

Climate-Induced Disaster Vulnerability in Nepal's Mountain Regions: A Study of the June 2021 Flood Event and Its Aftermath in Chame Village

Dipendra Lama*

Department of Anthropology, Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu

*Corresponding Author: lamadipendra@gmail.com

DOI: <http://doi.org/10.3126/jtha.v8i1.96408>

Abstract

This research paper examines the role of geographical marginality in determining vulnerability to climate-induced catastrophes in mountain regions of Nepal. Positioned in remote and isolated high-altitude areas, these regions are extremely exposed to hazards such as droughts, accelerated glacial melting, avalanches, and Glacier Lake Outburst Floods (GLOFs), all of which pose significant threats to human life, livelihoods and environments. Renowned as climate-induced hazard “red zones,” the study explores how the geographical and spatial characteristics of mountain landscapes of Nepal increase catastrophe impacts. The study is grounded on fieldwork carried out between June 2021 and October 2022, accompanied by follow-up field visits. It draws on primary data gathered through the lived experience of researcher as a flood survivor, participant observation, and collaborations with affected communities. Fundamental to the research is the 2021 flash flood in Manang district one of the harshest events in recent past which caused widespread destruction to infrastructure, including bridges, roads, and buildings, as well as to sacred sites and vital services such as electricity, water supply, and drainage systems. The catastrophe considerably disrupted everyday life and exposed the layered vulnerabilities coupled with geographic isolation. Findings shows that physical remoteness critically limited local response capacities, making rescue and emergency action exceptionally hard. State-led rescue and support efforts were inadequate due to communication breakdowns, transport delays, and the challenges caused by rugged landscape and unfavorable weather conditions. Recovery processes were further extended by the damage of the region’s only motorable road, intensifying risk exposure and increasing social susceptibility. Marginalized clusters including the children, pregnant women, elderly, and persons with disabilities faced unequal challenges during rescue and recovery. This study prompts policymakers and researchers to extend their emphasis beyond economic and social dimensions of vulnerability and to identify the critical impact of geographical influences in shaping climate-induced disaster risks.

Keywords: climate, disasters, Manang, mountain, vulnerability

Introduction

Nepal is categorized among the highest climate-vulnerable nations in the world, with studies identifying it in the top ten in the worldwide climate hazard index (Adhikari et al., 2021; KC, 2025). This elevated level of susceptibility is closely related to the country’s fragile landscape and geologically remote mountain areas, which are extremely vulnerable to climate-induced hazards such as excessive rainfall, flash floods, droughts, avalanches, and glacial lake outburst floods (GLOFs) (Khanal, 2020; Maharjan et al., 2021). Although, climate change is repeatedly framed as a global occurrence, its impacts are strongly localized, influencing the

everyday lives of peoples and communities through changing patterns of weather, including unpredictable rainfall and snowfall pattern, extreme cold events, heatwaves, and extended droughts (Cruickshank, 2007). In the Himalayan context, these changes are further intensified by rapid glacial retreat. Study shows that between 1977 and 2010, Nepal experienced a 24% reduction in glacier area, with continued glacier mass loss projected even under scenarios where global temperature rise is limited to below 1.5°C (Davis et al., 2021).

Research indicates that, approximately 15 million people worldwide are exposed to the potential impacts of glacial lake outburst floods (GLOFs), with populations in High Mountain Asia facing the greatest level of exposure (Taylor et al., 2023). Among the various climate-related hazards, monsoon-induced flooding remains one of the most destructive in the Greater Himalayan region (Sattler et al., 2025; Veh et al., 2020). Climate change is not only impacting Himalayan glacier, permafrost, and natural ecosystems, but it is also adversely influencing socio-cultural system (Poudel, 2020). In Nepal, major water-related disasters in recent decades include the Seti flood of 2012, glacial lake outburst floods in Bhotekoshi 2016, Barun Khola 2017, the Tarai floods of 2017 (Maharjan et al., 2021), and the Thame flood of 2024 in Solukhumbu district in Everest region. In recent decades, the Manang District particularly Chame Village the study site has experienced increasing climatic variability characterized by unpredictable weather patterns. In 2021, the district recorded an unprecedented 82.2 millimeters of rainfall, the highest ever documented by the Department of Hydrology and Meteorology (Neupane, 2023). This extreme precipitation was a key trigger of the June 2021 flood disaster. Simultaneously, rising temperatures, untimely snowfall, intense rainfall events, rapid glacial melting, and prolonged droughts have become more frequent compared to previous decades. These changes have had significant impacts on agricultural production and livestock systems (Poudel, 2018), while also increasing the occurrence of cascading hazards as a part of climate-related disasters (Lord, 2024) such as floods, GLOFs, landslides, and avalanches (Lama, 2024). The majority of settlements situated near river basins further intensifies exposure to flood hazards in the area.

Vulnerability to such catastrophes, however, is not similar. It is created by differential economic, social, and political situations, comprising factors such as age, class, gender, and access to resources (Khatri, 2021; Oliver-Smith & Hoffman, 2002). Substantiation from the June 2021 flood shows that marginalized groups comprising the children, elderly, pregnant women, persons with disabilities, economically underprivileged households, and those with partial social and kinship linkages experienced unequal impacts during the disaster events and its aftermath.

Beyond these well-known socio-economic and political dimensions of catastrophe vulnerability, this study underscores the critical yet repeatedly underexplored position of geography. The geographical location of communities specifically in isolated and difficult mountainous landscapes with inadequate infrastructure, including road networks, communication, hospitals, markets, and electricity considerably restricts response and recovery options in disaster events. Even households with comparatively better economic means face significant challenges in such situations, emphasizing physical geography as a central indicator of vulnerability in disasters.

