



Urbanization in the Himalayan Region: Transformation and Effects in Uttarakhand, India

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Abstract

Urbanisation in the mountainous regions is occurring at a rapid pace, and the Himalayan region is not an exception to this. Urbanization in the region has implications on the natural resources, landscapes, land use, people's lives and livelihoods, their beliefs, practices, the social and gender relations, and their relations and interaction with the natural resources. In the Uttarakhand state of India, unplanned and unregulated urbanisation has spread rapidly mainly due to three key factors: administrative, economic in the form of tourism and rural-urban migration. Such urbanization has come with a host of effects and transformations that are both advantageous and disadvantageous for the area and its peoples. The rise in tourism and particularly the development of religious tourism has had positive impacts on the socio-economic situation of the people with the opening up of employment in the hospitality sector. But more profound are the negative effects and impacts on the natural resources due to urbanisation. Decline and degradation of natural resources and disruption of key ecological processes is a serious concern, which has led to decrease in availability of water that is being felt by the people both in urban and peri-urban areas. Furthermore, with the changing climatic conditions, unregulated deforestation and construction in the fragile slopes in seeing increased instances of and severity of natural hazards like floods and landslides. The physical landscape and people's lives and livelihoods are undergoing transformations as a result of urbanisation in the area. Against this context, this study examines the implications and effects of urbanisation on the socio-cultural norms and practices among the mountain communities of Uttarakhand, India. Specifically, this paper explores the changes that have occurred in the socio-cultural norms and practices of the mountain communities due to urbanisation and its possible implications for the communities and the region.

Keywords: *Urbanization; Mountain Communities; Himalayan Region; Uttarakhand; Socio-Cultural Norms*

Introduction

Recent decades have witnessed rapid urbanization throughout the world. Urbanization comes with a host of advantages and disadvantages for the area and its people. Increased development in any region provides enhanced opportunities for employment and socio-economic services, better connectivity, upgraded infrastructure, and leads to an overall improvement in the standard of living. Simultaneously, it also leads to increased demand for resources locally available to fulfill the growth requirements. More importantly, a changing environment creates a visible shift in the mindset of the local population that wants to embrace such changes, but at the same time, remain attached to their value system related to the improvement of quality of life.

The mountain regions of India have not escaped the onslaught of urbanization. Urbanisation has rapidly spread beyond the foothills, extensively affecting the Himalayan region. Urbanization in the region has implications on the natural resources, landscapes, land use, people's lives and livelihoods, their beliefs, practices, the social and gender relations and their relations and interaction with the natural resources. Rapid urbanisation in this region, which is especially vulnerable due to the fragile topography and depleting natural resources, pose increasing exposure to natural hazards and "poses a need for assessments of emerging risks and vulnerabilities" (Dame et. al 2019: 189, FAO 2019). Urban growth in environmentally sensitive regions, such as the Himalayan region, where basic infrastructure and amenities are limited, has increasingly contributed to enhancing vulnerabilities for local populations; however, this issue has received limited scholarly attention (Haller 2014; Hewitt and Mehta 2012; Joshi 2018; Yi et al. 2016). This paper aims to contribute to this critical gap in knowledge.

This study examines the implications of urbanization on the socio-cultural norms and practices of mountain communities of Uttarakhand, India, and seeks to understand the broader significance of such transformations for both the communities and the region. Through a qualitative approach comprising of primary semi-structured interviews, focus-group discussions and review of existing secondary resources, this paper sought to examine the effects of urbanization on the socio-cultural norms and practices of the mountain communities in Uttarakhand.

It is hoped that the findings from this study will help prioritize and re-envision developmental plans that are more inclusive and minimize negative implications on residents' lives, livelihoods and their civil rights. This would also help in finding strategies to keep a balance between development and conservation of natural resources, modernity and traditional knowledge. This is particularly vital in today's world, where climate change and extreme weather is playing havoc in people's lives and livelihoods and the natural resources that mountain people are so dependent upon.

