Scenario of Geo-Hydrological Disasters and their Perception Among People in a Himalayan Town: A Case Study from Almora Town

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Abstract

Disasters, whether natural or human-made, often have a profound impact on people's perceptions and responses. The perception of disasters among people is complex and multifaceted, influenced by a combination of factual information, media portrayal, personal experience, cultural background, and societal responses. Understanding these perceptions is crucial for effective disaster preparedness, response, and recovery efforts. Public perception influences policy decisions related to land use planning, infrastructure development, building codes, and environmental conservation. Accurate perceptions of disaster risks inform policies that promote resilience and reduce vulnerabilities over the long term. Decision makers rely on public support and understanding implement effective policies that mitigate disaster risks. The Himalayas are highly prone to earthquakes, landslides, flashfloods, snow avalanches etc. Today likewise other towns, Himalayan towns are expanding. Population pressure and other urban problems are very common there. The present paper discusses the people's perception on disasters and their management in Almora town.

Keywords: *Disaster Management, Perception, Himalaya, Earthquake, Landslides*

1. Introduction

A Disaster is an event, natural or human-made, that has a significant impact which affects society or the environment in a destructive manner. Disaster management is

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the process of preparing for, responding to, and recovering from disasters, whether natural or human-made. It is a continuous cycle that includes activities from planning and mitigation before a disaster occurs, to response and relief during the disaster, and finally to reconstruction and recovery, aiming to minimize the impact of disasters on lives and property.

The Kumaon Himalayan region is highly vulnerable to natural disasters. Various natural calamities strike the study area almost every year, causing loss of life and property, agricultural land, forests, settlements, and assets worth millions of rupees. In the study area, natural disasters such as landslides, cloudbursts, earthquakes, large-scale devastation, storms, etc., occur naturally. Himalayan towns present a distinct framework of settlement. Over time, these towns have been increasingly burdened by population pressure. Unplanned development has raised questions about their future existence. The geographical structure, tectonic activities, changing climate, and human interventions have made these towns more vulnerable to disasters. Almora town is primarily sensitive to natural disasters. This region is particularly vulnerable to natural calamities such as earthquakes and landslides. Before managing any disaster, it is essential to understand what people know about that disaster, what their level of understanding is, and what their perceptions are. By knowing these aspects, disaster management can be implemented more effectively for that region.

2. Methodology

The study employs a mixed-methods approach, combining quantitative and qualitative research methods. This design allows for a comprehensive understanding of the subject matter by integrating numerical data with in-depth insights. A primary survey has been done to know the perception of people about disasters and disaster management. Male and female respondents are chosen equally for the survey. A 25-60 years age group has been taken to complete the questioner because this age group has greater responsibility regarding disaster-related training, ongoing construction work in the city, and the changes taking place. 65 male and 65 female respondents are taken because male and female are equally important for a society and their representation should be equally. The number of respondents is selected randomly.

There are 10 questions in the questionnaire. The questionnaire is divided into two parts. The first part is related to the general perception of disasters and the second part is related to the perception about geo-hydrological disasters.

Field photography is important to know the real ground situation. Authors have tried to take pictures of disaster-prone areas in the study area.

This methodology provides a robust framework for exploring the perceptions and management of disasters across different communities. By combining quantitative and qualitative approaches, the research aims to yield comprehensive insights that can inform more effective disaster management strategies for a mid-Himalayan town.

3. Objectives

1. To understand the reason of hazards in the study area.
2. To understand people perception on disasters in Almora town.

4. Literature Review

Disasters, whether natural or man-made, have significant impacts on societies globally. The perception of these disasters and their subsequent management are critical in mitigating their effects. This literature review explores various aspects of disaster perception and management, examining key themes, theoretical frameworks, and practical applications. Slovic (1987) highlights that people tend to overestimate rare, catastrophic events while underestimating common, less dramatic risks. Protection motivation theory (Rogers, 1975) explains how people are motivated to protect themselves based on their perception of the severity and likelihood of a threat, their perceived ability to perform protective actions, and the efficacy of those actions. Individual perceptions of disasters are shaped by personal experiences, media influence, and social networks. Studies (e.g., Wachinger et al., 2013) have shown that those who have experienced a disaster firsthand are more likely to perceive future risks as significant and take precautionary measures. Research by Gaillard and Mercer

(2013) indicates that traditional knowledge and practices play a vital role in shaping how communities perceive and respond to disasters. In 2014, Salvati et al. studied perception of flood and landslide risk in Italy.