Therefore, this paper contends for a further nuanced understanding of catastrophe susceptibility that incorporates geographical influences alongside social, political and economic factors (Shinn & Caretta, 2020; Oliver-Smith & Hoffman, 2002). By centering

geography, the paper seeks to elucidate why similar disaster events make unequal effects within diverse populations and places. Furthermore, paper highlights disasters are neither uniform nor universally experienced; rather, their effects are shaped by specific spatial and temporal contexts. Therefore, future research on climate-induced disasters should place geographical features at the center of analysis to better understand disaster risks, responses, and preparedness strategies, ultimately reducing their impacts on people and places.

This study was carried out in Chame Village, located in the Manang District of Nepal's central mountainous region. It primarily examines the June 2021 flood events encompassing the periods before, during, and after the disaster as well as the subsequent processes of recovery and reconstruction considering geography as a marker of vulnerability in catastrophic flood event. In this study, geography is conceptualized as the physical setting in which the community resided and where the flood event occurred.

Data Sources and Approaches

This study adopts a qualitative research design. Fieldwork was carried out over a period of approximately one year, from June 2021 to October 2022. A total of 13 Key Informant Interviews (KIIs) were conducted with individuals who had experienced housing loss due to the flood. These interviews were guided by semi-structured checklists designed to capture detailed accounts of the flood event and its aftermath. In addition, 8 formal interviews were carried out with elected representatives of local government and officials, including the District Administration Office, District Police Office, Nepal Army, and Armed Police Force, all of whom were directly involved in rescue operations and disaster management. Focus of these interviews were on key themes of impacts of the flood, emergency response to the event, reconstruction and aftermath of disaster recovery.

The checklists for the interviews were purposely designed open-ended, aiming to collect research participant's experiences, perspectives, narratives, and situated local knowledge. To balance the formal process of data collection, 16 informal conversations with various community members including elders, seniors, youth, women, and individuals from different socio-economic, occupation, gender, and religion were conducted during fieldwork and supplement visits. These exchanges helped in understanding of community's insights of catastrophe, vulnerability, and community resilience, focusing on lived experiences of community members during the flood event and its aftermath.

Furthermore, from my own positionality as a local survivor of the flood informed this research. Personal experiences of the life-threatening flood event, including observations of rescue challenges, situations in temporary camps, and community concerns considering longstanding recovery, provided circumstantial understandings. Active participation in rescue during the flood event and management of affected people in the temporary shelters further enhanced the understanding of ground realities of disaster. Altogether, these methodological approaches facilitated a broad examination of the disaster event, its impacts to the local population, the role of geographical and physical location in determining disaster vulnerability, and the dynamics of response to disaster, reconstruction, and recovery.

Study Site

The study was carried out in Chame village, former headquarters of Manang District, situated at an altitude of about 2,670 meters above sea level in the central Himalayan region of Nepal.

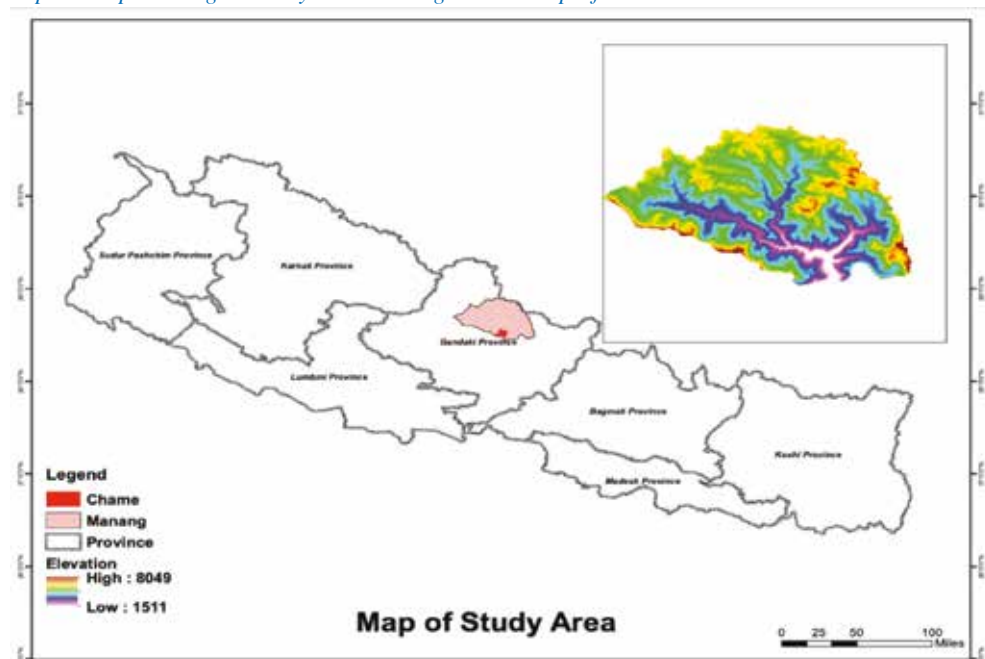
The study site was purposively selected for this research, because of destruction caused by the June 2021 flood event and its geographic location for further possible exposure of similar catastrophic events.

Chame village comprises approximately 120 households and is situated in the Marsyangdi River bank, characterized by vertical mountainous topography and high current glacial river systems flowing from South to North. The estimated population of Chame village is 1,200 characterizing various ethnic groups, that includes Ghale, Lama, Tamang, Newar, Dalit, and others. Buddhism is the dominant religious practice followed by the majority of local populations. The main sources of income are based on agriculture, tourism, small scale trade, services, and remittances from foreign employment. In addition, throughout the year a range of collective, individual, and household-level rituals are performed, echoing culturally rooted practices intended at maintaining positive relationships between the community and surrounding nature.