Urbanization in the Himalayan Region

In the Himalayan context, most towns historically emerged around sites of political or religious significance with distinct cultural meaning and functions attached to them (Mathieu 2003). The importance of these towns in the early 19th century grew as they became key transition points in the Trans-Himalayan trade routes between South and Central Asia (Rizvi 1999). The geopolitical situation of the region is a key driver of urbanisation, which led to substantive investments in road infrastructure and increase in the stationing of military forces (Demenge 2012). More recently, there has been significant rural-to-urban migration from the region, resulting in the rapid growth of urban clusters, in the form of urban and peri-urban towns along the Himalayan region (Goodall 2004; Joshi 2018). At present, despite its dense population, the Himalayan region is one of the most marginalized regions of the world due to rapid urban growth in the last few decades (Tiwari et.al. 2018, Anbalagan, 1993). Major factors driving urbanisation in the region are administrative processes, economic activities, and socio-cultural changes (Dame et. al 2019). With the transforming and broadening of administrative processes and structures, the

expansion of market forces, tourism and businesses, and changes in peoples' aspirations, the region is witnessing the rise of numerous ultra-modern projects, road networking, hydropower projects, real estate projects and commercial projects.

Three main characteristics of urban development identified in the region are expansion of urban areas into barren land, agricultural land, and densification of already existing built-up areas, particularly due to rural-urban migration (Dame et.al. 2019, Ishtiaque et.al. 2017). The area has also witnessed indiscriminate deforestation, concretization of agricultural land, and water bodies to have urban built-up development. This process of urbanisation in the region has resulted in land use changes which have numerous chain effects. The rapid and extensive change in land use has put immense pressure on forest cover, which in turn has disrupted the fragile ecological equilibrium in the region by impacting key ecological processes (Sharma et. al 2022). Decline in forest cover is leading to biodiversity and habitat loss (Batar et.al 217, Khan et.al. 2012), which has together disrupted the hydrological cycle of the water sheds reducing ground water recharge and eventually resulted in a decrease in the availability of water for drinking, sanitation and crop production (Patra and Kantariya 2014, Tiwari 2008; Prakash and Molden, 2020). Furthermore, due to the mountainous topography and fragile ecosystems, the Himalayan region faces the risks of natural hazards and disasters such as landslides, extreme rainfall and floods, which is intensified by climate change (Virginie Le Masson, 2013). The sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC 2023) emphasised the increasing risks of such hazards to human settlements, infrastructure, and the environment.

Much of the urban growth in the region is spontaneous, unplanned, and unregulated with no or little intervention from local governmental authorities; such settlements are mushrooming all across the region (Prakash, Abhinav and Bhagwati, 2018). Under such haphazard growth, many of these centers lack appropriate land-use strategies, basic infrastructural supports and sufficient amenities, thereby creating increased pressure and raising concerns about the sustainability of such development and the long-term cost borne by these regions (Hewitt and Mehta 2012, Tiwari and Joshi, 2014). People inhabiting mountain regions since time immemorial have evolved diversity of cultures that includes traditional knowledge, resource development, and environmental conservation practices, agricultural and food systems, and adaptation and coping mechanism to environmental changes (ICIMOD, 2010). However, in the urban centres, often unplanned and lacking essential services and infrastructure, and offering limited employment opportunities, both skilled and unskilled, hordes of population of mainly young men have deeply impacted all this. While the growth of urban areas has generated employment opportunities through the expansion of infrastructure and the emergence of diverse socio-economic services, the exponential rise in population has outpaced the region's capacity to sustain decent livelihoods. At the same time, the rich reservoir of indigenous knowledge and traditional practices is being rapidly eroded under the pressures of modernization (Joshi and Pant, 1990) This has also given rise to significant irreversible adverse impacts for the rural economy, society, livelihood and overall quality of life among the mountain communities. Economic insecurity is now becoming the single largest force leading to transformation of social, economic and cultural texture (Tiwari and Joshi 2015).

Transformations and Effects of Urbanization in Uttarakhand, India

Uttarakhand is the 27th state of India, formed in 2000 out of the state of Uttar Pradesh. This new state adopted the name "Uttarakhand", which means "northern region," in January 2007. The state is divided into two main divisions, Garhwal and Kumaon, and comprises of 13 districts, 113 town and cities, and is divided into eight municipal corporations, 25 municipal councils, 32 notified areas, nine army cantonment boards and 40 census towns for administrative purposes (Ghosal et. al 2024). The state is referred to as *Devbhoomi*, or the land of gods (Bhatt and Rawat 2024), and is known known for its mountains, myths, and spectacular scenery. Uttarakhand is one of fast-growing states, going through major transitional change with rapid urban development.

Uttarakhand has experienced rapid unplanned, uncontrolled and unregulated urbanization, particularly in the last two decades. (Prakash, Abhinav and Bhagwati, 2018; HPEC 2011). Ghosal et.al (2024) point out that Uttarakhand's urbanization is at a rate of forty percent due to the influx of floating population, and just in the last decade, share of urban population in the state has increased from ten percent to almost thirty percent of the total population. Some of the key factors that have driven urbanization in the state, include administrative processes, tourism, and rural-urban migration.

