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Climate-Resilient Coastal Mobility Planning for Tourism and Livelihoods: A Case of Thiruvananthapuram, India

Anvar S[1], Sangeeth K[2]

[1]Department of Architecture and Planning, TKM College of Engineering, Kollam, Kerala, India

[2]Professor, Department of Architecture and Planning, TKM College of Engineering, India

Abstract: ***Coastal transport corridors in developing regions are increasingly exposed to climate-induced risks, threatening both mobility and socio-economic systems (IPCC, 2021; Nicholls & Cazenave, 2010). This study examines the coastal road corridor of Thiruvananthapuram, India, to evaluate its vulnerability to climate hazards and its role in supporting tourism and local livelihoods. Using a mixed-method approach integrating spatial analysis, traffic assessment, stakeholder surveys, and climate risk mapping, the study identifies critical gaps in infrastructure resilience, multimodal integration, and accessibility. The findings reveal that large segments of the corridor are highly susceptible to flooding and erosion, while mobility systems remain predominantly vehicle-oriented with limited provision for non-motorized transport and last-mile connectivity (UN-Habitat, 2020). Conflicts between tourist mobility and local livelihood activities further exacerbate inefficiencies. To address these challenges, the paper proposes a Climate-Resilient Coastal Mobility Framework (CRCMF) that integrates context-sensitive infrastructure design, blue-green corridors, multimodal systems, and livelihood-oriented mobility planning. The framework contributes to advancing climate-resilient transport planning in coastal regions by linking environmental sustainability with socio-economic resilience.***

Keywords: Climate resilience, coastal mobility, sustainable transport, tourism, livelihoods, Thiruvananthapuram

1. Introduction

Coastal regions worldwide are increasingly vulnerable to the impacts of climate change, including sea-level rise, storm surges, and coastal flooding (IPCC, 2021). Transport infrastructure in these regions is particularly at risk, as disruptions to mobility systems directly affect accessibility, economic productivity, and community resilience (ADB, 2017).

In India, coastal corridors serve as critical socio-economic lifelines, supporting fisheries, tourism, and local economies (Ministry of Environment, Forest and Climate Change, 2019). The coastal stretch of Thiruvananthapuram, extending from Puthukurichy to Vizhinjam, functions both as a transport spine and as a tourism corridor. However, increasing climate risks, unplanned urbanization, and rising vehicular dependency have exposed significant vulnerabilities in the mobility system (TERI, 2018).

While existing studies focus on either climate resilience or mobility planning, there is limited research integrating both dimensions with local livelihood systems (UN-Habitat, 2020). This study addresses this gap by developing a climate-resilient mobility framework tailored to coastal contexts.

2. Research Objectives

The study aims to develop a climate-resilient and inclusive mobility framework for coastal corridors.

3. Methodology

A mixed-method approach was adopted, consistent with integrated transport and climate risk assessment frameworks (ADB, 2017; UN-Habitat, 2020).

4. Study Area Characteristics

The Thiruvananthapuram coastal corridor is characterized by dynamic coastal geomorphology, ecological sensitivity, and socio-economic dependence on fisheries and tourism (Ministry of Environment, Forest and Climate Change, 2019).

5. Results

5.1 Climate Vulnerability of Transport Infrastructure

Significant road stretches are exposed to flooding and coastal erosion, consistent with findings in coastal vulnerability studies (IPCC, 2021).

5.2 Mobility System Deficiencies

The dominance of private vehicles and lack of non-motorized transport infrastructure align with trends observed in developing coastal cities (UN-Habitat, 2020).

5.3 Tourism–Livelihood Conflict

Shared road space leads to congestion and safety issues, similar to findings in coastal tourism corridors (World Bank, 2019).

5.4 Accessibility Gaps

Weak connectivity between coastal and inland regions reflects broader transport inequities in peri-urban coastal areas (ADB, 2017).

6. Discussion

The findings highlight a systemic disconnect between transport planning and climate resilience. Existing infrastructure is not designed to accommodate environmental uncertainties, leading to frequent disruptions (IPCC, 2021). Integrated planning approaches combining infrastructure resilience, ecosystem-based solutions, and multimodal transport are more effective in enhancing long-term sustainability (UN-Habitat, 2020; World Bank, 2019).

7. Climate-Resilient Coastal Mobility Framework (CRCMF)

The proposed framework aligns with global best practices in sustainable and resilient transport planning (ADB, 2017; UN-Habitat, 2020).

8. Policy Implications

Integration of climate resilience into regional transport policies should align with Coastal Regulation Zone (CRZ) guidelines (Ministry of Environment, Forest and Climate Change, 2019).

9. Conclusion

This study demonstrates that climate-resilient mobility planning is essential for sustainable coastal development (IPCC, 2021). The proposed CRCMF provides a comprehensive framework integrating environmental, social, and economic dimensions of mobility.

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