

Ecological Losses of Tourism Activities in Uttarakhand

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Abstract

The Himalayan topography in Uttarakhand has emerged to be one of the most favored tourist destinations in northern part of India by attracting pilgrims to the Char Dham shrines and the adventure seekers to the valleys, ridgelines, and rivers of the area. This type of growth that has gained momentum since the formation of the state in 2000 has introduced income and jobs to a historically underdeveloped hill economy but put an increasing strain on terrain that is geologically young and seismically active. This is a review based on the published literature, which discusses the interaction between religious tourism, trekking, mountaineering, river rafting and similar adventure activities and deforestation, habitat fragmentation, the solid waste development, water pollution and slope instability in Kedarnath, Badrinath, Gangotri, Nainital and Valley of Flowers. Special focus is placed on Kedarnath tragedy of 2013 that scientists have related to extreme rainfall coupled with glacial lake instability and decades of uncontrolled construction work along the river basins. Community-based ecotourism and regulatory measures like carrying-capacity assessment are also reviewed and seen as potential remedies to unregulated expansion. It finds that the tourism economy of the state and the ecological base are not independent entities but lie within dependent systems and the long term balance of the two is dependent on how the future development is planned, monitored and implemented.

Keywords: Tourism, Uttarakhand, Disaster, mountain, deforestation.

Introduction

Hardly an Indian state demonstrates the conflict between economic prospect and environmental precariousness as vividly as Uttarakhand. Carved out of Uttar Pradesh in November 2000, the state bequeathed a topography of glaciated peaks, alpine meads, thick oak and conifer forests, river valleys already a draw to pilgrims centuries old and mountaineers more than a century old. The difference between statehood and the growth of the visitor was the rate and scale of growth, the development of road systems into formerly isolated basins, and the transformation of village economies to accommodate hospitality and transport services centered on tourist and pilgrim traffic.

The Himalaya is no stagnant setting of this activity. It is among the youngest and the most active mountain system tectonically on the earth and subject to cloudbursts, flash floods, and slope failures without human interference. The damage on such a terrain when overlaid with tourism infrastructure that is not properly planned is more likely to compound than add up. This review summarises what available literature claims about the environmental cost of tourism in Uttarakhand, and considers particular destinations instead of generic examples, and poses the question of what more environmentally friendly model of mountain tourism would entail. It does not state that tourism as such is the issue. Instead it sees tourism as a valid and frequently needed component of the regional economy with ecological implications that is determined by its management.

Tourism Development in Uttarakhand

The tourism in the present day Uttarakhand did not start after the creation of the state. Hindu pilgrimage to the Yamunotri,

Gangotri, Kedarnath, and Badrinath shrines of the Char Dham has been going on centuries, and hill stations of the colony, like Mussoorie and Nainital, were developed as an escape of the plains long before the independence era. The policy apparatus that came with statehood, a tourism department and an incentive system, were specifically designed with the purpose of driving tourism to be a engine of hill development because the economy of the new state had no large industries, and had a long history of out-migration of its middle and higher hills.

This growth size is recorded in recent tourism-carrying-capacity studies. The number of visitors of the four Char Dham shrines increased to over three million and a record of nearly five million visitors is registered in the past years compared to an estimated one million in the first half of the 2000s. Even the Char Dham pilgrimage alone is projected to bring in nearly 888 million US dollars every year and to directly employ approximately fifty thousand individuals, which justifies why state agencies have been hesitant to create stringent restrictions on the number of visitors even as issues like ecology have increased. In addition to religious tourism, the state has proactively embraced the concept of adventure and nature-centered tourism, now as a destination in its own right, which means that trekking trails, alpine meadows, and wildlife reserves are promoted by various researchers as one of the methods to direct the state-led growth towards the benefit of the locals and not just big operators.

Ecological Characteristics of the Uttarakhand Himalaya

The Uttarakhand Himalaya covers a number of different physiographic sections in a relatively narrow latitudinal area, between the Shivalik foothills in the south up to the high

peaks and glaciers of the Greater Himalaya. Vertical movements over a few tens of kilometers (horizontal movements) cause uplifts of several thousand meters in steep slopes, soils that are thin and subject to erosion, and river systems that are fed directly by glacial melting. The Kedarnath shrine is located near the Chorabari glacier and the moraine-dammed lakes in its vicinity, where, due to the seismotectonic sensitivity of the environment, the detection of changes has been described in the literature in detail with the help of digital elevation models and satellite images (Das *et al.*, 2015).

