CHAPTER 1

INTRODUCTION

Background

1. A disaster (from Middle French désastre, from Old Italian disastro, from Latin pejorative prefix dis- bad + astrum star) is the impact of a natural disaster / natural or man-made hazard that negatively affects society or natural environment. Disasters occur when hazards strike in vulnerable areas. The word disaster’s root is from astrology: this implies that when the stars are in a bad position a bad event will happen.

2. We use the term ‘disaster’ often in our everyday lives. It seems that anything from missing the bus to a lost football game can be a ‘disaster’. At the same time we constantly see and hear events such as earthquakes, nuclear accidents or environmental degradation being described as disasters. What then is a disaster? A disaster can be defined as an event that occurs when a hazard affects a vulnerable population or area. Disasters are often portrayed using the following equation:

\[ \text{Disaster} = \text{Hazard} \times \text{Vulnerability} \]

As this equation shows, the two key elements to a disaster are hazard and vulnerability.

3. **What Is A Hazard?** Hazards come in a number of forms: **Natural hazards.** These include Hydro meteorological (e.g. cyclones, floods), Geological (e.g. earthquakes, volcanoes) and Biological (e.g. epidemics, locust swarms). **Technological hazards** (e.g. gas leaks, industrial accidents, bridge or building collapses). **Environmental hazards** (e.g. sea level rise, desertification, climate change). A hazard alone will not cause a disaster. Hazards have to impact on a population or area before they can have disastrous effects. For example, a tsunami traveling over open-ocean is not a disaster, but when it strikes a population located on a coastline, the results can be disastrous.

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1. [Disaster - Wikipedia](https://en.wikipedia.org/wiki/Disaster), the free online encyclopedia.
3. *Ibid.*, The use of * indicates the interaction between hazard and vulnerability. It is arguable as to whether this stands for + or x.
4. **What Is Vulnerability?** A population or area being affected by a hazard has to be vulnerable for a disaster to occur. The vulnerability of a population relates to how susceptible it is to the effects of hazards and its ability to cope when struck. Vulnerability is influenced by factors such as location, state of housing, and colonial set up level of preparedness and ability to evacuate and carry out emergency operations. Different populations have different levels of vulnerability; this is one reason why hazards of a similar type and intensity can have quite varied effects on different populations. The root causes of vulnerability have a deeper origin, however, and to see why a population is vulnerable we must look at issues such as poverty, lack of access to resources, environmental and social conditions. In this way vulnerability has a direct relationship to the social, political and economic situation and the status of human rights. Populations suffering from high levels of poverty are often more vulnerable to hazards due to the fact that people’s resources are focused towards day-to-day survival rather than preparing for the possibility of future disasters. This is reflected in the fact that it is the poorest countries who are the hardest hit by hazards as they are often the most vulnerable.

5. **Disasters and Development.** Development plays a key factor in people’s vulnerability to hazards and can have both a positive and negative influence. People in countries that are termed as ‘developing’ often face issues such as poverty, lack of adequate infrastructure, lack of access to resources, and health issues that can increase their vulnerability to hazards. Development efforts aimed at addressing these types of issues can play a positive role in reducing vulnerability. Development can also have a negative influence. The influx of new economic systems, rapid urbanisation, altered food production and other socio-economic changes can increase vulnerability. Also, traditional coping methods such as traditional forms of housing, the growing of hazard resistant crops, traditional knowledge of hazards, methods of food storage, and strong community support can be displaced by the process of development.

6. **Are Disasters Increasing?** We often hear that disasters are happening more often and that the results are also becoming more severe. Is this the case? Is our world really becoming more dangerous to live in? It is clear that the number of disasters affecting the world is increasing. There has been a considerable growth in reported disasters since the beginning of last century, with growth being most notable since the 1940s. 184 disasters were recorded in the period 1940-1949 and some 2773 in the period 1990-1999.

