUT 2.0 Objectives:

- 1) AMRUT 2.0 is designed to provide universal coverage of water supply through functional taps to all households in all the statutory towns in the country and coverage of sewerage/septage management in 500 cities covered in the first phase of the AMRUT scheme.

- 2) The total indicative outlay for AMRUT 2.0 is ₹2,99,000 crore including Central outlay of ₹76,760 crore for five years.
- 3) This outlay includes funding of ₹22,000 crore (₹10,000 crore as Central Assistance) for ongoing projects of AMRUT till March 2023.
- 4) This has given the opportunity to increase funds and complete the ongoing projects.
- 5) Mission also has a reform agenda on ease of living of citizens through reduction of non-revenue water, recycle of treated used water, rejuvenation of water bodies, augmenting double entry accounting system, urban planning, strengthening urban finance etc.

3.10 Smart City Mission in Pune:

Pune Municipal Corporation (PMC) is on a list of 100 smart cities declared by the Government of India for development under the Smart Cities Mission.

Pune's quest for better urban living got a boost as it was listed among 100 cities selected by the Union Government of India.

3.10.1 Unique objectives taken by Pune for Smart City Mission:

1. Identifying the true needs and views of the citizens through extensive citizen engagement, for which Pune has come up with an amazing Citizen Engagement Model with 9 different phases, probably the largest of its kind in the urban world, reach out to more than 50% of the city's households.
2. Focus on 'More with Less' solutions – initiatives that have a high impact on quality of service and infrastructure but are less capital intensive and are easier to implement.
3. Focus on cities raising funds from own sources making the city's infrastructure projects to become self-sustainable and not dependent on State or Central funds to develop city infrastructure.
4. To develop a comprehensive Smart City Plan for Pune, with focus on urban renewal and retrofitting, smart infrastructure and services, and citizen participation.
5. To create a safe, secure and sustainable urban environment through the use of smart technologies and solutions.
6. To create a vibrant and liveable city by improving public transport, providing better access to public services, and improving the quality of life for citizens.
7. To promote economic development and job creation through the use of technology and innovation.
8. To develop a smart governance system that is transparent, accountable and responsive to citizens.
9. Focus on cities raising funds from own sources making the city's infrastructure projects to become self-sustainable and not dependent on State or Central funds to develop city infrastructure • Focus on low-cost Information-Communication & Technology (ICT) based solutions to improve quality of infrastructure.

3.10.2 Pune Focused On Four Different Modes of Citizen Engagement:

1. Face-to-face
 - a. Door-to-door visits and citizen engagement by PMC employees and volunteers to get forms filled.
 - b. Camps in schools, colleges, companies, slums.
 - c. Crowd-sourcing ideas in Ganesh Mandals during the Ganesh Chaturthi Festival.
2. Digital and online
 - a. Pune Smart City web portal—punesmartcity.in.
 - b. E-seva Kendra's and ward offices across the city with Smart City access.
 - c. Computer labs in schools and colleges opened to citizens.
 - d. Twitter handles and Facebook page, apps for smartphones, WhatsApp, missed calls.
3. Competitions for crowd sourcing of ideas and creativity
 - a. Essay, logo and mascot-design competitions in English and Marathi newspapers.
 - b. Area development competition for students from architecture colleges.
 - c. Digital "Hackathon" and "Appathon" conducted across 60 engineering colleges.
 - d. "Smart family" and "Smart citizen" initiatives.

4. Taking other core infrastructure from "good to great"

While Pune has done well compared to other cities on many dimensions of core urban infrastructure, it will still need to work on them to fulfil its aspiration of becoming one of the most liveable cities in India. Specific goals include:

5. Swachh Pune Mission

- a. 100 percent segregation at source (currently 57 percent) and efficient ITMS-enabled solid-waste management (SWM) system with 100 percent of waste recycled and all organic waste used for energy generation. 100 percent of slums to be covered by SWM services (30 percent currently)
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- c. 100 percent segregation at source (currently 57 percent) and efficient ITMS-enabled solid-waste management (SWM) system with 100 percent of waste recycled and all organic waste used for energy generation. 100 percent of slums to be covered by SWM services (30 percent currently)

6. Energy

- a. Smart grid set-up with net metering across the entire city
- b. All new buildings in city to be energy efficient and green
- c. Smart public lighting to reduce consumption by 15 to 20 percent
- d. Smart public lighting to reduce consumption by 15 to 20 percent

3.11 Projects Under Smart City In Pune:

1. Road and road widening
2. 100 electric buses
3. Redesign of streets
4. Smart parking
5. E-challan
6. Total smart parking
7. Bulk meters
8. Adequate water supply
9. Storm water use

3.11.1 Vision For SWM Project Under SMART City:

To provide most cost effective and efficient solid waste collection and disposal service while providing maximum practical protection to environment for zero waste city.