As showed in Figure 1, Manang District is part of Gandaki province of Nepal and is situated within the Annapurna Conservation Area. The map demonstrates the district's elevation gradient, which ranges from around 1,511 meters to 8,049 meters above sea level, echoing an elevated degree of Geographical difference.

Figure 1

Nepal's map showing the study site including its altitude profile.



Results and Discussion

Contextual Dimensions of Disasters and Vulnerability

Disaster studies should go beyond examining hazards solely as physical events. While such events may act as triggers, the scale and distribution of their impacts are shaped by social,

economic, political, and geographical conditions. As Tamang et al. (2020) contend, disasters are primarily social phenomena: while they may begin from natural hazards, their effects vary across individuals and communities depending on their capability to anticipate, manage with, resist, and recuperate.

Individuals and groups differ widely in their capacity to respond to and recover from catastrophes. Some are able to act fast and effectively, while others face delays and constraints that obstruct both response and recovery. In this respect, Torrence (2003) highlights the need to think a broader set of aspects when assessing why certain events accelerate into catastrophes while others do not. This perspective emphasizes that consequences are not determined by the hazard alone, but by the strength and adaptive capacity of affected peoples.

For instance, when two different communities face the same disastrous event, their recovery courses can vary notably. Communities with sounder institutional help, access to required resources, and social capital are usually well positioned to manage and recover, while additional vulnerable peoples often suffer extended and unequal recovery. Echoing on Hurricane Katrina and Rita, Hoffman (2005) witnessed that the most affected were the poorest groups, particularly historically marginalized racial communities. Likewise, Henry (2005) records that social structures and cultures shape disaster vulnerability, with ethnic minorities, marginalized classes or castes, religious groups, and certain occupations often living in precarious environments. A similar pattern was seen in the Earthquake in Guatemala, where the unequal impact on poorer populations forced to reside in hazard-prone areas due to economic limitations led to it being labeled as a “class-quake” (Blaikie et al., 1994).

Overall, the severity of catastrophe impacts is closely related to the affected populations characteristics and their managing capabilities. Comprehending disasters, thus, needs engaging with the real lived experiences of those directly affected and highlighting grounded, community-level examination. As Stephens (2002) proposes, meaningful disaster investigation must be embedded “on the ground,” mirroring actual situations and experiences rather than isolated conceptual models.

At the ground level, when calamitous events strike place, its effect and intensity can be seen throughout society’s form of susceptibility (Oliver-Smith & Hoffman, 1999), that is connected with society’s social, economic, demographic, and political structure called differential vulnerabilities (Khatri, 2021; Tamang et al., 2020). However social, economic, and political aspects are important in understanding disaster exposures, geographical features must also be given substantial notice for a more wide-ranging examination (Faas, 2016). Reflecting physical characters in disaster events the discrepancy in aid delivery was apparent, with assistance efforts mainly focused in easier access regions. For instance, during Melamchi flood in Sindhupalchowk district that happened same time in Manang district in June 2021, the event attracted significant consideration and help from the governmental and humanitarian organizations, relatively due to its nearness to the Kathmandu and easiness of access. In contrast, official Chairperson of Helambu Rural Municipality Nima Gyaljen Hyolmo voiced frustration over the disregard of flood-affected peoples in more remote parts of the same district was widespread in national media and social media platforms. A similar case was observed in the 2021 Manang flood, which, occurred in the same time as the flood in Melamchi, received considerably less assistance because of its isolated geographical location. These examples emphasize how geographical or physical remoteness can serve as an indicator of vulnerability in the contexts of catastrophe. Therefore, disaster risk reduction strategies

and policies must incorporate geographical considerations to enhance the effectiveness of response mechanisms and minimize the impacts on both people and place.

Disaster occurs when hazards intersect with people who are vulnerable not only in physical terms, but also in economic, social, political, and cultural ways (Garcia-Acosta, 2002). In contrast to this, it is important to note that vulnerability is not only associated with social and economic position of the people and community in the disaster settings. In the case of this study despite of majority people's good economic condition and social cohesion was overshadowed by living in the harsh remote geography where rescue, support and disaster assistance got delayed and ineffective due to access, bad weather and difficult and isolated geography.

Oliver-Smith (1999) opines, vulnerability refers to how a person's social and economic conditions, along with their geographic location before a disaster, influence the impact a natural hazard has on them (Gamburd, 2014). Vulnerability is also associated with Individuals who are already situated in marginalized socio-economic positions tend to face a disproportionately higher risk of experiencing disasters. Vulnerability to flooding, therefore, should be understood not solely as a consequence of physical hazards, but also as a function of underlying social vulnerabilities that heighten exposure and susceptibility to flood-related risks (Shinn & Caretta, 2020 p. 237). In the context of Hurricane Katrina, social vulnerabilities were unevenly distributed within communities and closely linked to prevailing power structures, as well as entrenched racial, ethnic, and gender inequalities both within and among the affected populations (Cutter et al., 2006). Drawing on the existing literature on disaster vulnerability, it is essential for disaster studies to incorporate the spatial location of affected populations into analyses of disaster events in order to inform more comprehensive and effective response mechanisms in future emergencies.

Ferudi (2007) identifies groups such as women, the elderly, minorities, persons with disabilities, and the poor as populations commonly characterized as vulnerable. Equally, Henry (2005) underlines that anthropological investigation has sought to reveal and address the structural circumstances of vulnerability that occur earlier to any disaster events, which influence certain communities to more risk or intensify the severity of disaster impacts. These situations include prolonged poverty, gender inequality, racial discrimination, differences in worldviews, and insufficient development.

Yet, a significant limitation in the both Ferudi and Henry's analysis is the inadequate consideration given to the role of physical or geographical location in influencing pre-disaster susceptibility. The geographical setting in which people inhabit is a critical factor shaping risk and exposure.