With Uttarakhand as a separate state, it was natural and necessary for the state to promote urban development in the region. As infrastructure along with related services for administrative processes were constructed, in previously small non-urban areas, a host of other allied structures such as housing for the government employees, educational institutions, buildings providing other essential and non-essential services mushroomed, which transformed these areas into urban towns.

Uttarakhand is endowed with magnificent natural beauty of majestic mountains, clear rivers, lakes and waterfalls, etc, which soon became a popular tourist destination, especially with the enhancement of road infrastructure. The spiritual and religious myths and stories surrounding these mountains and water bodies further added to its touristic appeal. Soon, all types of tourism, religious, adventure and recreational, developed rapidly in the state, leading to an acceleration in urban growth and large-scale infrastructural development led by commercial enterprises. Among tourism, religious tourism has been particularly significant, witnessing steady growth over the past several decades.

Converging with these factors is the rural-urban migration. As urban development took place, employment opportunities, skilled and unskilled, opened up. On the other hand, climate related issues such as floods, erratic rainfall, landslides, etc. affected agricultural production especially in the rural areas. In conjunction, the opening up of markets and access to information through radios, television, internet and smart phones gave rise to "new types of aspirations and desires" among both the urban and rural populace, especially among the younger generation (Goodrich et.al. 2017:41). This led to an increase in the migration from the rural areas to urban centres in search of employment and other income generating opportunities, further accelerating the urbanisation and expansion of built-up structures.

Research Method

The study adopts a qualitative methodology, drawing primarily on secondary sources and supplemented by select primary data. Secondary data consisted of research articles, books and government reports and other scholarly publications, while primary data was collected through semi structured interviews, focus group discussions and short surveys conducted among diverse social backgrounds, differentiated by age, gender, education, occupation and economic status. The fieldwork was conducted in the Chota Char Dham (i.e. Yamunotri, Gangotri, Kedarnath and Badrinath) region in the northern State of Uttarakhand, a site chosen due to its rapid urbanization in recent decades against the backdrop of its religious significance.

Research Findings

Urbanization has had numerous effects and transformations, positive as well as negative, in Uttarakhand. While tourism has been recognized as a small-scale, non-agricultural activity that can constitute an important source of employment for the rural poor, revenue generation, and economic growth in the area (Bahuguna et.al. 2011). Of the total population of approximately 1.25 crores in Uttarakhand, 10 lakh people are reported to be employed in tourism and allied businesses, with women constituting at least 30% of the workforce (Bhatt and Rawat, 2025). Respondents emphasized that tourism

has diversified their employment opportunities and income sources, particularly among women, who were previously restricted to domestic roles, but are now engaged in full-time or part-time economic activities in the form of seasonal shops, making and selling handicrafts, and other income generating activities. This shift has contributed to improved standard of living among residents.

Findings from focused group discussions highlight that better infrastructure, establishment of educational institutions and penetration of mobile phones have collectively strengthened the aspirations of the local communities. Improved services due to construction of roads, hotels, banks, hospitals, telecommunications, electricity, and helicopter services have contributed substantively towards a steady upward shift in the revenue generation and living standards of the locals (Bahuguna et.al. 2011). Respondents unanimously reported that due to these services, more tourist come to the area every year, resulting in a perennial flow of income. They further add that, religious tourism in particular has been a big boon for residents, raising their income.

An elderly man running a shop argued,

“When their (temples) doors are open, then the doors of wealth are open. When their doors are closed, then the doors of wealth are closed”.

Another respondent added that earlier people mostly lived in one room houses, but increasingly the situation was improving, and people are following better living standards,

“Today, no one eats without tomatoes, onions, etc. ... everyone is getting money, and everyone has developed a lot”.

Urbanization goes hand-in-hand with infrastructural development, such as better roads, hospitals, educational institutions, electricity, water, etc. Many respondents pointed out that with better availability and access to basic services, it became easier for people to live more comfortably.

Findings from qualitative interviews and focus group discussions also indicated that the growth in the tourism industry has created renewed incentives for cultural preservation. As tourists come from diverse cultural backgrounds, interaction between host communities and tourists from differing cultures have various positive and negative impacts (Bahuguna et, al, 2011). Respondents noted that in Uttarakhand, this has led to preservation of cultural monuments, promotion of culture, and emergence of newer forms of craftsmanship. Increased tourism has provided an elevated purpose for local communities to showcase their cultural identities and beliefs. This has helped communities to further strengthen the cultural fabric of the region. The gradual creation of semi-urban way of living, with focus on preservation of distinct cultural identity was evident in the interviews conducted in the field site. At the same time, with the development and rise of religious tourism, language adaptation to communicating effectively about their culture with religious (and other) tourists has been the single biggest behavioural transformation.