Centralized as well as decentralized processing facilities have been set up by PMC since 2009 resulting in a reduction of GHG by 5.8 times as surveyed by TERI in 2012.

3.11.2 Overview Of Waste Management In Pune City:

1. Pune generates 1600 -1700 tons of solid waste per day.
2. 160 trucks collect waste door-to-door, collecting an
3. average of 198 tons per day.
4. 563 containers and 116 compactor buckets dispersed around Pune.
5. Ward wise average- 350 to 750 gms. per capita per day
6. Construction and demolition waste generation -150-180 TPD
7. Garden waste generation - 50-60 TPD
8. Biomedical waste - 5-6 TPD

3.11.3 Current Processing Of Waste

1. Organic waste:

Centralized as well as decentralized processing facilities have been set up by PMC since 2009 resulting in a reduction of GHG by 5.8 times as surveyed by TERI in 2012.

Mandatory on-site waste disposal facility at residential and commercial properties constructed after 2000. A 5% tax rebate is provided on rate able value to encourage citizens to maintain this facility at society and individual levels.

2. Plastic Waste:

1. Plastic products have become an integral part of our daily life encouraging its production. 70% of this production is converted to waste. To address this problem and make Pune a plastic waste free city or zero plastic waste i.e., no plastic to land fill, PMC has
2. Plastic Waste Management Plan for the city in keeping with Plastic Waste Management Rules 2016 based on the principle of 'Extended Producers Responsibility'.
3. 200 material recovery centers, to Reduce, Reuse, Recycle and Recover 170 to 180 MT of plastic waste it generates per day
4. PET bottle crushing machines at 20 locations with high pedestrian footfalls
5. Toll free number 1800233 3232 where citizens can call and inform regarding the recyclable waste

3.12 PMC Has Undertaken The Following Activities to Tackle The Situation:

1. Various workshops organized for awareness of citizens, students and * Review of activities according to work waste generators packages
2. Formation of core committee
3. Tie up with formal recyclers
4. Conducted a study through their field staff to understand how scrap shops in the informal economy deal with E waste
5. An authorized E-waste collection center at Kothrud is functional.
6. E-waste collection drives, 'V collect', are organized by PMC
7. Designed printed and distributed IEC material

1. Biomedical waste:

1. PMC has outsourced collection, transportation and disposal of biomedical waste from various health care establishments
2. 5-ton capacity being augmented up to 10 tonnes
3. The biomedical waste is collected through 7 vehicles with GPRS tracking systems from 400 collection points across the city
4. The waste is collected in 3 color coded bags - yellow (for incineration), red (shredding or recycling or landfill) and white (sharp and glass material that is chemically treated and sent to hazardous treatment plant located at Ranjangaon)
5. PMC proposes an on-call service by two wheelers from small clinics, and hospitals with less than 10 beds and OPDs.

2. Sanitary napkin disposer:

With growing awareness regarding hygiene and the availability of sanitary napkins and diapers, their use has increased and so has the problem of their scientific disposal. PMC contacted the producers of these goods and requested them to provide for separate easily identifiable bags to discard the used pieces. Having got a negative response from them, PMC encouraged Swachh to make paper bags for the said purpose and promoted their usage. Also, a system for scientific disposal of the same was put in place.

1. 3 locations across the city & 600 to 900 pieces of sanitary napkins per day are scientifically disposed at each location
2. A system for collection, transportation and disposal is especially developed for the same and areas of focus are working women's hostel, red light areas, and girls' hostels and big residential societies
3. Proposed extension of these services to 15 more locations across the city

4. Proposals:

4.1 MSW Issue in Pune city:

Major MSW challenges for PMC:

1. In Pune city due to growth of population solid waste is increasing.
2. Major social work issue in Pune City is the growing problem of municipal solid waste management.
3. Pune produces around 1,400 tons of solid waste every day, and this waste is not properly managed. This has led to a number of environmental issues such as air and water pollution, land degradation, and health hazards.
4. The city also lacks proper waste disposal facilities, which has further exacerbated the problem.
5. In order to address this issue, the Pune Municipal Corporation has implemented various initiatives such as waste segregation, composting, and waste recycling.

