

DISASTER OCCURRENCE AND ITS MITIGATION PROCEDURE IN HILLY REGIONS: A CASE STUDY OF UTTARAKHAND STATE

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ABSTRACT

Disaster is defined as an occurrence or set of events that result in fatalities, damage to or loss of property, infrastructure, environment, basic services, or means of subsistence on a scale that is greater than what the afflicted population is typically able to handle. The term "disaster" is also used to refer to a "catastrophic situation in which the regular course of life or eco-system has been disrupted and extraordinary emergency interventions are necessary to save and preserve lives and or the environment." India is a nation that is susceptible to calamities. The disaster risk is greatest in steep area; hence mitigation and preventive measures must be meticulously planned. Landslides are very likely to occur due to the region's steep terrain and the rough morphology of the Himalayan mountain ranges. The topography of these areas makes it harder to carry out rescue and relief operations, which increases the risk to human life and the loss of public property.

India has one of the highest socio-economic vulnerabilities in the world due to its geo-climatic features. A disaster is a major breakdown in a society's functioning that causes significant losses in people, property or the environment that are greater than the society's ability to manage its own resources. Disasters are occasionally distinguished by whether they are "Natural" disasters or "Man-made" disasters. Earth earthquakes, tidal waves, floods, and droughts are examples of "natural disasters" that are frequently mentioned while deforestation, over tourism etc. are the examples of man-made disasters.

Keywords: India, Himalayas, Hilly Region, Disaster, Natural Disaster, Man-Made Disaster

INTRODUCTION

According to a report presented to the Parliament in 2016, Uttarakhand has the most unstable zones out of Himachal Pradesh, a state in the north of the Himalayas, and Jammu and Kashmir, a union territory (Singh, 1994; Alphen and Lodder, 2006; Chnsankar, 1982). Extremely dangerous natural dangers can affect the entire state of Uttarakhand (Singh and Rowbotham, 1995).

Uttarakhand, one of India's most disaster-prone states, is situated on the southern slope of the Himalayan mountain range. The state is susceptible to catastrophic events like earthquakes, landslides, mudflows, avalanches, cloudbursts, flash floods, and cloudbursts as a result of its topography and geology (Britton, 1986; Pachauri, 1984). Furthermore, it should be mentioned that over the past few decades, these threats have become increasingly frequent and intense in the fragile state. Scientists have established that anthropological variables are to blame for this (Pant, 1992; Tucci and Petry, 2006).

Disaster management is a well-thought-out method for attempting to lessen the risks brought on by disasters (Singh, 1991; Yan et al., 2006). However, disaster management focuses on creating strategies to lessen the impact of disasters rather than preventing or eliminating hazards. National Disaster Management Authority (NDMA) has been established in India to coordinate national responses to natural and man-made catastrophes (NDMA, 2009). The NDMA manages a number of initiatives for risk reduction and situational response. The governing authority for disaster management in India is called the National Disaster Management Authority (NDMA), which is presided over by the Prime Minister of India. The Disaster Management Act of 2005 requires the establishment of NDMA and the development of a supportive environment for institutional mechanisms at the State and District levels. It is the responsibility of NDMA to establish the policies, plans, and regulations for disaster management. India wants to create a culture that emphasizes preparedness, mitigation, prevention, and response.

STUDY AREA

The 27th State of India, Uttarakhand, was created on November 9th, 2000, when it was split off from northern Uttar Pradesh. It has an area of 53,483 sq. kms. and population of 101.17 lakhs. Uttarakhand is divided into 13 districts. It is primarily a hilly State that shares international borders with Tibet in the north and Nepal in the east. It is situated at the foothills of the Himalayan mountain ranges. Himachal Pradesh is to its North-West and Uttar Pradesh to its South (Fig. 1). It has a variety of glaciers, rivers, dense woods, and high peaks covered in snow, making it rich in natural resources, particularly water and forests. The powerful mountains are home to the Char-dhams, the four most respected and important Hindu temples of Badrinath, Kedarnath, Gangotri, and Yamunotri. It is actually called as Dev Bhoomi, The land of God. The capital of Uttarakhand is Dehradun.