It is also a landscape with active tectonic stress and it lies within the seismic belt of the Himalayan which increases the chances of hazards related to earthquakes to augment those of rainfall. The amount of forest cover in the larger Himalayan hill districts, which is a matter of national concern by virtue of its suggested ecological significance in watershed safeguarding and erosion control, has been identified to be far short of the recommended levels as recommended by the national forest policy and Uttarakhand has continually been featured among the states most adversely impacted by forest fire incidents in the recent surveys conducted on a biannual basis. This does not render the area inhabited, undeveloped, but it does imply that constructions, deforestation, and wastes have implications in this region that would be much milder in more stable areas.

Major Tourism Activities in Uttarakhand

The most prominent type of visitor activity to the state is still religious tourism. The Char Dham Yatra is at once receiving the greater part of pilgrim traffic, and is supplemented by all-year-round pilgrim traffic to Haridwar and Rishikesh, both of which are where the Ganga quits the mountains and enters the plains. A second key category is adventure tourism which encompasses trekking in alpine meadows like the Valley of Flowers, mountaineering trips to peaks on the Nanda Devi and Gangotri ranges, river rafting on the upper Ganga at Rishikesh, camping on riverbanks and trekking trails, and winter skiing at Auli. Wildlife tourism with the focus on the preserved ecosystems like the Kedarnath Wildlife Sanctuary, the Nanda Devi National Park and the buffer zones surrounding them has increased within the scope of these other categories, albeit at a lesser scale.

The only thing that connects these otherwise dissimilar activities is their concentration within few ecologically sensitive corridors. Although some researchers are hopeful about the role that ecotourism can play, they acknowledge that the bulk of tourism-related traffic in Uttarakhand is concentrated in a small number of popular circuits, instead of being spread across the entire geography of the state, which implies that the ecological footprint of tourism, regardless of its overall size, is just a few river valleys, ridgelines, and alpine areas.

Ecological Losses Associated with Tourism

One of the most obvious ecological costs is related to deforestation related to tourism infrastructure. All over the pilgrimage and trekking trails, roads, parking areas, hotels and guesthouses have been established in the slopes of the forests, and in the past year national forest surveys have consistently found fire occurring and canopy destroyed in exactly the districts the Char Dham trails traverse, with Uttarakhand showing up as one of the highest frequency spots of forest fires in the latest biennial national survey. The clearing of tree cover on steep slopes erodes root systems to stabilize the soil,

and it is this combination of construction, deforestation and slope hydrology and not either that researchers consider to be the cause of much of the landslide risk in tourism corridors.

Habitat fragmentation is based on similar reasoning. Char Dham catchment areas such as wildlife sanctuaries and national parks such as the Kedarnath Wildlife Sanctuary and Nanda Devi National Park cover much of the pilgrimage and trek routes and increased road traffic, foot traffic, pack-animal traffic through these areas disrupts species that rely on undisturbed corridors to move seasonally. Similar systematic reviews of the community-based mountain tourism of other parts of the Himalaya also consider biodiversity pressure and habitat disruption as an ongoing cost of unregulated nature-based tourism even when local communities do enjoy economic gains.

The plastic pollution and solid waste have received longer research interest since the late 1990s when initial research case of Himalayan trekking routes around the Valley of Flowers and Hemkund Sahib found that a poor waste collection set-up resulted in tourist waste littering the trekking routes and that the population participation in waste segregation was meager unless instigated institutional support was given (Kuniyal *et al.*, 1998). The same trekking corridor in a follow up case study revealed that the solid waste management infrastructure in such high mountain tourist spots was still wanting compared to pilgrimage and trekking traffic levels, which expanded significantly during peak pilgrimage and trekking seasons (Kuniyal *et al.*, 2003). Newer government statistics of the Char Dham area show solid waste generated between 1.5 to 2.0 tonnes a day during peak season at Kedarnath alone, something that the current municipal systems in a small mountain township were not initially created to manage.

