

A Comparative Study of Area-Based Development and Pan-City Strategies in Enhancing Urban Infrastructure Efficiency

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Abstract: *Rapid urbanization in India has increased pressure on urban infrastructure, creating challenges in transportation, housing, sanitation, waste management, and public services. To address these issues the Government of India launched the Smart Cities Mission, which promotes sustainable and technology-driven urban development through two major approaches: Area-Based Development (ABD) and Pan-City strategies. This study presents a comparative analysis of these two strategies in enhancing urban infrastructure efficiency in Indore. The research adopts a comparative and descriptive theoretical approach based on secondary data from government reports, policy documents and academic literature. Findings reveal that ABD is effective in transforming selected zones through focused investments in roads, drainage, housing, water supply, sanitation and public spaces producing quick and visible results. However, its benefits remain spatially limited. In contrast Pan-City strategies improve city-wide systems such as traffic management, waste collection, digital governance, water monitoring and public safety. Thereby benefiting a larger population and supporting long-term operational efficiency. The study concludes that neither strategy alone is sufficient for comprehensive urban development. ABD creates model areas of excellence while Pan-City initiatives ensure inclusiveness and scalability. Therefore, an integrated approach combining both strategies is most suitable for improving mobility, governance efficiency, environmental sustainability and quality of life in Indore. The study also recommends stronger planning, technology adoption, public transport investment, basic service improvement and citizen participation for future urban growth.*

Keywords: Area-Based Development (ABD), Pan-City, Smart City Mission, Infrastructure

I. INTRODUCTION

Urbanization in India refers to the increasing movement of people from rural areas to cities and towns, driven by factors such as industrialization, employment opportunities, education and improved infrastructure. Over the past few decades, India has witnessed steady urban growth, with the urban population reaching approximately 36.9% of the total population in 2024. Major metropolitan cities like Mumbai, Delhi, Bengaluru, and Hyderabad have emerged as hubs for economic activity, innovation, and migration. Urban areas contribute significantly to India's GDP and are projected to accommodate nearly 600 million people by 2036. Despite these economic benefits rapid urbanization also brings several challenges, including overcrowding, housing shortages traffic congestion, pollution and increased pressure on public services. Addressing these issues requires effective urban planning and a focus on sustainable development to ensure that India's urban transformation leads to inclusive and resilient cities.

The Smart Cities Mission is one of the most significant urban development initiatives launched by the Government of India to improve the quality of life in cities through sustainable and technology-driven solutions. Officially launched on 25 June 2015 by the Ministry of Housing and Urban Affairs the mission aims to promote cities that offer core

infrastructure a clean and sustainable environment and a decent standard of living for citizens. It seeks to transform selected cities into smarter and more efficient urban centers by integrating modern technology improved governance and increased citizen participation. The mission was introduced in response to the rapid pace of urbanization in India. As urban populations grow due to migration for employment education and better opportunities cities face mounting pressure on housing transportation water supply sanitation waste management and public services. Traditional urban systems often struggle to keep up with these demands. Therefore the Smart Cities Mission focuses on making cities more livable resilient and inclusive while ensuring the efficient use of resources.

Under the Smart Cities Mission 100 cities across India were selected through a competitive process known as the Smart City Challenge. Cities were encouraged to prepare proposals based on local needs citizen feedback and innovative development plans. The mission follows two main development strategies: area-based development and pan-city development. Area-based development involves retrofitting existing areas redeveloping old city zones and creating greenfield projects in new areas. Pan-city development focuses on applying smart solutions throughout the city such as intelligent traffic management systems digital governance platforms smart street lighting and surveillance systems. Technology plays a pivotal role in the mission. Smart solutions include the use of sensors data analytics e-governance systems integrated command and control centers renewable energy and efficient public transport systems. These measures enhance service delivery reduce energy consumption manage traffic and improve public safety. Simultaneously the mission emphasizes environmental sustainability through green spaces water conservation and waste recycling initiatives. A key feature of the Smart Cities Mission is citizen participation. Residents are encouraged to contribute ideas and feedback during planning and implementation ensuring that development projects address real community needs and foster people-centered cities.

