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Sustainability, Inclusivity, and Infrastructure Development in Kolkata: A Critical Analysis of the Smart Cities Mission

Papiya Dey

M.A in Political Science, M.Ed. (Pursuing), Department of Political Science,
The University of Burdwan, West Bengal, India.

E-mail – papiyadnk1@gmail.com

ABSTRACT

India's Smart Cities Mission has been one of the country's most visible urban policy initiatives, aiming to combine technological innovation, infrastructure modernization, and improved governance with better quality of life. In the Kolkata region, the most relevant Smart Cities Mission case is New Town Kolkata, a planned satellite township on the metropolitan fringe. This paper critically examines the extent to which the mission has advanced sustainability, inclusivity, and infrastructure development in the Kolkata context. The study is based on secondary sources, including official Smart Cities Mission documents, New Town development agency material, think tank reports, and academic literature on smart urbanism in India. The paper finds that the mission has contributed to visible gains in urban infrastructure, including integrated command and control systems, smart lighting, non-motorized mobility facilities, digital governance, and low-carbon transport initiatives. New Town has also developed a reputation for environmentally oriented projects such as solar infrastructure, public bicycle sharing, waste-to-energy initiatives, and green public spaces. However, the evidence also suggests that the model remains uneven in its social reach. The area-based development approach has tended to privilege selected zones, while the broader challenges of affordability, democratic participation, peri-urban displacement, and social inclusion remain only partially addressed. In this respect, smart infrastructure has often advanced faster than inclusive urban citizenship. The paper argues that the Smart Cities Mission has improved the material and managerial dimensions of urban development in the Kolkata region, but its sustainability gains remain incomplete unless paired with stronger social justice, wider territorial integration, and climate-sensitive planning. A more balanced framework is needed in which technological modernization is embedded within inclusive governance, affordable access, and ecological resilience.

Keywords: *Smart Cities Mission; New Town Kolkata; Sustainability; Inclusivity; Infrastructure Development; Urban Governance; Smart Urbanism; India.*

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1. Introduction

Urban India has entered a period in which infrastructure, digital governance, and climate resilience are increasingly discussed together. The Smart Cities Mission, launched in 2015, emerged in this context as a flagship urban transformation programme. Its stated objective is to promote cities that provide core infrastructure, a decent quality of life, a clean and sustainable environment, and the application of "smart solutions." The mission framework combines area-based development with pan-city initiatives, and it emphasizes technology as a tool for better governance and service delivery.

In the Kolkata urban region, this agenda is best studied through New Town Kolkata, a planned township developed on the eastern metropolitan fringe. Official New Town agencies now present the area as a "Green Smart City," with projects including solar-powered and cloud-connected energy-saving street lighting, public bicycle sharing, EV charging, smart parking, a biomethanation plant, and digital management systems. Official records also show the use of an Integrated Command and Control Centre for real-time monitoring during Cyclone Remal in May 2024, suggesting that smart-city tools have increasingly been linked to urban resilience and emergency response.

Yet the idea of the smart city in India has always been contested. The mission has been praised for modernizing infrastructure and encouraging innovation, but criticized for privileging enclaves, centralizing governance, and insufficiently addressing the needs of poorer residents. Scholarly and policy critiques argue that smart-city development in India can become technocratic and spatially selective, especially when infrastructure-led branding advances faster than inclusion, affordability, and democratic participation.

This paper examines these tensions in the Kolkata case. It asks three related questions. First, how far has the Smart Cities Mission contributed to sustainability in the Kolkata region? Second, has it produced an inclusive model of urban development? Third, what kinds of infrastructure gains has it actually delivered? The paper argues that New Town demonstrates real advances in planned infrastructure, digital management, and environmental design, but that these achievements remain incomplete unless social inclusion and metropolitan integration are treated as equally central goals.

2. Review of Literature

Hollands (2008) offered one of the earliest major critiques of the smart city idea. He argued that the term was often used as an attractive label rather than a clearly defined urban model. His work is important because it questioned whether "smartness" really improves social justice or simply rebrands entrepreneurial urban development.

Kitchin (2014) examined how big data and digital infrastructures shape smart urbanism. He showed that real-time monitoring may improve efficiency, but it can also strengthen technocratic governance, corporate control, and surveillance. This study is useful for understanding why smart projects should be judged not only by technology, but also by power and accountability.

