Applying Design Thinking for Climate-Resilient Urban Planning: A Practical Study of Sustainable Solutions from India's Smart Cities

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***Abstract*—The rapid urbanization and changes in climatic conditions have led to city floods, heat waves, and water crises, as well as straining the infrastructures. The conventional modes of urban planning are not readily adapted to an innovative practice that is humanistic and climate responsive. This paper examines how Design Thinking can be used as a strategy in the design of climate-resistant urban planning as part of the Smart Cities Mission in India. The methodology of the research is secondary research, which entails the review of policy documents, smart city proposals, government reports, and sustainability models, as well as reported case examples of the sampled Indian smart cities, including Pune, Surat, and Bengaluru. The paper identifies five stages of the Design Thinking process: Empathize, Define, Ideate, Prototype, and Test on climate-resilient projects such as flood management systems, smart water governance, heat action plans, green mobility, and waste management innovations. The results show enhanced adaptability and sustainability in urban areas where participatory planning, digital infrastructure, and iterative planning are in place. This paper suggests an empirical framework made of Design Thinking and urban climate resilience policy, and provides policy recommendations to upscale sustainability solutions in emerging economies.**

***Index Terms*—Design Thinking, Climate resilience, Smart Cities Mission, Adaptive capacity and Sustainability, India, participatory planning**

I. INTRODUCTION

A positive change in Indian cities is the rapid urbanization that comes with rising climate risks, including heat waves, unpredictable rainfall, and flooding, which jeopardize the infrastructure, health, and livelihoods (Sharifi and Yamagata 2022). Cities are both extremely susceptible to climate change and essential in resilience innovation because they are the locations of the concentration of population and economic activity (Sharifi and Yamagata 2022). The Smart Cities

Mission by the Government of India clearly aims to change the infrastructure and governance in urban areas by means of integrated and sustainable solutions (Gupta and Gupta 2024). Nevertheless, the current literature indicates that long-term climate-resilient planning and implementation are not explicitly part of numerous smart city propositions (Brookings 2016).

Design Thinking, characterized by problem-framing, iteration, and participatory problem-solving, has increasingly entered planning discourse to bring humanistic insights into complex public problems (Kanaani, ed. 2025). Although much of the design thinking research is based on design and business, scholars suggest that it can be used to influence adaptive urban planning where a creative solution to uncertainty and risk is needed. In this paper, the author explores how climate-resilient urban planning in the Indian Smart Cities can be supported by Design Thinking using secondary research and theoretical synthesis.

II. REVIEW OF LITERATURE

Urban resilience is the ability of a city to prevent, absorb, and recover from the effects of climatic shock, based on the adaptive planning approach, social capital, governance, and technology. Nevertheless, the majority of urban programs in India are project-oriented and disjointed, without a linkage to overall city planning. As Sharifi and Yamagata (2022) emphasize, smart city strategies should encompass both mitigation and adaptation in the present approach since modern approaches usually overlook the long-term climate dynamics. Digital governance and ICT infrastructure focus on the discussions of smart cities, but technology cannot guarantee resilience. Good governance, citizen participation, and coalition making are also essential because participatory strategies increase trust and empower cities to meet the local needs. Research indicates that systematic and participatory planning enables flexible solutions, which integrate formal planning tools and local knowledge.

Emerging approaches such as Design Thinking support this process by enabling an iterative collaboration between stakeholders, which are guided by empathy (Kanaani, ed. 2025). Research concerning participatory urban climate activities can also support the notion that local communities can use useful environmental data to guide adaptive planning (Ravi and Brück 2025), hence, connecting citizen engagement to data-driven policymaking. In the Indian setting, the process of urban transformation is interlinked with the concepts of sustainability, vulnerability, and social equity. According to Tyagi and Kumar (n.d.), although India has become more influential in the world, its climate resiliency levels are generalized and poorly localized, and they need to be regionalized to governance models. Bano et al. (2025) state that geospatial techniques like fine-scale heat mapping are crucial in identifying and targeting the spatial vulnerabilities to achieve better adaptation results.

Likewise, the Smart Cities Mission (SCM) has been criticized for its poor coverage of informal settlements, showing even more underlying issues of a combination of socio-economic inclusivity and infrastructure modernization (Prasad, Alizadeh, and Dowling 2024). These results indicate that resilience should not be dependent on technological development only, but should also deal with

structural and governance challenges associated with urban informality. Simultaneously, the Sustainable Urban Streets (SUS) framework, suggested by Bhagat and Kumar (2025), is a rather localized approach to the sustainability performance measurement, the general applicability of which is restricted. Taken together, these new frameworks are an increasing trend towards performance and evidence-based resilience assessment. Moreover, nature-based solutions (NbS) are becoming more popular as crucial tools of urbanization. According to Boateng et al. (2025), even though climate literacy has an important impact on household-level resilience behavior, institutional and policy gaps are still not allowing it to be adopted universally.

