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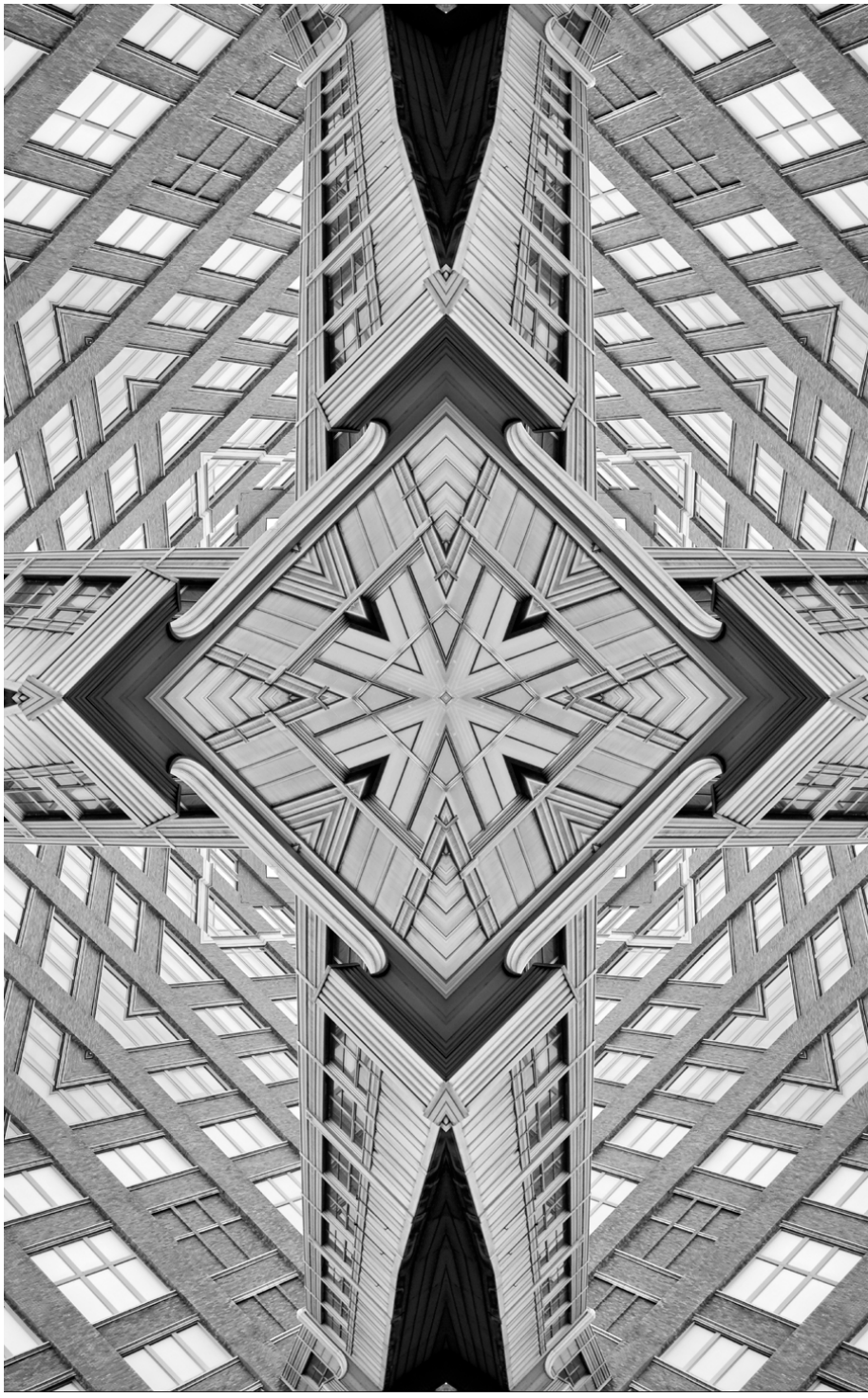

Urbanisation in India's Hills: Persistent Challenges and Plausible Pathways

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Abstract

India's development trajectory is closely tied to urbanisation. This brief critiques the existing urban planning framework in the country, examining the gaps and unique challenges posed by urbanisation and the impacts of climate change in hilly cities. The brief focuses on India's ecologically sensitive Himalayan ecosystem, which have historically received little attention in urbanisation discourse. The region's hilly urban areas have unique features that necessitate a nuanced policy approach tailored to addressing local concerns. Drawing on data from empirical studies and policy documents, this brief recommends targeted interventions to navigate the complexities of current urbanisation pathways in these hilly terrains. The aim is to contribute to more comprehensive and effective urban planning.

