

## COPING WITH DISASTERS IN SHIMLA: A MULTIDISCIPLINARY APPROACH

Sharma, Mamta<sup>1</sup>., Devi,R<sup>2</sup>., Khatri, R<sup>3</sup>. and Bhradwaj, D<sup>4</sup>.

<sup>1</sup>Department of Chemistry, Aditi Mahavidyalaya, University of Delhi, India

<sup>2</sup>Department of Geography, Aditi Mahavidyalaya, University of Delhi, India

<sup>3,4</sup>Department of Journalism and Mass Communication, Aditi Mahavidyalaya, University of Delhi, India

[mamta610@gmail.com](mailto:mamta610@gmail.com), [roshaniberi@gmail.com](mailto:roshaniberi@gmail.com), [dr.ritupradeepkhatri@gmail.com](mailto:dr.ritupradeepkhatri@gmail.com),  
[devenderbhardwaj@gmail.com](mailto:devenderbhardwaj@gmail.com)

**ABSTRACT:** Despite recent achievements in the field of disaster management, the increase in death and damage points out that there is a need for a realistic and practical plan. Advances within single disciplines, alone, cannot solve the challenges in disaster management. As various disciplines have become increasingly diversified, a more complete understanding of the vulnerability and mechanism in which disaster happens is needed, so that adequate strategy is identified. This paper explores the emerging consensus among scholars and practitioners for multi- and inter-disciplinary approaches to disasters and emergency management. It explains why such this strategy is deemed necessary and highlights the benefits of moving beyond explanations emanating from single or separate fields of study. To achieve this aim, the expertise of sciences, social sciences and language is combined. There has been recent progress in these individual disciplines, but multidisciplinary approaches must be implemented to tackle disasters in the future. The geographical location of Shimla is such that it is environmentally fragile and ecologically highly vulnerable to multiple disasters. It lies in Himalayan region located in the Zone IV and V making the region liable to experience the earthquake of intensity MSK VIII or more. In addition to it, river Satluj, Giri, Pabar rivers renders the population living on the banks of these rivers susceptible to floods. Now days due to the increasing developmental activities, the landslides are on the rise. Further the Shimla being enriched with the green cover leads to irreparable losses during summers due the incidents of forest fire. Keeping these problems in view, this paper comprises three objectives. They are: a) to record the spatial temporal incidences of disaster in the Shimla, b) to analyse the causes and impact of disasters in the Shimla and c) to suggest measures of mitigation based on multidisciplinary perspective. The investigation leads to analysis that the disasters are on the rise. Hence, there is a need of multidisciplinary research to mitigate disasters and to prepare the community by way of capacity building to respond in a better way by adopting appropriate measures to reduce the adverse impacts.

**Keywords:** Disaster management, Holistic, Vulnerability, Mitigation, Multidisciplinary

### 1. INTRODUCTION

Himalaya being a nascent mountain range and due to the continuous ongoing movement of tectonic plates, the Himalaya is still rising making this region vulnerable to the earthquake .The whole area of Himachal Pradesh falls into two earthquake zones viz. Zone IV and Zone V as per the BIS Zoning map of the Himachal Pradesh. Consequently the Shimla district is also located in the Zone IV

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and V (about 99.62% area falls in Zone IV and 0.38% falls in Zone V) making the region liable to experience the earthquake of intensity MSK VIII or more. Consequently rendering the human lives and property situated in this district more vulnerable to the disaster. Due to climate change and human intervention with nature because of ongoing unscientific developmental activities, the flash floods, landslides, cloudbursts are on the rise. Being the fragile ecology of Himalayan region, these hazards are causing havoc on the human lives and property as well as environment. Further the thrust of the Government to exploit its Hydro power potential has laid the road map for construction of many big, small and micro hydro power projects in district Shimla making it vulnerable to the industrial hazards also.

