STM JOURNALS

International Journal of
Pollution: Prevention & Control

ISSN: 3048-6750
Volume 3, Issue 1, 2025
January–June
DOI (Journal):10.37591/IJPPC

https://journals.stmjournals.com/ijppc

Review IJPPC

Cross-Border Disaster Preparedness in the Himalayas by Indian Armed Forces

Shripriya[1,*]

Abstract

The Himalayan region, known for its immense ecological and geopolitical significance, is also one of the most disaster-prone areas in the world. Its young and dynamic geological structure, coupled with increasing human activity, has amplified the frequency and severity of natural disasters such as landslides, floods, and earthquakes. Cross-border disaster preparedness in the Himalayas, particularly by the Indian Armed Forces, has emerged as a critical component of regional stability and humanitarian assistance. This study examines the physiographic and geodynamic vulnerabilities of the Himalayan region and highlights the proactive role played by the Indian Armed Forces in collaboration with neighboring countries like Nepal and Bhutan. The research emphasizes the importance of regional cooperation, shared resources, and cross-border early warning systems in mitigating disaster risks. Drawing from case studies such as Operation Maitri and Operation Rahat, it underscores the need for dedicated Himalayan-focused disaster management units and regular joint exercises for preparedness and resilience building. Furthermore, the paper explores the integration of advanced technologies like satellite imaging and real-time data sharing for predictive disaster management. It also stresses the significance of empowering local communities through capacity-building initiatives, ensuring that disaster responses are both inclusive and sustainable. The study proposes actionable recommendations, including the establishment of a dedicated Himalayan Guard, advanced training for civil-military coordination, and leveraging regional organizations for effective risk reduction and management. By fostering robust cross-border collaborations and harnessing technological advancements, this paper advocates for a holistic approach to safeguarding the fragile Himalayan ecosystem and its surrounding populations from the escalating challenges of natural disasters.

Keywords: Cross-border disaster preparedness, Indian armed forces, Himalayan region vulnerabilities, regional cooperation, disaster risk reduction

INTRODUCTION

The Himalayan region, stretching from the Shivaliks to the Tibetan Plateau, is not only a symbol of natural splendor but also an arena of geodynamic activity and environmental vulnerability. These youngest and ever-evolving mountain ranges are home to unique physiographic and ecological features, including perennial rivers like the Ganga and majestic glacial formations, making the region vital for both ecological and socio-economic sustenance. However, their geological youth and tectonic instability make them prone to frequent natural disasters such as landslides, floods, and earthquakes.

In this challenging terrain, the Indian Armed Forces, alongside regional and international partners, have played a pivotal role in disaster preparedness and response. Their contributions are exemplified through efficient rescue operations, humanitarian aid, and the development of early warning systems. Collaborative efforts with

***Author for Correspondence**
Shripriya
E-mail: shripriya04parashar@gmail.com

[1]Student, M.A (Defence and Strategic Studies) Department of Defence and Strategic Studies Meerut College Meerut, Chaudhary Charan Singh, Uttar Pradesh, India

Received Date: December 18, 2024
Accepted Date: December 22, 2024
Published Date: January 12, 2025

Citation: Shripriya. Cross-Border Disaster Preparedness in the Himalayas by Indian Armed Forces. International Journal of Pollution: Prevention & Control. 2025; 3(1): 29–35p.

neighboring nations such as Nepal and Bhutan have further reinforced cross-border disaster management initiatives, addressing shared vulnerabilities through data sharing, resource mobilization, and coordinated operations.

This explores the critical role of the Indian Armed Forces in cross-border disaster preparedness in the Himalayas. It highlights their operational frameworks, case studies of successful interventions, and the necessity of joint efforts in disaster risk reduction. By analyzing current practices and recommending strategic enhancements, this study underscores the importance of a cohesive, multi-agency approach to safeguarding one of the planet's most fragile and vital regions.

LOCATING HIMALAYAS

Physiography

The Himalayan region in India spans about 2,500 km, covering 13 states from Ladakh and Jammu & Kashmir in the west to Arunachal Pradesh and Nagaland in the east. It is home to some of the highest mountain ranges in the world and is the source of major rivers like the Ganga. These mountains were formed by the collision of the Indian and Eurasian tectonic plates during the Earth's early development (Figure 1) [1, 2].

