

Urban Morphology and Regulatory Mismatches in Hill Towns: A Case Study of Madikeri, Karnataka

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Abstract

Hill towns in India present unique planning challenges due to steep terrain, ecological fragility, and compact morphology. Conventional building byelaws, largely developed for plains, often fail to respond to these local conditions. This research investigates the sectional morphology of Madikeri, a hill town in Karnataka, to critically evaluate the applicability of current byelaws. Through the analysis of sectional drawings, the study highlights mismatches between statutory regulations and ground realities in terms of slope, road width, setbacks, and parking. The findings emphasize the urgent need for context-sensitive regulations that integrate terrain, ecology, and mobility concerns.

Keywords

Hill towns, Madikeri, Urban morphology, Building byelaws, Slope stability, Urban planning

Introduction

The urbanization of hill towns in India has intensified in recent decades, driven by tourism, population growth, and land demand [1]. Settlements in such regions are inherently constrained by steep topography, ecological sensitivity, and limited developable land. However, the regulatory environment guiding development has remained largely uniform, with municipal byelaws modeled on plain-city conditions [2]. This disjunction creates multiple challenges: unsafe slope cutting, congestion on narrow roads, and insufficient ecological safeguards.

Madikeri, the district headquarters of Kodagu in Karnataka, provides an illustrative case. Located within the fragile Western Ghats ecosystem, Madikeri's terrain and settlement morphology make it highly vulnerable to landslides, flooding, and ecological degradation [3]. This paper critically evaluates Madikeri's built form through sectional studies, comparing observed morphology with

applicable byelaws. By highlighting areas of mismatch, the study argues for reforms to ensure sustainable urban growth in hill towns.

Literature Review

Hill Town Morphology

Hill towns exhibit compact, irregular morphologies shaped by terrain. Nair [1] highlights how steep gradients force ribbon development along ridges and valleys, often creating congestion in narrow cores. Joshi [4] adds that urban growth in Indian hill stations frequently disregards slope capacities, leading to unsafe construction and ecological risks.

Planning and Regulatory Frameworks

Building byelaws are critical instruments for regulating development. However, most byelaws in India—including the Karnataka Municipal Building Byelaws (2017) [2]—were designed with plains cities in mind. Ramachandran [5] critiques their limited applicability in hilly contexts, noting how uniform setback and FAR standards often conflict with terrain realities. UN-Habitat [6] similarly stresses that regulatory frameworks must adapt to localized conditions, especially in environmentally fragile areas.

Slope and Geotechnical Concerns

Slope management is a recurring concern in hill settlements. The Hill Area Conservation Authority (2015) [7] prescribes retaining structures, drainage, and restrictions on construction above 30° slopes. Geological Survey of India [8] underscores that slope cutting without proper safeguards has contributed to recurrent landslides in Kodagu and other Western Ghats districts.

Traffic, Accessibility, and Parking

Transport and parking present major challenges in hilly towns due to constrained rights-of-way. Sharma [9] documents how on-street parking narrows effective carriageways, worsening congestion. The Indian Road Congress (2012) [10] recommends multi-level parking hubs in hill towns, yet their implementation remains limited.

Ecological and Cultural Dimensions

Ecological preservation is integral to the identity of hill towns. Singh [11] argues that unregulated urban growth directly threatens biodiversity corridors, water sources, and heritage landscapes. Kumar [12] stresses that maintaining vegetation buffers and incorporating local building traditions are vital for sustainable urban transformation.