Infrastructure efficiency is essential for the smooth functioning and sustainable growth of cities. Efficient infrastructure includes well-planned transportation systems reliable water supply sanitation services energy distribution waste management digital connectivity and public facilities. As urban populations expand rapidly cities must utilize their infrastructure effectively to meet increasing demands while minimizing costs and environmental impact. Efficient transport networks reduce travel time fuel consumption and traffic congestion thereby improving productivity and quality of life. Reliable water and sanitation systems help protect public health and curb the spread of disease.

Energy-efficient infrastructure such as smart grids and renewable energy systems reduces carbon emissions and ensures uninterrupted power supply for households and industries. Similarly effective waste management systems contribute to cleaner environments and greater resource recovery through recycling and reuse. Digital infrastructure supports e-governance online services and communication making city administration more responsive and accessible. Furthermore infrastructure efficiency strengthens economic development by attracting investment creating jobs and supporting business activities. It also enhances resilience against disasters like floods heatwaves and power failures through better planning and smart technologies. In rapidly urbanizing countries like India efficient infrastructure is vital for achieving sustainable urban development and enhancing the overall livability of cities. Thus investing in modern efficient and inclusive infrastructure is a key priority for future-ready cities.

This study aims to analyze and compare the efficacy of Area-Based Development (ABD) and Pan-City strategies within the Smart Cities Mission in enhancing the efficiency of urban infrastructure in Indore. It seeks to examine the ways in which these two strategies improve transportation water supply waste management digital services and overall urban governance. The research also aims to pinpoint the advantages drawbacks and obstacles to putting each strategy into action. The study is limited to Indore and focuses on a few smart city projects and how they affect the quality of urban life service delivery and sustainability.

Area-Based Development (ABD) is a part of India's Smart Cities Mission. It is a planned way to improve a certain area of a city by upgrading its infrastructure and renewing its buildings. It wants to turn certain neighborhoods districts or zones into well-developed sustainable and livable places by improving roads water supply sanitation housing public spaces transportation and smart technologies. ABD usually has three types of projects: retrofitting (making old areas

better) redevelopment (building new areas) and greenfield development (building new areas). The goal is to make model zones that will encourage growth in other parts of the city.

Pan-City strategies are part of India's Smart Cities Mission. They are city-wide development plans that use smart solutions all over the city instead of just in one area. The goal of these plans is to use technology-driven systems to make urban infrastructure governance and public services more efficient as a whole. Some common examples are smart street lighting digital governance platforms smart traffic management integrated public transportation monitoring of the water supply waste management systems and networks for city surveillance. The main goal of Pan-City strategies is to make life better for all residents of the city by improving service delivery connectivity sustainability and quality of life.

II. LITERATURE REVIEW

Praharaj (2025) examined the performance of India's Smart Cities Mission and found that Area-Based Development (ABD) often concentrates investment in limited urban pockets while Pan-City initiatives provide wider city-level benefits through traffic management surveillance and digital governance systems. The study noted that cities such as Indore used ABD selectively but Pan-City systems improved broader service efficiency.

Praharaj (2021) critically reviewed ABD projects in Indian smart cities and concluded that ABD improves local infrastructure quality through retrofitting and redevelopment but may exclude peripheral populations. The study highlighted the need for balanced integration of Pan-City strategies for equitable development.

Kesar et al. (2024) analyzed the institutional framework of the Smart Cities Mission and observed that city governance structures strongly influence project outcomes. Their findings suggest that successful cities like Indore benefited from coordinated planning between municipal bodies and SPVs especially in Pan-City service delivery.

Jha (2021) discussed issues and challenges in the Smart Cities Mission and stated that combining ABD with Pan-City strategies can temporarily solve infrastructure gaps in transport waste management and urban mobility. The paper emphasized technology-driven governance for sustainable urban systems.

Jawaid and Khan (2020) evaluated the Smart City Mission's role in improving urban environments. They found that smart infrastructure projects including water systems roads and waste management help cities address rapid urbanization pressures. Their observations are relevant to Indore's sanitation and mobility reforms.

