International Journal of Economic Practices and Theories (IJEPT)
ISSN: 2247-7225
Volume 2026, Issue 1

Disaster Risk and Tourism Industry Resilience: A Theoretical Framework for Risk Management in Uttarakhand's Pilgrimage and Adventure Tourism

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Abstract

Uttarakhand's tourism sector, heavily reliant on Char Dham pilgrimage and adventure activities, operates in one of India's most disaster-prone Himalayan regions. This paper examines the growing risks to the industry, particularly land subsidence in Joshimath and the seismic vulnerability of Tehri Dam which threaten downstream tourism hubs.

Drawing on Faulkner's disaster management framework, Ritchie's strategic crisis approach, the Sendai Framework and socio-ecological resilience theory, the study proposes the Himalayan Tourism Resilience Framework (HTRF). The five-phase framework i.e. Pre-Event, Prodromal, Emergency, Recovery and Adaptation & Transformation, offers mountain-specific strategies tailored to faith-based pilgrimage and remote adventure tourism. The research provides significant theoretical and policy implications for building resilient tourism in fragile Himalayan destinations.

Keywords: Disaster risk management, Tourism resilience, Uttarakhand, Pilgrimage tourism, Adventure tourism, Himalayan framework.

Introduction

Uttarakhand, a prominent Himalayan state, thrives on pilgrimage (Char Dham) and adventure tourism, contributing significantly to its economy. However, the region's fragile ecosystem faces escalating disaster risks as evidenced by the ongoing land subsidence crisis in Joshimath and the high seismic vulnerability of the Tehri Dam. A potential failure of the 260.5 meter (standing 260.5 meters tall, is one of the tallest dams in India) Tehri Dam could trigger catastrophic flooding, threatening major tourism hubs like Rishikesh and Haridwar with estimated losses ranging from ₹20,000 to ₹50,000 crore. (Government of India, The Ecologist, 2022)

This research paper examines disaster risks to Uttarakhand's tourism sector and proposes a Himalayan Tourism Resilience Framework (HTRF) for effective risk management. By integrating established disaster management and resilience theories with mountain-specific contexts, the study aims to enhance preparedness and long-term sustainability of pilgrimage and adventure tourism in disaster-prone areas.

Disaster Risks and Their Implications for the Tourism Sector

Uttarakhand's tourism sector is a cornerstone of its economy, driven by millions of annual visitors to pilgrimage sites (Char Dham Yatra) and adventure activities such as trekking, rafting and mountaineering. However, the state's location in the seismically active Himalayan region makes it highly vulnerable to climate-induced and geophysical disasters.

The 2013 Kedarnath floods exemplified how disasters can devastate tourism infrastructure, strand lakhs of pilgrims and cause massive economic losses while exposing systemic vulnerabilities. Recent years have seen

continued risks from landslides and extreme weather, even as the state pushes year-round tourism and adventure initiatives.

Year / Disaster	Tourism Sector Loss	Total Economic Loss	Key Source
2013 Kedarnath Floods	**USD 1 Billion** (approx. ₹6,500-7,000 Crore)	**USD 3.8 Billion**	World Bank / GFDRR Report
2013 Kedarnath Floods	**₹12,000 Crore** (anticipated revenue loss for 2013-14)	-	State Government Estimates
2013 (Overall Impact)	Heavy decline in tourist arrivals (approx. 30% drop)	₹50,000 Crore (infrastructure + others)	Various Official Reports
Joshimath Subsidence (2023-24)	50-60% decline in local hotel bookings & daily revenue	-	Local Business Reports (2024)