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Introduction

India is emerging as an important player in global development, particularly in the Global South, as it grows its economic heft.[1] Contributing to the country's growth story is urban development; cities currently account for 58 percent of gross domestic product (GDP), and this share is projected to rise to 70 percent by 2030.[2]

India is urbanising fast; by 2050, with a projected 404 million inhabitants in cities, it is expected to have the world's largest urban population.[3] However, issues related to liveability, from inadequate affordable housing due to insufficient public investment to worsening pollution levels, remain largely unaddressed.

Cities are also experiencing the worsening impacts of climate change, in the form of heat waves, excessive humidity, river overflows, and droughts.[4] According to climate predictions, increasing extreme weather events and a heightened risk from mismanaged water systems are expected to affect India's flood-prone cities like Mumbai and Bengaluru, thereby necessitating improved infrastructure planning and storm-water management strategies in these regions.[5] Policy analysts have also emphasised the importance of leveraging nature-based solutions to mitigate hydraulic hazards and rapidly adapt to the impacts of climate change.[6]

It is also not enough to focus only on tier-1 cities. As demonstrated by government initiatives over the last decade, including the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0, the Pradhan Mantri Awas Yojana (PMAY)-Urban, the Swachh Bharat Mission-Urban, and the Smart Cities Mission (SCM), achieving sustainable and inclusive growth requires measures tailored to each city's tier classification.[a] Interventions are supposed to be designed to strengthen the cities' resilience to climate-related hazards while also promoting conservation of natural habitats.[7] Furthermore, urban planners can more effectively address issues concerning urban sprawl and ecological disruptions if they focus on measures that are context-specific and promote balanced regional development.

a Considering India's diverse urban landscape, cities are grouped in four tiers based on their population size, economic development, infrastructure, educational and healthcare availability, and significance as regional administrative centres.