Tourism-related water pollution is now quantifiable on the molecular scale. An investigation of Nainital Lake, a big hill-station destination and the central drinking water supply to the Nainital town, discovered microplastic in all of the surface water and sediment samples studied, with tourist activity and run-off in the catchment determined as the primary contamination causes. Hydrogeochemical analysis of Gangotri glacier meltwater has recorded the base water chemistry at the glacier source of the Bhagirathi system upstream against which downstream pollution by settlements and pilgrim traffic could be measured to establish the close relationship between glacial water quality and human activity along these pilgrimage routes (Trivedi *et al.*, 2010).

Degradation of land, soil erosion and slope instability are constant topics in the disaster literature on this area. Kedarnath region was studied with the help of digital elevation models and revealed that the moraine-dammed lakes discharging the Mandakini River were already predisposed to outburst flooding, which the construction along the riverbanks transformed into a disaster, instead of a natural one (Das *et al.*, 2015). The socio-ecological surveys that were carried out following the 2013 disaster revealed decreasing forest coverage, changed land use, and soil erosion as long-term vulnerabilities in the Kedarnath valley preceding the disaster itself and defining the post-disaster recovery capabilities of the area (Maikhuri *et al.*, 2017).

Air pollution caused by transport associated with the tourism industry, although not yet researched separately compared to waste or water, is believed to be important enough that it is being reflected in current planning documents, that state tourism researchers are already suggesting limiting the vehicles entering Char Dham routes to cleaner emissions

standards, and that it is implicitly recognized that the unregulated traffic of vehicles along the narrow mountain valleys already represents a measurable source of pollution.

Case Studies from Uttarakhand

The most obvious one is the Kedarnath disaster of June 2013. In addition to extreme rainfall which was reported to be several times the seasonal average, sudden breach of the moraine-dammed lake near the Chorabari glacier caused catastrophic flash flooding down the Mandakini valley (Sati & Gahalaut, 2013). Satellite imagery and elevation modeling were used to analyze the event and it was concluded that the destruction was not only caused by rainfall but also by the glacial lake outburst (Das *et al.*, 2015) and that settlements and tourist infrastructure were the most affected, which were constructed near the river channel. A later study of the causes of the disaster, based on secondary analysis of government reports and academic literature, found that the disaster had been transformed from an extreme but not unprecedented weather event into one of the deadliest in the region's modern history, as a result of unchecked growth in tourism, unchecked building, deforestation and the lack of effective policy enforcement. The field works carried out in the following years found that the local communities, whose livelihoods were now inextricably linked to the pilgrim tourism, were facing difficulties in rebuilding both the economy and the environment at the same time (Maikhuri *et al.*, 2017), as damaged forest, eroded slopes and disrupted water sources kept hampering their recovery even long after the disaster had subsided.

A related case is Nainital. It is one of the oldest hill stations in Uttarakhand and almost all the economy of the town is dependent on this lake whose name the town shares, but this lake is now measurably polluted with microplastic particles, which are traceable to the tourist activity and the untreated runoff from the built up catchment surrounding the lake. This contamination is also a good example of how the pressure of tourism and public health can become intertwined in ways that are not immediately apparent to the visitors who are enjoying the scenery, as the lake is also the town's drinking water source.

The Valley of flowers and the adjacent trekking corridor of Hemkund Sahib are a classic example of waste management failure that has been around for a longer period of time. Research over the past two decades has followed the same underlying issue: a lack of infrastructure to collect and process the amount of waste generated by trekkers as compared to the remoteness and altitude of the site, starting with an initial assessment in the late 1990s (Kuniyal *et al.*, 1998) and a more detailed case study a few years later (Kuniyal *et al.*, 2003). The corridor is still visible in the present carrying capacity evaluation of the entire Char Dham region, indicating that this gap in management has been hard to fill despite increasing numbers of visitors.

The carrying-capacity study conducted on the Gangotri pilgrimage circuit revealed that the institutional and economic carrying capacity of the site was much lesser than its environmental and cultural carrying capacity, and that the limitation to the number of tourists was not the landscape but the infrastructure and governance. A similar trend was observed in the latest multi-criteria analysis, where the sustainable daily number of visitors for each of the four Char Dham shrines were calculated and it was seen that the number of visitors had already started hitting or coming close to the

limits in certain years in the peak pilgrimage at Kedarnath and Badrinath in particular.

