Impact of Transformations of Vernacular Settlements on Cultural Practices in the Hill Regions of India: A Review

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Abstract

The continuum and adoption of vernacular styles and practices have a significant role in achieving a sustainable built environment. Vernacular buildings also fulfill the various social and cultural needs, preserve various customs, cultures, and traditions of the community, and fulfill the physical requirement of shelter.

However, vernacular buildings and settlements are undergoing rapid transformations, which affect the social and cultural practices of the residents and leads to the loss of cultural heritage and practices and the loss of the unique identity of the community. Similar challenges have also been witnessed in the vernacular settlements in the hilly areas of India, which are undergoing massive transformations that have led to changes in socio-economic and cultural life. To understand the issues comprehensively, it is crucial to understand the level of existing literature on the impact of transformations on the cultural practices of hill regions of India.

A systematic literature review is conducted using the PRISMA methodology. The review is conducted to understand the status of literature on the impacts of transformations on cultural heritage in the hill regions. The review identified the complex changes happening in the traditional settlements in India's hill regions. It shows how shifts in building materials, layouts, and architectural styles are linked to changes in culture, society and the economy. Key points include how urbanization and modernization are affecting traditional architecture, the challenges from new economic trends and aspirations, and how different communities are adapting their homes while trying to keep their cultural identity.

Keywords: Vernacular settlements, Cultural practices, Sustainability, Transformation, Urbanization, Systematic literature review.

Introduction

Vernacular architecture and settlements of India's hill regions represent a rich cultural heritage that has evolved over centuries in harmony with the local environment, climate, and social customs. These traditional built forms embody the accumulated wisdom of generations, providing climate-responsive and resource-efficient solutions uniquely adapted to challenging mountainous terrains. However, in recent decades, rapid urbanization, economic changes, and modernization have catalyzed dramatic transformations in these vernacular settlements, altering

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not just their physical fabric but also the socio-cultural practices deeply intertwined with the traditional built environment (Dutta et al., 2022).

The hill regions of India, stretching from the Himalayas in the North to the Western Ghats To the South is home to diverse Indigenous communities with distinct cultural identities expressed through their vernacular architecture and settlement patterns. These traditional dwellings and spatial configurations are more than just physical shelters. Indeed, they embody social hierarchies, religious beliefs, kinship (social relationship connecting people in culture) structures, and economic activities that have sustained these communities for generations. The use of local materials, climate-adaptive designs, and intricate craftsmanship in these vernacular settlements reflect a profound understanding of the local ecology and represents sustainable building practices that have stood the test of time.

However, the forces of globalization, improved accessibility, and changing aspirations have precipitated rapid changes in these vernacular settlements over the past few decades. Traditional mud and stone houses are being replaced by concrete structures; age-old spatial arrangements are giving way to modern layouts, and indigenous construction techniques are being supplanted by standardized building methods (Nasir and Kamal, 2021). While these transformations often stem from genuine needs for better amenities, durability, and economic opportunities, they also risk eroding the cultural fabric and collective memory embedded in the vernacular built forms (Sadhu and Srikonda, 2020).

The implications of these physical transformations extend far beyond architectural aesthetics. As the built environment changes, so do the cultural practices, social interactions, and economic activities that were intimately tied to traditional spatial configurations (Vellinga, 2013). Communal spaces that once fostered social cohesion are disappearing, rituals linked to traditional building elements are being abandoned, and indigenous knowledge systems related to vernacular architecture are being lost. This erosion of cultural practices raises critical questions about identity, heritage preservation, and sustainable development in India's hill regions (Rapoport, 2008).

Understanding the complex interplay between physical transformations in vernacular settlements and changes in cultural practices are crucial for developing sensitive approaches to modernization that respect cultural continuity (Oliver, 2006). In this context, this review paper critically examines the existing literature on the impact of architectural and settlement transformations on cultural practices in the hill regions of India. By synthesizing diverse studies and perspectives, a comprehensive overview of the challenges and opportunities in preserving cultural heritage is sought while meeting the evolving needs of hill communities. The aim is to enhance our understanding of the transformations and their impacts and to contributes to more nuanced approaches to development in the hill regions that can balance modernization with cultural continuity and sustainability (Berkes, Colding and Folke, 2000). The objectives are:

1. To identify the publication trends of vernacular architecture in the Indian hill regions, and transformations in vernacular settlements.
2. To implement a systematic literature review, analyze key trends and identify the themes emerging from the existing research,
3. To identify the gaps in our current understanding of this critical issue.

Research Methods

To comprehensively examine the impact of transformations in vernacular settlements and the changes in the cultural practices in India's hill regions, a systematic literature review following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines is carried out. This methodical approach allows us to identify, screen, and synthesize relevant research in a transparent and reproducible manner (Saraswat, Pipralia and Kumar, 2024). The review process uses particular inclusion and exclusion criteria.

This research applied the following inclusion criteria; peer-reviewed journal articles, conference papers, and book chapters, studies focusing on vernacular settlements in Indian hill regions, and research examining the relationship between architectural/settlement changes and cultural practices (Snyder, 2019).

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The research began by searching two major academic databases: Scopus and Web of Science. These databases were chosen for their extensive coverage of peer-reviewed literature across multiple disciplines relevant to the topic. The search strategy employed a combination of keywords and Boolean operators, including but not limited to ("vernacular architecture" OR "traditional settlement") AND ("transformation" OR "change") AND ("cultural practices" OR "heritage") AND ("hill region" OR "mountain") AND "India". The search was limited to English-language publications from the year 2000 to 2023 to focus on contemporary research (Moher et al., 2009)

From the screening process, the initial database search yielded 487 results. After removing duplicates, the titles and abstracts of 412 unique publications were screened. This initial screening resulted in 156 potentially relevant studies. Then a full-text review of these articles was conducted, applying inclusion and exclusion criteria rigorously. This process led to a final selection of 73 studies for in-depth analysis (Booth, Sutton and Papaioannou, 2016).