Characteristics of Pune's waste

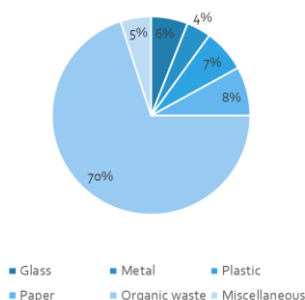


Figure 6. Map showing solid waste processing plant.

1. From the overall study of solid waste management in Pune city it is observe that Pune city generates about 1200-1300 metric tons of solid waste per day.
2. This unsegregated solid waste is disposed at landfill site near Uruli-Devachi village which is 20 km away from Pune city.
3. The 43 ha of land allocated for solid waste disposal, from which 15 ha area is already land filled and sealed off permanently.
4. Solid waste generated at disposal site is of two types biodegradable and non-biodegradable

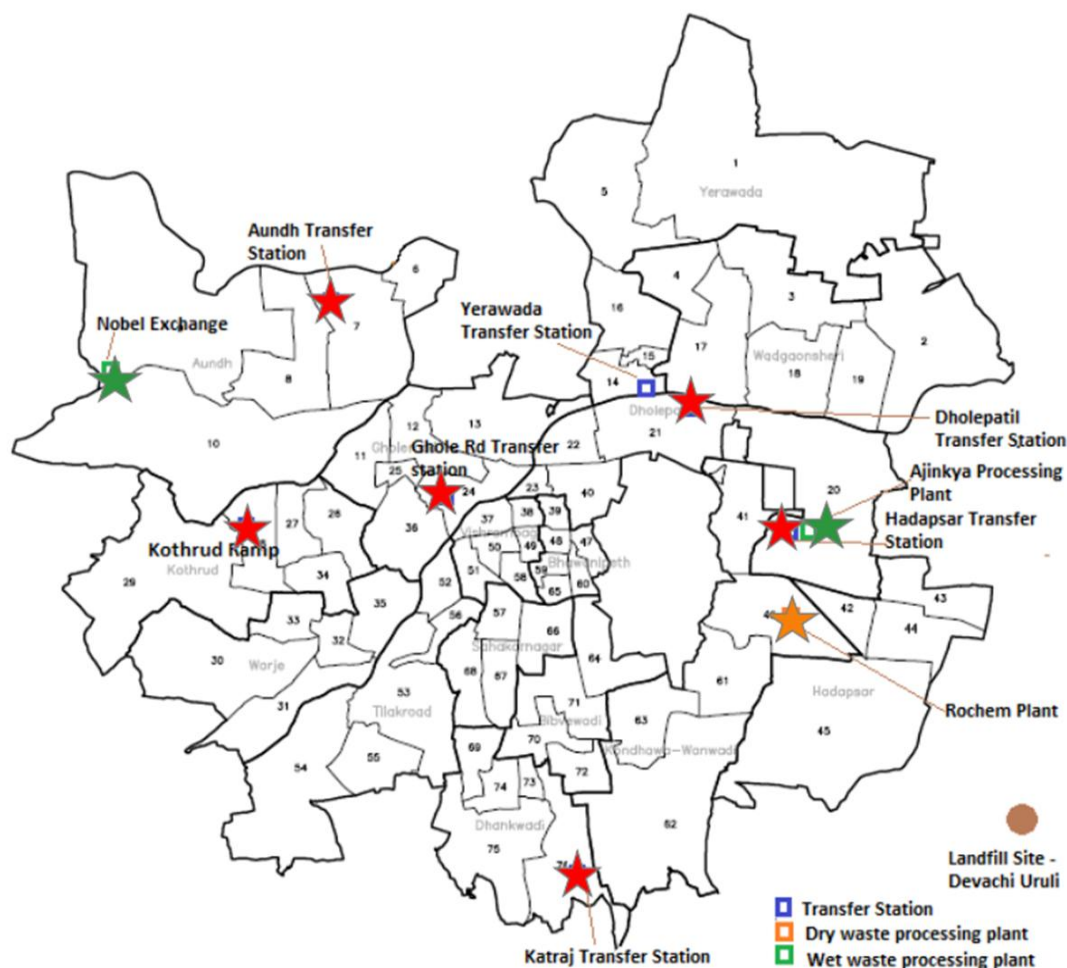


Figure 7. Map showing landfill-sites.