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4 Using the OFDA/CRED International Disasters Data Base (EM-DAT) definition of a disaster event having to fulfill at least one of the following criteria:

* 10 or more people reported killed
7. These statistics show there were 15 times more disasters reported in the 1990s than in the 1940s. What is clear is that we have seen a growth in world population and over the last fifty years. This growth has occurred not only in areas that are vulnerable to hazards (such as in coastal areas and urban centres) but also in populations that face issues that are known to contribute to vulnerability. Another consideration has been the rapid development in communication technology over the last fifty years. Improved access to information means disasters are being covered more effectively and accurately than in the past, resulting in the increase in the numbers of disasters reported. The increase in the number of disasters is therefore being influenced by the fact that we are becoming more aware of the disasters that are (and always have been) happening. The rise in the number of disasters affecting us is a result of a combination of factors. Climate change appears to be creating an increase in hydro meteorological hazards, our improvements in communication technology means more disasters are being reported, and a combination of population growth and an increase in the factors that add to people’s vulnerability have contributed to the increase in disaster events.

8. **What Is Disaster Management?** Disaster management is often described as a cycle that incorporates a number of stages. This can be represented as follows in diagram from:

![Diagram of disaster management cycle](https://www.unisdr.org/disasterstatistics/occurrence-trends-century)

* * * 100 people reported affected
* Declaration of a state of emergency
* Call for international assistance

9. **Post-Event Pre-Event.** The stages of the disaster management cycle often require different activities and measures and can involve different time scales. Immediately following a disaster, the post event activities of response and relief operations are implemented as quickly as possible. Rehabilitation, restoration and reconstruction activities can take months and years to complete, and the pre-event activities of preparedness, mitigation and prevention are ongoing measures that are aimed at reducing risk and the impact of future disasters.

10. **Types of Disasters.** Disasters can be divided into two; **Natural and Man-made.** The former includes Floods, Earthquakes, Forest Fires, Volcanic eruptions etc. while the man-made disasters include accidents, epidemics; uncontrolled spread of diseases, gas leaks, NBC related situations etc. In older days, the probability of most of these disasters occurring was very low. But of late, the probability of these low probability disasters occurring has increased. Some scholars attribute this to the increased footprint of humans (due to increase in population) which has resulted in many hazards getting converted into disasters\(^6\). A graph depicting the world wide trend of natural disasters is reproduced below\(^7\):

![Graph showing time trend of natural disasters, 1975-2005](image)

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\(^7\) General NC Vij, PVSM, UYSM, AVSM (Retired), Vice chairman, National Disaster Management Authority (NDMA), in address to the Higher Command (HC) Course, Army War College, Mhow, 14 November 2006
CHAPTER 1.1

RESEARCH METHODOLOGY

Rationale and Significance of the Study

1. The recent past has been a witness to many disasters – which have struck both developing and developed countries alike, all over the globe. The increasing range and occurrence of disasters has generated global concern. They have affected about one billion people, whilst claiming three million lives. The loss in terms of private, public and community assets has been astronomical; assessing which would be a Herculean task in monetary terms.

2. At the global level, there has been considerable concern over natural disasters. India, in turn has also well understood the need to adopt multi disciplinary and multi sectoral approach and incorporation of risk reduction in the developmental plans and strategies. The most reckonable step taken by Govt of India has been to upgrade the erstwhile reactive response of management, to a pro-active one involving preparedness, prevention and mitigation. The approach needs to the translated into National Disaster Framework through lessons learnt from case studies of natural and man-made disasters covering institutional mechanisms, disaster prevention strategy, early warning systems, disaster mitigation and human resource development.

3. The Armed Forces are the most important institution of a nation-state system and, thus, occupy an indispensable spot in this paradigm. Armed forces bring expectation on the unexpected situations and bring normalcy to the abnormal situations. Thus, the role of Armed Forces is being re-defined, the main focus has been upon the potential contribution to disaster relief operations.