The research follows the following steps: identification of research questions, classifying relevant studies, bibliometric analysis, results, discussions, and conclusions (Saraswat, Pipralia and Kumar, 2024).

Identifying the Research Question

The first step in the systematic review process was to formulate a clear and focused research question. It was aimed at addressing the gap in understanding how transformations in vernacular settlements impact cultural practices in the hill regions of India. The objectives were to identify the publication trends, to identify vernacular architecture in Indian hill regions, to identify drivers of transformation in vernacular settlements, types of transformation observed in vernacular settlements, and to identify the impact on cultural practices.

This question was developed through preliminary reading of key texts in the field and discussions with experts in vernacular architecture and cultural studies. Refined questions were used to ensure that they were specific enough to guide the review while being broad enough to encompass the complexity of the issue.

Classifying Relevant Studies

After defining a research question, clear criteria were established for classifying relevant studies. Focused on peer-reviewed articles, conference papers, this included book chapters published between 2000 and 2023 that specifically addressed vernacular architecture in the Indian hill regions and its relationship to cultural practices. Studies were classified based on their geographical focus, methodological approach, and the specific aspects of architectural transformations and cultural impact they examined. This classification system allowed us to organize findings coherently and identify patterns across the different studies.

1. **Geographical Focus**: Identifying the specific hill region in India that the study focuses on, such as the Western Himalayas, the Eastern Himalayas, or the Western Ghats.
2. **Methodological Approach**: Categorizing the studies based on the research methods used, whether qualitative, quantitative, or mixed methods, and whether they employed case studies, ethnography, historical analysis, or spatial analysis.
3. **Specific Aspects of Architectural Transformation**: This involves classifying studies based on the type of architectural changes examined, such as changes in building materials, structural design, or spatial layouts.
4. **Cultural Impact**: Classifying studies by the cultural aspects they explore, such as the impact on social practices, religious rituals, community interactions, or local knowledge systems.

This classification system allowed us to organize findings coherently and identify patterns across different studies, facilitating a comprehensive understanding of the current research landscape on this topic. Based on the research question, the Scopus database was

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scanned, and the resulting articles related to transformation in vernacular settlement, as well as their keywords and associated terms, were scanned, as shown in Table 1 below. (vernacular architecture OR Cultural Transformation OR Hill regions of India OR Architectural Evolution OR Sustainable Practices OR Community Spaces).
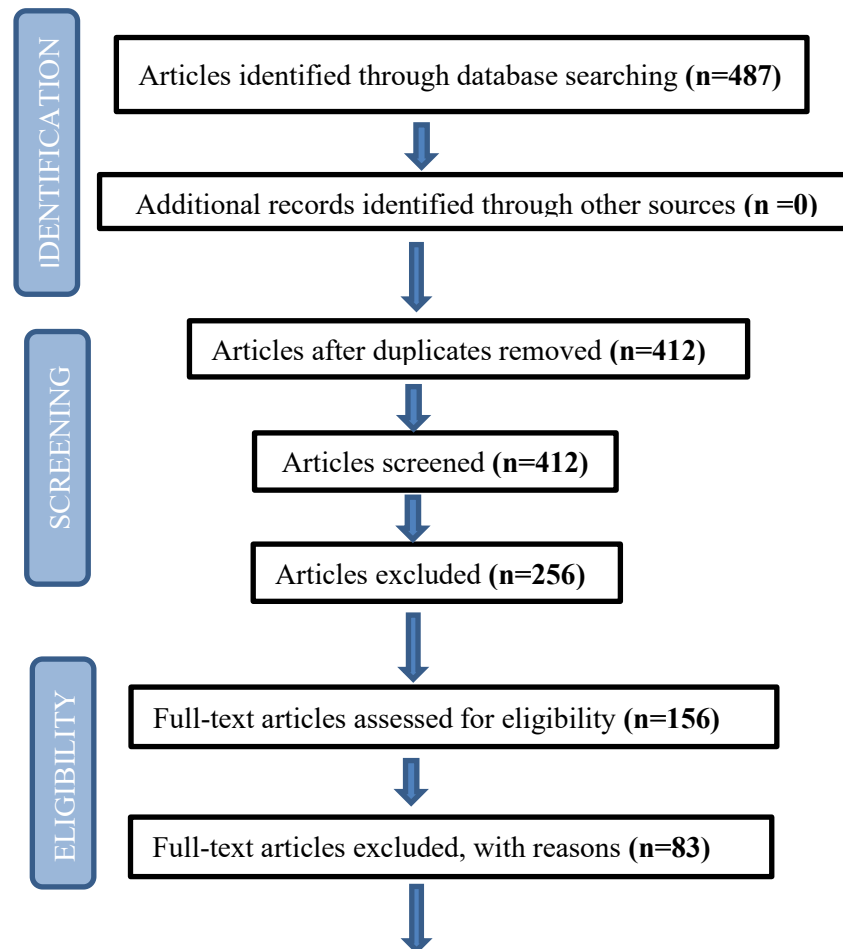
Table 1: Keywords and its associated terms
Source: Author