Datta (2015) analysed India's smart city vision through the case of Dholera, Gujarat. She argued that smart cities in postcolonial India are often presented as urban utopias linked to investment, global capital, and entrepreneurial development. Her argument helps explain why many smart city projects prioritize image-making and growth over inclusion.

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The Smart Cities Mission Guidelines (2015) officially defined the mission around quality of life, economic growth, technology use, and area-based development. The document claimed that local area development would improve liveability for the whole city. This policy vision is central to later debates because scholars often compare these promises with actual outcomes on the ground.

Anand (2018), in a policy brief on the Smart Cities Mission, showed that a large share of projects and budgets were concentrated in area-based development. This finding suggested that investment was often spatially selective rather than equally distributed across the city.

Mitra et al. (2018) studied urbanisation and changing waterscapes in New Town Kolkata. Using satellite-based analysis, the study showed that expanding built-up land had significantly affected water bodies. This work is important for linking smart urban growth with ecological pressure in the Kolkata region.

Praharaj (2021) critically assessed India's area-based smart city model and found that selected precinct development could deepen social polarization and gentrification. His study directly supports the argument that inclusivity remains a weak dimension in many smart city projects.

Ghosh and Arora (2022) focused specifically on New Town Kolkata and found that its smart city imaginary was not strongly distributive, participatory, or responsive to poorer groups. Their work is especially valuable for this study because it shows that New Town's planning mainly reflected the interests of middle- and higher-income residents. Karmakar (2022) similarly argued that the New Town model and the later Green City turn did not adequately generate inclusive local benefits, especially for surrounding villages.

3. Objectives of the Study

The paper has four objectives:

1. To examine the Smart Cities Mission framework in relation to the Kolkata urban region.
2. To assess the contribution of New Town Kolkata to sustainable urban development.
3. To analyze the extent to which smart-city initiatives have promoted inclusivity and equitable access.
4. To evaluate the infrastructure outcomes and policy limitations of the mission in the Kolkata case.

4. Methodology

This study is based on qualitative analysis of secondary sources. The material includes official Smart Cities Mission guidelines and progress reports, New Town Kolkata agency documents, and academic as well as policy literature on smart urbanism, sustainability, and inclusion in India. The use of secondary sources is appropriate because the paper's focus is analytical rather than ethnographic: it seeks to interpret the policy model and the observed direction of change rather than to present a household-level survey.

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The paper adopts a critical urban policy perspective. It treats sustainability, inclusivity, and infrastructure as linked but distinct dimensions. Sustainability refers to environmental performance, resource efficiency, and climate resilience. Inclusivity refers to the distribution of benefits, accessibility, participation, and social justice. Infrastructure development refers to the creation or modernization of physical, digital, and managerial systems that shape urban life.

5. Smart Cities Mission and the Kolkata Case

The Smart Cities Mission was designed around a mix of retrofitting, redevelopment, greenfield development, and pan-city smart solutions. In the Kolkata region, the most analytically relevant SCM-linked case is New Town Kolkata, a greenfield and planned expansion zone rather than the historic core city. Official sources and mission documents show that New Town became associated with smart-city planning, citizen consultation processes, and later a Green Smart City institutional framework.

This distinction matters. Kolkata as a metropolitan region contains inherited infrastructure deficits, dense older neighborhoods, informal settlements, and ecological vulnerability tied to wetlands, flooding, and heat stress. New Town, by contrast, is a comparatively planned urban extension with wider roads, newer utilities, and greater scope for integrating digital systems from the beginning. That makes it a useful case for studying the mission's ambitions, but also a limited one if the goal is to understand inclusion across the whole metropolis.

6. Results and Discussion

This section critically examines the outcomes of the Smart Cities Mission in the Kolkata urban region through the case of New Town Kolkata. The discussion is organized around three main dimensions: sustainability, inclusivity, and infrastructure development. These dimensions are closely interrelated. Infrastructure provides the material base of the smart-city project, sustainability reflects the environmental and resilience orientation of development, and inclusivity determines whether the benefits of that development are broadly shared. The evidence suggests that the mission has produced visible gains in infrastructure and selective gains in sustainability, but its contribution to social inclusion remains limited and uneven.