4. In keeping with the view, that the Armed Forces play an all important role in the context of Disaster Management, it is therefore, intended to analyse and investigate through case studies the various emerging concepts and complexities of Disaster Management in the Indian context and how their implication would be put to better use in the employability and capability of Armed Forces.
Survey of Work Done in the Research Area and the Need for More Research

5. Many scholars (mostly civilian) have worked on Disasters and Disaster management but hardly any one has discussed the ‘Role of Armed Forces in Disaster Management with specific reference to case studies, where as various works speak about the type of disasters and their possible reasons only. The Contingency Action Plan for Natural Calamities, the government’s blueprint for disaster response, is also more reactive than proactive. It emphasizes relief, not reduction. Crisis management and subsequent relief distribution must not be seen as the primary function of disaster management. It is increasingly evident that there is a need for an integrated approach which incorporated building disaster mitigation contents into the overall development plans, with a view to minimize the impact of disasters. To this end, case studies of Uttarkashi earthquake in 1991 and Orissa cyclone in 1999 would go a long way to give a fair insight of the lacunae and anomalies that came across in the management of disasters. Also, the 26/11 terrorist attack at Mumbai and in case of a possible nuclear disaster in the nation in a futuristic scenario based on threat perception also needs to be addressed in this context.

6. Disasters pose a great challenge to the human developmental cycle and a grave danger to mankind and their resources. They cause enormous destruction of human and animal lives, long lasting traumas and untold misery and know neither national nor regional boundaries. They strike at will and without warning. The only defence against this wrath is forecasting, if possible, proper preparation and planning. It is in keeping with these areas of concern that the research work has taken a holistic look at Disasters and Disaster Management, examined and made an attempt to formalize the role and preparedness of Armed Forces in the management of disasters in the Indian context and suggested objective measures to enhance its effectiveness.

Statement of Aims and Objectives of Study

7. **Aim.** The aim of the research was to examine various facets of Management and Role of disaster control systems in the country through specific case studies, as also to examine and formalize the Role of Armed Forces in Disaster Management in the Indian context.

8. **Objectives.** The objectives of this research work are to:
(a) Find out and analyse various aspects of natural and man-made disasters through case studies and their management.

(b) Know the existing mechanisms and suggest changes, if any.

(c) Analyse and recommend changes to improve existing efficiency of disaster management by the Armed Forces.

Methodologies and Techniques to be used

9. **Hypothesis.** Following are the pre-suppositions that needed to be prudently addressed:

(a) Management of disasters is a continuous problem in the Indian context.

(b) Armed forces can react quickly and respond rapidly to Disaster Management in fully self contained, self sufficient and highly mobile fashion.

(c) Army is being called to manage disasters – wherever a calamity occurs.

(d) Armed forces is perceived by the society and nation to be the most visible and appreciated face in the paradigm of Disaster Management.

(e) Well organised and integrated disaster control organisation will be able to handle the situation in the most effective and efficient way.

10. **Conceptual Framework.** The conceptual framework of the research project is based on the following:-

(a) **World Vulnerability Profile.** This includes a fair and objective comparison of the following:-

(i) Time trend of natural disasters from 1975 to 2010.

(ii) Global Economic losses-Developed and the Developing World.

(iii) Economic losses due to disasters in India.

(b) **Approach and Vision of the Govt of India.**

(i) Creation of a National Executive Committee (NEC).
(iii) Role and Charter of National Defence Management Authority (NDMA).
(iv) Relevance of a Public Awareness Campaign in case of a similar terrorist strike like 26/11 or a possible nuclear disaster in the nation.

(c) **Role of Armed Forces in Management of Disasters.**

(i) Armed forces role as part of the core of the Government’s response capacity.
(ii) Comparison of roles of various armies in disaster relief.
(iii) Armed forces provided timely assistance in casualty management, during the calamities in Orissa, Uttarkashi and Mumbai.
(iv) Preparedness of Indian Armed Forces for management of nuclear disasters and measures to enhance their effectiveness.

11. **Research Design and Methodology.** The research was planned to be conducted over a period of 24 months. It has included the following:

(a) Collecting and researching literature and content through case studies.
(b) Interacting with Govt and other agencies like research scholars, prominent personalities etc.
(c) Carrying out field visits to training institutes like NDMA and NIDM.
(d) Co-opting personal experiences of the researcher.
(e) Collection of findings and generation of research paper.