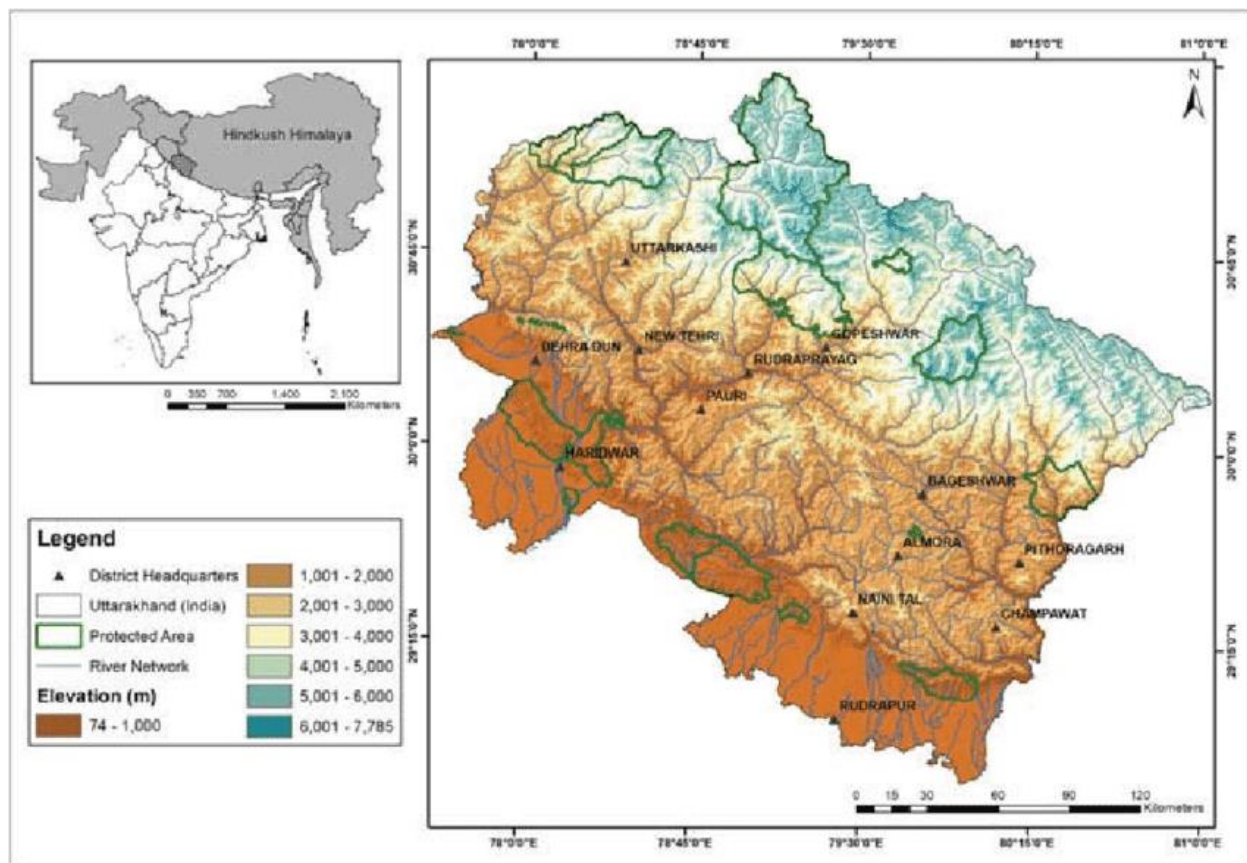


Figure 1: Study Area

The plains and the mountains are Uttarakhand's two primary distinct climate regions. Depending on altitude and location, the northern region of Uttarakhand experiences a characteristically Himalayan climate with significant variations. The monsoon and rainfall patterns are significantly influenced by this mountain range. The climate in the plains is very similar to that of the Gangetic plain as a whole. Summers are extremely hot and frequently humid, with highs reaching around 40°C. In higher altitudes, there is a frigid alpine environment with cool summers and brutal winters.