Located in northernmost India, the Himalayas are divided into seven main ranges:

- Pir Panjal Range (part of the middle Himalayas)
- Dhauladhar Range (Madhya Himalaya)
- Zanskar Range
- Ladakh Range
- East Karakoram Range
- Mahabharata Range (middle Himalayas in Nepal)

The region is geologically active, and even small changes in its environmental balance can lead to major impacts. This is because the Himalayas are the youngest mountain range on Earth and are still evolving.

Collaboration Between India, Nepal and Bhutan

India has provided help to its neighbors—Bhutan, Bangladesh, Sri Lanka, and Nepal—during natural disasters like cyclones and floods in recent years.

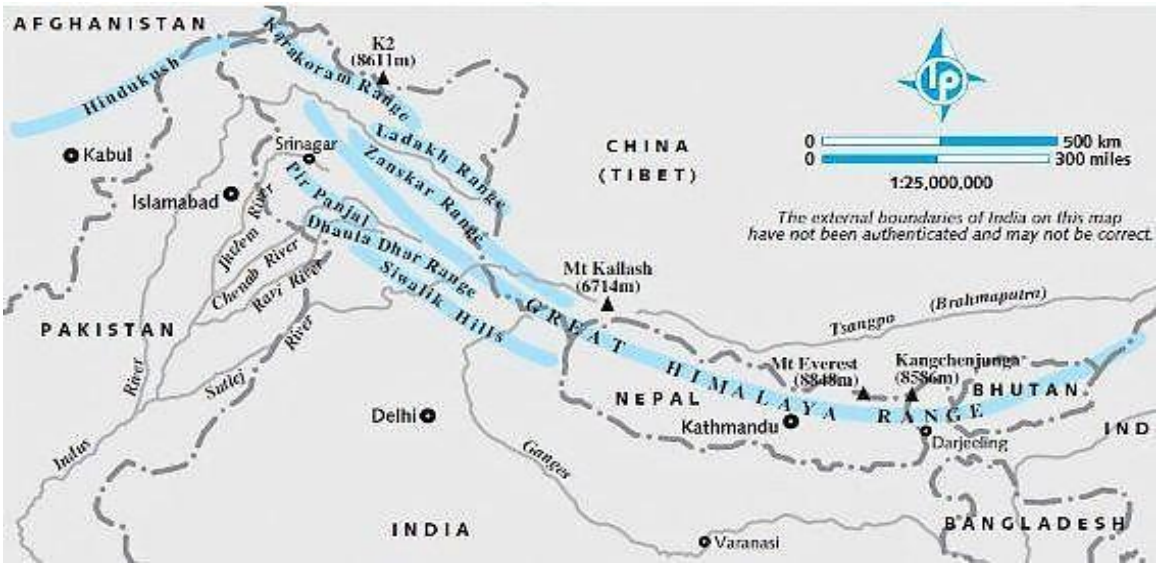

Figure 1. Map of the Himalayan mountain ranges highlighting key divisions, including Pir Panjal, Dhauladhar, Zanskar, Ladakh, East Karakoram, and Mahabharata ranges.

This support has been delivered through key organizations like the National Disaster Response Force (NDRF) within India and the Indian Armed Forces, including the Army, Navy, and Air Force, for international operations.

These humanitarian efforts not only showcase India's ability to respond to crises but also highlight its dedication to helping others in need. This is especially important for nearby countries like Nepal and Bangladesh, which frequently face disasters because of their fragile geography and location.

Disasters in the Himalayas

The Himalayas, being the youngest mountain range in the world, are very prone to erosion. They are still geologically active because the Indian and Eurasian plates collided around 50 million years ago, causing the mountains to keep rising. This makes the region highly earthquake-prone [3–7].

Cloud bursts are common in the Himalayas because of their unique landscape and steep slopes. These sudden bursts of rain often cause floods and landslides. One of the worst landslides occurred in Uttarakhand in 2013. The Himalayan region accounts for 44% of all disasters reported in India, with floods being the most frequent, making up 132 out of 240 recorded disasters since 1903.

Landslides, Extreme Temperatures, and Earthquakes follow as other Major Disasters

Landslides disrupt transportation and can cause loss of life and property. They can happen naturally or due to human activities. In areas with soil that retains little water, like Darjeeling, heavy rains increase the chances of landslides. Riverbank erosion also adds to the problem in areas where rivers bend sharply.