6.1 Sustainability Outcomes

The Smart Cities Mission in New Town Kolkata presents one of the clearest attempts in eastern India to combine urban modernization with environmental planning. Official project records show that New Town's pan-city strategy includes public bicycle sharing (₹3.15 crore), 25 electric vehicle charging units, graded cycle tracks and cycle sheds (₹0.62 crore), smart pumping and drainage infrastructure (₹6.19 crore), solar street lighting, and public Wi-Fi and digital connectivity projects. These initiatives indicate that the sustainability agenda is not merely symbolic; it has been translated into a set of concrete urban interventions.

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Table 1: Selected Sustainability-Linked Smart-City Projects in New Town Kolkata

Project	Status/Scale	Cost
Public Bicycle Sharing System	Ongoing	₹3.15 crore
Cycle Docking Stations	21 stations	₹3.99 crore
Graded Cycle Tracks, Sheds, Signage	Ongoing	₹0.62 crore
Cycle Track along service road	2450 meters	₹2.52 crore
Solar street lighting at pathways/green verge	Ongoing/completed	₹1.62 crore; ₹0.75 crore
Smart pumping drainage station	Ongoing	₹6.19 crore
EV charging infrastructure	25 units	Cost not shown in listing

Source: New Town Kolkata Green Smart City pan-city projects.

A closer reading of these projects shows that sustainability in New Town has been approached through mobility, energy efficiency, and resilience-oriented urban management. Cycling infrastructure and docking stations support non-motorized transport, solar lighting reduces dependence on conventional grid-based energy, and smart pumping arrangements point to the need for climate-sensitive urban drainage in a low-lying metropolitan region. In a deltaic environment like the Kolkata fringe, this is especially important because sustainability cannot be reduced to greenery or beautification. It must include the ability of the city to function under environmental stress.

The resilience aspect becomes even clearer in the official report from the Ministry of Housing and Urban Affairs, which noted that New Town Kolkata's Integrated Command and Control Centre (ICCC) monitored Cyclone Remal on 22 May 2024 in real time using satellite data, news feeds, and CCTV from multiple locations. This expands the meaning of sustainability beyond energy-saving infrastructure. It suggests that the smart-city model in New Town has begun to incorporate real-time hazard management, which is highly relevant in the climate-sensitive Bengal region. In practical terms, the ICCC improves the capacity of urban authorities to monitor emergencies, coordinate response, and reduce disruption during extreme events.

Still, the sustainability record should not be overstated. While New Town has adopted green and smart technologies, the larger metropolitan context raises concerns. The Kolkata region depends on wetlands, low-lying transitional land, and hydrologically sensitive surfaces. Rapid urban expansion may reduce permeable land, increase runoff pressure, and create long-term ecological strain if development outpaces environmental safeguards. Thus, the sustainability of smart-city interventions depends not only on the number of cycle tracks, solar lamps, or EV points created, but also on whether these projects remain compatible with flood management, wetland protection, and broader ecological balance. This means that New Town's environmental performance is promising, but still incomplete.

In this sense, the sustainability outcome may be described as moderately successful. The city has moved beyond rhetoric and implemented tangible green and resilience-linked projects. Yet the broader ecological sustainability of metropolitan expansion remains uncertain, especially in the absence of a stronger territorial integration between smart infrastructure and regional environmental planning.

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6.2 Inclusivity and the Social Reach of Smart Urbanism

If sustainability represents a partial success, inclusivity remains the weakest dimension of the Smart Cities Mission in the Kolkata case. The official mission framework emphasizes quality of life, improved services, and city-wide benefits, but actual implementation often works through selected zones, special-purpose vehicles, and high-visibility project packages. In New Town Kolkata, the official planning structure itself reflects this selective logic. The 2018 RFP for project management notes that the Area-Based Development (ABD) component was concentrated in Action Areas IA, IB, and IC, while additional elements were framed as pan-city projects. This indicates that investment intensity was spatially focused rather than uniformly distributed across the wider metropolitan region.

Table 2. Indicators of Selective and Inclusive Features in The New Town Model

Dimension	Evidence	Interpretation
Area-based focus	ABD identified in Action Areas IA, IB, IC	Development concentrated in selected zones
Pan-city components	Bicycle sharing, smart bus shelters, Wi-Fi, helpline	Some broader service-oriented benefits
Citizen helpline	24/7 toll-free helpline completed	Improves interface between citizens and authority
Health card / EHR modules	Digital citizen-service initiatives	Expands administrative inclusion
CCTV and command systems	Surveillance and emergency monitoring	Supports safety, but not necessarily equity

Source: New Town pan-city project list and NKGSCCL project documents.