## **2. METHODOLOGY**

The study is based on secondary data which is collected from disastrous weather events published by Indian meteorological Department. The methodology adopted includes vulnerability assessment on the basis of incidences of disaster in the study region. The research will include mapping to reflect the trends and spatial patterns simulated by using GIS technology.

**2.1** The non spatial data collected on different types of disasters (data in the form of tables and literatures) has been attached with spatial attributes and then finally shown on maps. Then, this data has been analyzed both in terms of time and space variations.

**2.2** The relationship between occurrences of disasters and vulnerability has been conducted reveals that there has to be multidisciplinary research to deal with multi disaster scenario.

## **3. RESULTS AND DISCUSSION**

The state of Himachal Pradesh is vulnerable to 25 hazards out of 33 hazards identified by the High Powered Committee of Government of India and further district Shimla is prone to 16 such hazards. The most imminent danger is due to earthquake, landslides, flash floods, cloud bursts, hailstorms and road accidents and is vulnerable to multi-hazards.

**3.1** Earthquakes quite devastating and sudden in nature, is one of the most common type of disaster that hits the study region. The District Shimla as a whole lies between mid Himalaya and greater Himalaya and due to the tectonic movements of the Indo Australian Plate and Eurasian plate the Himalaya is still rising and giving rise to tremors in the Himalayan region. Further the Jutog thrust, Kaurik thrust etc made this region more prone to the earthquake.

**3.2** Besides earthquakes, landslides are the other geological hazards that are common and peculiar to the region. Landslides are simply defined as the mass movement of rock, debris or earth down a slope and have come to include a broad range of motions whereby falling, sliding and flowing under the influence of gravity dislodges earth material. They often take place in conjunction with earthquakes, floods and cloudburst. The most common type of landslides that occur is debris slide, rock slide, rock fall, slump, wedge failure and planer failure.

*Table 1. Occurrences of Earthquakes in Shimla*

Date	Intensity/ Magnitude	Impact
05.03.1842	VI/VII	Houses Damaged
07.04.1856	VII/VIII	Loss to Life and Property
09.07.1860	V	Loss not Reported
05.10.1869	V	Loss not Reported
28.02.1906	6.5	Killed 26 people, Injured 45 people and 73 dwellings destroyed

Shimla is frequently experiencing landslides with slips and subsidences commonly occurring within overburden material and adversely affecting roads and unsoundly founded constructions. Landslide is most risk oriented hazard found in district Shimla affecting the human life and property in many ways like damages to the houses, roads, communication network agriculture etc. There are four vulnerable sectors to landslides in the Shimla constitutes around 67 kilometers stretch. The Rampur-Leori sector on NH-22 is longest and is of 25 kilometers followed by Sungri- Narkanda Sector, Theog-Sainj Sector each 15 kilometers and Rohroo-Chirgaon sector is 12 kilometers.

*Table 2. Major Landslides in Shimla*

Year	Location	Causes	Damages
1993	Jhakari	Flash Flood	NH-22 washed Away
1995	Chirgaon	Flash Flood	Rohroo and Chirgaon road washed away

**3.3** Flash flood is a rapidly rising and flowing surge of water that result from excessive rainfall or failure of a dam. Flash floods usually occur with little or no warning and can reach at full peak within few minutes. This phenomenon is quite common in Himachal Pradesh. Glacial melting due to global warming is another major cause of flash floods in Himachal Pradesh. The major glaciers in the higher hilltops are receding at an alarming rate, mainly due to anthropogenic activities. Deforestation, encroachment into the mountains and rapid industrialization often result in increase in temperature and subsequent frequency of flash floods. Along with this, the bursting of natural or man-made dams and cloudburst are other main causes of flash floods.

Shimla district's geographical location is such that it spreads from mid Himalaya to greater Himalaya and the river Satluj, Andhra, Pavvar, Nogali, Ganavi and other many smaller khuds/rivulets flowing through it makes the area and the people living around these more vulnerable to the floods /flash floods.