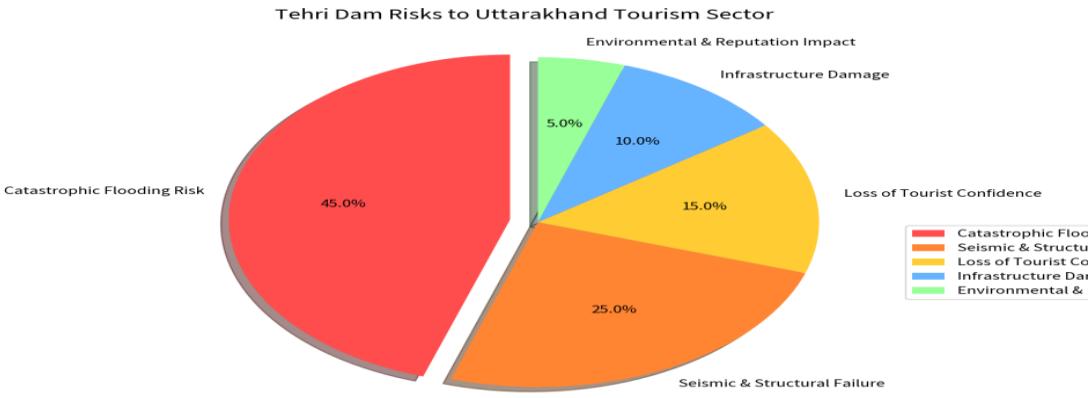
***Sources**: The World Bank & GFDRR (2013); Government of Uttarakhand (2013); Local business reports (2024).*

Similarly, another region Joshimath, a key Himalayan town in Chamoli district and an important gateway for Char Dham pilgrimage and adventure tourism, has been experiencing severe land subsidence. The crisis intensified dramatically in late December 2022 and early January 2023, when sudden subsidence caused cracks in over 868 houses and infrastructure. More than 1,000 structures were severely damaged, leading to the declaration of Joshimath as a landslide-subsidence zone. Subsidence rates were particularly high in 2022–2023, with maximum land deformation velocity recorded up to +94.46 mm/year in some northwestern parts. The causes behind it is that the town is built on ancient landslide debris with low bearing capacity. It lies in Seismic Zone V and issues like unplanned construction, inadequate drainage, deforestation and infrastructure projects have made the situation critical.

Aspect	Details	Impact on Tourism Sector
Crisis Period	Late Dec 2022-Early Jan 2023 (intensified)	Sharp decline in tourist arrivals
Structures Affected	Cracks in over 868 houses or 1,000 structures severely damaged	Multiple hotels damaged/closed
Subsidence (2022-2024)	30 cm sinking in parts of the town, max velocity +94.46 mm/year	Long-term fear among tourists
Tourist Footfall Decline	Dropped to just **5%** of normal levels (peak season)	Severe revenue loss for hotels & businesses
Hotel Bookings Decline	**~60% decline** in bookings post-2023	Many hotels reported near-zero occupancy
Business Revenue Loss	50% reduction in sales for local traders & shops	Overall economic disruption in tourism-dependent economy

***Sources:** Awasthi et al. (2024); Mongabay-India (2024); Down To Earth (2025).*

The Tehri Dam, located in the Central Himalayan Seismic Gap and Seismic Zone IV, presents significant seismic risks. Although designed to withstand earthquakes up to magnitude 8.0-8.4, experts warn that stronger tremors (8.5+) are possible. A potential dam failure could release over 4 billion cubic meters of water, generating a massive flood wave that might submerge downstream tourism hubs like Rishikesh, Haridwar and Devprayag. This poses a severe threat to pilgrimage and adventure tourism, endangering .5 to 2 million people while causing massive economic losses and eroding tourist confidence. (Bilham, 2016; The Ecologist, 2022)



Thus, Uttarakhand faces multiple hazards; cloudbursts, flash floods, landslides, earthquakes and GLOFs. Pilgrimage tourism (Char Dham) involves mass gatherings during monsoon-prone seasons, amplifying exposure. Adventure tourism operates in remote, high-risk zones with limited infrastructure. The 2013 disaster highlighted how unchecked tourism growth can exacerbate risks. Recent policies (e.g. all-weather roads, ropeways and year-round tourism strategy) aim to boost resilience but require careful theoretical scrutiny regarding carrying capacity and environmental load.