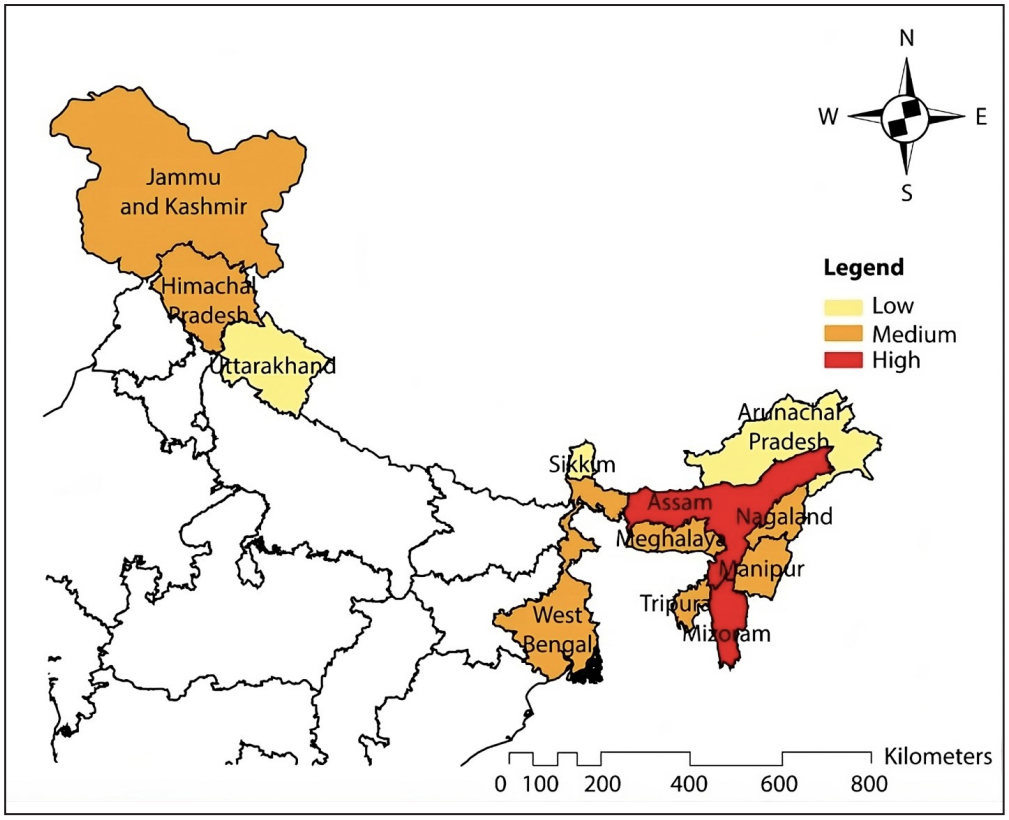
Introduction

Sensitising stakeholders about enhancing urban health, infrastructure, and ecosystems in the lower-tier cities is crucial for meeting the growing demand for affordable housing and for attracting industrial and commercial ventures, while advancing climate-resilient urban growth and sustainable development. The SCM and the AMRUT, both launched in 2015, have been framed keeping this urban reality in mind. The policies pay greater attention to urban development in tier-2 and tier-3 cities, which help reduce the growing population pressure on existing metropolises like Delhi, Kolkata, Mumbai, and Chennai.

This brief focuses on the challenges and opportunities specific to the towns and cities located in the Indian territory of the Hindu Kush Himalayas, in particular, the mountainous Indian Himalayan Region (IHR).[b] The IHR is a vast and diverse area, spanning 13 states (and two hill districts of Assam) across 533,000 sq. km of India's north and north-eastern regions. The Himalayas, in general, due to their unique topography and fragile ecosystems, are vulnerable to the impacts of climate change. The Intergovernmental Panel on Climate Change (IPCC)'s sixth assessment report emphasises how landslides, cloudbursts, and floods in the region are directly linked to shifts in climate patterns, pose escalating risks to human settlements, infrastructure, and the environment, underlining the urgency of addressing these vulnerabilities in urban planning.[8] In light of these growing risks, this brief discusses specific recent events where disasters in urban hilly terrains of the IHR led to severe financial losses. The brief will focus on some of the regional risks and governance challenges posed by hydrological and geophysical hazards, exacerbated by human interventions.

b The Indian Himalayan Region (IHR) stretches for 2,500 km. across 13 Indian States/Union Territories: Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Assam, and West Bengal.

Figure 1
Vulnerability Index of IHR



Source: Barua et al. (2020)[9]

Yet, these challenges are not unique to the IHR; they are observed in cities located in plains with hilly areas as well, such as Mumbai in Maharashtra or Guwahati in Assam. While both these cities are otherwise categorised as 'plains' given the dominance of their flat terrains, their hill areas present challenges similar to those of other hilly cities, such as landslides and drainage issues in their elevated zones.

This brief recommends pathways that include innovative policy changes, urban planning reforms, and the implementation of nature-based solutions to mitigate risks associated with urban development in hilly and mountainous regions. Wherever required, policy analyses and secondary literature analyses have also been incorporated to underscore suggestions for a more robust policy framework and accountability of institutions responsible for managing urban development in the IHR and similar regions.

Challenges of Urban Expansion in Hill Cities

Hill cities are known for their picturesque locations, cool climate, and unique biodiversity, making them appealing as both residential areas and tourism destinations. However, as tourism grows and their economies expand, these cities undergo changes in land use patterns and environmental dynamics.[10] The most important cities situated on hilly terrains in North India, particularly within the IHR, are Srinagar and Jammu in Jammu and Kashmir, Shimla in Himachal Pradesh, Dehradun in Uttarakhand, Darjeeling in West Bengal, Gangtok in Sikkim, Shillong in Meghalaya, Kohima in Nagaland, and Aizawl in Mizoram.[11] Their vulnerability to climate-related challenges is due to their unique geophysical setting and seismic sensitivity, as well as anthropogenic factors such as deforestation, rapid urbanisation, and questionable land use practices.[12,13] Excessive tourism also poses grave challenges,[14] calling for optimal resource management and policy interventions.[15]

Together, these challenges call for urban planners in hill cities to integrate economic development with not just biodiversity conservation, but disaster risk management and sustainable tourism. Successfully addressing these challenges demands a multidimensional approach—one that considers the unique geo-hazards such as landslides and floods, the pressures of rapid urban expansion, and the complex relationship between natural ecosystems and the built environment.[16]