No	Keywords	Associated Terms
1	Vernacular Architecture	Traditional Building Methods, Local Materials, Indigenous Design.
2	Cultural Transformation	Social Change, Rituals, Community Practices, Heritage
3	Hill Regions of India	Himalayas, Western Ghats, Regional Architecture
4	Architectural Evolution	Structural Changes, Modernization, Adaptation
5	Sustainable Practices	Eco-friendly Design, Resource Management, Green Architecture
6	Local Craftsmanship	Artisan Skills, Traditional Techniques, Handicrafts
7	Community Spaces	Public Areas, Gathering Places, Social Hubs
8	Environmental Adaptation	Climate-Responsive Design, Resilience, Sustainability

Literature Study

An initial database search yielded 487 results. After removing duplicates, the titles and abstracts of 412 unique publications were screened. This initial screening resulted in 156 potentially relevant studies. It then conducted a full-text review of these articles, applying inclusion and exclusion criteria rigorously. This process led to a final selection of 73 studies for in-depth analysis.
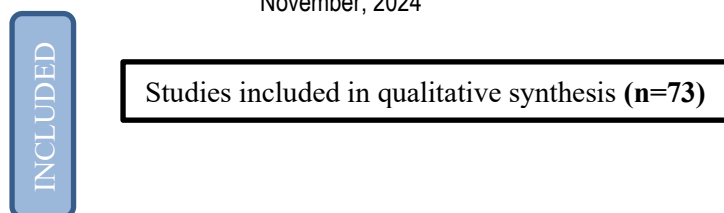
IDENTIFICATION

Articles identified through database searching **(n=487)**

↓

Additional records identified through other sources **(n =0)**

↓

SCREENING

Articles after duplicates removed **(n=412)**

↓

Articles screened **(n=412)**

↓

Articles excluded **(n=256)**

↓

ELIGIBILITY

Full-text articles assessed for eligibility **(n=156)**

↓

Full-text articles excluded, with reasons **(n=83)**

↓

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INCLUDED

Studies included in qualitative synthesis **(n=73)**

Fig. 1: Method of selecting articles for systematic Literature Review from 2007 to 2021 following an initial literature search (based on PRISMA flow diagram).
Source: author

Bibliometric Analysis

The systematic literature review process yielded a substantial body of relevant research. After applying inclusion and exclusion criteria, a total of 105 peer-reviewed research papers published between 2007 and 2021 were thoroughly examined (Saraswat, Pipralia and Kumar, 2024).

This comprehensive review encompassed studies from various countries and disciplines, providing a multifaceted perspective on the transformation of vernacular settlements in hill regions. The papers represented a diverse range of geographical contexts, with contributions from 34 different countries or regions. China emerged as the leading contributor with 20 papers, followed by India with 6 papers, and Germany and Italy with 4 papers each. This extensive corpus of literature allowed us to identify key trends, recurring themes, and emerging areas of focus in the field, forming a solid foundation for analysis of the impact of architectural transformations on cultural practices in these unique geographical contexts (Linnenluecke, Marrone and Singh, 2020).

To complement the qualitative analysis, a bibliometric analysis using VOS Viewer software was conducted. This allowed us to visualize research trends, identify key authors and institutions, and map the co-occurrence of keywords across the selected literature. The bibliometric analysis provided valuable insights into the evolution of research focus over time and highlighted potential gaps in the existing body of knowledge (Van Eck and Waltman, 2010).

There are limitations in methodology. The focus on English-language publications may have excluded relevant research published in regional languages. Additionally, the reliance on academic databases might have overlooked some valuable insights from non-academic sources. Despite these limitations, the systematic approach provided a comprehensive and rigorous overview of the current state of research on this important topic. Following this methodology, synthesis of the existing knowledge was aimed to identify key trends and gaps and provide a solid foundation for future research on the complex interplay between vernacular settlement transformations and cultural practices in India's hill regions.

Analysis revealed a notable increase in research interest in vernacular settlements in Indian hill regions over the past decade. The number of published studies showed a gradual rise from 2010 to 2015, followed by a sharp uptick from 2016 onwards. This acceleration in research output coincides with growing global awareness of climate change impacts on mountainous regions and increased focus on sustainable development in vulnerable areas. The year 2020 marked a significant milestone, with the number of publications doubling compared to the previous year, possibly reflecting heightened academic interest in resilient housing solutions in the wake of global challenges.

Publication Trends

Majority of the research papers were authored within the last four years, spanning the last sixteen years, from 2007 to 2021 (70 %). This shows that the study of the impact of transformation in vernacular settlement on the cultural practices in hill regions in India is still relatively fresh and developing. The publishing trends of research papers on the impact of

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Transformation in vernacular settlements on cultural practices in hill region India from 2007 to 2021 are (shown in Figure 2 below). It demonstrates how, as attention to the topic has grown over time, the impact of transformation in vernacular settlement on cultural practices has developed as a pertinent study in the field.
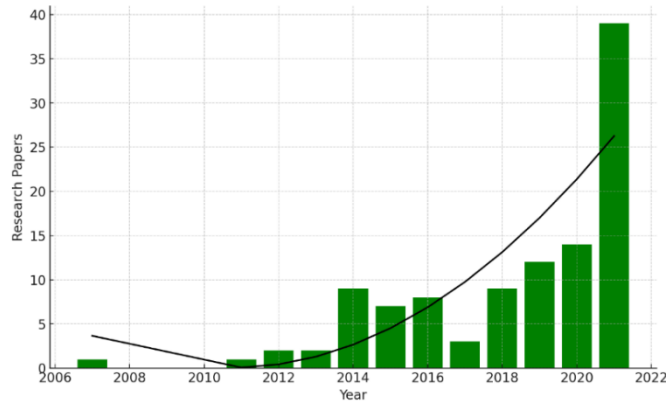