This pattern matters because inclusivity is not only about whether a project exists. It is about who benefits, who participates, and who may be left out. New Town is a planned township with newer roads, formal land development, and greater room for infrastructure integration. That makes it easier to install smart lighting, parking systems, cycle tracks, digital governance tools, and surveillance networks there than in the older, denser, and more socio-economically diverse parts of metropolitan Kolkata. The danger, therefore, is that the smart-city model produces a relatively efficient and attractive enclave while leaving wider inequalities intact.

At the same time, some inclusion-linked benefits are visible. The project list shows a 24/7 toll-free citizen helpline (₹0.48 crore), community health card initiatives using blockchain (₹0.60 crore), electronic birth/death record modules, real-time passenger information display systems for bus stops (₹2.8 crore), smart bus shelters, and public Wi-Fi zones (₹2.66 crore). These initiatives potentially widen access to services, information, and public interface. They may be especially useful in improving everyday governance, commuter convenience, and administrative transparency.

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Table 3. Selected Inclusion-Related Projects in New Town Kolkata

Project	Cost	Likely inclusion benefit
24/7 toll-free citizen helpline	₹0.48 crore	Easier grievance access
Community Health Card	₹0.60 crore	Health-service integration
Public Wi-Fi zones	₹2.66 crore	Digital access in public space
RPIDS at bus stops	₹2.8 crore	Better public transport information
Smart bus shelters	₹0.24 crore and ₹0.89 crore	Commuter comfort and usability
Electronic birth/death module	₹0.04 crore	Easier civic record access

Source: New Town pan-city projects.

However, technological access should not be confused with social inclusion in a deeper sense. Public Wi-Fi, smart bus shelters, and helplines improve urban convenience, but they do not automatically resolve issues such as affordability, housing inequality, displacement, uneven service reach, or limited democratic participation. A city may become more digitally responsive while still remaining socially selective. In the Kolkata region, this concern is especially important because the metropolitan population includes informal workers, low-income settlements, peri-urban residents affected by land transformation, and communities whose needs may not be adequately captured by high-tech planning models.

The institutional structure of smart-city implementation can also produce a participation gap. The use of a special purpose vehicle and project-driven governance may improve speed and coordination, but it can also reduce the everyday visibility of democratic accountability if local communities are consulted only at limited stages. Thus, while the mission clearly enhances managerial inclusion, its record on social justice and participatory inclusion remains more limited.

The New Town case therefore shows that technological inclusion has advanced faster than structural inclusion. Safer lighting, public transport information, digital services, and emergency response systems benefit urban users. Yet the deeper question of whether the Smart Cities Mission has created a more equitable urban region remains unresolved. In this dimension, the mission's impact may be considered partial and uneven.

6.3 Infrastructure Development

Infrastructure is the sphere in which the Smart Cities Mission has been most visibly successful. The New Town project listings show an extensive portfolio of completed and ongoing works, ranging from cycle infrastructure, smart parking, and CCTV systems to OFC backbone networks, administrative IT infrastructure, bus shelters, smart lighting, and public convenience facilities. This indicates that the smart-city model has produced not only isolated projects but also an integrated effort to modernize the physical and informational fabric of the township.

At the national level, the Ministry of Housing and Urban Affairs reported in May 2024 that 28 projects worth ₹220 crore were completed in that month alone under the Smart Cities Mission, and that 7,066 projects worth ₹1,41,500 crore had been completed overall. While these are all-India numbers, they help situate New Town within a broader implementation framework that has clearly moved beyond planning rhetoric into material execution.

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Table 4. Selected Infrastructure-Oriented Smart-City Projects in New Town Kolkata

Project	Status	Cost
CCTV Surveillance System Part I	Ongoing	₹13.77 crore
OFC backbone for CCTV surveillance	Ongoing	₹6.19 crore
Development of integrated vehicular and pedestrian safety measures	Ongoing	₹61.32 crore
IT infrastructure for new administration building	Ongoing	₹7.83 crore
Fastag-based vehicle parking solutions	Ongoing	₹0.20 crore
Smart street light arrangement	Completed	₹0.46 crore
Smart cycle stand	Ongoing	₹0.34 crore
Containerized toilets	Ongoing	₹0.96 crore

Source: New Town pan-city projects

The most important feature of this infrastructure development is that it goes beyond visible assets such as roads or poles. Smart infrastructure in New Town includes the systems that manage flows: traffic movements, surveillance feeds, administrative records, transport information, and emergency signals. In other words, the mission has supported a transition from purely physical infrastructure to hybrid infrastructure, where roads, lighting, transport, communication, and governance are increasingly linked through data and network systems.