Urbanisation's Impact on Ecology and Natural Resources

In the past few years, several parts of India's hilly terrains, such as Joshimath (Uttarakhand), Gangtok (Sikkim), and Darjeeling (West Bengal), have encountered geological hazards including excessive rains, flash floods, and landslides of unprecedented scale.[17] Their ecological environment is particularly vulnerable to the pressures of urban growth, more so as land for development is already scarce in these regions due to their steep slopes and irregular topography, slope morphology, and other geo-environmental constraints such as fragile soil composition and geological instability.[18] Human activities have also caused a decline in the green cover of these hilly areas, resulting in loose, exposed soil that is highly susceptible to erosion and the risk of landslides.[19]

As the urban land use patterns are shifting in the IHR to accommodate growing populations and economic activities, it is also straining the region's ecological systems. Studies focusing on regions like the Beas Valley in Himachal Pradesh and urban centres such as Shimla and Dehradun have yielded important findings regarding the impact of urbanisation on the local environment.[20] Researchers have analysed spatial indicators such as changes in land surface temperature, which reflect the extent of urban heat island effect, and habitat quality, to show how urbanisation, when poorly managed, can lead to the quicker degradation of natural habitats.[21]

A 2023 study found that Darjeeling could become one of West Bengal's most polluted cities within at least the next five years due to unplanned urbanisation, unauthorised land use, and biomass and combustion activities.[22] In Uttarakhand's Joshimath, unplanned construction, along with the region's geological fragility, have altered the local ecological balance, posing threats to life and property.[23] Being a strategically important site on India's border with China and a base of the Indian Army and the Indo-Tibetan Border Police (ITBP), Joshimath has no doubt received significant military attention. It has not been enough,[24] however, as seen in the shortcomings of the city's drainage, water supply, and sewage systems.[25]

This was not always the case. Many hill towns in North India were built during the British colonial period when development was deliberately kept low-density and housing low-rise. Houses comprised mostly cottages for the European and Indian elite along with some business-residential buildings for the local population. The towns were designed to cater to a specific population size: for example, Shimla (then called Simla) was planned and designed

for a maximum of 25,000 people. According to the last census of 2011, its population is now 814,010.[26] Over time, the hill towns became administrative centres, attracting more people, followed by infrastructural development to cater to the expanding tourism industry. However, building regulations failed to keep pace with the task of charting a judicious expansion of the housing infrastructure, leading to unscientific and inappropriate planning and design solutions.[27]

Understanding these dynamics requires an inspection that goes beyond factors like feasibility and accessibility and considers macro aspects such as state policies and economic transitions.[28] Studies are also needed to quantify the extent of urban sprawl, the rate of expansion, and the spatiotemporal differences at both the city and local levels. However, these specificities are often not considered while analysing their urban growth dynamics and drawing up regional development plans.

It is imperative that a judicious urban planning mechanism is set up for the hill cities. Evaluating the carrying capacity[c] of each hill city and ensuring its population does not exceed that figure, is critical to avoid environmental and climatic disasters in the future. In August 2023, Chief Justice of India D.Y. Chandrachud called for an expert committee[d] comprising professionals in fields such as ecology, hydrology and climate studies, to conduct a comprehensive survey of the carrying capacity of the Himalayan region.[29]

c 'Carrying capacity' is the maximum population size that an ecosystem can sustain without getting degraded.

d Covering 12 states and UTs: Ladakh and Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Manipur, Mizoram, Sikkim, Assam, Arunachal Pradesh, Meghalaya, Tripura, West Bengal, and Nagaland.

Hills in 'Plains' Cities: Contested Land Claims

In cities like Mumbai and Guwahati, typically classified as 'plains' cities due to their mostly flat terrain, the existence of hilly areas introduces challenges for urban governance. These hills feature complex topographical variations that make their management more difficult.[30,31] In many cases, their planning and development processes function in silos, creating limitations in effectively addressing environmental risks. The urban local bodies (ULBs), which are responsible for managing city affairs, often lack the necessary expertise and resources, and are struggling to regulate the hilly areas within their jurisdiction. This results in inadequate enforcement of policies meant to protect these areas from environmental degradation and unchecked urbanisation.[32]