Vaishampayan and Agarwal (2020) identified implementation barriers such as weak governance capacity funding delays and coordination problems. They concluded that both ABD and Pan-City models require strong administrative systems to achieve measurable infrastructure efficiency.

Tan and Taihagh (2020) reviewed smart city governance in developing countries and found that digital infrastructure alone cannot solve urban problems without social legal and financial reforms. Their findings support the need for inclusive planning in cities like Indore.

Indian Institute of Technology Roorkee (2022) assessed Indian smart cities and concluded that ABD improves targeted zones whereas Pan-City initiatives create city-wide operational efficiency. The report suggests that combining both approaches yields stronger long-term urban outcomes.

Objectives

- To understand the concept of Area-Based Development (ABD) and Pan-City strategies under the Smart Cities Mission.
- To compare the effectiveness of ABD and Pan-City strategies in improving urban infrastructure efficiency.
- To identify the strengths and limitations of ABD and Pan-City approaches in Indore.
- To evaluate how these strategies contribute to overall urban development and quality of life in the city.

Research Design

The study's research design employs a comparative and descriptive theoretical framework. It looks at two main strategies of the Smart Cities Mission: Area-Based Development (ABD) and Pan-City strategies to see how they help

make Indore's urban infrastructure more efficient. The research employs the principles of sustainable urban development intelligent governance and infrastructure management as its theoretical framework. We look at secondary data from government reports academic journals and policy papers to compare how well transport sanitation water supply waste management and digital services are doing. This design helps us figure out which development model works better.

Comparative Analysis of ABD and Pan-City Strategies

Basis of Comparison	Area-Based Development (ABD)	Pan-City Strategies	Theoretical Evaluation of Effectiveness
Coverage (Localized vs City-wide)	Focuses on selected zones neighborhoods or corridors within the city through retrofitting redevelopment or greenfield development.	Covers the entire city by applying common smart solutions across multiple sectors and services.	ABD creates visible model areas quickly while Pan-City strategies ensure broader and more inclusive urban benefits.
Infrastructure Efficiency	Improves infrastructure quality intensively in targeted areas such as roads, drainage, housing water supply and public spaces.	Enhances operational efficiency through city-wide systems like traffic management, waste collection tracking and utility monitoring.	ABD is effective for physical transformation; Pan-City is stronger for system-wide service optimization.
Technology Integration	Uses technology mainly within selected areas such as smart lighting, Wi-Fi zones surveillance and smart utilities.	Uses integrated digital platforms across the city including ICCCs, e-governance, smart mobility, GIS and sensor networks.	Pan-City strategies generally produce higher technological, scalability and interoperability than ABD.
Cost and Resource Allocation	Requires concentrated investment in smaller areas with high visual impact.	Requires distributed investment across departments and city networks.	ABD may show faster short-term results while Pan-City may generate higher long-term returns through efficiency gains.
Inclusiveness	Benefits residents within selected project zones first.	Benefits a larger share of urban residents simultaneously.	Pan-City strategies are usually more equitable if implemented effectively.
Sustainability	Can demonstrate sustainable urban design in pilot areas.	Can reduce emissions and resource waste city-wide through smart systems.	Combining ABD pilots with Pan-City scaling offers the strongest sustainability outcomes.

Strengths of Area-Based Development (ABD)

Area-Based Development (ABD) offers the advantage of focused and planned improvement within selected parts of a city. Since investments are concentrated in a limited area authorities can implement projects more efficiently and demonstrate visible results in a shorter period. ABD helps upgrade roads, drainage, housing, public spaces, water supply and sanitation in a coordinated manner. It also allows better project monitoring easier management and higher quality execution. In cities like Indore ABD can create model zones that inspire similar development in other urban areas.

Limitations of Area-Based Development (ABD)

The major limitation of ABD is its restricted spatial coverage as benefits are limited to selected neighborhoods rather than the entire city. This may create inequality between developed and undeveloped areas especially where peripheral regions continue to face poor infrastructure. ABD projects often require high capital investment and land management which can lead to delays or displacement concerns. In some cases the visible success of ABD zones may not significantly improve overall city-wide service efficiency if broader urban systems remain weak.