The above-mentioned positive effects have also brought with it several negative effects such as the depletion of natural resources, increase in climate risks, decline in the agricultural economy, challenges in the management of waste, and added social concerns.

Rapid urbanisation has resulted in the depletion and degradation of natural resources, particularly water, forest and biodiversity, along with agricultural land. Urbanisation has contributed to an increase in the degradation of natural forests from 2.06% to 9.63%, along with a reduction in irrigated land from 4.34% to 21.07% due to hydrological disruption and depletion of water resources around towns (Tiwari et. al. 2018) between 1971 to 2010. Some of the people interviewed argued that such environmental

changes were a result of rapid construction and urban development. Almost all respondents reported water problems in the region especially during the peak tourist season.

Urban development and constructions, deforestation, and hydrological disruptions were cited as contributing factors to the rising frequency and severity of landslides and floods in the region. Respondents added that every year, such calamities resulted in huge damage to property and infrastructure along with loss of lives and livelihoods.

Rural agricultural economy has also experienced a decline in the region as agriculture land has reduced due to encroachment on farmland for urban constructions and migration of youth for urban employment. This is destabilising the rural food and livelihood security and is bound to have long-term impacts on local food security, particularly among the poor and socially marginalized communities who constitute nearly 75% of the total population (Tiwari and Joshi, 2015). Respondents pointed out that land once used for crop cultivation is now dominated by concrete structures, which results in a shortage of agricultural land required for cultivating necessary number of crops.

Urbanisation has also brought with it an unexpected urban problem – increase in waste generation. Approximately three thousand metric tons of solid municipal waste is accumulated every day in Uttarakhand, but the state does not have organized waste management service, and the municipalities are left to manage this waste by themselves (Ghosal et.al. 2024; Vandana Sharma, 2023). Respondents voiced dissatisfaction with municipal waste services and management, reporting visible garbage accumulation in urban centres and around tourist hubs, particularly during peak seasons. In addition to environmental issues, participants also mentioned rising incidents of thefts, overcrowding, and strain on essential services such as electricity and water supply.

Discussion

Urbanisation has brought about many transformations in the state and the lives of people. Increasingly, agricultural fields and forests increasingly replaced by urban structures (Tiwari and Joshi 2015, 2016). Road networks, presently connecting over 70% of rural settlements were seen as facilitating this transformation. Improved connectivity has enabled a shift from subsistence farming to the cultivation of commercial crop such as fruits, vegetables, flowers and milk for sale both in the nearby and far-off markets (Tiwari et. al 2018:19). As one respondent argued,

“They have been built in the villages; they have been built here too. They have been built in all places”.

“Now you will see that the landscape and the fabric of all these places has undergone a major change”.

These changes illustrate how infrastructural development and market integration has reshaped rural livelihoods, reflecting broader patterns of rural-urban transformation in environmentally sensitive regions.

At the socio-cultural level, urbanization and tourism have created new opportunities for economic and social mobility. While the community experiences greater challenges in terms of environmental risks and shortage of essential supplies and services, local communities, particularly women and youth, have gained access to income-generating activities that were previously unavailable, contributing to improved standards of living and diversified household economies. Simultaneously, tourism has reinforced the visibility and value of local cultural practices, monuments, and crafts, fostered community pride and

strengthened cultural identity among the locals. These benefits are however accompanied by other challenges.

Respondents highlighted that exposure to modern amenities and digital media has led younger generations to abandon traditional practices, raising concerns about cultural dilution. The elderly observed that over-exposure to urbanization and social media especially among the youth:

“Younger generation involved in catering to tourist conveniences for economic prosperity... Modernization is threatening the continuity of cultural identities ... the younger generation are changing their system; they are not the same; they are all modern”.

The findings underscore the dual nature of urbanization: while it enables economic growth, livelihood diversification, and cultural promotion, it simultaneously strains environmental resources, disrupts traditional livelihoods, and challenges cultural continuity. This dynamic reflects broader debates in the literature on sustainable development in mountain regions, emphasizing the need for planning that balances economic development with environmental conservation and cultural preservation (Bahuguna et al., 2011; Tiwari & Joshi, 2015). In this context, the Uttarakhand case highlights the importance of integrated policies that consider both the material and socio-cultural dimensions of urbanization.