Bolin and Stanford (1999) extend this viewpoint by recognizing key factors of disaster vulnerability, including race, ethnicity, gender, age, social class, residency status and migration, literacy and language, also political ideology and practices of the states. In a similar line, Oliver-Smith and Hoffman (2002) contend that "hazards and disasters, as events and processes, are totalizing phenomena that integrate culture, society, and environment" (p. 6).

Grounding on these insights, it is critical for academics, researchers, and policymakers to conceptualize catastrophes as holistic and interrelated processes. This approach demands the incorporation of cultural, social, political, economic, and geographical or physical dimensions

to improve the efficiency of preparedness to disaster, timely response, and effective recovery approaches.

Loss, Damage, and Destruction Caused by the Flood

Glaciers are extremely delicate to climatic changes and assist as sharp, noticeable pointers of global warming (Taylor et al., 2023). Glacial Lake Outburst Floods (GLOFs) are naturally devastating threats. Evidence from the outburst of South Lhonak Lake in Sikkim, India, in October 2023 caused deaths of 55 peoples, missing 74 persons, and far-reaching destruction to infrastructure, making it one of the sternest multi-hazard catastrophe events documented in the region (Satter et al., 2025). Flood that hit Chame village in the June 2021 caused large destruction, damage, and loss to both private and public infrastructure, drastically altering the local physical settings and landscape. No human deaths or missing persons were reported as a result of this flood. The government’s “Flood and Landslide Report Manang 2021” titled June 2021 flood as “Landslide Dam Outburst Floods” estimates that the flood caused damages amounting to several million rupees, with the costs of recovery and reconstruction expected to exceed the initial losses. Previously scenic glacial rivers, which once enhanced the village's natural beauty as they flowed between settlements and forested areas, altered their course and volume, resulting in the destruction. The flood catastrophe damaged both tangible and intangible properties. Tangibly, the flood damaged roads, bridges, school, houses, buildings, shrines, electricity, drinking water supply, and telecommunications and brought changes in physical landscape of the village. On the other hand, the flood has generated intangible impacts to the people and place such as generated fear, anxiety, trauma, psychological effect and disrupted household and ruptured annual village rituals (Lama, 2023).

Table 1

Flood affected structures in study site.

Flood Affected Structures	Numbers	Location of the Structure
Individual Houses	13	Chame Village
School Building	3	Chame Village
Community Shrines	3	Chame Village
Bridges	3	Chame Village
Roads	1	Chame village
Electricity and water supply lines	1	Chame Village

A total of 13 houses were completely destroyed, and large portions of land were eroded in Chame village. 3 school buildings, 3 important tangible cultural heritages/communal shrines (Maane, Chhyorten, Mendang), 3 bridges and multiple section of the local access road were damaged, and electricity and water supply lines also destructed by the flood. This loss, damage, and destruction affected people and place in many ways. In response, residents were displaced and relocated to safer areas, including temporary shelters such as tents, community buildings, and even the newly constructed district prison building. This displacement occurred during the Covid-19 pandemic, further complicating the situation. Five individuals infected with Covid-19 were isolated in close proximity to one of the largest temporary camps, which accommodated approximately 500 people. While many residents remained in these temporary shelters for up to three months, some were forced to stay for as

long as a year.

In May 2021, just one month prior to the flood event, one of my interlocutors Man Bahadur Rana purchased a plot of land near the Marsyangdi River at a relatively low price from a local resident of Chame. Yet, because of the devastating flood his land became unrecognizable, as it was damaged by the altered course of the Marsyangdi River and buildup of boulders and sands. As a result, he is now stressed to reclaim and find the property. The land, initially planned for construction of house, has become non-livable, notably rising his susceptibility. Additionally, existing government guidelines disallow construction within a stated space from riverbanks, further complicated his condition. Due to financial limitations, he was unable to immediately purchase another plot of land in the safer place, forcing him to live in rental housing, thereby worsening his economic uncertainty. This individual case of flood affected person demonstrates that how one's physical location within the society can increase exposure in catastrophe situation.

One of the hardest hit households by the flood were three houses built under the “Janata Aawas Karyakram” (people housing programme) initiated and launched by the government of Nepal in 2019 to deliver housing support to economically deprived populations. During my conversations with 34 years old flood affected female informant narrated,

“We bought land saving years of hard work labor money and received support from the government to construct our houses, due to the destruction of our houses by the flood now we do not have houses to live and forced to live in tents” (Author’s field note, October 2021)

These three families hard hit by the flood belong to economically disadvantaged Dalit community, whose livelihood mainly reliant on daily wage labor. Their inhabited lands were located along the glacial river banks, areas characterized by steep landscape and pre-existing geomorphological loss. In the post disaster context, these families face major difficulties to resettlement, as the availability of inhabitable land in Chame village is limited, and the prices of land increased. Although these affected families have received partial monetary support from the government, organizations, and individuals, expensive cost of land and limited availability of inhabitable land stop them from buying land and building houses. This confluence of spatial, institutional, and economic limitations has further intensified their vulnerability.