These factors make the Himalayas highly vulnerable to natural disasters like earthquakes, landslides, floods, avalanches, cloud bursts, and forest fires. However, modern technology and satellite data now help predict many of these hazards, giving people time to evacuate. But sudden events like earthquakes and cloud bursts still leave little time to react (Figure 2) [8–11].

Experts like geologists, seismologists, and climatologists study these hazards to better understand them. Coordinated efforts among scientists and organizations can improve hazard forecasting and disaster management.

The "State of India's Environment 2024" report highlights the importance of the glaciers in the Hindukush Himalayas, which provide water to two billion people in Asia. Losing these glaciers would have catastrophic effects, urging leaders to take immediate action. This year alone, during the monsoon season, the Himalayan region saw 1521 landslides in just 17 days, increasing to 1813 by the end of the season.

Figure 2. Aftermath of a disaster with relief efforts underway.

Current Security Management in the Himalayas

The armed forces refer to a country's military, including the army, navy, and air force. These forces are trained, equipped, and prepared to handle operations during emergencies or unexpected situations. With rising threats from terrorism and local conflicts, the armed forces have adapted their training to manage such challenges, including disaster management. Disaster management is a crucial role of the armed forces. The "Disaster Management Act of 2005" outlines the responsibilities and roles of different agencies, ensuring accountability and coordination. It includes provisions for deploying the navy, military, air force, and other armed personnel, as well as civilian staff, to help manage disasters effectively [12–14].

The armed forces play several key roles in the Himalayan region, especially during disasters.

- *Rescue Operations:* The armed forces are better trained and equipped than civilian organizations, making them vital during disaster rescue missions.
- *Evacuation:* Safely moving people to secure locations is a critical part of disaster management, where the armed forces excel.
- *Providing Essentials:* They distribute food, shelter, clothing, and other necessities to affected populations.
- *Restoring Services:* Armed forces help quickly restore electricity, water, and communication systems.
- *Emergency Setup and Repairs:* They establish temporary hospitals and repair damaged roads and bridges [15–17].

Although the armed forces are theoretically called in when civilian agencies are overwhelmed, they often serve as the first responders in severe disasters due to their efficiency and capability (Figure 3).

The Himalayan region's security and management involve multiple government organizations:

1. *Indian Army:* Protects the country from external threats and secures borders. Specialized units like the Ladakh Scouts and Kumaon Regiment are trained for high-altitude combat and are equipped for extreme conditions.
2. *Indo-Tibetan Border Police (ITBP):* Ensures border security along the India-China border, gathers intelligence, and maintains peace.
3. *Border Security Force (BSF):* Handles security along the borders with Pakistan and Bangladesh, focusing on preventing smuggling, infiltration, and illegal activities.

Together, these agencies play a crucial role in disaster response and protecting the Himalayan region.

REGIONAL ORGANIZATIONS AND EXISTING INITIATIVES

The Himalayas are called the "third pole" because they have a vast area covered in permanent snow and many glaciers, second only to the polar regions. These glaciers supply water to Asia's major rivers, like the Ganga, Indus, Brahmaputra, Mekong, Yangtze, Salween, and Huang Ho.

Figure 3. Armed forces and rescue teams during disaster relief efforts.

Several organizations and initiatives work on disaster management in the Himalayas. For example, the "Disaster Management System (DMS) Himalaya" helps remote communities handle disasters at both pre- and post-disaster stages. It includes trained youth response teams, monitoring local weather and geological conditions, communication networks, resource directories, and a customized app for better coordination with the government. The "Integrated Mountain Initiative (IMI)" suggests using a landscape approach for disaster management, integrating land use planning with community participation.

"Himmotthan" is another organization focused on poverty reduction in the central Himalayas, also providing post-disaster relief and rehabilitation. They work on interconnected areas like livestock rearing, mountain farming, and water and sanitation. However, the region's fragile mountain ecosystems are highly vulnerable to disasters, which often disrupt these efforts. As a result, these initiatives cannot be seen in isolation from the frequent natural disasters that have impacted the area over the past decades [18].

IMPORTANCE OF CROSS-BORDER COLLABORATIONS

Working together across borders is important for managing disasters in the Himalayas. Sharing data between countries can help them prepare better for disasters. By pooling resources and expertise, countries can reduce risks and handle disasters more effectively. Setting up a regional platform for disaster management authorities to exchange information, strategies, and successful methods can further improve disaster response and preparedness.