After elaborating the risk behind the disasters, this paper develops a theoretical framework for risk management by integrating global tourism crisis models with contextual realities of Uttarakhand. It addresses the gap in mountain-specific theoretical adaptations for pilgrimage versus adventure tourism.

Proposed Theoretical Framework for Risk Management

The proposed Himalayan Tourism Resilience Framework (HTRF) builds upon established tourism disaster literature. Faulkner's (2001) six-phase model provides the foundational structure of disaster progression, while Ritchie (2004) adds strategic stakeholder coordination and feedback mechanisms. The Sendai Framework (2015) contributes principles of risk understanding, governance and resilience-building. Holling's adaptive cycle and socio-ecological systems (SES) theory further strengthen the framework's emphasis on absorption and transformation. Application of these theories to the Indian Himalayan context, reveal critical gaps in addressing faith-driven pilgrimage and remote adventure tourism, which this framework aims to bridge. The Himalayan Tourism Resilience Framework (HTRF) adapts existing models with mountain-specific elements:

Phase 1: Pre-Event (Prevention & Preparedness): This foundational phase emphasizes proactive risk reduction in Uttarakhand. It addresses chronic threats such as Joshimath land subsidence and Tehri Dam's seismic vulnerability. By identifying risks in Char Dham pilgrimage routes and adventure zones, and building capacity through planning and training, it aims to minimize exposure in the fragile Himalayan ecosystem.

Roadmap:

- Conduct comprehensive multi-hazard risk mapping using GIS, satellite data and geological surveys.
- Enforce strict carrying capacity norms for sensitive sites like Kedarnath and Hemkund Sahib.
- Implement mandatory community training programs for homestay owners, guides and priests.
- Deploy ICT integrated early warning systems (mobile apps, SMS alerts, real-time sensors).
- Integrate disaster resilience into all tourism policies and infrastructure approvals.

Phase 2: Prodromal (Warning & Monitoring): The prodromal phase involves heightened vigilance when early signs of disaster appear, such as heavy rainfall, seismic activity or accelerated subsidence as seen in Joshimath. Monitoring must be tailored to Uttarakhand's unique pilgrimage calendar (May to November for Char Dham), when tourist influx peaks.

Roadmap:

- Establish 24/7 real-time monitoring through IMD, ISRO and local observatories.
- Issue pilgrimage-specific advisories aligned with yatra schedules.
- Activate tourism-specific alert systems via mobile apps and local administration.
- Coordinate with tour operators for temporary suspension or rerouting of trips.
- Engage faith leaders to communicate risks sensitively without causing unnecessary alarm.

Phase 3: Emergency (Response & Evacuation): During an active disaster (e.g., flash floods from Tehri Dam failure or cloudburst), rapid and coordinated action is critical. This phase emphasizes safe evacuation while respecting the faith-driven mindset of pilgrims. Effective communication and inter-agency coordination can significantly reduce casualties in high-density pilgrimage areas and remote adventure zones.

Roadmap:

- Activate unified command centers involving NDMA, State Disaster Management and Tourism Department.
- Implement faith-sensitive evacuation protocols with support from religious organizations.
- Use drones and GIS for rapid assessment and rescue in inaccessible terrains.
- Ensure clear, multilingual communication through loudspeakers, social media and radio.
- Prioritize vulnerable groups (elderly pilgrims, solo trekkers) in rescue operations.

Phase 4: Recovery (Short to Medium-term Restoration): This phase focuses on restoring normalcy after the disaster. Strategies must differ for pilgrimage tourism (which relies heavily on faith and image) and adventure tourism (which depends on product experience). Post-2013 Kedarnath experience shows that quick image restoration and targeted marketing are essential for economic revival in Uttarakhand.