During the support and relief distribution, a 36-year-old woman, Saraswati B.K., became emotional and expressed her distress, stating,

“I have been unable to sleep at night; my home has been destroyed, and I have no place to stay. I am currently residing in a tent, which is highly uncomfortable, but I have no other option. It has now been a month since I began using sleeping pills. Due to the trauma caused by the flood and the collapse of my house, I suffer from insomnia. A physician recommended medication to help me sleep, and I have been relying on it since” (Translated from video by Indreni TV, 2022)

Similarly, Mr. Budha Ram Gurung, aged 64, also lost his home in the flood. His daughter, 37 years old Sunita Gurung, conveyed her father's emotional struggles

“My father is experiencing deep emotional distress after witnessing the destruction of the house he built with over 30 years of government service. While others tell us to be grateful that none of our family members were harmed, the psychological and emotional impact from our perspective is far more complex. Currently, we are living in a

temporary house constructed on local people's land, which provides no sense of stability to our family. Because, at any time, the land owner may ask us to vacate the property. Prior to destruction of our house by the flood, we were much more confident living in our own home. It is difficult to explain how traumatic it is to lose everything and to constantly be reminded of what was lost.” (Author’s field note, October 2022)

Next to Mr. Gurung’s house, Karma Chhому, a 54-year-old woman also lost her house in the same flood event. While she was in Kathmandu her house in Chame was completely swept away by the flood. While she returned Chame after four months of the flood, she was unable to find the land and the location of her house. When I visited her in her in Kathmandu, she was accompanied by the relatives and mother’s group from her community. She tearfully described,

“That house was bought with my own money after years of hard work in abroad. That house has many precious memories and emotional importance for me. I am just wondering how will I recover from this big loss.” (Author’s field note, July 2021)

Community members tried to comfort her, but the deep pain and sense of loss due to the destruction of her house were clear in her tear and voice. When I was doing my fieldwork in the Chame village in the October 2021, I met her in Chame village, at that time she was actively seeking help from cadastral survey office to identify the exact location and land where her house was located, stressing her continued physical and emotional attachment to her house, even after the house and lands were completely destroyed by the flood.

Zaman, (1999) in study of disaster and vulnerability in Bangladesh, showed the main reasons behind drought, periodic floods, and coastal cyclones are caused by the geography and climate. Likewise, in the cases discussed in this research show that all destructed houses and lands by the flood were located in close to glacial river basins and within erosion-prone, and steep terrains. The fast flowing and high discharge of floodwaters drastically contributed to the damage of structures, lands, and the displacement of affected peoples and households. In contrast, those houses situated at a greater distance from the river and on comparatively stable landforms and locations were largely unaffected by the flood. Particularly, all destructed infrastructures, shrines, houses, and lands were situated close to the river and at the edges of previously eroded settings. These findings highlight the critical role of geographical and physical setting in shaping differential vulnerabilities and exposure to flood catastrophes.

Due to the June 2021 flood event, Manang district faces significant social, economic and environmental losses. Since then, recurrent monsoon seasons have instilled persistent fear and uncertainty among local residents, who remain apprehensive about the possibility of similar flooding events reoccurring. Despite the passage of five years, recovery efforts at the local, provincial, and federal levels have been slow and insufficient. A lack of adequate financial and material resources has constrained affected individuals and communities from fully reconstructing the damage incurred. As a result, recovery at the community level has primarily been limited to the resumption of basic daily activities.

Geography and Disaster Vulnerability

Study noted that, there were 79 % people of the Nepal reside in rural areas (KC, 2025). Manang district is geographically characterized remote and rural yet surrounded by beautiful mountains, lakes, rivers, and forests that attracts numerous domestic and international tourists

every year. Settlements are situated along Marsyangdi riverbanks and surrounded by steep mountainous terrain. Motorable road access was only established in 2013 and remains non-operational year-round (Lama, 2024). The region's steep and fragile topography, combined with rocky road alignments and fast-flowing rivers descending from higher elevations, renders the road network particularly vulnerable during the monsoon season. Annually, multiple segments of the approximately 100-kilometer road corridor suffer damage or become impassable due to flash floods and landslides. This road is critical lifeline for the inhabitants of Manang district, which serves for both transportation of necessary goods and mobility. When road access is disrupted during extreme weather events, supply chains are broken, leading to significant hardship particularly in cases of illness or emergency. Additionally, adverse weather conditions and difficult terrain further complicate aerial rescue and supply operations, especially during the winter and monsoon periods.

Disaster vulnerability is viewed as a result of person's characteristics, poor decision making, an unequal socio-economic situation; geographical proximity to danger, historical causes, and the outcomes of frequency of the hazard itself (Faas, 2016; Zhukova, 2020). Nepal is a landlocked country characterized by three distinct ecological regions: The Mountain, Hill, and Tarai (plains). The Mountain region, marked by rugged terrain, limited connectivity, and inadequate access to basic services, is sparsely populated, with only 6.1% of the total population, Hill region accommodates 40.3% of the population and the Tarai plains, hosting 53.6% of the country's population (NSO, 2021).

The nature of catastrophic events, coping mechanisms and recovery differs across these three geographical areas. The flood in plain areas of Nepal and floods in hill and mountain areas varies in its impact and intensity. In the plain areas, high sediment loads contribute to channel instability causing the water level on the ground rises and flood causes drawn the area (Chhinal et al., 2026). In the hills and mountains flood in the downstream water and high current cause damage in both landscape and buildings causing place becoming unrecognizable. These extreme water current and flood is enough to damage whole landscape within a few time periods if it continues. Therefore, the nature of the same water related disasters have differential impact to the people and place across these three geographical areas of the country.

Anthropologists see disasters beyond physical event and finds root causes of disaster vulnerabilities in the societal pattern. Demographic features like age, gender, caste, and disabilities plays important role in disaster vulnerabilities alongside socio-economic and political system of the society and country. But what is so important to look at disasters in the context of the mountain communities of Nepal throughout the multiple disaster events is the isolated and marginalized geography makes intensity of disaster impact deeper to the people and communities (Lord, 2025).

It is not only the magnitude of the event but where the events occurred or take place is more important to understand the impacts and recovery process. For example, in the context of developed country the responding mechanisms and recovery processes to the disasters is quicker than developing countries due to available resources (human and economic) and governance system. Likewise, when same disaster events hit the capital city of the Kathmandu and remote areas like Manang, the chances of response and recovery is way more effective and faster in the capital city than the geographically isolated place like Manang. This is due to time and resource mobilization to respond disaster event and recovery and reconstruction

processes. In the cities construction materials, labors (both skilled and unskilled), technical support and supervision is quickly available in comparison to remote geographical location.