Creating a system to warn countries early about disasters, enabling quicker and more coordinated responses and building stronger institutions to help nations handle and respond to the growing risks in mountain regions are important. Cross-border efforts include the SAARC Disaster Management Centre, which supports the SAARC region by providing policy advice, technical help, training, and capacity-building services for managing disaster risks. The center also promotes the sharing of information and expertise for effective disaster management.

Since 2005, the Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) has been held every two years, organized by Asian countries in partnership with the United Nations Office for Disaster Risk Reduction (UNISDR). This conference is a key regional platform for disaster risk reduction. Its success comes from strong collaboration between host governments and the UNISDR, which provides technical support. AMCDRR has played a major role in boosting political commitment and advancing disaster risk reduction efforts at all levels.

CASE STUDIES

In 2013, heavy cloudbursts over the Himalayas caused severe flooding, also affecting Nepal. The Indian Air Force carried out "Operation Rahat," airlifting nearly 19,600 people and delivering 382,400 kg of relief supplies. The Indian Army launched "Operation Ganga Prahar" and "Operation Surya Hope," rescuing close to 100,000 people, including in areas along the Indo-Nepal border (Figure 4).

Figure 4. Military personnel conducting rescue operations and airlifting supplies during disaster relief missions.

In 2015, after a devastating earthquake in Nepal, India launched "Operation Maitri" (Friendship), a rescue and relief mission by the Indian government and Armed Forces. India was the first country to respond, starting its efforts within 15 minutes of the earthquake. This full-scale operation provided immediate aid to Nepal.

In 2020, Cyclone Amphan impacted India and Bangladesh, with some effects reaching Nepal. India supported Nepal by supplying relief materials and coordinating emergency responses. The Indian Army deployed 24 units, six naval ships, and two Indian Air Force C-130 aircraft to assist, reaffirming India's commitment to helping its neighboring Himalayan countries during crises.

FUTURE RECOMMENDATIONS

Need of a Dedicated Himalayan Guard

In the Himalayas, disaster preparedness is not consistent and needs significant improvement. The idea of managing disasters with programs focused on prevention, mitigation, preparedness, response, relief, and recovery is a relatively new approach.

First, the government should create a center of excellence in disaster management for the Indian armed forces. Second, since field units in disaster-prone areas might not have the latest equipment, these areas should be provided with specific resources for disaster response. This would prevent military equipment from being used for non-combat tasks. Efforts should also focus on using the expertise of the armed forces to help strengthen civil authorities, including disaster response teams, so they can become more self-reliant and less dependent on the military.

Additionally, the National Disaster Response Force (NDRF) is considering stationing specialized mountaineering teams in the higher parts of the Himalayas. These teams would be prepared and ready to carry out fast rescue operations during snow avalanches, landslides, and glacial lake outburst floods.

Need of Joint Operations and Exercises

It is crucial to focus on natural hazards and strengthen community resilience in this disaster-prone area, which can be done through joint military operations and multi-functional training exercises [19, 20]. These operations should train the Indian Army, Navy, and Air Force to work together effectively in the mountains for disaster preparedness and management. The Indian Armed Forces have been key in managing cross-border disasters, using their skills in logistics, rescue, and humanitarian aid.

CONCLUSION

The Himalayan region's unique geographical and ecological complexities demand a multifaceted and robust approach to disaster preparedness and management. As evidenced by the critical role of the Indian Armed Forces, cross-border collaboration remains indispensable in addressing shared vulnerabilities and enhancing regional resilience. The successful implementation of operations like Maitri and Rahat highlights the effectiveness of joint efforts in mitigating disaster impacts and underscores the importance of continued partnerships with neighboring countries like Nepal and Bhutan.

To strengthen this framework, establishing dedicated disaster management units such as a "Himalayan Guard," investing in advanced training for civil-military coordination, and integrating technology-driven early warning systems are crucial steps forward. Additionally, fostering institutional collaborations through regional platforms like SAARC Disaster Management Centre and AMCDRR will amplify preparedness strategies and ensure resource optimization.

The future of disaster preparedness in the Himalayas hinges on a balanced approach that combines proactive military interventions with community-based initiatives and regional cooperation. By prioritizing cross-border collaboration, resource-sharing, and continuous training, the Indian Armed Forces can serve as a cornerstone in securing the Himalayas against an ever-growing spectrum of natural disasters. This cohesive strategy will not only safeguard human lives but also preserve the ecological and geopolitical stability of this vital region.