It has been noticed that sudden heavy rains are occurring in some part of the district during the last two decades causing the situation of flashfloods. Landslides resulting

in devastating and huge loss to the human life and property which is being attributed to the climate change caused due to the large human interference with the nature activities like deforestation, developmental activities like construction of roads ,bridges, hydel projects, buildings etc. The documentation of such incidents in this district is as under.

*Table 3. Occurrences of Flashfloods in Shimla*

<b>Date</b>	<b>Location</b>	<b>Causes</b>	<b>Impacts</b>
08.07.1973	Nathpa	Rockfall	-Formation of Lake -Loss of Property in Lacs
24.02.1993	Jhakari	Landslide	-River Satluj was Blocked -About 1 km of NH-22 damaged -Huge loss to Public Property and Land owners
31.07.2000 to 01.08.2000	Rampur and Nearby	Heavy Rains	-At least 140 people died along with 1673 cattle and 12400 sq.km area affected -Roads and Bridges were washed away
26.06.2005	Parchu Lake	Bursting of Parchu Lake	-Washed away various roads and bridges
06.07.2005	Pabbar River	Heavy Rains	-Washed away State Highways, foot bridges, buildings and houses -Loss of Life and Property

*Table 4. Occurrence of Cloudburst in district Shimla*

<b>Date</b>	<b>Location</b>	<b>Impact</b>
11.08.1997	Chirgaon and Rampur	Chirgaon -Inundated Andhra River -About 124 people died along with 456 cattle washed away -Roads and bridges washed away completely Rampur -Killed 19 people, 464 cattle, 105 houses damaged. -Land measuring 40 hectare damaged
10.08.2001	Chirgaon	-Complete washing away of adjoining Basti, Village paths, roads and bridghes cattle sheds.
August 2003 and 2007	Rampur	-Killed 7 people -Damage to cattle sheds, public and private property

**3.4** Forest fire is a major cause of degradation of forest. While statistical data on fire loss are not well placed, it is estimated that about 90 percent of the forest fires are occurred due to human error or manmade. The forests of the Himachal Pradesh are more prone to forest fire compared to forests in other parts of India due to various biotic and geographic reasons. With increasing population pressure, the forest cover of the country is deteriorating at an alarming rate. Especially in recent past the incidences of forest fire have increased tremendously due to human induced activities. Along with various factors, forest fires are a major Causes of forest fire are both natural and also due to human intervention. Fires occur naturally due to lightning, but most fires are caused by the local community. Approximately 90percent of the forest fires are due to human interventions, both intentional and

unintentional. In states like Himachal, forest fires have a close link with livelihood. People residing within forests or nearby areas are dependent on forests for their source of income/ day to day fuel. They ignite forests for collection of forest produces or clearing land for agricultural purposes. Some fires are caused due to poor knowledge and the negligence of the people. Throwing burning cigarettes and cooking food in the forest are such causes of forest fire. The remaining 10percent of forest fires are due to natural processes such as lightning, increase in temperature during summer etc. Shimla district is under thick forest cover and the flora varies from the pine tree to oaks to cedar . However during the hot dry spell sometimes the human negligence the unattended small spark in the forest triggers forest fire which spreads to the whole forest and becomes difficult to control resulting in huge loss to the natural resources of the district i.e. flora and fauna and to the extent that some time the fire enters the nearby villages causing huge loss to human life and property.

*Table 5. Forest Fire Affected Area in the District Shimla*

<b>Year</b>	<b>Number of Fires</b>	<b>Area Affected ( in Hectares)</b>	<b>Estimated Loss ( in Rs Lacs)</b>
2008-09	59	2012	13.5
2009-10	247	5165	99
2010-11	159	1118	27
2011-12	38	597	19
2012-13	178	2142	27