In addition, the country's disaster reconstruction and recovery processes are highly centralized within the federal government. In the case examined in this study, government expert teams visited the affected site only long after the disaster, prepared assessment reports, and subsequently advanced them through planning and budgeting procedures (Lama, 2025). This prolonged bureaucratic process significantly delays reconstruction and recovery efforts in the post-disaster period.

Even five years after the flood event, affected populations continue to reside in temporary shelters. Important infrastructure, including the only Besisahar-Chame motorable road assisting as a lifeline, remains not properly constructed, while local roads, drainage system, bridges, electricity, and settlement protection measures are still ineffective and incomplete. This situation intensifies vulnerability to local people, forcing community members to live under uncertainty. Considering the fragile geographical settings and landscapes, the incident of additional hazard event could further increase risks, posing threats to both lives and places.

Due to harsh climatic conditions reconstruction activities in the high mountain communities like Manang district faced constrained to a period of around four to five months yearly. During the monsoon season, most sections of the roads are regularly blocked by landslides further restricting mobility and accessibility. Furthermore, one and only motor road in the district becomes non-operative year-round, which considerably affects the transportation of materials required for the construction. Likewise, government's standard for construction must be followed to, despite the fact that Indigenous Technical Knowledge and system often offer more contextually suitable, actual, and sustainable resolutions (Poudel, 2020). Subsequently, interrupted transport, linked with limited construction periods due to climatic restrictions, plays an important role in slowing the process of reconstruction and recovery. These challenges are further intensified by geographical isolation and remoteness in this study.

Downstream Settlement Patterns and Hazard

Manang district, is composed of a total of 43 small and large villages and settlements. 15 of these settlements are located alongside the Marsyangdi River, situated on narrow flatlands encircled by steep terrains and gorges. There are 10 identified lakes in Manang district, of which five glacial lakes are in a dangerous position (personal observation). These lakes are mostly positioned in the high-altitude areas; in case of an outburst, the water will flow towards the settlements and into the Marsyangdi River, possibly causing disastrous damage and making the displacement of local peoples from their 'thakthalo' (ancestral lands). However, wide-ranging studies including hydrology, glaciology, meteorology, geography, social sciences, physical sciences, and geology remain inadequate to report these critical yet very important issues.

In their study on GLOFs and associated downstream impacts and risks in the Indian Himalayas, Dubey and Goyal (2016) examined how downstream communities face significant exposure to potentially catastrophic socio-economic consequences resulting from GLOF events. Settlement patterns play an important role in water related disasters (Ghatak et al., 2012) particularly flood. In my conversation, one of my 60 years old male interlocutors shared why people settled in their location "the traditional settlements are settled by our

forefathers calculating food security, drinking water, forest resources and livelihood opportunities by calculating weather and climate patterns.” With changing climatic patterns, the frequency and intensity of landslides and related geomorphic processes are increasing, thereby elevating the risk of Glacial Lake Outburst Floods (ICIMOD, 2026). Owing to its geographical setting and the accelerated retreat and melting of glaciers, the majority of villages and settlements in Manang District are highly exposed to flood hazards associated with potential GLOF events. Most settlements are situated in the Marsyangdi River basin surrounded by steep landscape, Glaciers and Glacial lakes on top. Seismic activity, excessive rainfall, and rising temperatures are contributing to the expansion of glacial lakes, thereby increasing the likelihood of outburst events (Davis et al., 2021). GLOFs disasters have the highest death toll worldwide (Veh et al., 2020). This developing risk signifies a serious concern and needs urgent consideration to safeguard vulnerable communities in the high mountain regions from related hazard impacts.

Most of the villages and settlements devastated by the June 2021 floods were located near to the Marsyangdi River and glacial rivers, as well as on steep slopes next to river. Manang District is featured by deep valleys formed between great rocky landscape and river systems. Houses and families that suffered substantial losses were largely situated in close to the rivers and landslide-prone areas. These geographical conditions played a serious role in worsening exposure and susceptibility to flood hazards.

Partnership with Communities for Better Preparedness to Disasters and Risks Reductions

Catastrophic events may occur at any time and in any geographical location. In a place similar to Manang District, where fragile topography, changing patterns of climate, and recurrent hazard events interconnect, strengthening partnership with local communities and its members is crucial for improving preparedness to disasters and risks reductions. Poudel (2025) opines, local communities have widespread knowledge of environmental processes and offer precious understandings into local priorities and challenges.

One-size-fits-all policies and practices are often seen ineffective in disaster risk reduction and response because all disasters and their disasters impacts are always extremely context-specific (Lama, 2023). A bottom-up approach is thus essential to better comprehend the disasters and recovery dynamics. Within Nepal’s current federal structure, local government units must proactively involve with communities to leverage social networks, indigenous knowledge, local skills, and a deep understanding of geographical, social, and cultural contexts. Community’s meaningful participation in preparedness to disasters, emergency response, and recovery can meaningfully improve resilience. It will help to protect people and places, reduce intensity of disaster impacts, and support more effective reconstruction and recovery processes.

In order to map disaster events, responses, and recovery effectively it requires to think and act beyond technical expertise and solutions. All-inclusive approach must also account for the country’s diverse geographical features, socio-economic, cultural contexts and demographic patterns, while designing disaster risk related plans and policies. Local governments can play an important role in producing and applying this contextual information to prevent communities and their surroundings from the impacts of disasters. To realize this, disaster management committee of every local governments must be fully practical and

operative, with proper means and support systems founded by provincial and federal government authorities to guarantee they are well-equipped and fully functional to respond and recover from any kind of disaster situation (Lama, 2025).