It is blessed with a rich bio-diversity that includes, among other things, 175 uncommon kinds of fragrant and medicinal plants. It is accessible to a variety of business prospects in horticulture, floriculture, and agriculture because it has nearly all main climate zones. It offers significant potential for eco-, adventure, and leisure-based tourism.

OBJECTIVES

The following are the main objective of the present study-

- To analyze spatial-temporal occurrences of disaster in the study area.
- To study the disaster mitigation procedures in the study area.

DATA BASE

The present study is primarily based on secondary data base for analyze spatial-temporal occurrences of disaster and mitigation procedures in the study area. The secondary data has been collected from different, organization like SDMA, NDMA, which includes the mitigation procedures. Geobrowser Google Earth is used to get satellite images related.

RESULTS AND DISCUSSION

Spatial-temporal occurrence of disasters in uttarakhand state

Since most of Uttarakhand is mountainous, there are natural disasters like earthquakes, landslides, and icebergs falling here every year. Additionally, since most of Uttarakhand is forested, there are losses in life and property due to disasters like fire in the forests and floods in the rivers due to excessive rain. According to experts, The Himalayas are young and delicate, making them particularly vulnerable to calamities like landslides, earthquakes, and floods, especially during the monsoon season when their vulnerability is increased.

According to Dr. Sushil Kumar, a former head of the Institute of Himalayan Geology's Geophysics Group, the Himalayas are a very young mountain range, with just dirt covering the top 30 to 50 feet of its surface. If this soil is even slightly disturbed, especially during the rainy season, it starts to erode and might cause landslides.

FLOOD

Floods are brought on by unusually heavy, prolonged rainfall. In one area of the country or another, floods occur every year. There is a lack of a planned, systematic strategy to cope with the floods despite the fact that the country's primary flood-prone locations have already been identified. The Uttarakhand flooding incident serves as a reminder of the importance of careful planning for development in hilly areas (Fig. 2). The catastrophe resulted in significant harm, devastation and fatalities. It also made us wonder if we are ready to deal with such calamities. What measures is the government taking to lessen them? Can the wrath of calamities be tolerated by our structures, roads, and bridges? Large-scale hydroelectric dam development is upsetting the ecosystem in all locations. In the higher reaches of the Ganga River, hydropower plants have been built by the central electricity authority and the Uttarakhand power department.

