3. Disaster Management in The Indian Himalayan Region - Environment

The 2025 monsoon devastated Himalayan states, revealing their extreme vulnerability to climate-driven disasters like floods and landslides. This underscores the urgent need to shift from reactive response to a proactive strategy combining advanced technology, sustainable development, and community resilience. The 2025 monsoon season has starkly exposed the profound fragility of the Himalayan states, with a series of floods, cloudbursts, and landslides causing widespread devastation. Despite commendable disaster response efforts, this crisis underscores the urgent need for a paradigm shift towards technology-driven preparedness, robust institutional frameworks, and enhanced community resilience to mitigate escalating climate-driven risks.

Monsoon Disasters (2025) - A Snapshot

Dehradun & Uttarakhand - Devastating flash floods occurred in Dharali. The Indian Army responded by constructing a 400-foot cableway for rescue and relief. Indian Air Force Chinook helicopters airlifted heavy equipment. Advanced technology like drones and satellite communication links were instrumental in guiding swift evacuations.

Jammu & Kashmir - Multiple **cloudbursts** in the **Chenab–Tawi river basins** resulted in over **140 deaths**. The coordinated efforts of the **Indian Army** and the **National Disaster Response Force (NDRF)** were highlighted by the rapid construction of emergency **Bailey bridges** and the safe evacuation of pilgrims.

Punjab - Swollen Ravi, Beas, and Sutlej rivers posed a threat of catastrophic breaches. Effective coordination among the National Disaster Management Authority (NDMA), Central Water Commission (CWC), and Bhakra Beas Management Board (BBMB), supported by Indian Army Aviation near Madhopur Headworks, prevented major loss of life.

Himachal Pradesh - Torrential rains led to widespread slope failures and landslides. Over 10,000 pilgrims were successfully evacuated from the Manimahesh Yatra. The Border Roads Organisation (BRO) worked under treacherous conditions to restore critical road connectivity.

About the Indian Himalayan Region (IHR)

Geographical Spread - The IHR spans 13 Indian States and Union Territories - Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Assam, and West Bengal.It stretches over 2,500 km and constitutes approximately 16% of India's total geographical area.

Population and Diversity - The region is home to nearly 50 million people. It is characterized by diverse ethnic communities such as the Ladakhis, Bhutias of Sikkim, Tibetan Buddhists, and Gaddis of Himachal Pradesh, each possessing unique cultures, languages, and traditions.

Significance of the Indian Himalayan Region (IHR)

Ecological Significance - It is a global biodiversity hotspot, hosting rare species like the snow leopard and red panda, and regulates the subcontinent's climate and monsoon patterns.

Hydrological Importance - Known as India's "water tower," it is the source of major perennial rivers like the Indus, Ganga, and Brahmaputra, sustaining around 500 million people downstream.

Economic Role - The region is vital for hydropower, horticulture (apples, saffron), tourism, and pilgrimage-based economies.

Cultural Importance - It is home to major pilgrimage sites like Amarnath, Kedarnath, and Badrinath, reflecting India's deep spiritual heritage.

Strategic Importance - Serving as India's northern frontier with borders shared with China, Nepal, Bhutan, and Pakistan, the IHR is crucial for national security and geopolitical strategy.

Himalayan Disaster Risk - Causes and Profile

The disaster risk in the Himalayas is a complex interplay of natural vulnerabilities, human activities, and institutional gaps.

Natural Causes	Human-Induced Causes	Institutional & Social Gaps
Geological Fragility - Young, unstable fold mountains with active fault lines. **70% of India's landslides** occur here (GSI, 2023).	Unplanned Development- Unchecked Road widening, hydropower tunneling, tourism, and urbanisation in fragile zones.	Weak Early Warning Systems - Patchy real-time monitoring and delayed alerts for events like floods and landslides.
High Seismic Activity - Most of the region falls under **Seismic Zones IV & V**, making it highly prone to earthquakes that can trigger landslides.	Deforestation and Mining - These activities reduce slope stability, increase soil erosion, and block natural drainage channels.	Governance Complexity - Overlapping jurisdictions of district, state, and central agencies slow down coordination and response.
Hydro-Meteorological Hazards - Prone to cloudbursts, flash floods, and **Glacial Lake Outburst Floods (GLOFs)**. **329** potentially dangerous glacial lakes identified (NRSC, 2022).	Encroachment - Construction in riverbeds and floodplains significantly increases vulnerability to floods.	Healthcare and Resource Gaps - Remote and marginalized communities often lack access to medical infrastructure and resources for resilience.
Climate Change Multiplier - The Himalayas are warming at **twice the global average**, leading to glacial retreat and a **200% rise in cloudburst incidents** in Uttarakhand since 2010 (IMD, 2023).	Pilgrimage Pressure - Overcrowding on vulnerable routes like the Char Dham Yatra strains infrastructure and increases risk.	Low Public Awareness - Citizens often ignore safety alerts, and mock drills are not taken seriously, remaining tokenistic.