Roadmap:

- Launch aggressive **"Safe Uttarakhand"** image restoration campaigns for pilgrimage tourism.
- Promote product diversification (new routes, eco-tourism packages) for adventure tourism.
- Provide financial relief and insurance support to affected homestays and operators.
- Conduct infrastructure damage assessment and prioritize reconstruction of key tourism assets.
- Monitor tourist feedback to rebuild confidence through transparent reporting.

Phase 5: Adaptation & Transformation (Long-term Building Back Better): The final phase emphasizes learning from disasters to create a more resilient tourism system. It promotes **"building back better"** through green infrastructure, community empowerment and policy reform. In the context of Tehri Dam risks and Joshimath subsidence, this phase aims to transform vulnerabilities into opportunities for sustainable development.

Roadmap:

- Integrate climate-resilient and green infrastructure in all reconstruction projects.
- Empower local communities through skill development and ownership in tourism enterprises.
- Revise tourism policies to incorporate mandatory disaster resilience clauses.
- Establish a dedicated Himalayan Tourism Resilience Fund for ongoing adaptation.
- Promote research and knowledge sharing with other mountain destinations.

Discussion and Conclusion

The proposed Himalayan Tourism Resilience Framework (HTRF) effectively addresses the limitations of generic disaster management models by integrating the unique Himalayan fragility, seismic vulnerabilities, and the distinct cultural dimensions of faith-based pilgrimage tourism. It aligns well with Uttarakhand's existing tourism policies while underscoring the urgent need for stricter enforcement of building codes, carrying capacity regulations and climate-resilient infrastructure development.

This paper contributes a contextually grounded theoretical framework that enhances disaster preparedness and long-term resilience in Uttarakhand's tourism sector. By adopting the HTRF, effective risk management can transform potential disasters from major setbacks into opportunities for sustainable development, community empowerment and responsible tourism growth in the fragile Himalayan region.

References

1. Awasthi, S., et al. (2024). Analyzing Joshimath's sinking: Causes, consequences, and future prospects with remote sensing techniques. *Scientific Reports*, *14*, Article 10876. https://doi.org/10.1038/s41598-024-60276-3
2. Bilham, R. (2016). *The Gorkha earthquake and the Tehri Dam*. CIRES, University of Colorado. https://cires1.colorado.edu/~bilham/Tehri%20Dam%2017%20March%202016.pdf
3. Down To Earth. (2025, April 2). *Joshimath sinking crisis: Over 30 cm subsidence in two years alarms residents*. https://www.downtoearth.org.in/natural-disasters/still-sinking
4. Government of Uttarakhand. (2013). *Uttarakhand disaster 2013: Preliminary damage assessment report*.
5. Mongabay-India. (2024, March 1). *Joshimath's economy wanes as tourists dwindle*. https://india.mongabay.com/2024/03/joshimaths-economy-wanes-as-tourists-dwindle/
6. National Institute of Disaster Management. (2013). *Uttarakhand floods 2013: A post-disaster assessment*.
7. The Ecologist. (2022, March 11). Fear over India's dangerous dams. https://theecologist.org/2022/mar/11/fear-over-indias-dangerous-dams
8. The Ecologist. (2022, March 11). *Fear over India's dangerous dams*. https://theecologist.org/2022/mar/11/fear-over-indias-dangerous-dams
9. The World Bank & Global Facility for Disaster Reduction and Recovery (GFDRR). (2013). *India: Uttarakhand disaster June 2013 – Joint rapid damage and needs assessment report*. https://documents.worldbank.org/curated/en/322951468041658053/pdf/826430WP0P146600Box379864B00PUBLIC0.pdf
10. The World Bank. (2014). *Rapidly assessing flood damage in Uttarakhand, India*. https://www.worldbank.org/en/results/2014/07/29/rapidly-assessing-flood-damage-uttarakhand-india
11. Uttarakhand State Disaster Management Authority. (2023). *Joshimath land subsidence situation report*. Government of Uttarakhand.
12. Uttarakhand Tourism Development Board. (2014). *Tourism impact assessment: 2013 floods*.