**3.5** The study region needs to develop a holistic approach to manage the entire gamut of disasters. It is not the case that there is action plan or disaster mitigation charter does not exist in the study region. Vulnerability analysis and risk assessment are essential for developing mitigation. Mitigation planning is best accomplished from a multi-hazard and multidisciplinary perspective. The reduction in the level of risk involved in one hazard may increase the level of risk from another hazard. Consequently, it is important to consider that some mitigation alternatives may not be viable given a particular set of hazard conditions. For example, constructing a house on higher reaches can be beneficial in a flood prone area, but it becomes a problem in an earthquake zone. There are various organizations at all levels involved in risk mitigation, such as National Disaster Management Authority, State Disaster Management Authority and District Disaster Management Authority. Even at state level and district level disaster mitigation, there are various departments involved in the given tasks of mitigation puts question on their roles as disaster managers. The roles and responsibilities of each department should be clearly identified. There should be coordination among these organizations working on the same plan of action to avoid overlapping or gap of work. It was felt that there is need to set up or establish a research center for disaster mitigation. This department should involve the expert not only from disaster management but experts from other relevant areas working on specific hazards, specific streams of knowledge to work under one roof. Their focus should be on conducting research on all the issues related to disasters in the region. The experts of various departments working in their own arena of research do not lead to complete understanding of

reality as it is practiced at this moment. The real success of mitigation plan lies on a platform where all are geared towards one common goal.

The importance of integrated research activities is especially prevalent in disaster studies and emergency management. Several decades ago Gilbert White and Eugene Haas recognized that “little attempt had been made to tap the social sciences to better understand the economic, social, and political ramifications of extreme natural events” (cited by Mileti 1999). However, today, Ehren Ngo asserts “ideally, disaster research is multidisciplinary, and understanding the impact of disasters . . . requires a synthesis of various disciplines” (2001). For instance, Mileti observes that “hazards research now encompasses disciplines such as climatology, economics, engineering, geography, geology, law, meteorology, planning, seismology, and sociology” (1992), and his book, *Disasters by Design*, is a notable example of combining diverse knowledge sets from an eclectic group of well-known scholars. Britton also states “disaster research and its close companions (hazard research and risk research) and their application in the emergency management context is becoming more multidisciplinary” (1999). Cutter and her colleagues agree that the study of disaster “is an interdisciplinary endeavor and spans the divide between the social, natural, engineering and health sciences” (2003). Studying disasters from the perspective of different disciplines and assimilating their findings should not be viewed as an end unto itself. Instead, multi- and interdisciplinary research should be regarded as the means to better understand disasters and more effectively formulate and implement disaster policies. There are a number of reasons why this is the case.

First, scholars and practitioners are increasingly aware that we are experiencing more hazards today in terms of number and diversity. There are a number of natural hazards that may affect us including, but certainly not limited to, earthquakes, tsunamis, tornadoes, hurricanes, floods, droughts, wild fires, landslides, avalanches and other events triggered above, on, or below the earth. There is also the possibility of more anthropogenic-related incidents such as computer disasters, infrastructure failures (blackout), hazmat releases, industrial explosions, railroad derailments, and intentional disasters such as plane hijackings, anthrax attacks or suicide bombings. Beyond these hazards, humans may be faced with biological threats such as SARS, Avian Flu, West Nile, AIDS, Hoof and Mouth disease, etc. With this in mind, Thomas and Mileti assert that the “hazards managers of the future will require an understanding of a wider variety of hazards. Few will have the option of only considering a single hazard, but instead must be more broadly trained to consider the full range of hazards that exist in a given area, including natural, technological and terrorist hazards” (2003). Of course, we must take into account the fact that hazards are not isolated and they often interact one with another. For instance, an earthquake may cause a landslide or the breach of a dam. A wildfire may threaten a nuclear power plant or an industrial facility. A terrorist attack may include the sabotage of infrastructure, or the use of chemical or biological weapons. Future emergency managers must have an appreciation for complex, compound or cascading disasters.