12. **Data Sources.**

(a) **Primary Data.** Information was collected from interviews, case studies, lessons learnt, and personal experience of the researcher.
(b) **Secondary Data.** Books, magazines, newspaper clippings, internet, periodicals, Army War College journals, publications of UNDP, WHO, World Bank, National Disaster Management Authority (NDMA), National Institute of Disaster Management (NIDM), Seminar Papers by Army Training Command (ARTRAC).

14. **Research Instruments.** Case studies, websites, observation method and interviews with personnel involved in disaster management (rescuers) as well as those who were rescued.

15. This research is dependent on empirical evidences. On conceptualization, application of appropriate concept and hypothesis were helpful in understanding the entire framework of study since significant elements of statistical meticulousness and accurateness (where ever applicable) have been applied for proper prediction and suggestions. However, it is easy to calculate and predict certain economic costs of disaster related damage and casualties, but the real cost of any unforeseen disaster/calamity is beyond the reach of any calculator. Nevertheless, I have considered verifiability, generality, predictability and objectivity scientifically throughout the study.
1. The Webster dictionary defines **disaster** as a sudden calamitous event producing great material damage, loss and distress. Very often, the terms, ‘hazards’ are used inter changeably, but their connotation and consequences are distinct and must be kept in view. A hazard is the occurrence of a physical phenomenon at a given site that is capable of causing loss and damages. If a hazard such as the cyclone hits an unpopulated coastal area, it should not be considered a disaster. However, it will be called a disaster, if its hits a populated region and life and property in the area get severely affected\(^8\). A hazard, therefore, is a pre-disaster situation that could turn into a full- blown disaster if it results in causalities, be they human, socio – economic or infrastructure, it is always the unmanaged hazard that leads to disastrous results. Disasters vary in terms of their intensity, disruptive potential, predictability and direction. They can even be slow in their onset. Disasters occur where vulnerable people are overwhelmed by extreme events or hazards, either, natural, human or a combination of both.

2. **Types of Disasters.** Graphically these could be classified as under\(^9\):-

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\(^8\) Prof Pardeep Sahni and Dr Alka Dhameja, “Managing Disaster” in Economic news, 12-16 Aug 2000.

\(^9\) "Overview of Disaster Management at National Level" P. Michael V. Siromony Director, Natural Disaster Management, Government of India E.Mail: michael@krishi.delhi.nic.in
Chemical Disasters

Toxic Gases & Nuclear Radiation

Food Contamination

Soil Contamination & Pesticides

Water Contamination

Figure 1.2(2)

Water & Climate Related Disasters

Drought

Hurricanes

Cyclones

Tsunami

Tornadoes

Floods

Hailstorms

Avalanches

Storm Surges (Ocean)

Figure 1.2(3)
3. The division between natural and manmade disasters is to some extent an over simplification, as many disasters are actually caused by more than one or combination of various forces. Some disasters can set a chain reaction such as floods can lead to epidemics which may in turn lead to refugees. It is difficult to predict precisely where and when a man made disaster will occur, therefore, it is more difficult to prepare for one. However, it is possible, with varying degrees of accuracy to predict the occurrence of a natural disaster.

4. **Distribution Of Natural Disasters And People Affected By Them.** A diagrammatic representation of the distribution of natural disasters and the number of people affected by them from 1975 - 2001 is as below

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10 EM-DAT: The OFDA/CRED **International Disaster Database** (http://www.cred.be)
5. **Losses Due To Disasters.** The global trend shows an increase in disaster occurrences with the estimated damage of approximately USD 401 billion and 406,199 lives lost in Asia alone between the years 1990-99. Global Economic losses have gone from USD 75.5 billion in 1960 to USD 659.9 billion in 1990 and in USA in 2005 by Hurricane “Katrina” by itself to a loss of USD 160 billion\(^1\). The following diagrams and charts depict the magnitude of the global economic losses due to disasters, a worldwide percentile comparison of these and economic losses in India due to disasters\(^2\).