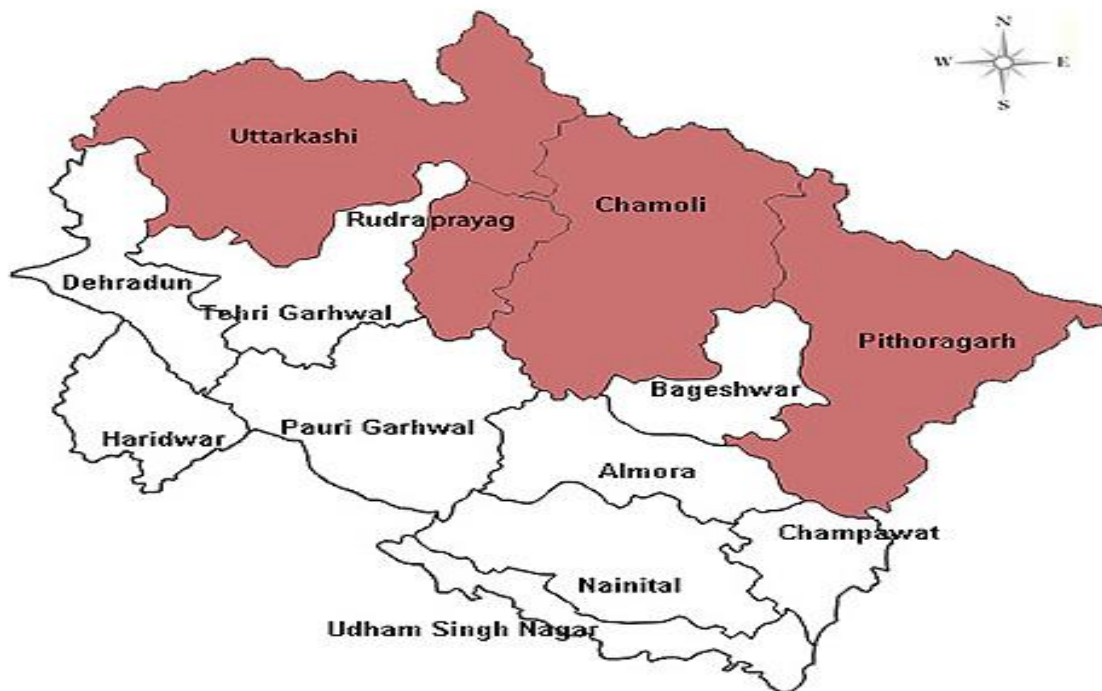


Figure 2: Flood Prone Area

The main causes of floods in Uttarakhand have been determined to be unchecked constructions along riverbeds, hillsides, and the building of multi-story hotels in vulnerable areas to meet the ever-expanding needs of tourism. The administration must concentrate on developing a strong system for managing pilgrims and tourists, as well as on properly allocating finances and adhering to laws for tourism infrastructure, if it is to avoid such incidents in the future.

EARTHQUAKE

The Himalayan Mountains are the only 'living' mountains in the world because of the plate tectonic activity that is causing them to grow taller. The Himalayas' active seismic character is exclusively due to this internal turbulence, which is supported by the fact that frequent earthquakes cross the entire belt, causing significant damage to both people and property. Overall, the Himalayan mountain range and its foothills are where more than 90% of earthquakes in India occur. Scientifically, it has been demonstrated through experimentation that seismicity intrudes into a region through already-existing zones of weakness, and the Himalayas' neo-tectonic activities turn them into such a zone of weakness.

It should be highlighted that uncontrolled development activities in seismicity-prone areas, which multiply the number of fatalities and property losses, are the main cause of the damages in the case of an earthquake (Fig. 3).



Figure 3: earthquake zone wise distribution of districts in uttarakhand

Therefore, extra care should be taken when carrying out important developmental activities like establishing human settlements, urbanizing, building roads, laying railway tracks, etc. Japan, one of the seismically most vulnerable nations, has successfully demonstrated that the damage caused by an earthquake, even one with a Richter scale magnitude of 7, can be reduced by implementing a comprehensive strategy that includes raising awareness, erecting structures that are earthquake resistant, maintaining a high level of preparedness, and creating and routinely updating a comprehensive disaster management plan.

LANDSLIDE

The mass movement of boulders, rubble, or earth down a slope that displaces earthen material along the route is referred to as a Landslide/Landslip. They frequently occur together with other natural disasters that involve movement of the earth, such as earthquakes, floods, or volcanoes. In mountainous regions with little to no forest cover, heavy landslides are another effect of persistent rainfall that stops rivers from flowing (Fi. 4). These river blockages have the potential to wreck havoc on the settlements downstream if and when they burst.