The challenges in managing hilly terrains in cities are also intertwined with broader socio-economic issues, particularly poverty, housing security, and the proliferation of informal settlements.[33] Many of the residents living in unauthorised settlements on the hills are among the poorest in the city, lacking access to basic services such as healthcare. In Mumbai, the scale of informal settlements on the city's hills is vast, with around 150,000 families living in these areas. Out of these, 327 locations have been officially classified as 'dangerous zones',[e] at high risk of landslides and other disasters.[34] Despite repeated warnings and the evident danger, many residents remain for a lack of affordable options.[35]

In Guwahati, the hills are a contested territory between different stakeholders. On one side are the residents, many of whom are migrants or indigenous communities who rely on the hills for shelter and livelihood opportunities. On the other are environmental groups working to preserve the ecological integrity of these hills.[36] Environmental activists argue that the expansion of informal housing on the hills has led to habitat destruction and encroachment on wildlife corridors belonging to species such as leopards and the Asian elephant.[37] However, the hill settlers—many of whom belong to tribal communities—stake their claim to the hills as the region's indigenous people, while also pointing out that the government should scrutinise instead the high-value real estate on the hills.[38] The designation of parts of Guwahati's hills as protected wildlife reserves, such as the Amchang Wildlife Sanctuary, has intensified the legal and social disputes surrounding these areas.[39]

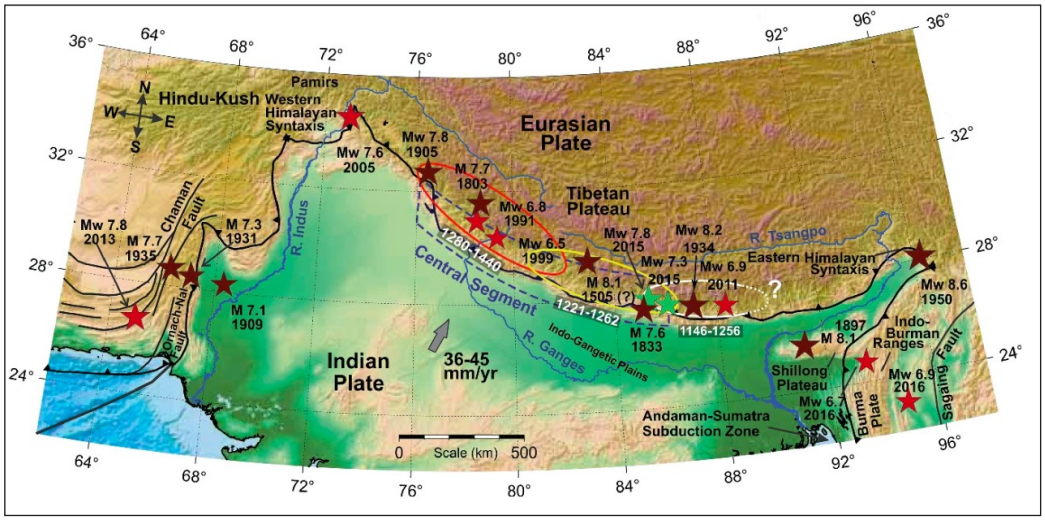
e Specific areas within Mumbai that are prone to landslides include Vikhroli, Chembur, and Mahul.

Whether it is the cities in the hilly terrains or the hills in plains cities, much needs to be done to achieve a holistic framework of governance and sustainable urbanism. This brief makes the following recommendations towards better management of urban hilly terrain:

1. Incorporate more earthquake-resistant infrastructure and buildings

The Himalayan belt, extending from Kashmir in the North to Mizoram and Arunachal Pradesh in the East, is a seismic hotspot.[40] The heightened seismic activity is attributed to the northward up-thrust of the Indian plate beneath the Eurasian plate.[41] Figure 2 shows the Himalayan plate boundary (the black line) producing varying ranges of moment magnitude (Mw).[f,42] The stars indicate the Mw levels and the years in which the earthquakes occurred.

Figure 2
The Himalayan Belt of the Indian Sub-Continent



Source: Rajendran and Rajendran (2022)[43]

f 'Moment magnitude' is a scale used to measure the intensity of earthquakes.