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\(^1\) Dr Santosh Kumar, National Institute Of Disaster Management (NIDM), *Op Cit*.
\(^2\) Vij, *Op Cit*.

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*Figure 1.2(8)*
Figure 1.2(9)

COMPARISON OF PERCENTAGE LOSSES IN THE WORLD DUE TO DISASTERS, 1991-2001

AFRICA (0 %)  EUROPE (21 %)  AMERICA (26 %)  ASIA (52 %)  OCEANIA (1 %)

Figure 1.2(10)

INDIA
ECONOMIC LOSSES DUE TO DISASTERS

Annual Impact on People
1. Losses in lives - 4334.
2. People affected - 30 Million.
3. Houses lost - 2.34 Million.

Annual Financial Losses
1. Percentage of GDP - 2%.
2. Percentage of Central Revenues (for relief) - 12%.
CHAPTER 1.3

RISK AND VULNERABILITY PROFILING

Asia and the Pacific Region

1. To assess the vulnerability of any region it is imperative to not only study disaster events but also protection structures and coping mechanisms that exist, since there are many aspects to a disaster such as the type of disaster, the region in which it has occurred and so on and so forth. It therefore becomes important that the vulnerability of a particular region be assessed in a dynamic context. The contributive factors to vulnerability consequently would include:

   (a) Geo-physical location.
   (b) High population density.
   (c) Population concentration in hazard zones.
   (d) Flood Plains.
   (e) Coastal zones.
   (f) Environmental Degradation.
   (g) Urbanisation.

2. It has been observed that in the instances of cyclone affected areas, the mortality rate in developing countries was far more than the developed countries. However, hot spots in developed countries suffered higher economic losses in proportion to GDP per unit area because of more development and industrialization.

3. The drought profile shows the African subcontinent as the worst affected in absence of adequate systems to tackle a drought situation. In Asia, on the other hand famine related events have become lesser because of measures taken between the years 1970-80 to put proper systems and structures in place.

13 Dr Subbiah Arjunapermal, Asian Disaster Preparedness, Bangkok
4. The most vulnerable region on the map to floods and earthquake alike is the Asia-Pacific Region. In fact 70 per cent of all hazards (with the exception of drought) happen in this region alone. Because of Geo-Physical location the number of disaster events in Asia is higher as compared to any other region in the world. This region, however, is more prone to tropical cyclones, earthquakes and floods. The Asia Pacific Region is the hot spot for disaster managers also because half of the world's population resides in eight countries in this region alone.

5. In Bangladesh they have an excellent cyclone preparedness programme that permeates to the grass root level. The community resources have been so effectively planned, managed and structured that the mortality level came down from one million people in 1970 to less than 5000 people dead in the most recent disaster that struck the country.

6. Yet another phenomenon that the world has been witnessing is rising global temperature due to frenetic industrial development activity around the globe. The global evidence shows that extreme weather events are becoming more common and severe leading to unprecedented floods, droughts and storms. Thus we expect more El Nino's (sea surface temperature anomalies) that are aggravated by climate change in Asia Pacific region. Around 10 per cent variation can be adjusted to, but for extreme variations carefully planned systems have to be in place. Failing this, we will have to face what happened in Mumbai in 2005 or the drought that hit North West India in July 2002 -the wettest month of the year yet again. These extreme disaster events are extremely destructive as they are low probability events to which urban environments are more vulnerable and then there are biological hazards to deal with too. Our disaster management systems are yet to come to terms with this category of extreme events.