This is a major change from older urban infrastructure models. In a conventional framework, roads, drainage, and public facilities are built as separate assets. In the smart-city model, these are integrated into a coordinated urban management system. CCTV networks, command centres, OFC backbones, citizen helplines, and real-time bus information all reflect this new logic. It improves operational efficiency and allows urban authorities to respond more quickly to congestion, emergencies, and service demands.

The strongest evidence of infrastructure success in New Town is the scale and diversity of projects already listed under the mission. The ₹61.32 crore vehicular and pedestrian safety project is particularly notable, as it signals an attempt to combine mobility improvement with safety-oriented street design. The substantial investment in digital surveillance and network systems similarly shows that New Town's smart-city infrastructure is not limited to beautification but includes deeper administrative modernization.

Yet infrastructure-led success has clear limits. New roads, surveillance systems, smart shelters, and EV charging units do not automatically solve metropolitan inequality. Infrastructure can be modern and efficient while still disproportionately serving formal, planned, and better-connected urban zones. For that reason, the infrastructure story must be interpreted alongside the weaker performance on inclusivity.

6.4 Synthesis: Has the Mission Delivered?

Taken together, the evidence suggests that the Smart Cities Mission has delivered real but selective gains in the Kolkata case. Its strongest performance lies in infrastructure modernization, where project implementation is visible, numerically substantial, and institutionally grounded. Its

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performance in sustainability is moderate, with meaningful advances in solar lighting, cycling, EV support, and resilience monitoring, but with unresolved ecological questions related to regional land-use change. Its weakest performance is in inclusivity, where technological improvements have not yet translated fully into broader social equity, metropolitan integration, or deep democratic participation.

Table 5. Overall Assessment of Smart Cities Mission Outcomes in The Kolkata Case

Dimension	Major Gains	Main Limitation	Overall Assessment
Sustainability	Solar lighting, cycling, EV support, ICCC hazard monitoring	Ecological pressures of expansion remain	Moderate
Inclusivity	Helplines, bus information, Wi-Fi, digital records	Selective spatial reach, limited social justice impact	Weak to partial
Infrastructure	Strong project implementation, digital and physical modernization	Benefits may remain concentrated	Strong

This pattern is not unique to New Town. It reflects a broader feature of smart-city development in India, where implementable infrastructure projects often advance faster than more difficult reforms related to social justice, affordability, and participatory governance. In the Kolkata urban region, the mission has clearly changed the material and managerial landscape of New Town. What it has not yet fully done is ensure that the gains of smart urbanism are distributed in a socially and territorially inclusive way. That remains the unfinished part of the smart-city agenda.

7. Conclusion

The Smart Cities Mission has undeniably changed the vocabulary and practice of urban development in India. In the Kolkata context, its clearest expression is New Town Kolkata, where planned expansion has been combined with digital systems, green infrastructure, and managerial modernization. The case demonstrates that smart-city policy can improve infrastructure quality, strengthen urban resilience tools, and support a more environmentally conscious form of city-building.

Even so, the case also reveals the limits of a technology-first development model. Infrastructure has improved more quickly than inclusion. Environmental ambition is visible, but long-term sustainability remains uncertain unless ecological safeguards are integrated more deeply into metropolitan planning. Participation exists, but democratic control over urban transformation remains uneven. In short, the Kolkata experience shows that a smart city can be efficient, modern, and visually sustainable without yet becoming fully inclusive.

A critical reading of the mission therefore leads to a balanced conclusion. The Smart Cities Mission has worked best as an infrastructure and governance modernization programme. It has worked less well as a framework for urban justice. For the Kolkata region, the next step is not to abandon smart urbanism but to deepen it by making it more affordable, more participatory, and more ecologically grounded. Only then can the promise of sustainability, inclusivity, and infrastructure development converge in a genuinely transformative way.

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