5. Study Area

The study area is located between 29°37' to 29°62' North latitude and 79°40' to 79°67' east longitude (fig.1). The study area is situated on a ridge in the Central Himalayas. The average altitude of this ridge above sea level is 1600 meters. The eastern part of this ridge is known as Tail Faat (sunny) and the western part is known as Sail Faat (shady). Currently, the study area covers an area of 7.54 square kilometers in Almora. Almora municipality was established in the year 1864. At present, the entire Almora municipality consists of 13 wards. Almora town is surrounded on three sides by hills known respectively as Syahi Devi, Kasar Devi, and Banari Devi, which also have temples of the goddesses. The Kosi and Suyal rivers flow to its west and southeast, respectively.

Tail Faat (sunny)

Sail Faat (shady)

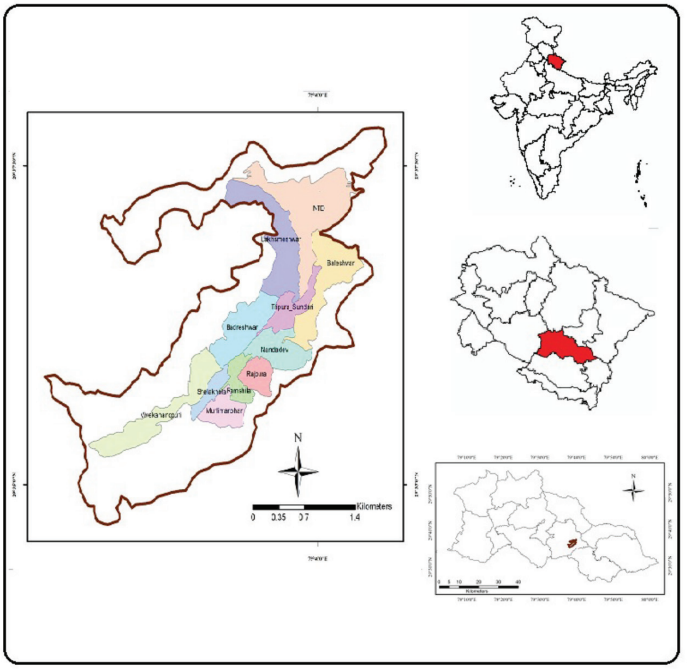

Figure 1 : Location Map of the Study Area

6. Result & Discussion

6.1 Geology & Geo-hydrological Hazards

Landslide and Earthquake are the main geo-hydrological hazards in the study area. The area of investigation is impacted by active faults and other geological movements. The study area is bounded by two thrust, North Almora Thrust and South Almora thrust. The entire area comes under Almora Crystalline. Tectonic activities are still going on, so the area of investigation is unstable. Many mountainous regions prone to landslides have also experienced moderate to significant earthquake activity throughout recorded history. Earthquakes in these steep, landslide-vulnerable areas significantly heighten the risk of landslides, either through ground shaking or the shaking-induced loosening of soil, which facilitates rapid water infiltration. The Lesser Himalaya, in particular, is highly susceptible to seismic activity. According to the seismic zonation map, the study area comes under the 4-5 zone.

6.2 Climatic Conditions & Hazards in the area of investigation

The climate plays a crucial role in the occurrence of disasters. The area of investigation consists warm and temperate type of climate which gets maximum rain in the monsoon. Rainfall is a basic indicator of hydrological disasters. The study area witnessed flash flood and landslides in the recent past.

Table 1 : Rainfall Data of Almora Region 1992 to 2019

Year	Rainfall in mm
1992	764
1993	1205
1994	1008
1995	889
1996	874

Year	Rainfall in mm
1997	1042
1998	1127
1999	683
2000	1185
2001	679
2002	803
2003	690
2004	996
2005	1307
2006	865
2007	1033
2008	920
2009	1178
2010	1505
2011	1230
2012	982
2013	972
2014	1282
2015	883
2016	974
2017	779
2018	654
2019	1140

Source: NRDMS Centre Almora

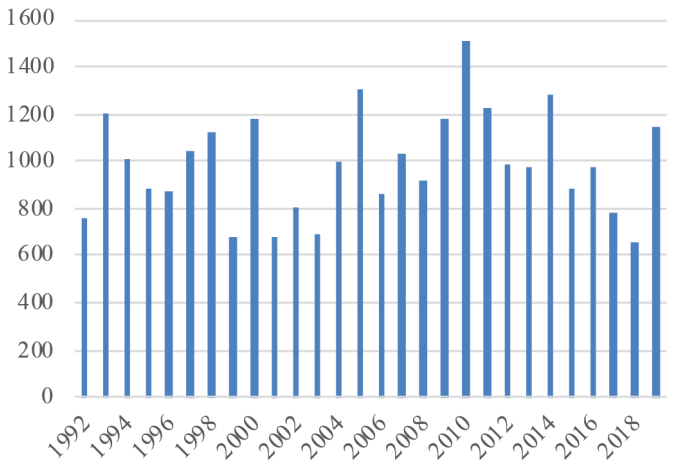

Figure 2 : Rainfall in mm

Table number 1 shows the rainfall data for the Almora region. 1998, 2010, 2014 and 2019 are the years in which the area got high rainfall as well as experienced cloud burst and landslide disasters.