7. Studies have undoubtedly shown an increase in the number of registered disasters. The under developing and developing countries suffer the most in the wake of a disaster. Also seen is that disaster-related deaths due to hydro-meteorological hazards have declined in the last two decades though disaster related deaths due to geological hazards continue to be high. The economic losses are also considerable and are on the rise. Improved data collection may play a role in alleviating at least some of the factors that a disaster unleashes.
India

8. Physical vulnerability relates to the physical location of people, their proximity to the hazard zone and standards of safety maintained to counter the effects\textsuperscript{14}. For instance, some people are vulnerable to flood only because they live in a flood prone area. Physical vulnerability also relates to the technical capacity of buildings and structures to resist the forces acting upon them during a hazard event. The extent to which a population is affected by a calamity does not purely lie in the physical components of vulnerability, but is contextual also to the prevailing social and economic conditions and its consequential effect on human activities within a given society. Research in areas affected by earthquakes indicates that single parent families, women, handicapped people, children and the aged are particularly vulnerable social groups. The geophysical setting with unplanned and inadequate developmental activity is a cause for increased losses during disasters. In the case of India, the contribution of over-population to high population density, which in turn results in escalating losses, deserves to be noted. This factor sometimes tends to be as important as physical vulnerability attributed to geography and infrastructure alone.

\begin{center}
\begin{tabular}{|l|}
\hline
\textbf{INDIA’S KEY VULNERABILITIES} \\
Coastal States, particularly in the East Coast and Gujarat are vulnerable to cyclones, \\
4 crore hectare land mass is vulnerable to floods. \\
68 per cent of net sown area is vulnerable to drought, \\
55 percent of total area is in Seismic Zones III-V, and vulnerable to earthquakes. \\
Sub-Himalayan/Western Ghat is vulnerable to landslides. \\
\hline
\end{tabular}
\end{center}

Table 1.3(1)

9. The continent of Asia is particularly vulnerable to disaster strikes. Between the years 1991 to 2000 Asia has accounted for 83 per cent of the population affected by disasters globally. While the number of people affected in the rest of the world were 1,11,159 in Asia the number was 5,54,439. Within Asia, 24 per cent of deaths due to disasters occur in India, on

\textsuperscript{14} Disaster Management: The Development Perspective, an extract of the Chapter in the Tenth Five Year Plan Document (2002-2007), Government of India, Ministry of Home Affairs, National Disaster Management Division
account of its size, population and vulnerability. Floods and high winds account for 60 per cent of all disasters in India. While substantial progress has been made in other sectors of human development, there is need to do more towards mitigating the effect of disasters.

10. **India's Vulnerability Zones For Natural Calamities.** The following pie chart shows the relative percentages of India's vulnerability zones for natural calamities\(^{15}\). The following is evident:-

(a) **Hazard Vulnerability in India.**

(i) 55% of land vulnerable to Earthquakes.
(ii) 8% of the land vulnerable to cyclones.
(iii) 5% of land vulnerable to Floods.

![Pie chart showing vulnerability zones for natural calamities](image)

(b) **Wind and Cyclones.**

(i) 1981-1990: 262 cyclones in a 50 Km wide strip on the East Coast.
(ii) Less severe cyclonic activity on west coast (33 in the same period).
(iii) In 19 severe cyclone storms, death toll is more than 10,000 lives.
(iv) In 21 cyclones in Bay of Bengal – 1.25 million lives have been lost.

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\(^{15}\) Siromony, *Loc Cit.*
11. **Earthquakes.** Till the J and K earthquake, India had suffered four major earthquakes in the span of last fifty years along with a series of moderate intensity earthquakes that have occurred at regular intervals. Since 1988, six earthquakes have struck different parts of the country. These caused considerable human and property losses\(^\text{16}\).

### Major Earthquakes in India, 1988-2001

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 21, 1988</td>
<td>Bihar-Nepal Border</td>
<td>6.4</td>
</tr>
<tr>
<td>October 20, 1991</td>
<td>Uttarkashi, Uttar Pradesh</td>
<td>6.6</td>
</tr>
<tr>
<td>September 30, 1993</td>
<td>Latur- Osmanabad, Maharashtra</td>
<td>6.3</td>
</tr>
<tr>
<td>May 22, 1997</td>
<td>Jabalpur, Madhya Pradesh</td>
<td>6.0</td>
</tr>
<tr>
<td>March 29, 1999</td>
<td>Chamoli, Uttar Pradesh</td>
<td>6.9</td>
</tr>
<tr>
<td>January 26, 2001</td>
<td>Bhuj, Gujarat</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Table 1.3(3)

12. **Disaster Losses.** The cost of life, livelihood and property due to disasters far exceeds those due to conflicts or any other single factor.

