

## 1. Details of Module and its structure

Module Detail	
Subject Name	Geography
Course Name	Geography 02 (Class XI, Semester - 2)
Module Name/Title	Natural Hazards and Disaster – Part 1
Module Id	kegy_20701
Pre-requisites	Basic knowledge about the occurrence of disaster in different ways
Objectives	After reading this lesson, learners will be able to: <ul style="list-style-type: none"><li>• Define disaster, Natural Hazard</li><li>• Acquire knowledge and understanding about the need for disaster management.</li><li>• Acquire knowledge about the activities included in the disaster management.</li></ul>
Keywords	Disaster, Natural Hazard, Hazard, Disaster mitigation, Risk, Vulnerability, Capacity, Preparedness.

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## Natural Hazards and Disasters

During the past several decades it is observed that the world is exposed to different types of disasters. You might have heard about the forest fire in Amazon basin and Australia which led to large scale depletion of endemic flora and fauna. Further, you must have definitely heard about the epidemic caused by novel corona virus, which took lives of many people. Who is responsible for this? Are we responsible?

We have already caused too much damage on our planet and still continuing to do the same with the rapid developmental activities. The pace of damaging the earth is accelerating every year as a result we are also facing various challenges from the nature unprecedentedly. Sometimes it becomes much beyond the capacity of human beings to cope up with the challenges given by nature. Now it is the time for us to understand and analyse how to prevent, prepare and recover ourselves from such disasters, which is beyond our control. Nature is giving us ample opportunities to understand and act. Alarm bells of annihilation are heard round the world. If we do not, respond promptly to the signals given by nature, very soon humans and other life forms will be wiped off from the planet earth.

Change is the law of nature. It is a continuous process that goes on uninterruptedly involving phenomena, big and small, material and nonmaterial that make our physical and socio-cultural environment. It is a process present everywhere with variations in terms of magnitude, intensity and scale. Change can be a gradual or slow process like the evolution of landforms and organisms and it can be as sudden and swift as volcanic eruptions, tsunamis, earthquakes and lightening, etc. Similarly, it may remain confined to a smaller area occurring within a few seconds like hailstorms, tornadoes and dust storms, and it can also have global dimensions such as global warming and depletion of the ozone layer. Besides these, changes have different meanings for different people. It depends upon the perspective one takes while trying to understand them. From the perspective of nature, changes are value-neutral (these are neither good nor bad). But from the human perspective, these are value-loaded. There are some changes that are desirable and good like the change of seasons, ripening of fruits, while there are others like earthquakes, floods and wars that are considered bad and undesirable. Observe the environment you live in and prepare a list of changes, which take place over a long period of time and those, which take place within a short period of time. Do you know why some changes are considered good and others bad? Prepare a list of changes, which you notice in your daily life and give reasons why some of these are considered good and others bad. In this chapter, we will read about some of these changes, which are considered bad and have haunted humankind for a long time. Disasters in general and natural disasters in particular, are some such changes that are always disliked and feared by humankind.

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## **What is a Disaster?**

The term disaster owes its origin to the French word “Disaster” which is a combination of two words ‘des’ meaning bad and ‘aster’ meaning star. Thus the term refers to ‘Bad or Evil star’.

According to UNISDR:

**Disaster is** “*A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts.*”

**(UNISDR stands for United Nations International Strategy for Disaster Reduction, which came in to existence in the year December 1999)**

Disaster is an undesirable occurrence resulting from forces that are largely outside human control, strikes quickly with little or no warning, which causes or threatens serious disruption of life and property including death and injury to a large number of people, and requires therefore, mobilisation of efforts in excess of that which are normally provided by statutory emergency services”. For a long time, geographical literature viewed disasters as a consequence of natural forces; and human beings were treated as innocent and helpless victims in front of the mighty forces of nature.