Conclusion

Rapid urban growth in Uttarakhand has brought significant transformations, creating employment opportunities, improving employment opportunities and raising living standards for many residents, with tourism being a primary driver of economic growth in the region. At the same time, unplanned urbanisation has generated substantial challenges. Natural resources are being depleted, ecological processes disrupted, and socioeconomic vulnerabilities widened. The region faces increased vulnerability to landslides, floods, and other climate-related risks, exacerbated by infrastructure development on fragile slopes (Anbalagan 1993, Tiwari et.al. 2018). Further, seasonal tourist influxes strain basic services, leading to congestion, and create shortage of water, problem in waste disposal, and road accidents. The main reason for such problems is the promotion of these areas as a tourist destination without a proper land-use plan (Ghosal et. al 2024). While the local population accepts these trade-offs for economic benefits, the situation underscores the need for sustainable urban planning and effective governance. Measures such as regulated visitor flow, stricter land-use policies, and strengthened civic infrastructure are critical for balancing development with environmental and social sustainability.

While the above study has illustrated several key developmental challenges and local experiences and perceptions among the community, due to its dependence on a small sample size, the findings may not be fully generalizable to all urbanising mountainous area in India. Future research could employ quantitative insights to provide a broader understanding of the long-term environmental, socio-cultural and economic impacts of urbanisation.

Nevertheless, this paper highlights the dual nature of urbanisation in environmentally sensitive mountain regions – while it fosters economic growth and social mobility, it also poses significant environmental and cultural risks. The study underscores the importance of sustainable urban planning, regulated tourism, and strengthened civic infrastructure to balance development with ecological conservation and cultural preservation.

References

1. Anbalagan, R. (1993): Environmental Hazards of Unplanned Urbanization of Mountainous Terrains: A Case Study of A Himalayan Town. *Quarterly Journal of Engineering Geology*, 26, 179–184.
2. Bahuguna, Abhay; Joshi P. C. and Maikhuri, R. K. (2011). Socio-cultural impacts of pilgrimage in Kedarnath and adjoining Areas of Garhwal Himalayas. *Journal of Environment and Bio- sciences*. Vol. 25 (2): 303-306.
3. Batar, A. K., Watanabe, T., & Kumar, A. (2017). Assessment of land-use/land-cover change and forest fragmentation in the Garhwal Himalayan Region of India. *Environments*, 4(2), 34.
4. Bhatt Arvind and Rawat Sudhanshu, (2025). Growth of Tourism Industry in Uttarakhand. *International Research Journal of Arts and Social Science* Vol. 12(1) pp. 1-7.
5. Dame, J., Schmidt, S., Müller, J., & Nüsser, M. (2019). Urbanisation and socio-ecological challenges in high mountain towns: Insights from Leh (Ladakh), India. *Landscape and urban planning*, 189, 189-199.
6. Vandana Sharma ‘Diya’ (2023). India Foundation Journal : The 2013 Kedarnath Tragedy and the Post-calamity Eco-conscious Development, 67-76.
7. Demenge, J. (2012). The political ecology of road construction in Ladakh Ph.D. Thesis. UK: Institute of Development Studies, University of Sussex.
8. Goodall, S. K. (2004). Rural-to-urban migration and urbanisation in Leh, Ladakh. *Mountain Research and Development*, 24(3), 220–227.
9. Goodrich, C.G., Mehta, M., Bisht, S. (2017). Status of gender, vulnerabilities and adaptation to climate change in the Hindu Kush Himalaya: Impacts and implications for livelihoods, and sustainable mountain development. ICIMOD. Working Paper 2017/3. Kathmandu: ICIMOD.
10. Ghosal, Avishek; Kumar Anil and Rai, Sushil Kumar. (2024). Review on Issues and Challenges to Sustainable Urban Development in the State of Uttarakhand. *Journal of Renewable Energy and Sustainable Development (RESO)*. Volume 10, Issue 1, June 2024 - ISSN 2356-8569. <http://dx.doi.org/10.21622/RESO.2024.10.1.758>.
11. Haller, A. (2014). The “sowing of concrete”: Peri-urban smallholder perceptions of rural–urban land change in the Central Peruvian Andes. *Land Use Policy*, 38, 239–247. Available at: <https://doi.org/10.1016/j.landusepol.2013.11.010>.
12. Hewitt, K., and Mehta, M. (2012). Rethinking risk and disasters in mountain areas. *Journal of Alpine Research | Revue de géographie alpine*, (100-1).
13. HPEC. (2011). Report on Indian Infrastructure & Services. High Powered Expert Committee, Ministry of Urban Development, Government of India.
14. Ishtiaque, A., Shrestha, M., & Chhetri, N. (2017). Rapid urban growth in the Kathmandu Valley, Nepal: monitoring land use land cover dynamics of a Himalayan city with Landsat imageries. *Environments*, 4(4), 72.