### Global Losses Through Natural Disasters

According to Reinsurance Company ‘Munich Re’ costs associated with natural disasters has gone up 14 fold since the 1950s. Each year from 1991 to 2000, an average of 211 million people were killed or affected by natural disasters - seven times greater than the figure for those killed or affected by conflict. Towards the end of the 1990s the world counted some 25 million ‘environmental refugees’ - for the first time more people had fled natural hazards than conflict.


Table 1.3(4)

\(^{16}\) Disaster Management- The Development Perspective, *Op Cit.*, PP.3-4.
13. The magnitude of the problem can easily be gauged from the following tables depicting the cumulative annualised flood damage losses, total losses due to natural disasters in India, annual damage due to heavy rains, landslides and floods, damage due to cyclone in Orissa in October 2000 and losses due to droughts from 1999-2001.

Cummulative Annualized Flood Damage (Rs in Crore)

![Graph showing cumulative annualized flood damage](image)

Source: Central Water Commission

**Table 1.3(5)**

<table>
<thead>
<tr>
<th>Year</th>
<th>People affected (Lakh)</th>
<th>Houses &amp; buildings, partially of totally, damaged</th>
<th>Amount of property damage/loss (Rs in Crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>595.6</td>
<td>2,449,878</td>
<td>40.06</td>
</tr>
<tr>
<td>1986</td>
<td>550.0</td>
<td>2,049,277</td>
<td>30.74</td>
</tr>
<tr>
<td>1987</td>
<td>483.4</td>
<td>2,919,380</td>
<td>20.57</td>
</tr>
<tr>
<td>1988</td>
<td>101.5</td>
<td>242,533</td>
<td>40.63</td>
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<td>1989</td>
<td>30.1</td>
<td>762,340</td>
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<tr>
<td>1990</td>
<td>31.7</td>
<td>1,019,930</td>
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<tr>
<td>1991</td>
<td>342.7</td>
<td>1,150,109</td>
<td>10.90</td>
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<td>1992</td>
<td>190.9</td>
<td>570,969</td>
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<td>1993</td>
<td>262.4</td>
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<td>1994</td>
<td>735.3</td>
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<td>1995</td>
<td>542.5</td>
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<td>549.9</td>
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<td>2000</td>
<td>594.34</td>
<td>2,786,355</td>
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<tr>
<td>2001</td>
<td>788.19</td>
<td>846,878</td>
<td>12000</td>
</tr>
</tbody>
</table>

*Annual Reports, NDM Division, Ministry of Agriculture*
Annual Damage due to Heavy Rains, Landslides and Floods

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Districts affected</th>
<th>Villages affected (No)</th>
<th>Population affected (Lakh)</th>
<th>Crop Area affected (Lak Ha)</th>
<th>Houses Damaged (no.)</th>
<th>Human life loss (no.)</th>
<th>Cattle loss (no.)</th>
<th>Estimated value of loss to houses (Rs. in crore)</th>
<th>Estimated value of Public properties (Rs. in crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1999</td>
<td>202</td>
<td>33,158</td>
<td>328.12</td>
<td>8.45</td>
<td>894,823</td>
<td>1,375</td>
<td>3,861</td>
<td>0.72</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>2000</td>
<td>200</td>
<td>29,964</td>
<td>416.24</td>
<td>34.79</td>
<td>2,736,355</td>
<td>3,048</td>
<td>102,121</td>
<td>631.25</td>
<td>389.72</td>
</tr>
<tr>
<td>3</td>
<td>2001</td>
<td>122</td>
<td>32,363</td>
<td>210.71</td>
<td>18.72</td>
<td>346,878</td>
<td>834</td>
<td>21,269</td>
<td>195.57</td>
<td>676.05</td>
</tr>
</tbody>
</table>

Table 1.3(7)