*Table 6. Multidisciplinary Approach in various Disciplines*

<b>Discipline</b>	<b>View(s) of Vulnerability</b>	<b>Recommendation(s)</b>
Geography	Vulnerability is determined by the use of hazard-prone areas	Land-use planning that takes into account hazards to reduce risk
Meteorology	Vulnerability is due to a lack of advanced warning of severe weather	Acquisition, creation and effective use of warning systems
Engineering	Vulnerability occurs when structures and infrastructure cannot withstand the forces of hazards	Design and construction of buildings and infrastructure that promotes disaster resistance
Anthropology	Vulnerability emanates from constraining values, attitudes and practices	Alter attitudes to discourage risk-taking practices and susceptibility
Economics	Vulnerability is related to poverty and results in an inability to prevent, prepare for or recover from a disaster	Improve the distribution of wealth and purchase insurance to minimize losses and promote resilience
Sociology	Vulnerability is a product of inaccurate assumptions about disaster behavior and is related to race, gender, age, disability, etc.	Understand behavioral patterns in disasters and pay attention to needs of special populations
Psychology	Vulnerability is a function of overlooking or minimizing risk and not being able to cope emotionally with stress and/or loss	Help people to recognize risk and provide crisis counseling to enable resilience
Epidemiology	Vulnerability is susceptibility to disease or injury and is related to malnutrition and other health factors	Improve provision of public health/emergency medical care before, during and after disasters
Environmental Science	Vulnerability is proneness to environmental degradation, which may change weather patterns and produce long-term disasters	Conserve natural resources, protect green space areas, and ensure that debris management is performed in an environmentally conscious manner
Political	Vulnerability is produced by the political structure and	Alter structure of political system and educate politicians and legislators

Science	incorrect decision making	about disasters
Public Administration	Vulnerability results from misguided laws, the failure to implement policies effectively, and an inability to enforce regulations	Strengthen response and recovery capabilities through preparedness measures, improved policy implementation and increased code enforcement
Law	Vulnerability results from negligence, which is a failure to act as reason or legal statutes dictate	Understand the law, alter statutes, and ensure compliance to widely accepted ethical practices in emergency management
Journalism	Vulnerability is a result of insufficient public awareness about hazards and how to respond to disasters	Dispel myths about disasters, foster increased media capabilities, and educate the public about hazards
Emergency Management	Vulnerability is the lack of capacity to perform important functions before and after disaster strikes (e.g., evacuation, search and rescue, public information, etc.)	Foster public awareness about disasters and build capacities through hazard and vulnerability analyses, resource acquisition, planning, training and exercises
Homeland Security	Vulnerability is due to cultural misunderstandings, permeable borders and fragile infrastructure, and weak disaster management institutions	Correct domestic and foreign policy mistakes, enhance counter-terrorism measures, protect borders and infrastructure, and improve WMD capabilities

Adapted from McEntire, David A. 2003 "Searching for a Holistic Paradigm and Policy Guide" *International Journal of Emergency Management* 1 (3): 298-308.

Second, emergency management includes various functions across many phases. Activities in this profession include: hazard and vulnerability assessments, land-use planning, structural mitigation, the passing of laws and ordinances, code enforcement, education of politicians and citizens, planning, training, exercises, warning, evacuation, sheltering, debris management, and donations management. Other measures to be taken are continuity of government, volunteer management, traffic control, fire suppression, damage assessment, disaster declaration, mass fatality management, emergency medical care, public information, individual assistance, public assistance, decontamination, WMD detection, environmental restoration, etc. Such steps are integral to emergency management, although finding the proper balance among mitigation, preparedness, response and recovery activities is difficult to obtain (Thomas and Mileti 2003).



A third reason why it is important to take a multi- or inter-disciplinary approach is because there are so many actors involved in emergency management. At the *Designing Educational Opportunities for Emergency Managers Workshop* in Denver in 2003, Ellis Stanley, the Emergency Manager of Los Angeles, stated that in his city departments from Aging to the Zoo have an important role in preventing or responding to disasters. Emergency managers are undoubtedly not the only participants in emergency management, although they do play a central role. Additional actors include politicians, flood plain managers, fire and police officials, building code inspectors, meteorologists, representatives of the American Red Cross, business continuity planners, and volunteers of religious organizations. There are numerous others in state and federal government. In many ways, the lines and boundaries among the levels of government and all departments, agencies and organizations in the public, private and non-profit sectors are blurring (e.g., homeland security needs the support and involvement of local jurisdictions and businesses to be effective). Expertise and experience in any given sector is not enough due to the current disaster setting.