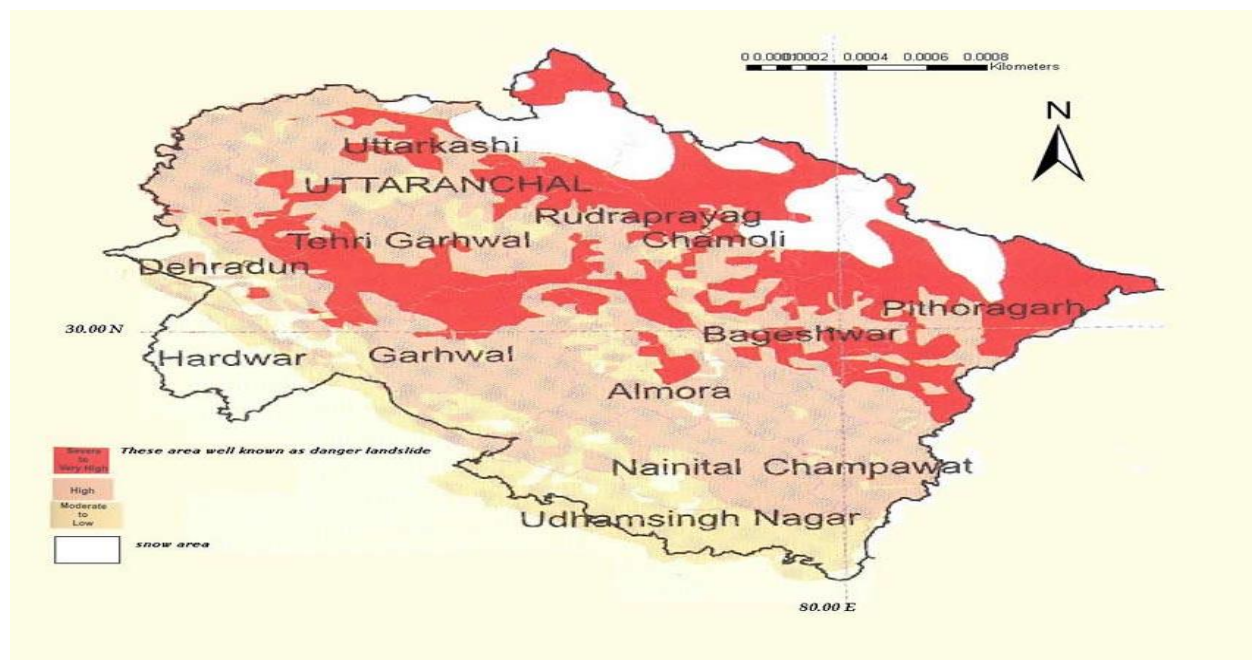


Figure 4: Landslide affected districts of uttarakhand

The state experiences one or more significant landslides almost every year, which have a wide range of social effects. Some of the biggest effects of landslides in Uttarkhand include loss of life, damage to homes, roads, communication infrastructure, and agricultural land. Because there are no other modes of transportation other highways, this has an impact on the state.

CLOUDBURST

Cloudbursts are brief periods of intense rainfall. Water Vapours are typically condensed into raindrops when clouds pass over a region of low air pressure and temperature. These raindrops then fall to the earth because of their weight. However, there are multiple layers of clouds in mountainous places. All the vapours abruptly turn into water at once when a layer travelling at a higher altitude enters a region of exceptionally low atmospheric pressure. While dropping from a height, this water column also absorbs water from clouds in other lower layers before falling quickly to the ground. Only a few cloudburst events have been documented in Extra Peninsular India, whilst the majority occurs in the Himalayan Mountains. There should be no justification for individuals to continue to experience it as the major rainfall zones have already been recognized and delineated on a national scale. It highlights how inadequate our efforts are at disaster mitigation.

Flash floods, landslides, and flooding occur in various areas of the state when there is a lot of rain in a short period of time. It is because drainage systems cannot keep up with the rate and

volume of water entering them. In hilltops, very heavy rainfall causes a rapid, high-speed water flow that can cause havoc in the settlements below the hillock. Sometimes, this fast-moving water avoids the usual route and carries mudflows, debris flows, and rock falls with it. Such floods and flows virtually never provide enough time for planning. Areas are abruptly submerged by flash floods, which last for a short while. However, its potential for harm is just as great as that of regular floods.

Table 1. Major disasters occurred in uttarakhand

Sr.No.	Year	Type of Disaster	Impacts of Disaster
1	1998	Malpa Landslide	One of the worst natural disasters that mankind has ever experienced, the 1998 Malpa landslide claimed 255 lives, including 55 Kailash Mansarovar pilgrims. The Sharda River was partially obstructed by the resulting debris.
2	1999	Chamoli Earthquake	A 6.8-magnitude earthquake struck the Chamoli district in 1999. There were around 100 fatalities, and the neighbouring Rudraprayag area also suffered greatly. The earthquake caused several ground deformations, landslides, and changes in water flow, among other things. Both the ground and the roadways had cracks.
3	2013	Kedarnath Flood	Devastating floods and landslides were generated by a multi-day cloudburst in June 2013. The state government reported that the disaster was estimated to have killed more than 5,000 individuals. More than 3 lakh pilgrims were stranded in the valleys leading to the Char Dham pilgrimage sites as bridges and roads were destroyed.
4	2017	Chamoli Flood	27 people have died in floods and massive landslide blocked the road in this region.