15. International Centre for Integrated Mountain Development (ICIMOD) (2010): Mountains of the World—Ecosystem Services in a Time of Global and Climate Change: Seizing Opportunities—Meeting Challenges. Framework paper prepared for the Mountain Initiative of the Government of Nepal by ICIMOD and the Government of Nepal, Ministry of Environment.
16. Joshi, B. (2018). Recent trends of rural out-migration and its socio-economic and environmental impacts in Uttarakhand Himalaya. *Journal of Urban and Regional Studies on Contemporary India*, 4(2), 1–14.
17. Joshi, S. C., & Pant, P. (1990). Environmental implications of the recent growth of tourism in Nainital, Kumaun Himalaya, UP, India. *Mountain Research and Development*, 10(4), 347-351.
18. Khan, S.M.; Page, S.; Ahmad, H.; Harper, D (2012). Anthropogenic influences on the natural ecosystem of the naran valley in the western Himalayas. *Pakistan J. Bot.* , 44, 231–238.
19. Mathieu, J. (2003). The mountains in urban development. Lessons from a comparative view. In T. Busset, L. Lorenzetti, & J. Mathieu (Eds.). *Alpes – Himalaya – Andes – Alpen – Himalaja – Anden. Historie des Alpes – Storia delle Alpi – Geschichte der Alpen (Alpes – Himalayas – Andes. History of the Alpes)* (pp. 15–33). Zürich: Chronos.
20. Patra, P. and Kantariya, K. (2014): Science-Policy Interface for Disaster Risk Management in India: Toward an Enabling Environment, *Current Science*, 107(1), 39–45.
21. Anjal Prakash and David Molden, *Water Policy* (2020) 22 (S1): 1–8.
22. Virginie Le Masson (2013): Exploring Disaster Risk Reduction and Climate Change Adaptation from a gender perspective – Insights from Ladakh, India, 1-367
23. Prakash C, T., Abhinav, T., & Bhagwati, J. (2018). Urban Growth in Himalaya: Understanding the Process and Options for Sustainable Development. *Journal of Urban and Regional Studies on Contemporary India*, 4(2), 15-27.
24. Rizvi, J. (1999). *Trans-Himalayan caravans: Merchant princes and peasant traders in Ladakh*. New Delhi: Oxford University Press (India).
25. Sharma, S., Joshi, P. K., & Fürst, C. (2022). Exploring multiscale influence of urban growth on landscape patterns of two emerging urban centers in the Western Himalaya. *Land* 11 (12): 2281.
26. Tiwari, P. (2008). Land use changes in Himalaya and their impacts on environment, society and economy: A study of the Lake Region in Kumaon Himalaya, India. *Adv. Atmos. Sci.* 25, 1029–1042.
27. Tiwari, P.C.; Joshi, B (2014). Environmental Changes and their Impact on Rural Water, Food, Livelihood, and Health Security in Kumaon Himalayas. *J. Urban Reg. Stud. Contemp. India*. 1, 1–12.
28. Tiwari, P.C. and Joshi, B. (2015): Climate Change and Rural Outmigration in Himalaya. *_e_ Journal_ of Change and Adaptation_in_ Socio-Ecological Systems (CASES)*, 2, 8–25.
29. Tiwari, P.C. and Joshi, B. (2016): Rapid Urban Growth in Mountainous Regions: _e Case of Nainital,_ India. *Urbanization and Global Environment Change (UGEC) Viewpoints*, Global Institute of Sustainability, _Arizona State University, Tempe.

30. Tiwari, P. C., Tiwari, A., & Joshi, B. (2018). Urban growth in Himalaya: Understanding the process and options for sustainable development. *Journal of Urban and Regional Studies on Contemporary India*, 4, 15–27.
31. Yi, Y., Zhao, Y., Ding, G., Gao, G., Shi, M., & Cao, Y. (2016). Effects of urbanization on landscape patterns in a mountainous area: A case study in the Mentougou District, Beijing, China. *Sustainability*, 8(11), 1–14. <https://doi.org/10.3390/su8111190>.

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