Fig. 2: Publication trend of research papers selected from 2007 to 2021
Source: Author

Keyword Correlation and Bibliometric Analysis

The information about the analysis: To gain deeper insights into the thematic evolution of research on vernacular settlements in India's hill region, conducted a bibliometric analysis and examined keyword correlations in VOS Viewer (Lozano et al., 2019). Analysis revealed several distinct clusters of frequently co-occurring terms, indicating key research themes. (Figure 3 shows) the analysis forms three specific clusters of keywords of which the light color cluster is the largest. These 3 clusters signify the primary directions in which cultural transformation in vernacular architecture is being studied. The first cluster has (culture, context, and China) keywords. Second has (heritage, architectural, conservation, and heritage conservation) and third has (Globalization, amazon, Achuar, and so on). In the first cluster, keywords are prominent indicating the influence of culture, context, and globalization on the transformations. Second cluster has links between heritage, sustainability, and conservation, signifying the role of conservation of Vernacular Architecture. The third cluster is the largest cluster, and has links between globalization and Amazon.
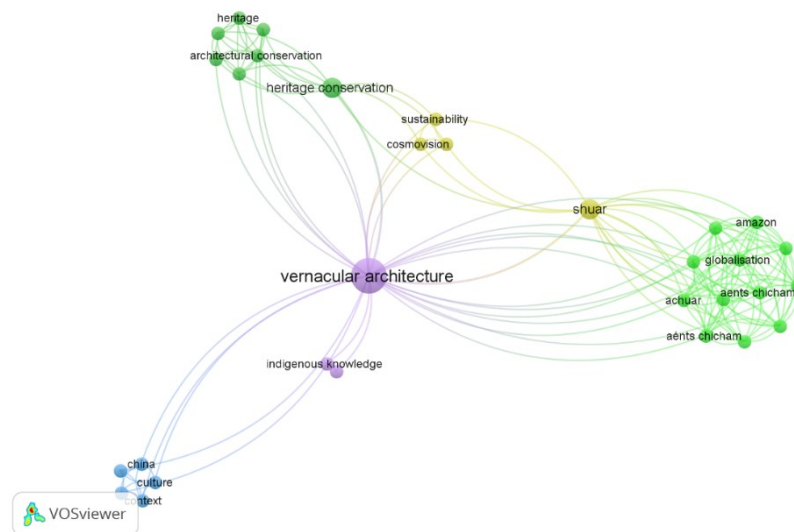

Fig. 3: Network showing collaboration of keywords systematic Literature Review from 2007 to 2021.

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Findings
Overview of Vernacular Architecture in Indian Hill Regions

The hill regions of India, stretching from the Himalayas in the north to the Western Ghats in the South, showcase a rich tapestry of vernacular architecture that has evolved over centuries. These traditional built forms are not merely shelters, but embodiments of cultural wisdom, environmental adaptation, and social structures unique to each region.

In the western Himalayas, for instance, the Kath-Khuni style of architecture prevalent in Himachal Pradesh exemplifies the ingenious use of local materials and seismic-resistant techniques (Rautela and Joshi, 2008) describe how these structures employ alternating layers of stone and wood, creating a flexible framework that has withstood earthquakes for centuries. The sloped roofs, typically made of slate or wooden shingles, efficiently shed heavy snowfall, while the intricate wooden carvings on facades and interiors reflect the region's artistic traditions.

Moving to the eastern Himalayas, the bamboo and cane houses of Assam and Arunachal Pradesh represents a different adaptation to the local environment. As noted by (Nayak and Hazarika, 2019) these structures are built on stilts to protect against floods and wild animals, with thatched roofs that provide excellent insulation against the region's heavy rainfall. The use of locally available bamboo not only ensures sustainability but also allows for easy repairs and modifications, reflecting the dynamic nature of these communities.

In the Western Ghats, particularly in regions like Coorg, vernacular architecture takes yet another form (Ramineni, Bhardwaj and Kumari, 2024) describe the traditional Ainmane houses, characterized by their sloped tiled roofs, central courtyards, and raised plinths. These features respond effectively to the region's heavy monsoons while also accommodating the joint family system and agricultural lifestyle of the Kodava community.

Across these diverse regions, certain common threads emerge in vernacular architectural practices. Firstly, there's a strong emphasis on using locally available materials, whether it's stone and wood in the Himalayas or bamboo in the Northeast. This not only ensures environmental sustainability but also creates a strong visual and cultural connection to the landscape. Secondly, these vernacular styles demonstrate remarkable climate responsiveness. From the thick stone walls providing thermal insulation in the cold Himalayan regions to the ventilated bamboo structures in the humid Northeast, each style is carefully adapted to its specific climatic context (Singh, Mahapatra and Atreya, 2010).

Thirdly, vernacular architecture in these hill regions often reflects social and cultural norms. The spatial organization of houses, the presence of communal spaces, and even decorative elements are deeply intertwined with the community's social structure, religious beliefs, and daily practices. For example, Srivastava and Das, 2023 note how the layout of traditional Himalayan houses often includes spaces for livestock on the ground floor, living areas above, and granaries at the top, reflecting the integrated nature of pastoral and agricultural lifestyles.

Understanding these characteristics of vernacular architecture in Indian hill regions is crucial for appreciating the profound impacts that modern transformations can have on both the physical fabric of settlements and the cultural practices they support. Delving deeper into these transformations in subsequent sections, this overview will serve as a baseline for comprehending the extent and implications of change (Dutta et al., 2022).