Working closely with local communities further improves and strengthens disaster risk reduction efforts, as it permits the expansion of more efficient and effective mitigation strategies and processes for recovery that are based in local realities (Lord, 2024). At present moment, national models for disaster assessment rely greatly on technical reports and data. However, there is an urgent need to learn from past disaster events and the reconstruction efforts to that events. It is very important to note that, despite of waiting for disasters to occur, practical measures should be arranged to reduce risks and impacts. These comprise establishment of early warning systems and finding high-risk areas such as GLOF prone areas, landslide-prone zones, river basins settlements, and other indicators of susceptibility.

Disaster risk reduction preparedness, planning, and policies should place geographical characteristics of the country in the center. Realistic measures such as early warning systems, pre-disaster preparation including essential supplies of food, medicines, clothing, to disaster prone communities and temporary housings and ensuring their delivery to remote and isolated geographical location can meaningfully improve communities' ability to cope during disaster emergencies.

Conclusion

Climate change is a real problem of 21st century and it has global impacts to the people and environments which is affecting numerous aspects of our everyday lives. In the high Himalayas, one of its most significant impacts of climate change is the rapid glaciers melting and increased intensity of rainfall pattern, which contribute to flooding and glacial lake outburst floods (GLOFs). These hazards carry serious pressures and threats to livelihoods, human life, and the environment, mainly for downstream communities of the Mountain regions. Three different ecological regions (mountain, Hill and Terai) of Nepal reveal unique social, cultural, political, economic, demographic, and geographical characteristics. Accordingly, the degree of impact, as well as the capacities for disaster response and recovery also varies across these distinct regions. Mountains are important from many point of views particularly its ecosystems play a crucial role in sustaining ecological balance, serving as key sources of freshwater and making revenue for small scale local communities and larger national economies throughout tourism. Therefore, mountain regions are important from ecological, social, economic, and environmental perspectives. Protecting mountain regions and their residents from the threats brought by climate change and related hazards demands pressing and sustained action and attention. Therefore, it is very essential that any discourses, and research on climate change, disaster risks and vulnerability must center geographical specificities in their examination. Incorporating such appropriate issues into disaster risks reduction is critical for the understanding and preparation of effective, context-sensitive short- and long-term planning and policy frameworks. Each disastrous event is a important learning opportunity, enabling the enhancement of approaches and strategies, the improvement of skills, and better preparedness for future hazards. Strengthening community engagement and empowering local governments through the provision of adequately trained human resources and the implementation of practical, user-friendly policies including early warning systems can significantly contribute to minimizing the adverse impacts of disasters on both populations and environments. Therefore, future research on climate change and disasters

should integrate geographical features into analysis to enhance disaster risks reduction and strengthen preparedness, supported by interdisciplinary collaboration.

.

References

- Adhikari, D., Prasai, R., Lamichhane, S., Gautam, D., Sharma, S., & Acharya, S. (2021). Climate change impacts and adaptation strategies in Trans-Himalaya region of Nepal. *Journal of Forest and Livelihood*, 20(1), 16-30.
- Blaikie, P., T. Cannon, I. Davis & B. Wisner (1994) At Risk: Natural Hazards, People's Vulnerability, and Disasters. Routledge, London.
- Bolin, R., & Stanford, L. (1999). Constructing vulnerability in the first world: the Northridge earthquake in southern California, 1994. In *The angry earth* (pp. 103-126). Routledge.
- Chhinal, L., Thakuri, S., Mathema, A. Bhakta, Dulal, B., & Khanal, S. N. (2026). Flood Hazard Mapping and Risk Evaluation in the Lower Karnali River Basin of Nepal. *Geographical Journal of Nepal*, 19(1), 23–43. <https://doi.org/10.3126/gjn.v19i1.92144>
- Cruikshank, J. (2007). Do glaciers listen? Local knowledge, colonial encounters, and social imagination. UBC Press.
- Cutter, S. L., Emrich, C. T., Mitchell, J. T., Boruff, B. J., Gall, M., Schmidtlein, M. C., ... & Melton, G. (2006). The long road home: Race, class, and recovery from Hurricane Katrina. *Environment: Science and Policy for Sustainable Development*, 48(2), 8-20.
- Davis, M., Hocqet, R., & Shrestha, A. (2021). Glacial lake outburst flood: a shared risk across the Hindu Kush Himalayas. <https://www.sei.org/features/glacial-lake-outburst-floods-hindu-kush-himalayas/> accessed on 23/02/2026
- Dubey, S., & Goyal, M. K. (2020). Glacial lake outburst flood hazard, downstream impact, and risk over the Indian Himalayas. *Water Resources Research*, 56(4), e2019WR026533.
- Faas, A. J. (2016) Disaster Vulnerability in Anthropological Perspective. *Annals of Anthropological Practice*, 40(1): 14–27.
- Furedi, F. (2007). The changing meaning of disaster. *Area*, 39(4), 482-489.
- Gamburd, M. R. (2014). The golden wave: Culture and politics after Sri Lanka's tsunami disaster Indiana University Press.
- Garcia-Acosta, V. (2002). Historical disaster research. *Catastrophe and culture: The Anthropology of Disaster*, 49-66.
- Ghatak, M., Kamal, A., & Mishra, O. P. (2012, October). Background paper flood risk management in South Asia. In Proceedings of the SAARC workshop on flood risk management in South Asia (pp. 9-10).
- Henry, D. (2005). Anthropological contributions to the study of disasters. Disciplines, Disasters and Emergency Management: The Convergence of Concepts Issues and Trends From the Research Literature.
- Hoffman, S. M., & Oliver-Smith, A. (1999). Anthropology and the angry earth: An overview. In A. Oliver-Smith & S. M. Hoffman (Eds.), *The angry earth: Disaster in anthropological perspective* (pp. 1-16). Routledge.
- Hoffman, S. M. (2001). The Monster and the Mother: The Symbolism of Disaster, in *Catastrophe and Culture*, edited by Susanna M Hoffman and Anthony Oliver-Smith. School of American

Research Press, Santa Fe.