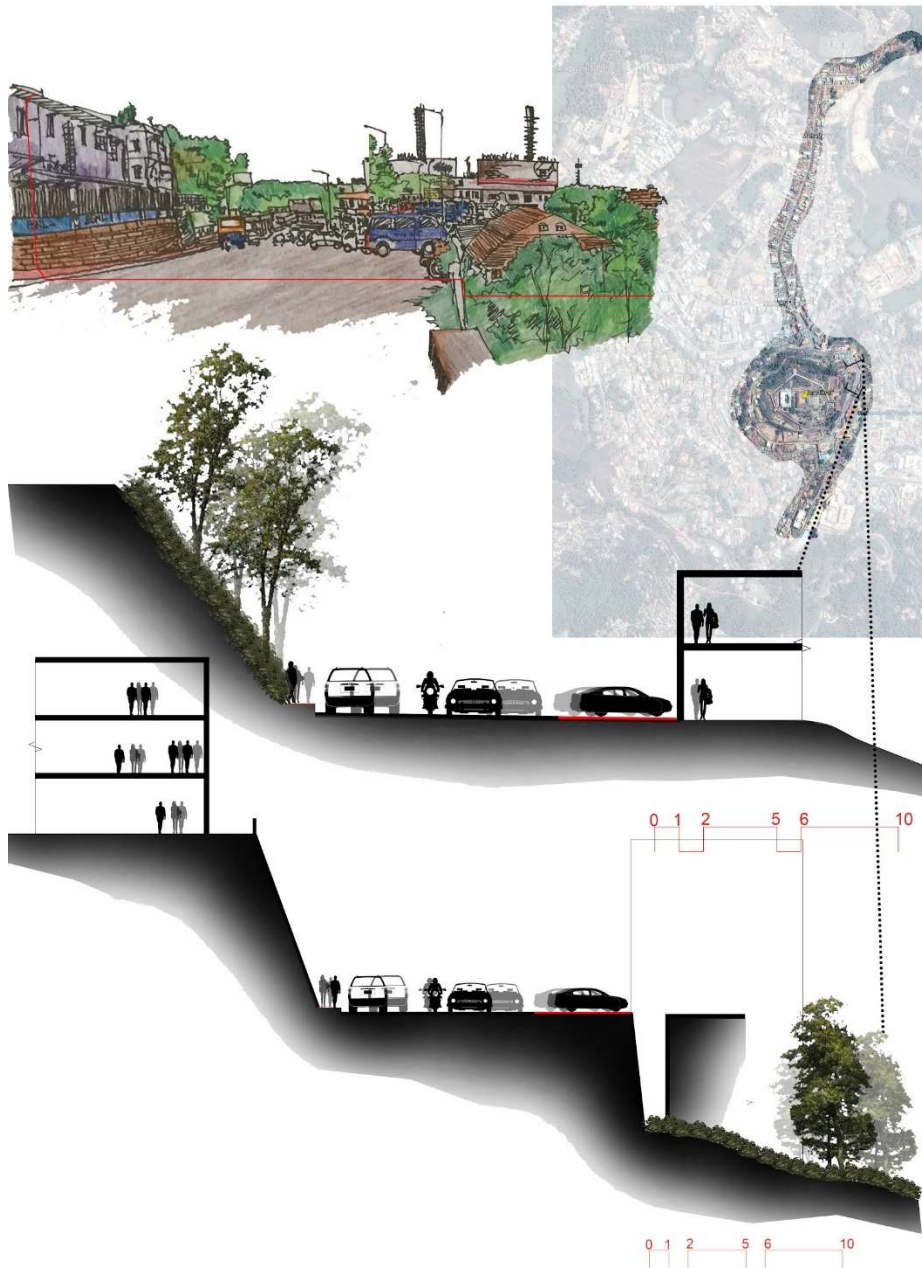
Research Gap

While existing literature documents challenges of hill town planning, limited research specifically benchmarks sectional urban morphology against statutory byelaws in small Indian towns like

Madikeri. This study addresses that gap by directly comparing design sections with regulatory frameworks, thereby highlighting areas for byelaw reform.

Methodology

This



study relies on sectional drawings of Madikeri town prepared through urban design studio surveys. These sections capture terrain gradients, road widths, building footprints, and slope modifications.

Figure 1: Sectional drawing of Madikeri town depicting terrain, road width, and built form.