Recommendations

Seismic activity in the Himalayan region is linked to not only the geological complexities arising from the collision of the Indian plate with Tibet, but also the architectural deficiencies influencing the seismic magnitude.[44] Various studies have highlighted the dangers of constructing buildings that lack adequate seismic safety provisions.[45] Irregular building configurations, particularly on hill slopes, contribute to higher torsional impacts during seismic events, which can lead to severe structural damage or building collapse.[46] Earthquakes can lead to massive risks and losses, emphasising the importance of adopting a comprehensive approach to earthquake-resistant architectural design and construction practices.[47,48]

Being exposed to high seismic vulnerability also calls for a more robust understanding of prevailing urban designs, especially the structural deficiencies that still exist in hilly regions. According to India's National Building Code, areas with an elevation of more than 600 metres or an average slope of 30 degrees or more can be classified as 'hilly'.[49] Over 21 percent of the Indian subcontinent falls in this category.[50] Learning from past experiences with hazards, and better preparing for them, involves revisiting safety guidelines and amending area codes. Seismic zones need to be delineated and stringent building restrictions imposed.

The importance of studying local geology is highlighted in a study that investigated Soil-Structure Interaction (SSI) for improved seismic analyses of slope-based buildings.[51] This entailed considering surface topography, soil characteristics, and other geological factors that may induce or amplify ground motion. Integrating this with studies focusing on building stability assessments and collaborating with geotechnical and design engineers could be useful. A few studies have already investigated the seismic vulnerability of Indian hill towns and observed deficiencies in their structural planning. One study utilised Geographic Information System (GIS) techniques, remote sensing, and Rapid Visual Screening (RVS) to look for inadequate seismic safety provisions in older constructions in Uttarakhand's Nainital.[52] Another employed three-dimensional analytical models of buildings to examine multi-storey building configurations in hilly terrains using "non-linear static pushover analysis and dynamic analysis".[53] The findings of such studies must be taken into consideration to advance sustainable urbanism in the hills and ensure minimal loss and damage during earthquakes.

2. Create 'Sponge Cities' by streamlining water management

Adapting the sponge city mechanism for the country's hill cities can play a critical role in managing water and floods. 'Sponge cities' refers to a design strategy that uses green infrastructure and permeable surfaces for sustainable water management.[54] Hill areas often face problems related to soil erosion and water runoff during intense rainfall and landslides. Ecological design principles for hills suggest aligning routes with the natural topography to minimise disruption of the original landscape while maximising landscape surfaces.[55]

The idea behind sponge cities is to reduce reliance on 'grey infrastructure' such as levees, pipes, dams and channels, and develop green infrastructure—strategically designed natural, semi-natural, or engineered systems for better water management. Rainfall during the monsoon season can be absorbed and stored and used later in the dry season. As reported in a World Economic Forum (WEF) report of 2022, nature-based solutions (NbS) for infrastructure can be 50 percent more affordable than grey infrastructure and offer 28 percent more value.[56]

By incorporating the use of permeable surfaces and green infrastructure, sponge cities help direct water more efficiently, while also slowing down the flow of water during intense rain, thus reducing the risk of flash floods. They also enable creating green corridors along the water route, incorporating buffer greenbelts and green hill patches, thus enhancing the aesthetics of the space.[57] With many hill cities frequently facing water crises, sponge city infrastructure can aid in the recycling of rainwater, thus addressing issues of water shortage. A sponge city can manage not only 'too much' water, but also reuse rainwater to help mitigate the impacts of 'too little' water.

Chennai and Kochi, both vulnerable to floods, are exploring the 'sponge city' model as a possible long-term solution.[58] In March 2023, the Greater Chennai Corporation announced that it was identifying vacant open spaces where 'sponge parks' could be established well in advance of the monsoon.[59] Assam is also preparing sponge city master plans for four cities—Guwahati, Nagaon, Silchar and Dibrugarh.[60]

However, it is crucial that the foundational groundwork is prepared in terms of infrastructure and policy before integrating any sponge city concept into an urban master plan. Guwahati, for example, still lacks critical infrastructure

such as a sewage treatment plant (STP) or an adequate sewerage network. The existing drainage system channels sewage and waste directly into the city's wetlands, severely compromising the water quality.[61] The hill settlements of Guwahati also lack basic civic amenities, including wastewater management. Informal arrangements for waste disposal by the hill dwellers often fail during heavy rainfall, causing extreme run-off, which not only increases the risk of landslides but also contributes to the pollution of nearby wetlands.