REFERENCES

1. Kumar G, Dimri BR. Armed forces and disaster management in India. Econ Affairs. 2018; 63 (3): 753–760.
2. Nikku BR, Nepali B, Dahal S. Disaster relief aid as soft diplomacy: case of Canadian disaster diplomacy in Nepal 2015 earthquakes. Can Polit Sci Rev. 2023; 17 (1): 133–146.
3. Giri B, Jehan M, Mohiuddin M, Noor A, Sheraz A. Devastating flood in Nepal amid a humanitarian crisis: a call for action. J Nepal Med Assoc. 2024; 62 (280): 858–861.
4. Davis AE, Gamble R, Roche G, Gawne L. International relations and the Himalaya: connecting ecologies, cultures and geopolitics. Aust J Int Affairs. 2021; 75 (1): 15–35.
5. Pallathadka H, Pallathadka LK. A critical analysis of possible natural disasters in the Himalayan region and a detailed study of the consequences thereof. Integrat J Res Arts Humanities. 2022; 2 (6): 187–194.
6. Parsons RJ. Strengthening sovereignty: security and sustainability in an era of climate change. Sustainability. 2011; 3 (9): 1416–1451.
7. Kumar A. Demystifying a Himalayan tragedy: study of 2013 Uttarakhand disaster. J Indian Res. 2013; 1 (3): 106–116.
8. Muhsen R, Elnaqa A, Abu Murshid E. Disaster resilience through rainwater flood management: the case of Zaatari Refugees Camp, Jordan. Papers Appl Geogr. 2024: 1–25. doi: 10.1080/23754931.2024.2436358.
9. Kavehrad M, Habbab IM. A simple high-speed optical local area network based on flooding. IEEE J Select Areas Commun. 1988; 6 (6): 944–949.
10. Kathleen Geale S. The ethics of disaster management. Disaster Prev Manage Int J. 2012; 21 (4): 445–462.
11. Shi P, Shaw R, Ardalan A, Chan EY, Choudhury JR, Cui P, Fu B, Han G, Han Q, Izumi T, Kasuga F. Fourteen actions and six proposals for science and technology-based disaster risk reduction in Asia: Second Asian Science and Technology Conference for Disaster Risk Reduction: Science-Policy Dialogue for Implementation of the Sendai Framework, April 2018. Int J Disaster Risk Sci. 2018; 9: 275–279.
12. Garge RN, Ha H, Khoo S. Disaster risk management and the role of the armed forces: critical analysis of reactive disaster management in India. In: Ha H, Fernando R, Mahmood A, editors. Strategic Disaster Risk Management in Asia. New Delhi, India: Springer; 2015. pp. 49–67.
13. Chauhan P, Sain K, Mehta M, Singh SK. An investigation of cloudburst-triggered landslides and flash floods in Arakot Region of Uttarkashi District, Uttarakhand. J Geol Soc India. 2022; 98 (12): 1685–1690.
14. Chauhan A, Chopra BK. Deployment of medical relief teams of the Indian Army in the aftermath of the Nepal earthquake: lessons learned. Disaster Med Public Health Preparedness. 2017; 11 (3): 394–398.
15. Sumpter RS, Braddock MA. Source use in a “news disaster” account: a content analysis of voter news service stories. Journalism Mass Commun Q. 2002; 79 (3): 539–558.
16. Sharma VK, Singh S. Challenges in Disaster Management in Hill Areas: A Case Study of Sikkim. IC Centre for Governance. 2021; 249: 248.
17. Rautela P. Indigenous technical knowledge inputs for effective disaster management in the fragile Himalayan ecosystem. Disaster Prev Manage Int J. 2005; 14 (2): 233–241.
18. Shabab R, Ali A, Iqbal S, Awan MS. Armed forces and disaster management. Am J Soc Sci Res. 2015; 1 (3): 152–157.
19. Ghosh C, Pal I. Geotechnical measures for Uttarakhand flash flood – 2013, India. Geotech Eng. 2017; 48 (1): 117–127.
20. Thakur T, Singh K, Sharma A. A review on analysis and mitigation strategies for landslide risk management: case studies of Nainital, Satluj Valley, Pipalkoti, Jhakri, Panjpiri in Himalayan Region, India. J Mining Environ. 2024; 15 (4): 1255–1270.