### **Disaster is mainly caused by the activities of:**

**I. Nature** :( Classification of natural disaster based on its origin is dealt in the later part of this module.)

#### **Examples of disaster carried out by Nature:**

1. The Tsunami which hit the coast of Indonesia, India, Srilanka etc on 26<sup>th</sup> December 2004
2. Bhuj earthquake of 2001
3. Odisha Cyclone of 1999

### **II. Human Beings:**

#### **Examples of disaster caused by human activities:**

1. Due to Industrial disasters such as Bhopal Gas tragedy and Chernobyl nuclear disaster
2. Wars and Civil Strife
3. Structural failures (dams, mines etc)
4. Release of CFCs (Chlorofluorocarbons) and increase of greenhouse gases
5. Environmental contamination.

**III. There are some other activities of human beings that accelerate or intensify disasters indirectly:**

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**Landslides and floods and desertification due to deforestation, unscientific land use and construction activities in fragile areas are some of the disasters that are the results of indirect human actions.**

Things to do- Now,

Based on the knowledge acquired can you identify some other human activities going on in and around your neighbourhood and schools that can lead to disasters in the near future? Can you suggest some measures to prevent it?

### **What is Natural Hazard?**

**Natural Hazards are elements of circumstances in the Natural environment that have the potential to cause harm to people, property or both.** These may be swift or permanent aspects of the respective environmental settings like currents in the oceans, steep slope and unstable structural features in the Himalayas or extreme climatic conditions in deserts or glaciated areas. As compared to natural hazards, **Natural Disasters are relatively sudden and cause large scale, widespread death, loss of property and disturbance to social systems and life over which people have a little or no control. Thus, any event can be classified as disaster when the magnitude of destruction and damage caused by it is very high.**

Generally, disasters are generalised experiences of people around the world, which is associated with destruction and no two disasters are similar and comparable to each other. **Every disaster is unique in terms of the local socio-environmental factors that control it, the social response it generates, and the way each social group negotiates with it.** However, the opinion mentioned above is indicative of four important things.

- 1. The magnitude, intensity, frequency and damages caused by natural disasters have increased over the years.**
- 2. There is a growing concern among people the world over to deal with the menace created by these so that the loss of human life and property can be minimised.**
- 3. Significant changes have taken place in the pattern of natural disasters over the years.**
- 4. There has also been a change in the perception of natural disasters and hazards.**

Previously, hazards and disasters were seen as two closely associated and interrelated phenomena, i.e. areas prone to natural hazards, were more vulnerable to disasters. Hence, people avoided tampering with the delicate balance that existed in a given ecosystem. People avoided intensification of their activities in such areas and that is how disasters were less damaging. Technological power has given large capacity to human intervention in nature. Consequently, now, human beings tend to intensify their activities into disaster prone areas increasing their vulnerability to disasters.

**Colonisation of flood plains** of most of the rivers and **development of large cities and port-towns like – Mumbai and Chennai along the coast**, and touching the shore, due to high land values make them vulnerable to the occurrence of cyclones, hurricanes and tsunamis. See the image given below a coastal village which is highly populated is submerged due to tsunami.



Image 1: A coastal village in Sumatra subjected to flooding

Source:[https://upload.wikimedia.org/wikipedia/commons/thumb/8/80/US\\_Navy\\_050102-N-9593M-](https://upload.wikimedia.org/wikipedia/commons/thumb/8/80/US_Navy_050102-N-9593M-040_A_village_near_the_coast_of_Sumatra_lays_in_ruin_after_the_Tsunami_that_struck_South_East_Asia.jpg/800px-US_Navy_050102-N-9593M-040_A_village_near_the_coast_of_Sumatra_lays_in_ruin_after_the_Tsunami_that_struck_South_East_Asia.jpg)

[040 A village near the coast of Sumatra lays in ruin after the Tsunami that struck South East Asia.jpg/800px-US Navy 050102-N-9593M-](https://upload.wikimedia.org/wikipedia/commons/thumb/8/80/US_Navy_050102-N-9593M-040_A_village_near_the_coast_of_Sumatra_lays_in_ruin_after_the_Tsunami_that_struck_South_East_Asia.jpg/800px-US_Navy_050102-N-9593M-040_A_village_near_the_coast_of_Sumatra_lays_in_ruin_after_the_Tsunami_that_struck_South_East_Asia.jpg)