While efforts are underway to build a sewerage project for the city of Guwahati, in collaboration with the Japan International Cooperation Agency (JICA), more interventions are needed to also develop diversion channels to ensure that the wastewater is redirected to the proposed STP for treatment before discharge, alongside initiatives to restore and maintain water quality.[62]

The sponge city model is a relatively novel approach to urban water management, and while its principles have shown promise in various contexts, each city that adopts this concept will encounter specific local challenges. Factors such as the existing infrastructure, topography, climate, and socio-economic conditions will all influence the effectiveness of sponge city strategies. Therefore, cities like Guwahati will need to customise their approach to address their unique geographical and infrastructural circumstances.

3. **Adopt polycentric/joint management**

A polycentric urban development approach involves creating multiple centres of growth and activity rather than focusing development solely on a single urban core—something that could be particularly beneficial to hill cities as it spreads development pressures across various nodes.[63] By distributing resources, economic activities, and infrastructure more evenly, hill cities can better manage their complex terrains and reduce the risks of overburdening fragile ecosystems.

Such a polycentric development model would necessitate active collaboration with local communities and stakeholders to identify and preserve natural barriers, ensuring minimal occupation and intrusion into sensitive areas, while also ensuring that local populations retain access to their resources, without

being displaced or marginalised.[64] In fragile hill city environments, improving the quality of life for residents means carefully addressing the development of these nodes or hubs. It is not just about building infrastructure but ensuring that the needs of each cluster—whether it be human communities, wildlife habitats, or natural water bodies—are met in a way that maintains balance. Spatial clustering analysis can be employed to identify these clusters and understand how they interact in conjunction with local knowledge.[65] Cluster mapping can also help create a comprehensive picture of the city and its natural surroundings, guiding development in a way that supports sustainable urban growth.

In hill cities, community-based forest management can be integrated within a polycentric urban development by fostering collaborative and inclusive decision-making processes.[66] The interconnection of nodes in polycentric urban development mirrors such collaborative efforts, emphasising functional linkages and flows. As cities strive to balance development and ecological sustainability, these linkages become increasingly crucial in both urban planning and forest management practices.[67] Thailand and Indonesia serve as good examples where the adoption of community-based forest management principles in hill and mountainous cities has informed policies and found a strong foothold in the national development agenda.[68]

Environmental planning in India's Himalayan hill cities could similarly transcend traditional top-down decision-making and engage in comprehensive integration of diverse departments.[69] This could involve examination of land use patterns, hydrology, soil and slope conditions, along with mapping hazardous and ecologically sensitive areas, such as those close to rivers and potential flood-prone zones.[70] To address varying climatic conditions, a nuanced categorisation into normal and extreme scenarios might also be useful, dividing regions into high, medium, and low-risk areas, outlining the specific challenges faced by urban hills.[71]

Joint Forest Management (JFM), which engages local people as primary stakeholders to address the ecological concerns of hilly cities, can be an effective initiative.[72] JFM seeks to enhance forest conservation by including local village communities and providing livelihood opportunities. Originating in West Bengal in 1972 as an arrangement of reforesting degraded areas and sharing revenue, the programme has evolved over the years. It now offers improved material incentives to encourage greater community participation. However, despite its positive intentions, several barriers that hinder effective implementation of JFM, such as bureaucratic constraints, lack of access to information and disparities in power dynamics, remain.[73]

In many Himalayan floodplain regions, lack of information hampers the estimation of surface runoff, river flows, and storm water patterns, leaving potential flood areas undetected. Leveraging open-source satellite imagery alongside advanced computational tools such as Google Earth Engine and Python could be useful, as they aid in identifying diverse land types and earmarking areas for development and conservation.[74] Subsequently, this comprehensive information could be shared with state-level nodal agencies, including state disaster management departments, district administrations, and urban planning departments, to ensure a collaborative and informed approach to tackling environmental challenges in Himalayan hill cities.

4. **Leverage technology and interdisciplinary work**

Judicious landscape planning has to be both data-driven and contextually informed. Scholarly discourse on an ideal site-level planning process emphasises three main stages: site knowledge, site investigation, and site synthesis.[75] This method not only engages local stakeholders but also allows for the incorporation of diverse perspectives in the planning process, co-creating high-resolution models that effectively merge local knowledge with existing planning records.[76] The collaborative aspect of this process also ensures that the resulting scenarios reflected the complexities of local governance, including power dynamics, community needs, and environmental considerations.