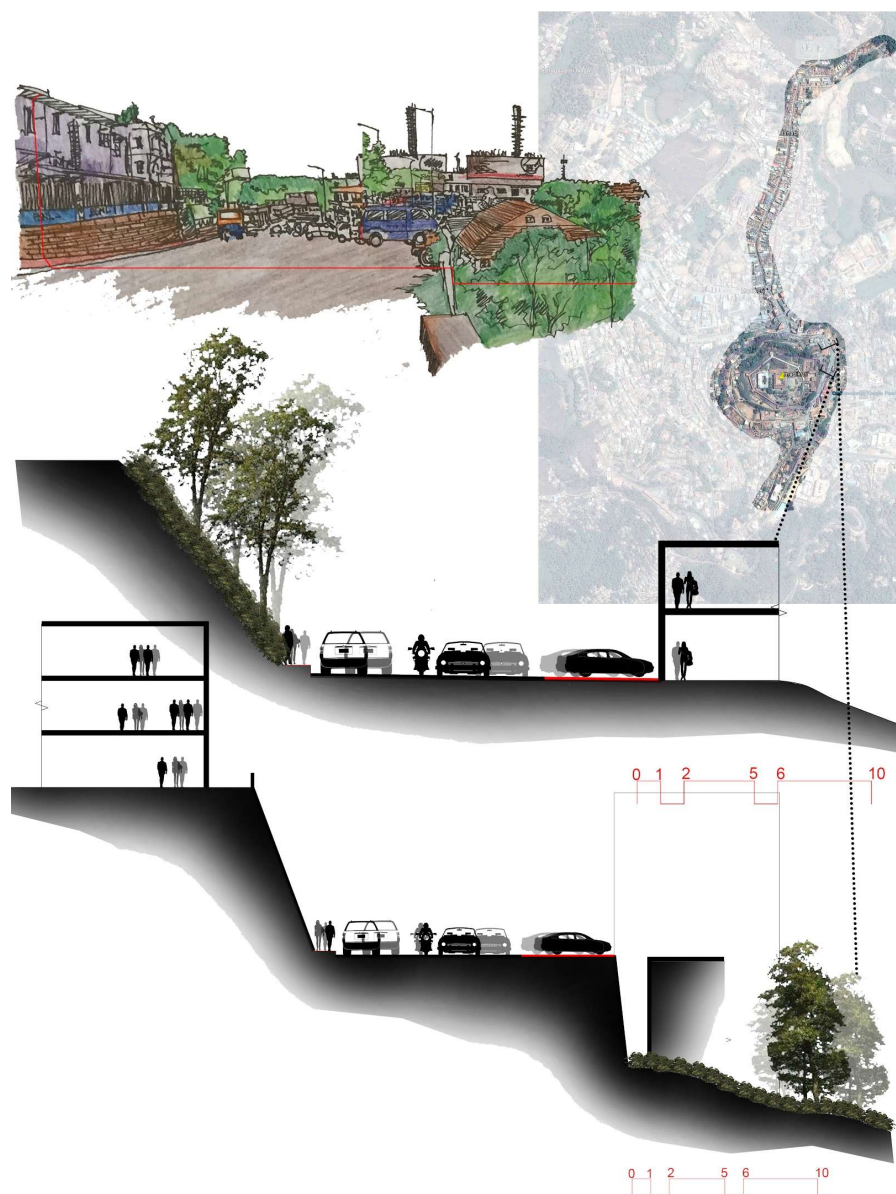


Figure 2: Alternative sectional drawing of Madikeri town with slope interventions and building profiles.

These sectional studies are compared against statutory provisions in the Karnataka Municipal Building Byelaws (2017) and related national guidelines. Secondary sources—including government reports, academic literature, and standards from the Indian Road Congress—are used for benchmarking.

Findings

Parameter	Byelaw/Guideline Requirement	Observed in Madikeri Sections	Implications
Slope Management	No construction above 30° slope; mandatory retaining & drainage [7]	Extensive slope cutting with inadequate retaining	Landslide and erosion risks [8]
Road Width	Minimum 7 m (residential); 9–12 m (collector roads) [2]	4–5 m in core town sections	Congestion, reduced mobility [9]
Parking Provision	On-plot parking, multi-level parking in dense areas [10]	On-street parking dominates	Reduced carriageway width, unsafe conditions
Setbacks	Uniform front/rear setbacks based on plot size [2]	Inconsistent; many buildings abut road edge	Reduced ventilation, fire risk
FAR (Floor Area Ratio)	1.5–2.5 depending on zone [2]	Applied uniformly without terrain adjustment	Overbuilt slopes, structural risk [5]

Ecological Safeguards	Maintain vegetative cover, protect drainage channels [11]	Loss of green cover, blocked drains	Flooding, biodiversity loss
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Discussion

The findings highlight systemic mismatches between Madikeri’s morphology and statutory frameworks.

1. Slope Stability
Despite guidelines restricting development on steep gradients, extensive slope cutting is prevalent. This indicates both weak enforcement and inadequacy of blanket rules that fail to provide context-specific slope design solutions.

2. Mobility and Parking
The dominance of narrow road widths with on-street parking confirms Sharma’s [9] observation that hill towns face chronic congestion. Current byelaws mandating wider roads and off-street parking are unrealistic without land readjustment mechanisms.

3. Setbacks and FAR
The uniform application of setback and FAR rules disregards slope variations. This results in compact clusters along steep terrains, creating unsafe and poorly ventilated built environments. Terrain-sensitive FAR regulations are urgently needed.

4. Ecological Concerns
Loss of vegetative buffers and blocked drainage channels highlight weak ecological integration in planning. Singh [11] and Kumar [12] emphasize that urban growth in fragile ecosystems must preserve natural systems and traditional construction practices—recommendations largely absent in Madikeri’s development.

In sum, while regulations exist, they are either unsuited to local conditions or ineffectively enforced, leading to a widening gap between statutory expectations and ground realities.

Conclusion

The case of Madikeri demonstrates a systemic mismatch between urban morphology in hill towns and prevailing byelaws. Sectional analysis reveals challenges in slope stability, parking, setbacks, and ecological integration. The study highlights the urgent need for context-specific

byelaws, incorporating geotechnical safeguards, terrain-sensitive FARs, and sustainable mobility strategies. Future policies must also recognize the ecological fragility of hill towns within the Western Ghats, ensuring that urban growth aligns with both safety and sustainability.

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