- ICIMOD (2026). Glacial Lake Outburst Flood. <https://www.icimod.org/mountain/glacial-lake-outburst-flood/> accessed on 23/2/2026
- KC, T. (2025) Climate change in Nepal who pays the price. <https://nepaleconomicforum.org/climate-change-in-nepal-who-pays-the-price/>
- Khanal, B. N. (2020). Nepal: A brief country profile on disaster risk reduction and management. Ministry of Home Affairs, Government of Nepal, 1-34
- Khatri, M. B. (2021). Differential vulnerability and resilience of earthquake: A case of displaced Tamangs of Tiru and Gogane villages of Central Nepal. *Progress in disaster science*, 12, 100205.
- Lama, D. (2023). Disaster vulnerabilities and community resilience in the mountain district of Nepal: a study of the June 2021 flood event and its aftermath in Chame village. Unpublished M.Phil. thesis submitted to Central Department of Anthropology, Tribhuvan University, Faculty of Social Sciences and Humanities.
- Lama, D. (2024). Social Imaginations of Motor Road: Dissecting Discourse and Actualities. *Tri-Chandra Journal of Anthropology*, 1(1), 26-41.
- Lama, D. (2024). Symbolic Meaning of Disasters: Appeasing Malevolent Spirits through Ritualistic Practices in the Himalayan Community. *Rigvedic Himalaya*, 1, 55-71
- Lama, D. (2025). Need of All Encompassing Governance in Disasters for Better Preparedness and Response. *Anthropological Journal of Nepal and Himalaya*, Vol. 1(1): 99-118
- Lord, A. (2024). Rethinking Himalayan Cryosphere Risk Assessment in the Wake of Nepal's Thame Disaster. https://www.stimson.org/2024/rethinking-himalayan-cryosphere-risk-assessment-in-the-wake-of-nepals-thame-disaster/#elementor-toc__heading-anchor-5 accessed on 26/4/2026
- Maharjan, S. B., Steiner, J. F., Shrestha, A. B., Maharjan, A., Nepal, S., Shrestha, M. S., ... & Gupta, N. (2021). The Melamchi flood disaster: Cascading hazard and the need for multihazard risk management. Kathmandu, Nepal: ICIMOD. <https://doi.org/10.53055/ICIMOD.981>
- Neupane, V. (2023). Two years since Manang floods: locals in Nepal's rain shadow fear being long-term climate refugees. <https://english.onlinekhabar.com/climate-refugees-after-manang-floods.html>
- Oliver-Smith, A., Hoffman, S. M., & Hoffman, S. (Eds.). (1999). *The angry earth: disaster in anthropological perspective*. Routledge.
- Oliver-Smith, A., & Hoffman, S. M. (2002). Introduction: Why anthropologists should study disasters. *Catastrophe and culture: The anthropology of disaster*, 3-22.
- Poudel, J. M. (2018). Pond becomes a lake: challenges posed by climate change in the Trans-Himalayan Regions of Nepal. *Journal of Forest and Livelihood*, 16(1), 87-102.
- Poudel, J. M. (2020). Human dimensions to climate change: insights from the case study in the Nhāson Valley of Nepal Himalaya. *Journal of Tourism and Himalayan Adventures*, 2(1), 42-56.
- Poudel, J. M. (2025). Changing Weather-World in Nepal Himalaya: Exploring from Anecdotal Narratives. *The Geographical Journal of Nepal*, 18, 15-31
- Sattar, A., Cook, K. L., Rai, S. K., Berthier, E., Allen, S., Rinzin, S., & Bhat, S. Y. (2025). The Sikkim flood of October 2023: Drivers, causes, and impacts of a multihazard cascade, *Science*, 387, eads2659.
- Shinn, J. E., & Caretta, M. A. (2020). If it wasn't for the Faith-Based Groups, We Wouldn't Be Where

We Are Today. *Southeastern geographer*, 60(3), 235-253.

- Stephens, S. (2002). Bounding uncertainty: The post-Chernobyl culture of radiation protection experts. *Culture and Catastrophe: The Anthropology of Disaster*, 91-112
- Tamang, M. S., Shakya, D. V., Pradhan, M. S., Gurung, Y. B., Mabuhang, B., & Khajum, M. (2020). Community resilience capacity: A study on Nepal's 2015 earthquakes and aftermath (pp. 1-40). Central Department of Anthropology, Tribhuvan University.
- Taylor, C., Robinson, T. R., Dunning, S., Carr, J. R., & Westoby, M. (2023). Glacial lake outburst floods threaten millions globally, *Nat. Commun.*, 14, 487.
- Torrence, R. (2003). What makes a disaster? A long-term view of volcanic eruptions and human responses in Papua New Guinea. In J. Grattan & R. Torrence (Eds.), *Natural disasters and cultural change* (pp. 308-328). Routledge.
- Veh, G., Korup, O., & Walz, A. (2020). Hazard from Himalayan glacier lake outburst floods. *Proceedings of the National Academy of Sciences*, 117(2), 907-912.
- Zaman, M. Q. (1999). Vulnerability, Disaster, and Survival in Bangladesh: Three Case Studies. In *The Angry Earth* (pp. 162-177). Routledge
- Zhukova, E. (2020). Private humanitarian responses to disaster vulnerabilities: the Chernobyl children from Belarus in Italy. *Childhood*, 27(2), 238-253.