Gaps –

1. Capacity of secondary transportation is only 70%.
2. Lack of coordination between, primary collection, primary and secondary transportation.
3. Insufficient number of Bulk Refuse Carriers leading to pile up of primary collection vehicles at transfer stations.
4. Only 40% vehicle drivers are available.
5. Outdated weighbridges and equipment call for modernization of transfer stations

4.1.1 Recommended Waste Treatment Methods For The Issue:

By using following methods of solid waste disposal PMC can tackle major dumping issue of MSW-

1.Sanitary Landfill- It involve the dumping of waste into a land fill. A low-laying open area out of the city where solid waste/ Garbage is collected and dumped. e.g., Food Waste

2. Incineration Method- It is mainly used to dispose of the medical waste hazardous and toxic wastes. Waste can be easily be rid by using this method. It features combustion of waste to transform them into base component with the generated heat being trapped for Deriving energy. e.g., E-waste

3. Integrated System- Integrated waste management system all-inclusive waste prohibition, recycling, composting and disposal program. An efficient integrated system considers how to prohibit, reuse, recycle, manage solid waste in ways that most efficiently. and it protect environment and human health.

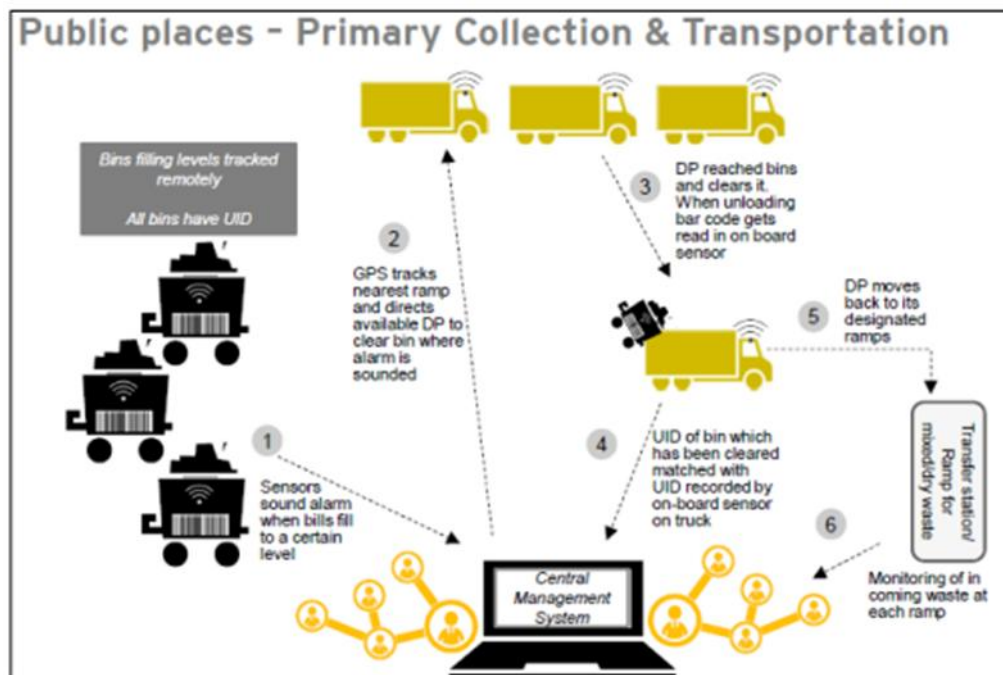


Figure 8. IT- based SWM integrated system.

IT Based SWM Integrated Monitoring System:

1. IT SWM monitoring system to track all types of waste streams from a centralized monitoring system.
2. Creation of a dashboard to provide information on all indicators
3. Ward wise budget allocation to be linked to performance of the prabhags on the indicators

4.2 Water scarcity issue in Pune city:

1. Pune city is going to experience a rapid rise in population by 2025, which will stand at around 4,267,485.
2. The city is facing a severe water scarcity due to the over-exploitation of groundwater resources.
3. The city's water supply is heavily dependent on the monsoon rains. During the summer months, the water supply is inadequate and the demand for water is much higher than the supply.
4. The city also faces a problem of water contamination due to the release of untreated sewage and industrial effluents into the rivers and lakes.
5. The government of Maharashtra has taken several steps to address the water scarcity issue in Pune.
6. These include the construction of dams and reservoirs, the implementation of water conservation measures, the promotion of rainwater harvesting, the introduction of water-efficient technologies, and the adoption of water reuse and recycling technologies.
7. The government has also launched a water conservation campaign to raise awareness about the importance of water conservation.
8. Despite these efforts, the water scarcity issue in Pune remains a major challenge.