Sustainable Tourism and Mitigation Strategies

There have been many calls for community-based ecotourism to be a viable alternative growth model which brings tourism benefits to conservation, instead of tourism harming conservation. Proponents of ecotourism as an antidote to rural out-migration in Uttarakhand believe that ecotourism can create jobs and reduce the negative environmental impact of large commercial tourism operators, if it is not just a marketing label but is also planned at the circuit level, with customer awareness and conservation messaging. The findings of these land-based studies align with broader literature reviews of community-based mountain tourism in the Himalayan region, which also warn that benefits for biodiversity are not guaranteed and depend on how well local institutions control the behaviour of tourists and their use of the resources.

In recent years the carrying capacity assessment has shifted from being an academic notion to an operational planning tool. The most detailed study done recently on the Char Dham shrines has integrated geospatial, climatic, biodiversity and socioeconomic parameters to determine the sustainable number of daily visitors for each shrine and to determine the possible locations for tourist flow away from the most crowded shrines. The National Green Tribunal's own evaluations of the Himalayan Region in India on carrying capacity also have led State agencies to adopt formal limits on visitors instead of growth targets. The results are similar to the earlier destination-specific studies on the Gangotri where it was concluded that infrastructure and institutional development should be done in sync with, not following, the increase in visitors' numbers (Sati, 2018).

Waste management reform has targeted interventions at source and decentralised waste collection. It has been suggested that material recovery facilities, bio-composting pits and better segregation at the point of generation would be more effective than end-of-pipe cleanup campaigns, which was the very conclusion of the earlier studies of waste generated by trekking in the Himalayan region in the 1990s and which is the focus of the planning documents for Char Dham presently (Kuniyal *et al.*, 1998). State pollution control authorities have started to document the waste generated in the districts more systematically, as a pre-condition to designing collection systems that are commensurate to the actual, instead of assumed, tourist volumes.

Future Prospects and Policy Recommendations

The state's current tourism policy explicitly mentions that nature and adventure tourism, health and wellness tourism and religious and cultural tourism are parallel growth sectors and this opens an opportunity to actively steer some tourist demand from the most crowded pilgrimage routes to lesser crowded destinations, if infrastructure investment keeps pace with such a diversification. This decentralisation, recognising and developing satellite tourist sites around the main shrines, is already suggested in the recent carrying capacity study as one of the practical ways of alleviating concentrated pressures on the environment without limiting overall tourist numbers. Tougher enforcement of environmental impact assessment requirements for hotels and road construction in eco-sensitive areas will help solve the problem of deforestation and slope instability at the source instead of after damage has been done, as recommended by the National Green Tribunal in its

own report on eco-sensitive zone management. Ongoing monitoring of forest cover and fire incidence via the national biennial survey process would provide a baseline to evaluate the effectiveness of these interventions in the future. With respect to waste and water, there is a need to increase the source-segregation infrastructure and water quality monitoring, including of emerging contaminants like micro plastics, beyond Nainital to other tourist sites of the lake and rivers to fill a data gap that prevents policy responses to be based on just a few case studies and not a state-wide picture. It's doubtful that any of these measures will work on its own. Limits on carrying capacity that lack enforcement will continue to be aspirational; ecotourism projects will continue to be plagued by a lack of true ownership by communities; and waste infrastructure without behavioral change among pilgrims and trekkers will continue to be overloaded in peak seasons. The research reviewed here indicates that these three strands – regulatory, infrastructural and community-based – must be worked on concurrently, not as alternatives.

Conclusion

Since the statehood, tourism has emerged as a key economic activity in Uttarakhand, creating jobs and livelihoods in an economy which has been facing difficulties in retaining its population in the hills. This same expansion has put a constant strain on a relatively young, steep, earthquake riven and only partially resilient landscape to deforestation, waste production, and construction that accompanies the influx of large numbers of visitors. Though the 2013 Kedarnath disaster is the most glaring example of the consequences of such pressures when coupled with extreme weather, the gradual accumulation of plastic waste in Nainital Lake, the waste management challenges around the Valley of Flowers, and the carrying-capacity issues reported across the Char Dham shrines demonstrate that the problem is not one of a single catastrophic event. In this context, sustainable tourism is not a question of either economic development or ecological protection. It calls for the development of institutional capacity, ranging from carrying capacity limits to community-based ecotourism to source-level waste management, to allow both to grow together rather than at the expense of one another.

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