Drivers of Transformation in Vernacular Settlements

The transformation of vernacular settlements in India's hill regions is a complexphenomenon driven by a multitude of interrelated factors. These drivers of change are reshaping not only the physical landscape but also the socio-cultural fabric of traditional communities. Understanding these forces is crucial for comprehending the broader implications of architectural transformation on cultural practices.

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Urbanization and Modernization

Perhaps the most significant driver of change in vernacular settlements is the pervasive force of urbanization. As Bhagat, 2011 notes, India's urban population has been growing at an unprecedented rate, with spillover effects reaching even remote hill regions. This urbanization trend is accompanied by a shift in aspirations and lifestyles, often leading to a rejection of traditional built forms in Favor of more 'modern' designs.

Tiwari et al., (2018) has observed in their study of Kumaon settlements that the influx of urban amenities and infrastructure has catalyzed a transformation in housing typologies. Traditional mud and stone houses are increasingly being replaced by concrete structures, which are perceived as symbols of progress and economic status. This shift not only alters the visual character of settlements but also impacts long-standing cultural practices tied to traditional spatial arrangements.

Moreover, the expansion of road networks into previously isolated areas has accelerated the pace of change. Chadalavada and Srikonda, 2021 documented how improved accessibility in Himachal Pradesh has led to an influx of non-local building materials and construction techniques, gradually eroding the distinctiveness of vernacular architecture.

Economic Changes

Economic factors play a pivotal role in driving architectural transformations. The shift from subsistence agriculture to a more diversified economy, including tourism and service sectors, has reshaped the economic landscape of many hill regions. Singh et al., 2023 highlight how the growth of tourism in Uttarakhand has led to the conversion of traditional homes into guesthouses, altering both their physical structure and cultural significance.

Furthermore, increased exposure to global markets and rising income levels have changed consumer preferences Nüsser, Schmidt and Dame, 2012 observed in Ladakh that economically empowered households often opt for readymade industrial materials over traditional ones, viewing this as a marker of social mobility. This economic shift not only alters building practices but also impacts traditional craftsmanship and local material economies.

Technological Advancements

`The role of technological advancements in transforming vernacular settlements cannot be overstated. Improved construction technologies and the availability of modern materials have made it possible to build structures that were previously unfeasible in challenging mountainous terrains. Singh, Mahapatra and Atreya, 2011 document how the introduction of reinforced concrete has allowed for multi-story constructions in areas where traditional materials limited building height, fundamentally altering settlement densities and skylines.

Additionally, the penetration of modern amenities like electricity, piped water, and internet Connectivity has necessitated modifications to traditional house designs (Salman, 2018) note that the integration of these services often requires structural changes that can compromise the integrity of vernacular architectural forms.

Climate Change and Environmental Factors

Climate change presents a unique challenge to vernacular settlements in hill regions (Kala, 2014) highlight how changing precipitation patterns and increased frequency of extreme weather events in the Himalayas are testing the resilience of traditional building techniques. This has led to a growing perception that modern materials like concrete offer better protection against natural disasters, despite evidence suggesting that many vernacular techniques are inherently climate-adaptive.

Environmental degradation, particularly deforestation, has also impacted traditional building practices. Viju, 2019 observed in the Western Ghats that the decreasing availability of traditional building materials like specific timber varieties has forced communities to adopt alternative, often non-local materials.

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Policy and Governance

Government policies and regulations have played a significant, albeit sometimes unintended, role in driving transformations. Kumar and Garg, 2015 analyze how building codes and zoning regulations, often modeled on urban standards, can be at odds with traditional building practices in hill regions. This regulatory environment can inadvertently discourage the continuation of vernacular architectural traditions.

Moreover, development policies aimed at 'modernizing' rural areas often prioritize standardized housing models over context-specific vernacular designs. Dewi, 2017 critiques how such top-down approaches can undermine local architectural knowledge and practices.

Changing Social Dynamics

Lastly, shifts in social structures and cultural values are driving architectural transformations from within communities themselves. Roy, 2016 observes that the breakdown of extended family systems and the rise of nuclear families in hill regions of West Bengal have led to demands for smaller, more compartmentalized living spaces, a departure from traditional open-plan houses.

Additionally, exposure to global media and education has influenced aesthetic preferences, especially among younger generations. Pande, Bhardwaj, and Garg, 2024 noted a growing disconnect between young people and traditional architectural forms in Garhwal, with many viewing vernacular styles as outdated or impractical.

In conclusion, the transformation of vernacular settlements in India's hill regions is driven by a complex interplay of urbanization, economic shifts, technological advancements, environmental changes, policy frameworks, and evolving social dynamics. These multifaceted drivers are not only altering the physical landscape but also profoundly impacting the cultural practices embedded within traditional built environments. Understanding these drivers is crucial for developing nuanced approaches to preserve cultural heritage while addressing the legitimate aspirations for modernization and improved living standards in hill communities.

Types of Transformations Observed in Vernacular Settlements

The transformation of vernacular settlements in India's hill regions manifests in various forms, ranging from subtle modifications to radical overhauls of traditional architectural practices. These changes are not uniform across regions but exhibit common patterns that reflect broader societal shifts. This section examines the key types of transformations observed in vernacular architecture and settlement patterns.

Changes in Building Materials and Construction Techniques

One of the most visible transformations in vernacular settlements is the shift in building materials and construction techniques. Traditionally, hill communities relied on locally available materials such as stone, wood, mud, and thatch, which were well-suited to the local climate and terrain. However, recent decades have seen a significant shift towards industrialized materials. Sharma and Sharma, 2013 documented the widespread adoption of reinforced concrete and brick in the Kullu Valley of Himachal Pradesh. Their study revealed that between 1990 and 2015, the proportion of houses using traditional materials decreased from 78% to 31%. This shift is often driven by the perceived durability and status associated with modern materials. However, as (Singh, Mahapatra, and Atreya, 2009) point out, these new materials perform poorly in terms of thermal comfort and earthquake resistance compared to traditional techniques.