Strengths of Pan-City Strategies

Pan-City strategies provide city-wide benefits by improving services across the entire urban area. These strategies are highly effective for systems such as traffic management, waste collection, water monitoring, public transport, digital governance and safety surveillance. Their wider reach ensures that a larger population benefits from development initiatives. Pan-City projects are scalable and can integrate multiple departments through technology platforms leading to better coordination and operational efficiency. For a growing city like Indore Pan-City solutions support inclusive and long-term urban management.

Limitations of Pan-City Strategies

Pan-City strategies often face implementation challenges because they require coordination among many departments, agencies and stakeholders. Large-scale technology integration can be costly and may need strong technical expertise, continuous maintenance and reliable data systems. Delays in procurement funding constraints and institutional inefficiency can reduce project effectiveness. In addition if digital access is unequal some citizens may not fully benefit from smart governance services. Without proper planning and monitoring city-wide systems may become complex and difficult to manage efficiently.

Impact on Urban Development and Quality of Life

Area Based Development (ABD) has a major impact on urban development through transformation of selected zones of a city with planned upgradation of infrastructure and better land utilization. It upgrades roads, drainage, water supply, sanitation, housing parks and public spaces in the targeted areas. These improvements are good for mobility for cleanliness and safety and environmental quality. ABD also increases property values, attracts investment and spurs economic activity in developed areas. For residents this translates to a better quality of life improved services a healthier environment and more orderly neighborhoods. ABD can create model urban areas in cities like Indore to promote further city development.

Pan-City strategies impact urban development by offering smart solutions for the entire city rather than a selected portion of it. These strategies improve traffic management, waste collection, water monitoring, public transport, digital governance, street lighting and public safety systems. This makes them more efficient decongests improves service delivery and strengthens city administration. Pan-City strategies are more inclusive of urban growth as benefits are extended to a larger population. Citizens experience an improved quality of life with easier access to services safer urban environment reduced travel time and cleaner environment. Pan-City initiatives can promote sustainable and efficient long-term management of the city in Indore.

III. CONCLUSION

The study found that both Area-Based Development (ABD) and Pan-City strategies have important roles in improving urban infrastructure efficiency under the Smart Cities Mission. ABD was found to be better in delivering focused and visible improvements in selected areas through better roads, sanitation, housing, drainage and public spaces. It helps in creating model zones and attracts investment. But the benefits are confined to specific localities. Smart traffic management, waste management, water monitoring, digital governance, public transport and surveillance systems were found to be more effective in providing city-wide benefits through Pan-City strategies. These strategies increase

operational efficiency inclusiveness and sustainability in the long run by serving a larger urban population. However they have challenges such as high-cost technical complexity and coordination issues between departments.

The Area-Based Development (ABD) and Pan-City strategies have both made significant contributions to urban development but their impacts differ in terms of scale focus and long-term outcomes. ABD focuses on intensive infrastructure investment and planned redevelopment to transform selected parts of a city. It delivers tangible visible improvements to roads, housing, drainage, parks, smart lighting and cleanliness. These changes tend to increase land values attract private investment and create model zones which illustrate the capacity of modern urban planning to improve living standards. However not all the residents in the city may have immediate access to the benefits as ABD is limited to certain places. In contrast Pan-City strategies improve systems and services across the whole city having a wider urban impact. Smart traffic management, intelligent waste collection, integrated command centers, digital governance, water supply monitoring and public transport solutions cater to a much larger population. These measures will improve the daily functioning of the city reduce congestion improve the efficiency of administration and make life more convenient for the public. Pan-City projects are particularly important for long-term sustainability focusing on operational efficiency data-based governance and scalable service delivery.