Systemic Shortcomings in Himalayan Disaster Preparedness and Recovery

Predictive Surveillance Gaps - Continuous, large-scale monitoring of glacial lakes, slope instability, and debris flows by agencies like NRSC and GSI is lacking. A CAG report (2023) highlighted the underutilisation of satellite-based risk mapping.

Limited Citizen Preparedness - Despite over 1 crore SMS alerts being sent during the 2025 monsoon, public awareness of evacuation routes and SOPs remains poor, especially along pilgrimage corridors.

Unchecked Development - Widespread construction in riverbeds and disregard for seismic codes continue to exacerbate disaster risks, as seen in the recent collapse of structures in Uttarakhand and Himachal Pradesh.

Post-Disaster Recovery Challenges - Reconstruction efforts often neglect crucial slope stabilization measures, and delays in compensation payments hinder the timely rehabilitation of affected communities.

Key Government Initiatives and Programs for Himalayan Resilience

National-Level Frameworks and Initiatives

1. **National Disaster Management Plan (NDMP, 2019) -** Provides a comprehensive framework for disaster management with a special focus on mountain ecosystems.
2. **National Landslide Risk Mitigation Project (NLRMP) -** Focuses on hazard zonation mapping, slope stabilization, and installing early warning systems.
3. **NDMA Guidelines for GLOFs -** The NDMA has issued specific guidelines and SOPs for managing the risks associated with Glacial Lake Outburst Floods.
4. **Aapda Mitra Scheme -** A community-focused initiative to train local volunteers in disaster-prone districts to serve as first responders.
5. **National Mission on Himalayan Studies (NMHS, 2015) -** Supports sustainable resource management and community-led resilience building.

Scientific Research and Glacier Monitoring

Multi-Agency Research - Several ministries, including **MoES, DST, and MoEFCC**, support research programs to study Himalayan glaciers.

Glacier Retreat Trends -

1. Hindu Kush Himalaya - Mean retreat rate of 14.9 m/year.
2. Brahmaputra Basin - Highest retreat rate at 20.2 m/year.
3. Karakoram Anomaly - Glaciers in the Karakoram region show negligible retreat, a unique phenomenon.

Field-Based Monitoring - The National Centre for Polar and Ocean Research (NCPOR) has been monitoring six glaciers in the Chandra basin since 2013. The advanced research station 'Himansh' (operational since 2016) facilitates long-term field studies.

Institutional Coordination - A Steering Committee on Monitoring of Glaciers was established in 2023 by the Ministry of Jal Shakti to coordinate research. A Centre for Cryosphere and Climate Change Studies (C4S) was set up at the National Institute of Hydrology, Roorkee (2023).

Associated Global and National Programs

Global Initiatives -

1. **Sendai Framework for Disaster Risk Reduction (2015–2030) -** Guides global efforts in risk assessment and resilience.
2. **Paris Agreement (2015) -** Encourages climate adaptation and resilience.
3. **Coalition for Disaster Resilient Infrastructure (CDRI, 2019) -** An India-led global partnership.
4. **UN-SPIDER -** Provides space-based information for disaster management.

Other Supporting National Programs -

1. **National Mission for Sustaining the Himalayan Ecosystem (NMSHE) -** A key mission under the **NAPCC** to safeguard glaciers and biodiversity.
2. **Indian Himalayas Climate Adaptation Programme (IHCAP) -** A collaboration between India and Switzerland for capacity building and science-based policy.
3. **SECURE Himalaya Project -** A **MoEFCC-UNDP-GEF** initiative for sustainable management of alpine pastures and biodiversity.

Way Forward - A Multi-Pronged Strategy

Massive Technology Scale-Up - Mandate GIS-based risk mapping for all district-level planning. Use AI-driven models for better forecasting of flash floods and cloudbursts. Ensure 24x7 remote monitoring of glacial lakes and slopes by NRSC and drones. Expand the Doppler Radar Network across Himalayan valleys to improve warning times.

Institutional and Governance Strengthening - Establish a professional disaster management cadre at state and district levels. Integrate civil society organizations like NGOs and panchayats into disaster management plans.Strictly enforce "no-build zones" in riverbeds and ensure adherence to seismic and engineering codes.

Community-Centric Preparedness - Expand the Aapda Mitra volunteer training program to schools, colleges, and local bodies. Conduct mandatory mock drills in high-risk areas and pilgrimage towns. Promote disaster preparedness literacy as a civic responsibility.

Resilient Recovery and Reconstruction - Adopt a "Build Back Better" approach, ensuring reconstructed roads include slope stabilization and river embankments are reinforced. Promote the use of green technologies and slope-sensitive construction. Regulate pilgrim footfall on pilgrimage corridors and use technology for enhanced safety.

Conclusion

Building resilience must be the cornerstone of all development activities in the Himalayas. As the Sendai Framework asserts, disasters are not natural but are a consequence of risks embedded in societal practices. Adopting a technology-driven, community-participatory framework is essential for creating sustainable and safe mountain communities, aligning with the objectives of SDG-11 (Sustainable Cities and Communities) and SDG-13 (Climate Action).

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