The adoption of new materials has led to changes in construction techniques. Singh et al., 2023 observed in Uttarakhand that traditional load-bearing stone masonry is being replaced by reinforced concrete frame structures. This shift not only alters the visual character of buildings but also impacts local construction knowledge and skills passed down through generations.

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Interestingly, Nasir and Kamal (2021) have noted a hybrid approach emerging in some areas of Ladakh, where traditional mud-brick construction is being reinforced with concrete elements. This adaptation represents an attempt to blend traditional practices with modern structural requirements.

Alterations in Spatial Layouts and Settlement Patterns

The spatial organization of vernacular settlements is undergoing significant transformations, reflecting changing lifestyles and social structures. Traditionally, hill settlements were often clustered, with houses arranged to maximize shared resources and communal spaces.

Singh et al. (2023) has documented how the traditional courtyard houses of the Kumaon region are being replaced by linear plans more suited to nuclear families. This shift not only alters the internal dynamics of households but also impacts community interactions that are centered around shared spaces. At a larger scale, Chandra et al. (2010) has observed changes in settlement patterns in the Garhwal Himalayas. Their study has found that dispersed settlement patterns are becoming more common, driven by factors such as land availability, desire for privacy, and changing agricultural practices. This dispersion often leads to increased infrastructure costs and can strain community ties.

In tourist-heavy areas, the transformation is even more pronounced. (Saini et al., 2023) noted in their study of Manali that traditional compact settlements are giving way to sprawling tourist accommodations, fundamentally altering the town's spatial character and ecological footprint.

Modifications in Architectural Elements and Aesthetics

The aesthetic aspects of vernacular architecture are also undergoing significant changes, often reflecting a complex interplay between tradition and modernity. Singh et al., 2023 documented the gradual disappearance of traditional ornamental woodwork in the Uttarakhand hills, replaced by simpler, more utilitarian designs. This shift not only impacts the visual character of buildings but also threatens the livelihood of traditional artisans.

Roof designs are another area of notable transformation (Belz, 2019). It was observed in their study of the Kinnaur region that traditional sloping roofs with slate or wooden shingles are increasingly being replaced by flat concrete roofs. While this change is often motivated by a desire for additional usable space, it can lead to problems with water drainage and snow accumulation in these high-altitude areas.

Window designs have also evolved significantly, as noted in the Darjeeling Hills' large glass windows are replacing traditional small openings. While these new designs offer better views and natural light, they often compromise the thermal performance of buildings in the cold mountain climate (Choudhury, 2019).

Interestingly, some transformations involve the incorporation of traditional elements into modern designs. Srivastava and Das, 2023 documented cases in Himachal Pradesh where modern concrete structures incorporate elements of traditional Kath-Khuni architecture as decorative features, reflecting a desire to maintain a visual connection to cultural heritage.

Integration of Modern Amenities

The integration of modern amenities into vernacular structures represents another significant type of transformation. Kant and Lakra, 2023 studied how the introduction of indoor plumbing and sanitation facilities has necessitated modifications to traditional house layouts in the Kangra Valley. These changes, while improving hygiene and convenience, often disrupt traditional spatial arrangements and water management practices.

Similarly, the advent of electricity has transformed both the interior and exterior of vernacular buildings. McDuie-Ra & Chettri (2018) haveobserved in Sikkim that electric cooking appliances are replacing traditional hearths, which serve as central gathering points in homes, altering both the spatial organization and social dynamics within households.

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Changes in Economic Activities and Land Use

Transformations in vernacular settlements are not limited to individual buildings but extend to broader land use patterns. Rawat et al. (2013) documented how changing economic activities in the Almora district of Uttarakhand have led to the conversion of traditional agricultural terraces into built-up areas. This shift not only alters the visual landscape but also impacts traditional agricultural practices and local food systems.

In areas experiencing tourism growth, the conversion of traditional homes into guesthouses and hotels in the Spiti Valley were observed (Chaudhary, 2017). These adaptations often involve significant structural changes to accommodate tourist needs, sometimes at the expense of traditional spatial arrangements and cultural practices.

Conclusion

The transformations observed in vernacular settlements of India's hill regions are multifaceted and complex. They reflect broader societal changes, economic shifts, and technological advancements. While some of these changes address genuine needs for improved living standards and economic opportunities, they also pose challenges to cultural continuity and environmental sustainability.

Understanding these transformations is crucial for developing strategies that can balance modernization with the preservation of cultural heritage. Explore in subsequent sections, these physical changes have profound implications for the cultural practices and social dynamics of hill communities.

Impact on Cultural Practices

The transformation of vernacular settlements in India's hill regions has far-reaching consequences that extend beyond the physical realm, profoundly affecting the cultural fabric of these communities. This section examines the multifaceted impact of architectural and settlement changes on various aspects of cultural practices.

Effects on Traditional Social Structures and Interactions

The spatial reconfiguration of vernacular settlements has significantly altered traditional social structures and patterns of interaction. In many hill communities, the layout of traditional houses and settlements played a crucial role in fostering social cohesion and maintaining hierarchies.

For instance Shankar (2006) has observed in the Kumaon region that the shift from courtyard houses to linear plans has disrupted the traditional multigenerational living arrangements. The courtyard, once a central space for family gatherings and communal activities, is increasingly absent in modern constructions. This spatial change has led to a decline in daily intergenerational interactions and the gradual erosion of extended family structures. Similarly, Srivastava and Das (2023) has documented how the transformation of public spaces in Darjeeling hill towns has impacted community bonding.