The comparison shows that ABD is more effective for concentrated physical transformation and quick visible results while Pan-City strategies are better for inclusive growth and city-wide efficiency of infrastructure. In a large and fast growing city like Indore relying on just one strategy can hinder overall development outcomes. ABD without Pan-City support can create isolated smart zones. Pan-City without ABD may upgrade systems but not have demonstration areas of urban excellence. Hence the best model of urban development is the combination of both strategies. The Pan-City strategies can take the ABD as a pilot for innovative urban design and infrastructure improvement and disseminate the benefits to the wider city population. Together they improve mobility, environmental quality, governance efficiency, economic opportunities and citizen well-being.

Recommendations for improving urban infrastructure

Strengthen Integrated Urban Planning: Cities should adopt coordinated planning that links transport, housing water supply, sanitation and land use. This helps avoid unplanned growth and ensures efficient use of resources. Long-term master plans should focus on sustainability and future population needs.

Invest in Smart Technology: Urban authorities should use smart systems such as intelligent traffic signals, digital governance platforms, water monitoring sensors and waste tracking systems. These technologies improve service delivery reduce costs and increase operational efficiency.

Upgrade Public Transport: Expanding affordable and reliable public transport systems such as buses, metro rail and cycling infrastructure can reduce traffic congestion and pollution. Better connectivity also improves mobility and access to jobs and services.

Improve Basic Services: Continuous investment in water supply, sewage treatment drainage, waste management and street lighting is essential. High-quality basic infrastructure directly improves public health safety and living standards.

Encourage Public Participation: Citizens should be involved in planning and monitoring urban projects through consultations and digital feedback systems. Public participation helps identify real needs improves transparency and increases the success of infrastructure projects.

REFERENCES

- [1]. World Bank. (2024 January 30). *Gearing up for India's rapid urban transformation*. <https://www.worldbank.org/en/news/opinion/2024/01/30/gearing-up-for-india-s-rapid-urban-transformation>
- [2]. Ministry of Housing and Urban Affairs. (2024). *Smart Cities Mission: Transforming urban India*. Government of India. <https://smartcities.gov.in>
- [3]. United Nations Human Settlements Programme. (2023). *World cities report 2023: Envisaging the future of cities*. UN-Habitat. <https://unhabitat.org/>

- [4]. Praharaj S. (2025). *An appraisal of the 100 Smart Cities' Mission in India*. Journal of Urban Technology. <https://www.tandfonline.com/doi/full/10.1080/10630732.2025.2549672>
- [5]. Praharaj S. (2021). *Area-based urban renewal approach for smart cities development in India: Challenges of inclusion and sustainability*. Urban Planning 6(4) 202–215. <https://www.researchgate.net/publication/356340912>
- [6]. Kesar P. et al. (2024). *Past present and future of the Smart City in India: An institutional perspective*. Cities 146 104775. <https://www.sciencedirect.com/science/article/pii/S0264275123005875>
- [7]. Jha R. (2021). *Smart City Mission: Issues and challenges India*. National Institute of Urban Affairs. https://niua.in/sites/default/files/2025-07/2021_1_Smart%20City%20Mission.pdf
- [8]. Jawaid M. F. & Khan A. R. (2020). *The Smart City Mission in India and prospects of improvement in the urban environment*. IOP Conference Series. <https://www.researchgate.net/publication/347081943>
- [9]. Vaishampayan S. & Agarwal A. (2020). *The Smart City Concept: Challenges in adoption and implementation in India*. Journal of Real Estate Construction & Management. <https://journals.sagepub.com/doi/pdf/10.1177/2977657020200306>
- [10]. Tan S. Y. & Taeihagh A. (2020). *Smart city governance in developing countries: A systematic literature review*. <https://arxiv.org/abs/2001.10173>
- [11]. Indian Institute of Technology Roorkee. (2022). *Impact assessment of Indian Smart Cities*. https://mgcl.iitr.ac.in/uploads/Publication_Impact_Assessment_of_Indian_Smart_Cities.pdf
- [12]. Ministry of Housing and Urban Affairs. (2024). *Smart Cities Mission*. Government of India. <https://smartcities.gov.in>
- [13]. United Nations Human Settlements Programme. (2023). *World cities report 2023: Envisaging the future of cities*. UN-Habitat. <https://unhabitat.org>