Demography in the study area

Demography plays an important role in disaster management. In areas with high population density, the impact of disasters is greater because more people are affected. This also influences people's perceptions. In densely populated areas, people may have more information and resources, which can lead to better perceptions and responses to disasters.

Table 2 : Ward-Wise Population of the Study Area (2011)

S.N.	Ward	Male	Female	Total Population
1.	Tripur Sundari	1160	1299	2459
2.	Ramshila	1127	1132	2259
3.	Badreshwar	1764	1705	3469
4.	Dugalkhola	1122	1060	2182

S.N.	Ward	Male	Female	Total Population
5.	Selakhola	737	700	1437
6.	Lakshmeshwar	1673	1634	3307
7.	Murlimanohar	1485	1464	2949
8.	Baleshwar	2374	2245	4619
9.	Railapali	1253	810	2063
10.	Rajpura	2054	1850	3904
11.	Nandadevi	2014	1825	3839
12.	Vivekanand Puri	1128	1274	2402
13.	NTD	1839	1636	3475
	Total Population	**19730**	**18634**	**38364**

Source: Municipal Board Almora

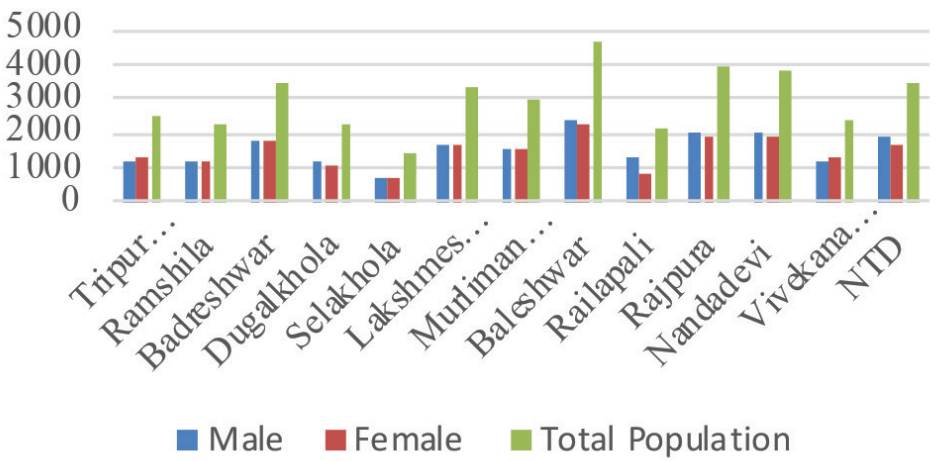

Figure 3 : Ward-Wise Population (Reviewer Comment: Fig. Included)

Rajpura, Vivekannadpuri, Dugalkhola & Railapali wards are more vulnerable to landslides. Small landslides in every monsoon take place. In these areas, construction activities are also progressing rapidly, but they are not being carried out in accordance with regulations.

Construction on Steep slopes (Field Photographs)

The photographs taken during the field visit indicate that construction work is being carried out on the slopes in Almora, which is not appropriate from a disaster management perspective. This has been observed more prominently in Dugalakholi, Railapali and Rajpura.

People Perception

A questionnaire was developed to understand people's thoughts and perceptions about disasters, and it was administered to 130 individuals from 13 wards of Almora. This group included men and women aged between 25 and 60 years.

General Perceptions about Disasters

1. Do you know about Disaster?

Table 3

SN	Respondents	Yes	No	Total
1	Male	46	19	65
2	Female	51	14	65
	Total	**97**	**33**	**130**

Source: Primary Data

According to the table number 3, 74% of total respondents know about disasters. Percentage of female is more, which is interesting as well as good because female spent more time in their homes and more vulnerable to the disasters.

2. Do you know the difference between Hazard & Disaster?

Table 4

SN	Respondents	Yes	%	No	%	Total
1	Male	4	6	61	94	65
2	Female	3	4	62	96	65
	Total	**05**	**11**	**123**	**95**	**130**

Source: Primary Data

A vast 95% of respondents do not understand the difference between a hazard and a disaster. This reflects a critical weakness in disaster literacy, which could negatively impact both individual preparedness and community resilience.