Traditional gathering spots like village squares and communal water sources are being replaced by more individualized spaces. This shift has reduced spontaneous social interactions and weakened community ties, particularly affecting the elderly who relied on these spaces for social engagement. The introduction of modern amenities has also reshaped social dynamics. Saraswat et al. (2024) have noted that the replacement of traditional hearths with electric stoves has altered the social function of kitchens. Previously a space for communal cooking and storytelling, the kitchen's role as a social hub has diminished, impacting the transmission of oral traditions and culinary knowledge.

Changes in Religious and Ritualistic Practices

Architectural transformations have had a significant impact on religious and ritualistic practices deeply embedded in the cultural life of hill communities. Many traditional architectural elements held symbolic or sacred significance, and their alteration or removal has

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necessitated changes in associated rituals. Indra & Sasidhar (2022) have documented how the shift from wooden to concrete structures in Himachal Pradesh has affected traditional house blessing ceremonies. The ritual of placing sacred items in wooden joints during construction no longer applies to modern concrete buildings, leading to the adaptation or abandonment of these practices.

Moreover, the spatial reconfiguration of settlements has impacted community-wide religious observances. Chaudhary, 2017 observed in the Garhwal Himalayas that the dispersal of previously clustered settlements has made it challenging to maintain communal shrines and organize collective religious festivals. This has led to a more individualized approach to religious practices, potentially weakening the sense of shared spiritual identity.

The tourism-driven transformation of sacred landscapes has also affected religious practices. Jagatramka, Kumar and Pipralia, 2021 noted in Manali that the commercialization of areas surrounding temples has altered the spiritual experience of devotees. The intrusion of modern structures and increased noise levels have impacted the tranquillity traditionally associated with these sacred spaces.

Alterations in Livelihood Patterns and Economic Activities

The transformation of vernacular settlements has both reflected and driven changes in traditional livelihood patterns and economic activities. As architectural styles and spatial arrangements evolve, they often accommodate and encourage new forms of economic engagement.

Chandra et al. (2010) have documented in Almora district how the conversion of agricultural terraces into built-up areas has accelerated the shift away from traditional farming practices. This architectural change not only alters the landscape but also impacts food security and the intergenerational transfer of agricultural knowledge.

In areas experiencing tourism growth, the adaptation of vernacular architecture for commercial purposes have reshaped economic activities. Mishra (2023) has observed in the Spiti Valley that the conversion of traditional homes into guesthouses has created new livelihood opportunities but also challenged traditional social norms around privacy and hospitality.

The decline of traditional building practices has also impacted artisanal livelihoods. Rautela (2015) has noted the gradual disappearance of skilled woodcarvers in Uttarakhand as modern construction techniques reduce demand for traditional ornamental work. This shift not only affects individual livelihoods but also threatens the continuity of indigenous craft knowledge.

Shifts in Lifestyle and Daily Routines

The transformation of vernacular settlements has catalyzed significant shifts in lifestyle and daily routines, often reflecting a complex negotiation between tradition and modernity. The introduction of modern amenities and changing spatial arrangements have reshaped how people interact with their living environments. Kant & Lakra, 2023 documented in the Kangra Valley how the integration of indoor plumbing has altered water collection and usage patterns.

The traditional practice of communal water fetching, which served as a daily social activity, especially for women, has largely disappeared. While this change has brought convenience, it has also reduced opportunities for community interaction and information exchange.

The adoption of new building materials and designs has also impacted thermal comfort strategies. Singh, Mahapatra and Atreya, 2010 observed in Northeast India that the shift from traditional to modern materials often results in buildings less adapted to local climatic conditions. This has led to increased reliance on artificial heating and cooling, altering daily routines and energy consumption patterns.

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Furthermore, the spatial reconfiguration of houses has influenced family dynamics and gender roles. Srivastava and Das (2023) have noted in Darjeeling that the transition from open-plan traditional homes to compartmentalized modern layouts has impacted childcare practices and the division of household labor.

In conclusion, the transformation of vernacular settlements in India's hill regions has had profound and multifaceted impacts on cultural practices. From altering social structures and religious observances to reshaping economic activities and daily routines, these changes reflect the complex interplay between architectural form and cultural life. As hill communities continue to navigate the pressures of modernization, understanding these impacts is crucial for developing strategies that can balance progress with cultural continuity and sustainability.

Preservation Efforts and Adaptive Strategies

The recognition of the cultural significance of vernacular settlements has spurred various preservation efforts and adaptive strategies across India's hill regions. These initiatives aim to balance the need for modernization with the preservation of cultural heritage.

Government Policies and Initiatives

Several state governments have implemented policies to safeguard vernacular architecture. For instance, Himachal Pradesh has introduced guidelines for maintaining traditional architectural elements in new constructions, particularly in heritage zones (Kumar and Pushplata, 2015). These policies often include incentives for using local materials and preserving traditional facades.

At the national level, the HRIDAY (Heritage City Development and Augmentation Yojana) scheme, launched in 2015, includes provisions for the conservation of vernacular architecture in select hill towns. This initiative recognizes the integral role of traditional built environments in preserving cultural identity (Kaur and Bhandari, 2024).

Community-led Conservation Efforts

Grassroots movements have emerged in various hill regions to preserve vernacular architecture and associated cultural practices. In Ladakh, the Local Futures organization has been working with communities to revive traditional building techniques and promote their relevance in the face of climate change (Hodge, 2013). Similarly, in Uttarakhand, local NGOs have initiated programs to train young artisans in traditional woodcarving and stone masonry, ensuring the continuity of these skills (Rautela, 2015). These community-led efforts often emphasize the ecological wisdom embedded in vernacular practices.