By systematically analysing spatial data alongside socio-economic factors, planners can foster the integration of urban planning with ecosystem services, ensuring that development is harmonised with ecological health.[77] This process underscores the potential of geo-design-based techniques, which use geospatial technologies to inform and enhance site-level planning.[78] When spatially explicit and consistent with the broader socio-economic setting, such an approach can contribute significantly to addressing regional challenges and measuring carrying capacity.

The next step in this evolution should be to transit to a web-based platform that invites collaboration with local partners to actively visualise the zone in question. A case in point is the Western Ghats Spatial Decision Support System (WGSDSS) developed by the Centre for Ecological Sciences, Indian Institute of Science, Bengaluru,[79] available in both Android and web versions. The

Sahayadri mobile app, part of this system, integrates bio-physical, climatic, environmental, geological, and social variables to display data on the eco-sensitive zones of the Western Ghats at the village and grid level. It aims to aid governance, manage ecological and hydrological needs and other societal concerns pertaining to the Sahyadri hill ranges.

Given the limitations of a singular approach, interdisciplinary work as such emerges as a potential solution, fostering collaboration, mutual learning, and co-creation.[80] By offering novel perspectives and encouraging innovative thinking about spatial design, it is invaluable for sustainable urban development, especially when facing the multifaceted challenges of new urban settings.[81] Integrating quantitative assessments with qualitative perspectives can further enrich the field, involving ecologists, political and environmental scientists, alongside spatial modellers and planners. In the Himalayan case, universities are seeking to establish specialised departments, integrating hill area planning, peri-urban planning, environmental planning and disaster resilience; a lot, however, remains to be done.[82]

While global research councils advocate interdisciplinary practices, their implementation remains weak, especially in the developing world. The temporal nature of projects works against in-depth understanding, promoting instead a fast-paced knowledge production setting.[83] Without proper coordination, collaboration among multiple agencies may still lead to unclear mandates and groups working in silos. Institutional challenges, such as insufficient clarity and goal alignment, pose further hurdles.[84] Addressing these is crucial to realising the benefits of interdisciplinary approaches.

Conclusion

Making hilly cities liveable through sustainable measures is a great opportunity for India to overcome the complex challenges of urbanisation. It would also advance India's commitment to the Sustainable Development Goals (SDGs), in particular Goal 11 ('Sustainable Cities and Communities') and Goal 13 ('Climate Action'). These goals emphasise the importance of creating resilient urban environments that not only accommodate growing populations but also prioritise environmental sustainability and social equity.[85]

India's existing urban planning and policy framework, which has historically focused on plains, must realise that hills need a distinct policy outlook. The failure to acknowledge this has led to political instability in many hilly areas over time, often stemming from discontent about either the lack of development or the developmental path taken.[86] Therefore, addressing the unique issues faced by these regions through equitable and sustainable principles will have a cascading impact on both civilian well-being and the national discourse. By learning from the state governments of the Northeast, where cities like Shillong, Aizawl, and Kohima have demonstrated relative success in managing landslides and climate vulnerabilities, other regions can adopt best practices and strategies tailored to their specific contexts.

To safeguard the delicate Himalayan ecology, several factors must be considered.[87] Strategic town design, adherence to architectural norms, and a decisive halt of haphazard construction are all essential components of a sustainable approach.[88] This includes integrating improved land use planning into municipal master plans, consolidating existing urban settlements and prioritising the provision of essential urban facilities, such as regular water supply, drainage, waste disposal, and electricity, before embarking on new construction projects in the area. It is also important to enforce state regulations that account for seismic vulnerability, local aesthetics, and ecological sustainability.

Concerned state agencies need to conduct further studies examining the impact of Anthropocene activities on the ecology and natural resources of the hills, chart ways to address them, and frame a carrying capacity limit to safeguard them. Collaborating with experts from educational and research institutes, such as the G.B. Pant National Institute of Himalayan Environment or the Centre for Urban Science and Engineering (CUSE) at the Indian Institute of Technology, Mumbai, can provide valuable insights. By prioritising these strategies, India can pave the way for a more sustainable future for its hilly cities, creating liveable environments that support both the population and the natural landscape.

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