3. What are the types of disaster in Almora?

Table 5

SN	Type of Disaster	Number of Respondents	%
1	Natural	86	66
2	Man Made	14	11
3	Both	23	23
	Total	**130**	**100**

Source: Primary Data

4. Do you know about disaster management?

Table 6

SN	Disaster Management	Number of Respondents	%
1	Don not Know	25	19
2	During & Post-Disaster Management	83	64
3	Pre, During & N114 Post Disaster Management	22	17
	Total	**130**	**100**

Source: Primary Data

The data reveals a significant gap in knowledge of pre-disaster planning, which is a critical component of disaster risk reduction. People tend to associate disaster management mostly with response and recovery, rather than preparedness and mitigation. This mindset can limit community resilience, as prevention and

preparedness efforts (e.g., hazard mapping, early warning systems, community drills) are neglected or underprioritized.

5. Have taken any training related to disaster management?

Table 7

SN	Respondents	Yes	%	No	%	Total
1	Male	09	14	56	86	65
2	Female	05	08	60	92	65
	Total	14	11	116	89	130

Source: Primary Data

Above tables shows the perception and understanding reading to disaster and its management. Most of the respondents does not have much understanding regarding to disaster management. Table number 4 shows 95 % of total respondents do not know the difference between hazard and disaster. In table number 5, 89 % of total respondents have not trained in disaster management. The fact that 89 % of the total respondents have not received any kind of training indicates that there is no prior preparedness among people to deal with disasters.

Perceptions about Geo-hydrological disaster

1. What do you know about earthquake?

   Respondent have less understanding about earthquakes. They say that the sudden shaking of earth is called an earthquake. Only 22% of total respondent know the reason behind it, rest 78% do not know the reason behind an earthquake.

2. Do you know which earthquake zone Almora falls?

Table 8

SN	Respondents	Yes	%	No	%	Total
1	Male	20	31	45	69	65
2	Female	15	23	50	77	65
	Total	**35**	**27**	**95**	**73**	**130**

Source: Primary Data

Out of 130 respondents, only 27% (35 individuals) were aware of the earthquake zone in which Almora falls. A significant 73% (95 individuals) were not aware. This reflects a very low level of seismic risk awareness among the population.

3. What could be consequences of this?

Responses:

- A large number of people may die.
- Many people may get injured.
- Buildings, bridges, roads, and other structures may be destroyed.
- Electricity, water, and gas supply may be disrupted.

4. Do you know about earthquake resistant buildings?

Table 9

SN	Respondents	Yes	%	No	%	Total
1	Male	25	39	40	61	65
2	Female	10	15	55	85	65
	Total	**35**	**27**	**95**	**73**	**130**

Source: Primary Data

In table number 9, only 27% of total respondents know about earthquake resistant buildings. Most of the people knows about the consequences of earthquake.

5. Do you know about landslide?

   All the respondents have minimum understanding about landslide hazard. They said 'sliding of land is called a landslide. The main causes of landslides are heavy rainfall, slope erosion, and the reduction of vegetation.

6. Do you know the landslide prone areas in Almora?

   According to the respondents Dugalkhola, Railapali, Near Rghunath City Mall, Ranidhara are the major landslide prone areas in Almora town.

Table 10

SN	Respondents	Yes	%	No	%	Total
1	Male	21	32	44	68	65
2	Female	25	38	40	62	65
	Total	**46**	**35**	**84**	**65**	**130**

Source: Primary Data

Respondents have identified Dugalkhola, Railapali, Near Raghunath City Mall, and Ranidhara as the major landslide-prone areas in Almora town. Out of 130 respondents, only 35% (46 individuals) were aware of the landslide-prone areas. A significant 65% (84 individuals) were not aware of such zones. This indicates a low level of awareness among the general population about the local disaster-prone regions. The results reflect a general lack of public awareness, which could worsen the impact of landslides if early warnings or evacuations are ignored.

7. Conclusion

In conclusion, the perception of geo-hydrological disasters among people in Almora town is shaped by many complexities. People have less understanding of disaster management. Today, towns are expanding in the Himalaya. As a result, problems are also increasing.

This study reveals that Almora town is vulnerable to the perspective of geo-hydrological disasters, and the perceptions of the people regarding disasters indicate that there is a need for disaster-related information and training. Most of the individuals included in the study have only very limited general knowledge about disasters.

Enhancing disaster education programs, advancing early warning systems, and combining local knowledge with scientific insights can significantly improve resilience in these vulnerable regions. Future studies should explore the shifting impact of climate change on disaster risks and examine how various communities adapt to these evolving challenges. By integrating traditional wisdom with modern disaster management practices, we can develop more effective, community-centered strategies for disaster preparedness in the Himalayas. By fostering a collaborative approach that bridges traditional insights with modern disaster risk- reduction methods, policymakers and communities can work together to build a more resilient and informed society in the Himalayas.

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