In conclusion, based on the literature, it is highlighted that integrated governance, adaptive technologies, community involvement, and nature-based approaches should come together to enable Indian cities to develop true, long-term climate resilience.

Synthesis and Identified Research Gap

Based on the reviewed literature, the following gaps are identified:

1. The work on climate resilience remains disjointed and has a technical character (Tyagi and Kumar n.d.; Bano et al. 2025).
2. Smart city projects face a problem with the integration of inclusivity and informality (Prasad, Alizadeh, and Dowling 2024).
3. There are assessment instruments that are yet to be integrated on a large scale (Bhagat and Kumar 2025).
4. Solutions based on nature and communities require firm institutional structures (Boateng et al. 2025).

III. OBJECTIVES OF THE STUDY

1. To investigate the challenges of the existing climate-resilient urban planning strategies in the Indian Smart Cities Mission as stated in the recent literature.
2. To examine how the issues of participatory governance, inclusivity, and evaluation systems are represented in current smart city resilience programs.
3. To investigate the relevance of the Design Thinking framework (Empathize, Define, Ideate, Prototype, Test) to reinforce climate-resilient urban planning.

IV. RESEARCH METHODOLOGY

This paper employs a qualitative secondary research design to investigate how the concept of Design Thinking can be integrated into climate-resilient urban planning in India within the Smart Cities. A secondary research design is appropriate as it enables for a systematic synthesis of documents on policies, climate frameworks, peer-reviewed literature, and evidence of case analysis at the city level to determine conceptual connections and patterns in implementation (Johnston, 2017).

Since explicit applications of Design Thinking remain limited in the literature on climate-resilient planning in India, an analytical approach based on documents enables the mapping of Design Thinking to current resilience practices in theory.

3.1 Data Sources

In order to confirm the transparency and replicability of the study, publicly accessible and peer-reviewed secondary sources are utilized exclusively. The data sources include:

1. Official Reports of the Smart Cities Mission (SCM)

Reports on Area-Based Development (ABD) projects, Integrated Command and Control Centers (ICCC), and sustainability projects (Ministry of Housing and Urban Affairs, 2023).

2. Publications of the Housing and Urban Affairs department

Urban transformation reports, climate action plan reports, and progress reports of implementation to the Smart Cities mission (Ministry of Housing and Urban Affairs, 2023).

3. NITI Aayog Sustainability and SDG Reports

Reports that combine the urban development plans with Sustainable Development Goal 11 (Sustainable Cities and Communities) (NITI Aayog, 2022).

4. Frameworks of Urban Resilience at IPCC

As a definition, urban climate resilience, adaptation pathways, and risk governance are all standardized by Intergovernmental Panel on Climate Change (IPCC) sixth assessment report (AR6) working group II across the world (IPCC, 2022).

5. Peer Review Journal Research Articles - quantitative

Research papers on the issues of adapting to climate change, smart cities, urban management, and resiliency in an Indian context (Sharifi and Yamagata 2022; Sharma, Joshi, and Singh 2021).

6. Cases and municipal climate action plans on the city level

Formal local sources, such as:

- Statistics: Surat Climate Change Trust
- Pune Smart City Development Corporation Ltd
- BSCL resilience plans, Bhubaneswar Smart City
- Indore solid waste management reports

V. DATA ANALYSIS AND INTERPRETATION

Table 1: Comparative Secondary Data: Bengaluru, Pune, Surat

Indicators	Bangalore (Bengaluru Smart City Ltd.)	Pune (PSCDCL)	Surat (Surat Smart City Development Ltd.)
Smart City Selected Year	2017	2016	2016
Total SCM Project Cost (₹ Cr)	1,000	3,333	2988
Projects Completed	95% (632/665)	99% (55/55)	100% (82/82)

Key Climate Focus	Water security & urban flooding, climate-resilient infrastructure	Sustainable mobility, walkability, digital governance	Smart water management, flood & disaster management
Nature-Based Solutions	Lake restoration projects, implementing rainwater harvesting	Reduce urban heat island effect, enhance air quality, increase biodiversity	Strengthening coastal resilience through mangrove restoration
Alignment with SDG 11	Moderate	High	High (Resilience-focused)

Inference: The findings indicate that Pune and Surat have a higher implementation efficiency than Bengaluru and highlighting the importance of governance coordination and nature-based solutions.