Damage due to Cyclone in Orissa in October 2000

<table>
<thead>
<tr>
<th>Date of occurrence of districts</th>
<th>Total no of districts</th>
<th>Districts affected</th>
<th>Villages affected (No)</th>
<th>Population affected (Lakh)</th>
<th>Crop Area affected (Lak Ha)</th>
<th>Houses Damaged (no.)</th>
<th>Human life loss (no.)</th>
<th>Cattle loss (no.)</th>
<th>Estimated value of loss to houses (Rs. in crore)</th>
<th>Estimated value of Public properties (Rs. in crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-18,10.99</td>
<td>30</td>
<td>4</td>
<td>5,181</td>
<td>37.47</td>
<td>1.58</td>
<td>331,580</td>
<td>199</td>
<td>10,578</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29-30,10.99</td>
<td>30</td>
<td>12</td>
<td>14,643</td>
<td>129.22</td>
<td>18.43</td>
<td>1,828,532</td>
<td>9,887</td>
<td>446,531</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Annual Reports, Natural Disasters Management Division, Ministry of Agriculture

Table 1.3(8)

Losses due to Droughts: 1999-2001

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Districts affected</th>
<th>Villages affected (No)</th>
<th>Population affected (Lakh)</th>
<th>Damage to crops area (Lak Ha)</th>
<th>Estimated value of damaged crops (Rs. crore)</th>
<th>Cattle population affected (in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1999</td>
<td>125</td>
<td>-</td>
<td>369.88</td>
<td>134.22</td>
<td>6.44</td>
<td>345.60</td>
</tr>
<tr>
<td>2</td>
<td>2000</td>
<td>110</td>
<td>54,883</td>
<td>378.14</td>
<td>357.00</td>
<td>371.87</td>
<td>541.67</td>
</tr>
<tr>
<td>3</td>
<td>2001</td>
<td>103</td>
<td>22,255</td>
<td>88.19</td>
<td>67.44</td>
<td>NA</td>
<td>34.28</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>338</td>
<td>77,138</td>
<td>836.21</td>
<td>568.66</td>
<td>376.31</td>
<td>921.55</td>
</tr>
</tbody>
</table>

Source: Annual Reports, Natural Disasters Management Division, Ministry of Agriculture

Table 1.3(9)

14. As a result, if we see the vulnerability multi hazard map of India we are faced with all kinds of hazards in all directions (refer diagram below\(^\text{17}\)). An analysis of severity index based on compilation of data collected in the last 50 years of loss to economy and lives, and frequency of incidences, affirms beyond doubt that the Indian sub continent is one of the most disaster prone areas in the world. The most severe cases are that of earthquakes, drought, cyclones and floods. Studies have shown that the overall disasters both natural and man-made that Indian sub continent is prone to can be categorized into 33 kinds.

\(^{17}\) Santosh, *Loc Cit.*
15. The cumulative economic losses suffered due to disasters in India are a matter of grave concern. Consequently, the Calamity Fund released by the 12th Finance Commission to tackle such calamities has gone up to 23000 millions rupees. However, it is unfortunate that funds are not allocated for mitigation in similar measure. Money is easily allocated when a disaster hits a particular place. The National Calamity Contingency Fund (NCCF) is also there in case money falls short. A sum of 40,000 million rupees has been allocated by the 12th Finance Commission to be disbursed, ex-gratia.

16. So what is the problem in reducing risk and vulnerability? Do we lack knowledge, appropriate skills or resources? Do we lack commitment or is it the absence of right attitude? A paradigm shift is needed where the focus is on prevention, preparedness and mitigation. The global initiative exists and at the national level too the commitment exists in the direction of owning hazards and working towards a sound mitigation plan. But it is also happening at State level and permeating to various sectors. The National Institute of Disaster Management is working on the human resources plan for disaster management. It now really is the time to institutionalize and link development processes to disaster mitigation so that it becomes a way of life for all stakeholders. It is time to now start influencing preparation and mitigation measures, rather than being only concerned about disasters consequent to their occurrence.