4.2.1 Solutions For The Issue:

1. Groundwater sources:

1. PMC should ensure controlled groundwater extraction in the region to keep a check on its level and quality by studying it on regular intervals.
2. In fact, groundwater use should be completely restricted citing its decreasing levels and should only be used during emergency times when the water availability falls short.

2. Surface water sources:

1. Mulshi dam on Mula River is a potential source, which could provide water for rising irrigation and domestic demand of the city.
2. Revival of degraded Katraj and Pashan lakes in Pune city could become an additional potential freshwater source for the region in future. The lakes were once a major source of water for the people living in the city. Over the years, due to rapid urbanization the lakes got degraded and today lie in a pathetic condition. waste disposal in water bodies, which blocks the flow of rainwater run-off.

4.3 Air Quality Issue In Pune City:

Pune City is rapidly growing in each sector and today's growth is sign that city become metro city within short period. In addition to the water crisis, Pune is also facing an air pollution crisis.

The city has seen a rapid increase in air pollution levels due to the increase in vehicular traffic, industrial emissions, and construction activities. The air pollution levels in the city are much higher than the national standards and pose a serious health risk to the residents.

The government has taken several steps to reduce air pollution in the city, such as the introduction of stricter emission norms for vehicles, the adoption of clean energy sources, and the promotion of public transport.

However, the air pollution levels in the city remain high and need to be addressed urgently. Vehicular emission continuously deteriorates air quality of city and effecting on climate. The survey conducted by Pune-based Parisar has revealed that cities in Maharashtra that are part of the Smart City Mission have fitted air sensors, but there is no clarity on how the data generated will be used.

1. Pune currently has a total of 15 air pollution monitoring stations across the city, operated by three separate systems.
2. The Maharashtra Pollution Control Board (MPCB) operates a system of five monitoring stations, and IITM (through its System of Air Quality and Weather Forecasting and Research, SAFAR) program operates an additional 10 monitoring stations.
3. The Pune Smart City Development Corporation also maintains an independent network of 50 environmental monitoring stations, which measure air pollution, temperature, humidity, noise, and radiation levels.

4.3.1 Mitigation Measures For PMC To Take:

1. Programs, like planting trees in order to reduce fine particulate air pollution, could help to address multiple environmental health risks in Indian cities.
2. For example, one recent modeling study estimated that tree planting could appreciably lower both PM_{2.5} concentrations and urban temperatures in cities worldwide.
3. Also encouraging E-vehicles plays a major role in combating the pollution problem.
4. PMC should hold programs to promote e-vehicles.
5. By combining several of these approaches, air pollution sources can be reduced at the same time that AQI programs help people adjust their behavior to protect themselves from current levels of air pollution.

7. Conclusion:

90% of AMRUT expenditure will be on improving water supply and sewerage infrastructure followed by storm water drains, non-motorized urban transport and provision of green spaces and parks. Smart Cities Mission is a Centrally Sponsored Scheme (CSS) and the Central Government proposes to give financial support to the Mission to the extent of Rs. 48,000 crores over five years i.e., on an average Rs. 100 crore per city per year.

There is a strong complementarity between the AMRUT and Smart Cities Mission in achieving urban transformation. While AMRUT follows a project-based approach, the Smart Cities Mission follows an area-based strategy. Synergy of Implementation bodies is clearly laid out in the modus operandi of the schemes. Citizen engagement and participation have been the most highlighting factor in the selection process of Smart cities. There are constraints and challenges with respect to Finance, Technical Capacity and Institutional Capacity.

Cooperative federalism and ULB participation at the gross root level implementation are hallmarks of the schemes. Both schemes have given adequate priority to Area specific Sustainable development and environment issues. The smart city concept is one such upcoming concept which is deemed to be the solution for the present-day problems as well as the sustainable future.

In that context, AMRUT and Smart Cities Mission schemes have been initiated prioritizing core areas of urban development, there is a need to review the progress of projects and implementation of reforms, periodically and it has to be strengthened by the Central Government for effective implementation of projects.

More and more sustainable development projects to be included as add on components in the schemes. There is a need for convergence of these two schemes from the perspective of sustainable development and local issues.

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Conflicts of Interest

The authors report no conflicts of interest.

Data Availability Statement

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Institutional Review Board Statement

Not applicable.

CRedit Author Statement

Mayuri Dattatray Latpate: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Visualization, Writing –original draft, Writing – review & editing.
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