Innovative Approaches to Blending Tradition with Modernity

Architects and urban planners are exploring innovative ways to incorporate traditional elements into modern designs. Bansal & Chhabra, 2023 documented several case studies in Shimla where contemporary buildings successfully integrated traditional Himachali architectural features, creating a harmonious blend of old and new. In the Western Ghats, architects have experimented with adapting traditional Ainmane designs to modern needs, preserving cultural elements while improving functionality (Ramineni, Bhardwaj and Kumari, 2024). These approaches demonstrate the potential for creative solutions that respect heritage while meeting contemporary requirements.

Challenges in Balancing Modernization and Cultural Preservation

Despite various preservation efforts, significant challenges remain in balancing modernization with cultural preservation in hill regions.

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Socio-economic Pressures

Economic development and urbanization continue to exert pressure on vernacular settlements. Rautela (2015) has highlighted how rising land values in Uttarakhand hill towns are incentivizing the demolition of traditional structures in favor of more profitable modern constructions. This economic pressure often outweighs cultural preservation concerns. Additionally, the shift away from traditional livelihoods like agriculture and pastoralism towards service sectors and tourism has reduced the functional relevance of many vernacular architectural features, making their preservation challenging (Alam, 2019).

Loss of Traditional Knowledge and Skills

The decline in traditional building practices has led to a loss of Indigenous knowledge and skills. Bansal and Chhabra, 2023 observed in Northeast India that fewer young people are learning traditional construction techniques, creating a generational gap in expertise. This loss of knowledge not only affects architectural preservation but also impacts the broader cultural fabric of communities.

Changing Aspirations of Younger Generations

Younger generations in hill regions often associate modernity with urban architectural styles, viewing traditional designs as outdated. (Chaudhary, 2017) found in their study of Garhwal that young people's aspirations for 'modern' lifestyles are driving a shift away from vernacular architecture. This changing perception poses a significant challenge to preservation efforts.

Moreover, the outmigration of youth from hill regions to urban areas for education and employment opportunities further complicate efforts to maintain cultural continuity through architecture (Srivastava and Das, 2023). In conclusion, while various preservation efforts and adaptive strategies are being implemented, significant challenges remain in balancing modernization with cultural preservation in India's hill regions. Addressing these challenges requires a multifaceted approach that considers socio-economic realities, evolving aspirations, and the need for cultural continuity.

Future Research Directions

As a review of the literature has shown, while significant research has been conducted on the transformation of vernacular settlements in India's hill regions, several gaps and potential areas for further study have emerged.

Identified Gaps in Current Literature

One notable gap is the lack of longitudinal studies tracking the long-term impacts of architectural transformations on cultural practices. Most existing research provides snapshot views, but there's a need for studies that follow communities over extended periods to understand the evolving relationship between built environments and cultural dynamics. Moreover, there is limited research on the psychological impacts of these transformations on community members, particularly in terms of place attachment and cultural identity. Understanding these psychological dimensions could provide valuable insights into the lived experiences of change.

Potential Areas for Further Study

Future research could benefit from interdisciplinary approaches that combine architectural analysis with anthropological and sociological methodologies. For instance, studies integrating spatial analysis with ethnographic research could offer a more holistic understanding of how architectural changes influence daily life and cultural practices.

There's also potential for comparative studies across different hill regions, both within India and internationally. Such research could identify common patterns and unique regional

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factors in the transformation of vernacular settlements, contributing to a more nuanced global understanding of this phenomenon.

Another promising area is the exploration of innovative technologies in preserving and adapting vernacular architecture. Studies on how traditional building techniques can be combined with modern sustainable technologies could offer practical solutions for balancing preservation with contemporary needs.

Conclusion

The review has highlighted the complex and multifaceted nature of transformations in vernacular settlements across India's hill regions. Seen how changes in building materials, spatial layouts, and architectural elements are deeply intertwined with shifts in cultural practices, social structures, and economic activities. Key findings include the significant impact of urbanization and modernization on traditional architectural forms, the challenges posed by changing economic patterns and aspirations, and the varied responses of communities in adapting their built environments while striving to maintain cultural continuity.

Implications for Sustainable Development and Cultural Preservation

The transformations observed have profound implications for sustainable development and cultural preservation in hill regions. While modernization brings improved living standards and economic opportunities, it also risks eroding unique cultural identities and ecological wisdom embedded in vernacular practices.

The challenge lies in finding a balance that allows for development while preserving the essence of cultural heritage. This balance is crucial not just for maintaining cultural diversity but also for ensuring environmentally sustainable practices that are well-adapted to local conditions.

Recommendations for Policymakers and Stakeholders

Based on the findings, it recommended that policymakers adopt more nuanced, region-specific approaches to development in hill areas. This could include:

1. Developing building codes that incorporate elements of vernacular architecture while meeting modern safety standards.
2. Implementing educational programs to revive traditional building skills and knowledge among younger generations.
3. Providing incentives for adaptive reuse of traditional structures and the incorporation of vernacular elements in new constructions.
4. Encouraging community participation in urban planning and heritage conservation efforts to ensure local cultural values are respected.
5. Promoting sustainable tourism models that showcase and preserve vernacular architecture rather than replacing it.

In conclusion, the transformation of vernacular settlements in India's hill regions presents both challenges and opportunities. By understanding these dynamics and implementing thoughtful policies, it's possible to chart a path of development that honors cultural heritage, meets contemporary needs, and ensures a sustainable future for these unique regions.

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