VI. KEY FINDINGS

The cross-case study of Surat, Pune, and Bengaluru reveals that there are definite trends related to the way in which climate resilience is incorporated in the Smart Cities Mission. It should be noted that the term "policy" does not mean design thinking, but its steps are implemented in practice.

6.1 Participatory Approaches Empower Urban Resilience

Cities that received stakeholder feedback and vulnerability mapping followed more consistent resilience journeys. Surat reinstated its institutions after floods. Pune utilized the engagement of citizens in the development of areas. The two examples show that citizens do help in the identification of risks and in impacting solutions. The IPCC (2022) argues that inclusive governance contributes to the adaptive capacity through the aid of local knowledge.

6.2.ICT Integration Enhances Adaptive Capacity

The three cities established Integrated Command and Control Centers. These centers interrelate the environment, traffic, emergency response, and the redress of grievances. Digital dashboards will be used to provide real-time information that enables quick decision making. This is a positive sign for adaptive governance (Sharifi and Yamagata 2022).

6.3.Nature-Based Solutions Improve Sustainability

The IPCC (2022) concepts of ecosystem-based adaptation are implemented in the redesigning of drainage and lake projects in Bengaluru. They mitigate the risk of floods and enhance ecology. The Pune redesign of streets helps to cool the city and minimize the emissions that support SDG 11 (NITI Aayog, 2022). Technological solutions were also found not to be as sustainable as hybrid green and digital solutions.

6.4.Institutional Collaboration Is Central

There is a need for resilience in the long-term needs to be coordinated at the level of municipal agencies, climate trusts, smart city bodies and state departments. The Climate Change Trust of Surat demonstrates the manner of integrating resilience. The administration in the Bengaluru city is disjointed, which limits integration at the system level. Sharifi and Yamagata (2022) assert that smart cities must evolve beyond technological-based approaches to city governance resilience. Institutional coherence enhances adaptive capacity, as presented by our research.

VII. DISCUSSION

The paper examines the aspect of climate-safe city planning under the mission of Smart Cities. It cited research on design thinking and governance. The results of Bangalore, Pune, and Surat confirm some of the central theory and policy arguments.

- First, citizen-led planning makes the planning more resilient. Those cities whose risk maps and transport plans were done using local input demonstrated better-fitting actions.
- Second, the adaptive capacity is elevated by technological links. ICCC and flood alerts in Surat indicate that technology can be used to control risks and organize.
- Third, hybrid digital-green interventions provide better results than purely infrastructure-based upgrades. A systems-thinking approach proves most effective in Bangalore's lake rehabilitation with sensors and Pune's eco-focused smart mobility showcase systems.
- Fourth, Area-Based Development is a pilot project. Pilots allow cities to experiment with corridors, drainage, and computer regulations and scale up what is successful.

Suggestions

According to the synthesis of the empirical data and the policy analysis, the following recommendations can be offered:

1. Make Participatory Design Thinking Institutional

The citizen consultations are supposed to be shifted into non-event-based stakeholders' meetings to long-term co-creation platforms that are part of municipal governance systems.

2. Expand ICT Beyond Surveillance Toward Predictive Governance

Predictive climate analytics, AI risk modelling, and integrated environmental dashboards are some of the predictive planning features that ICCCs should integrate to do proactive planning.

3. Ensuring Nature-Based Urban Infrastructure

Blue-green infrastructure (urban wetlands, permeable surfaces, urban forests) should be a priority of the cities as cost-effective climate adaptation technologies.

4. Establish Dedicated Climate Financing Mechanisms

Special municipal climate resilience funds and green bonds ought to be institutionalized in order to decrease reliance on central mission-based allocations.

5. Develop Cross-city Learning platforms

Bangalore, Pune, and Surat can share knowledge, which institutionalizes the best practices and speeds up national models of replication.

VIII. CONCLUSION

This paper has shown that climate-resilient urban planning within the Smart Cities Mission of India can be conceptualized as a cyclical adaptive governance process, rather than as an upgrade of infrastructure.

Using the Design Thinking phases - Empathize, Define, Ideate, Prototype, and Test, combined with resilience strategies, cities can shift to sustainable urban results based on the principles of vulnerability mapping, systemic risk framing, green-digital innovation, pilot experimentation, and data-driven governance.

The examples of Bangalore, Pune, and Surat demonstrate that the process of resilience formation is a result of the interaction between participatory governance, technological facilitation, and institutional cooperation. The long-term sustainability, however, demands more root structural changes in terms of financing, inter-agency coordination, and constant involvement of citizens.

Finally, the Smart Cities Mission is not only an initiative of technological modernization of India but a transformative governance approach that can enhance the development of India through the Sustainable Development Goal 11 and climate-adaptive urban futures.

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