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**Table given below shows the magnitude of death caused due to some of the major natural disasters taken place during 1948-2005.**

<b>Table 7.1 : Top Twelve Natural Disasters Since 1948</b>			
<i>Year</i>	<i>Location</i>	<i>Type</i>	<i>Deaths</i>
1948	The Soviet Union (now Russia)	Earthquakes	110,000
1949	China	Floods	57,000
1954	China	Floods	30,000
1965	East Pakistan (now Bangladesh)	Tropical Cyclones	36,000
1968	Iran	Earthquakes	30,000
1970	Peru	Earthquakes	66,794
1970	East Pakistan (now Bangladesh)	Tropical Cyclones	500,000
1971	India	Tropical Cyclones	30,000
1976	China	Earthquakes	700,000
1990	Iran	Earthquakes	50,000
2004	Indonesia, Sri Lanka, India, etc.	Tsunamis	500,000*
2005	Pakistan, India	Earthquakes	70,000*

Source : United Nations Environmental Programme (UNEP), 1991

\*News Report from National Institute for Disaster Management, Government of India, New Delhi

## **Action plan for disaster management**

- a) Concerted efforts have been taken by different countries at various levels to mitigate loss caused by natural disaster. It is also being felt that the damages caused by natural disasters have global repercussions that are beyond the means and capabilities of individual nation-states to cope up with. **Hence, the UN General Assembly declared 1990-1999 as the International Decade for Natural Disaster Reduction (IDNDR). First International conference on Disaster management was held in May 1994 at Yokohama, Japan. This was subsequently called the Yokohama Strategy and Plan of Action for a Safer World. Second world conference was held at Kobe in 2005 (It endorses the Hyogo Declaration and the Hyogo Framework for Action 2005-2015) and Third conference at Sendai in 2015(The Sendai Framework for Disaster Risk reduction 2015-2030).**

### **Yokohama Strategy and International Decade for Natural Disaster Reduction (IDNDR)**

Yokohama Strategy for and Plan of Action for a Safer World

All the member states of the United Nations and other states met at the World Conference on Natural Disaster Reduction in the city of Yokohama from May 23<sup>rd</sup>-27<sup>th</sup> 1994. It acknowledged that the impact of natural disasters in terms of human and economic losses has risen in recent years, and society in general has become vulnerable to natural disasters. It also accepted that these disasters affected the poor and disadvantaged groups the worst, particularly in the developing countries, which are ill equipped to cope with them. Hence, the conference adopted the Yokohama strategy as guide to rest of the decade and beyond, to mitigate the losses due to these disasters.

The resolution of the World Conference on Natural Disasters Reduction is as mentioned below:

- (i) It will note that each country has the sovereign responsibility to protect its citizens from natural disasters:
- (ii) It will give priority attention to the developing countries, particularly the least developed, land locked countries and small-island developing states:
- (iii) It will develop and strengthen national capacities and capabilities and where appropriate, national legislation for natural and other disaster prevention, mitigation and preparedness, including the mobilization of non-governmental organizations and participation of local communities;