Source: Based on secondary data

Disaster management in uttarakhand

The tragedy of June 16-17, 2013 served as a reminder of the world's immense destruction due to the high death toll and extensive damage to homes, property, roads, bridges, buildings, woods, plantations, crops, and agricultural land. The destruction due to disaster was so extensive that it was dubbed the Himalayan Tsunami. In this tragedy Rudraprayag, Chamoli, Uttarakashi, Bageshwar, and Pithoragarh districts were the badly affected areas. The area that witnessed the worst damage in Uttarakhand was Rudraprayag district. According to official sources, the calamity claimed about 5,000 lives as well as 13,000 animals. This calamity had an impact on

4,200 communities in all, 300 of which were seriously impacted. About half of the crops were damaged as over 20,000 hectares of agricultural land were entirely washed away. Additionally, the disaster resulted in extensive losses of public utilities such drinking water schemes, bridges, roads, schools, and other government buildings.

Over 70,000 visitors and 1 Lakh locals were also left stranded in the upper parts of Uttarakhand's mountainous topography by the calamity. The Government of Uttarakhand, with the assistance of the Army, Indian Air Force (IAF), Indian Tibet Border Police Force (ITBP), National Disaster Response Force (NDRF), and Border Security Force (BSF) has launched the largest rescue mission in the history of disaster management. In addition to saving the lives of thousands of animals, they rescued more than 1.1 Lakh people from flood-affected areas.

Disaster Mitigation and Management Centre (DMMC) is the premier centre in Uttarakhand for disaster mitigation and management, protecting the community and the environment from the overwhelming destruction brought on by disasters. It currently operates as an independent institute under the auspices of the Department of Disaster Management of the Government of Uttarakhand. The Disaster Mitigation and Management Centre (DMMC) will examine and consider preventative, preparedness, and mitigation issues for all projects and serve as a think tank for the Ministry or Department. Although the State Disaster Management Authority was established a long ago, the government of Uttarakhand has come under fire for its lax approach to implementing important aspects of disaster prevention, mitigation, and preparedness. Furthermore, disaster management never formed a part of the state's development agenda, the disaster information system failed to be reliable, and the type and magnitude of disasters have been severely underestimated.

Disaster management includes prevention as a key component. Measures taken to stop natural disasters or other emergency situations from being caused or arising by natural phenomena are referred to as preventative measures. Since not all situations can be avoided, the idea is seen to have considerably larger implications. The creation of long-term plans and programmes to reduce the likelihood of disasters occurring is what is meant by prevention actions. Disaster preparedness and mitigation are two examples of pre-disaster planning actions. The goal of disaster mitigation is to lessen the impact of the hazard that led to the tragedy. Since communities are likely to recover more quickly from the effects of the disasters, mitigation is now recognized as a crucial element of sustainable development.

CONCLUSION

The majority of Indian population lives in the Indian Himalayan Regions, which also serve as a vital hub for food, energy, and water for society, biodiversity, and life. However, these regions

are frequently hit by devastating natural disasters. The study identifies artificial factors including construction activity, deforestation, and tourism as well as natural factors like harsh weather conditions and topographical influences that have exacerbated the extreme conditions. As we know that, Uttarakhand is a disaster prone state because of its location. In Uttarakhand state, a number of disasters have occurred as a result of anthropogenic activity, excessive tourism and over-exploitation of natural resources. In order to adopt an eco-friendly development plan that is area-specific and not based on a borrowed idea, it is urgent. Thus, the lesson learned from these events is the importance of developing in harmony with environment, limiting visitor overpopulation, and emphasizing disaster management.

Natural hazards are caused by climatic instability and cannot be controlled, but by lowering vulnerability and boosting capacity, we can establish efficient warning systems and reduce damage. A well-organized, planned response to the tragedy and preparedness will help save lives. The great people who have lived and are living on Earth have emphasized that "unity and unanimity devoid of discords" are the keys to success. The deployment of technologies and strategies by the government will help to lessen the harm caused by disasters. In order to help in giving the necessary assistance during such famines and floods, as well as delivering basic requirements like food and drinking water to the afflicted households, a number of disaster management agencies must be established at the village and state levels.

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