These points suggest that the traditional disciplines involved in emergency management may not be able to address – in spite of their long history of excellent contributions to the field – every issue or answer question relating to disasters. Furthermore, the traditional approach to the study of emergency management is incomplete or does not work. It is incorrect to assume that we can study hazards and problems of vulnerability, develop alternative policy options concerning what functions and phases to address, choose one route to pursue, and move on to the next concern (Mileti 1999). In most cases, challenges are interrelated and complex, and solutions are multi-faceted with both advantages and disadvantages. “Buy in” and collaboration among all participants are also vital for success. Multi- and inter-disciplinary research also helps to fill in the gaps in academia. Although there remains much to be learned in any given area of focus, the major holes in disaster studies today exist across disciplines and not necessarily within them. Utilizing the unique methods and analysis from different disciplines also allows flexibility in approach. Integrating the research of scholars from several disciplines also permits a holistic understanding of the unique and multi-faceted disaster problems we are facing today.

#### **4. CONCLUSION**

The district of Shimla is vulnerable to different disasters. All the disasters like earthquakes, landslides, forest fire, flash flood and cloud burst has shown the increasing trend and have also become more widespread including almost all parts of the study region. Mitigation is not yet practiced to its fullest extent. So the mitigation plan is in its initial stage of development and implementation. A paradigm shift has been recently taken place at the national level from the relief centric syndrome to holistic and integrated approach with emphasis on mitigation. The potentials exist to reduce hazard risk through the various mitigation measures. The cooperation of government departments, NGOs and local people is needed for proper implementation of the mitigation measures to reduce the risk of a disaster. Shimla is vulnerable to multi disasters and mitigation plans will be developed and adapted locally. Mitigation strategies need to ensure the higher level of community involvement and participation. In rural areas, characterized by inadequate infrastructure and poverty groups, all mitigation efforts will have to be backed up by a strong and committed programme of social development for the communities.

Constant re-examination, therefore, of development Policies and programmes, leading to equity and social justice, will be pre-requisite to ensure the success of mitigation efforts that are being proposed. Hence, there is a need of multidisciplinary research to mitigate disasters and to prepare the community by way of capacity building to respond in a better way by adopting appropriate measures to reduce the adverse impacts.

Thus, we can no longer accept simplistic views of disasters because they do not correspond to reality. Emergency managers, if they are to truly be effective, must have a sound understanding of the “science” of several disciplines. But, because disasters are often and incorrectly viewed as uncommon events that are separated from daily human activities, emergency managers should also gain skills in the “art” of their craft as well (e.g., sales, marketing, inter-personal communication, persuasion, argument, public speaking, networking, political posturing, cajoling, societal mobilization, etc.). Therefore, multi-faceted disaster problems require intricate assessments and inter-related solutions promoted by professionals who are respected for their wide-range of knowledge, skills and abilities. There are certainly significant barriers inhibiting multi- and inter-disciplinary research and drawbacks are equally possible. Scholars from different disciplines do not speak the same language, which poses substantial communication challenges. In addition, values also complicate the sharing of knowledge and the application of information across different disciplines (e.g., some scholars want to foster land-use planning while others want to improve warning system effectiveness). There is likewise a difference of opinion regarding the domain boundaries of different fields of study. These challenges are undoubtedly formidable and may even be impossible to overcome. Hence, multi- and inter-disciplinary research may not adequately capture all knowledge pertaining to disasters, and there is always the chance that findings will be regarded as irrelevant, incomplete, erroneous, or even offensive to some because of different epistemological assumptions.

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