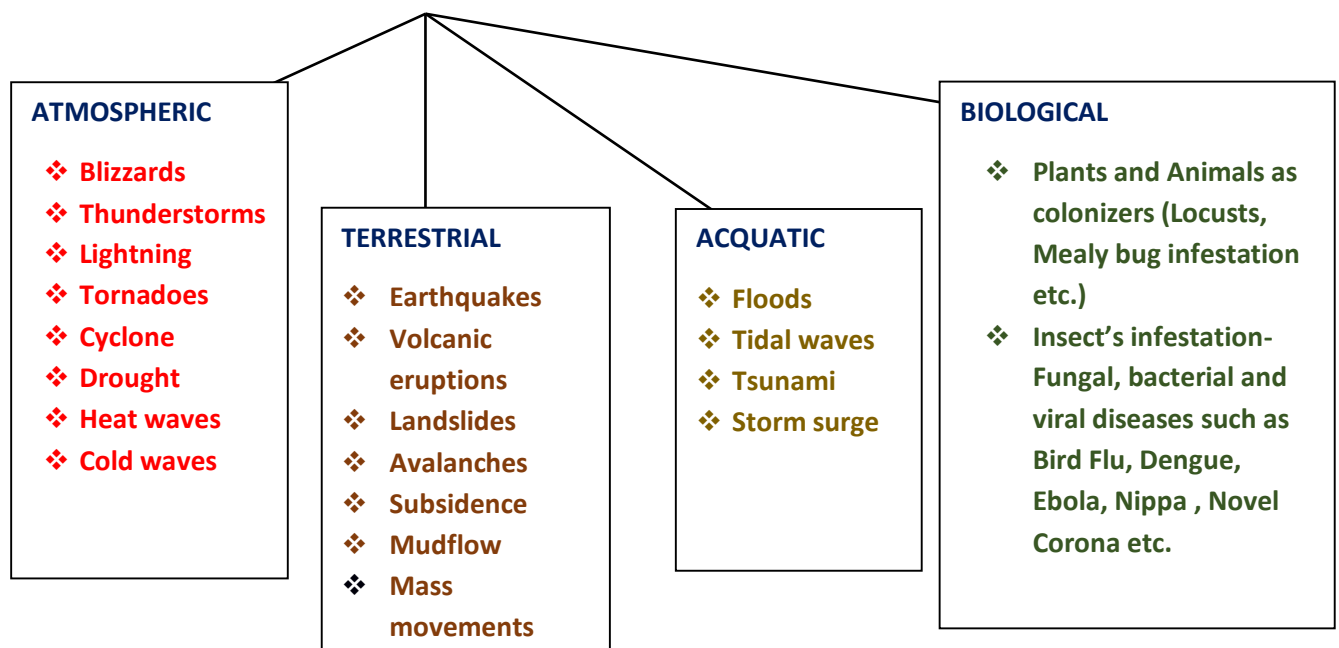
- (iv) It will promote and strengthen sub regional, regional and international cooperation in activities to prevent, reduce and mitigate natural and other disasters, with particular emphasis on:
- (v) (a) Human and institutional capacity-building and strengthening;
- (b) Technology sharing: the collection, the dissemination and utilization of information; and (c) Mobilisation of resources.

The Sendai Framework for Disaster Risk Reduction 2015-2030 is popularly known as Sendai Framework. It was endorsed by the UN General Assembly following the Third UN World Conference on Disaster Risk Reduction (WCDRR). It advocates for :The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

### Classification of Natural Disasters

Identification and classification of disasters is being considered as an effective and scientific step to deal promptly and efficiently with the disasters. Broadly, natural disasters can be classified under four categories (See chart given below).

#### Classification of Natural Disasters based on their origin



India is vulnerable to disasters like earthquakes, cyclones, landslides, avalanches, floods, droughts and forest fires. Every year it loses thousands of lives and property worth millions due to these natural calamities. About 59 per cent of India is prone to earthquakes of moderate to very high intensity, over 12 per cent of its land is prone to floods and river erosion, near

about 5700km of coastal area is prone to cyclone and tsunamis, nearly 68 per cent of cultivable area is prone to drought and many our hilly areas are at the risk of landslide or avalanches. Look at the multi-hazard map of India given below and identify these areas.

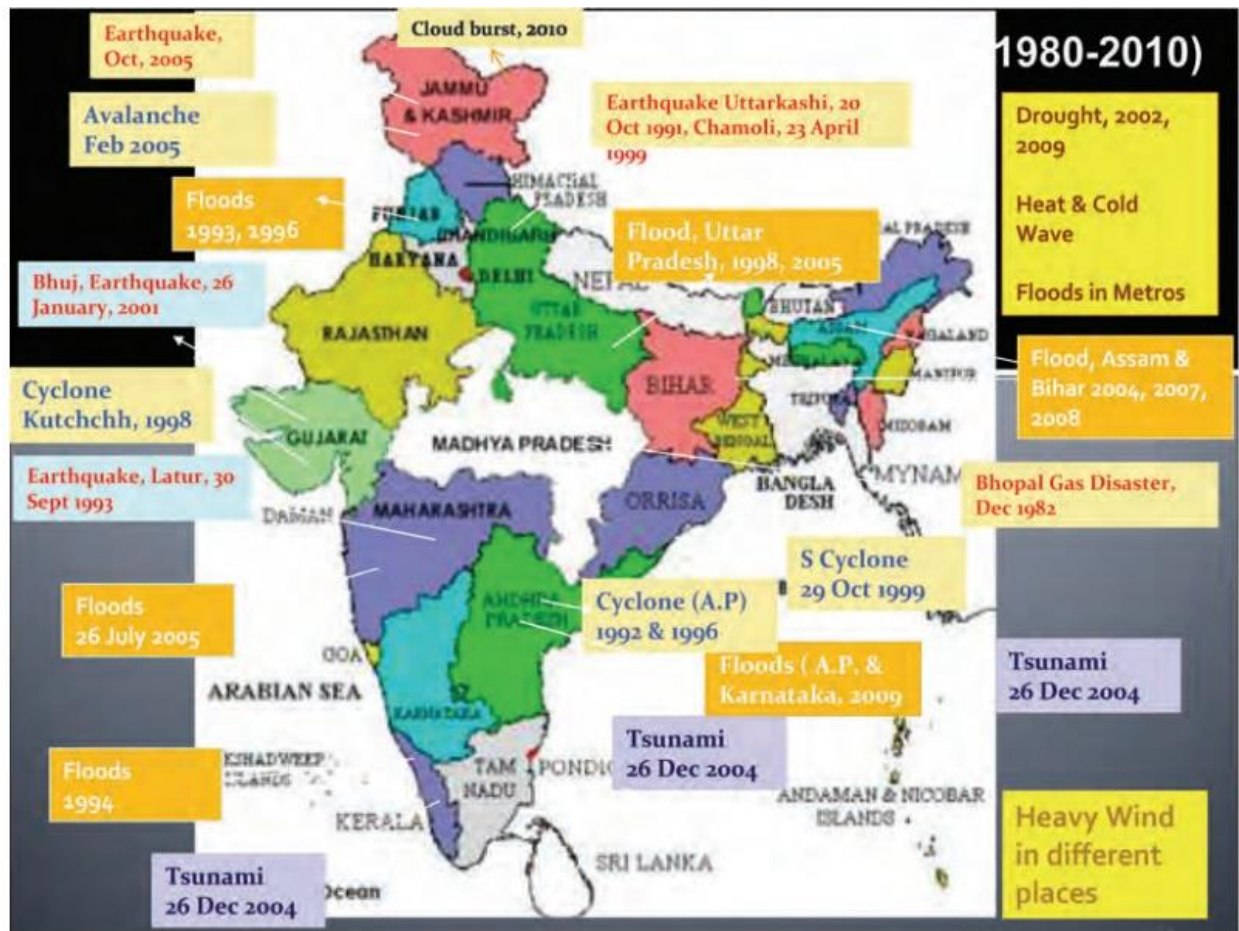


Image 2: Major disasters in India from 1980-2010

Source : [https://www.undp.org/content/dam/india/docs/disaster\\_management\\_in\\_india.pdf](https://www.undp.org/content/dam/india/docs/disaster_management_in_india.pdf)

## Disaster Mitigation and Management

India due to its geographic structure, climatic and socio-economic condition is prone to various types of disasters. During the last decade itself India had to face several disasters caused due to various reasons. Disasters occur without any warning and it is seen that their intensity, frequency and impact is increasing over the years. Hence we cannot stop the occurrence of any unprecedented disaster but we can reduce its impact through disaster mitigation and management.

In order to learn more about disaster management one should understand the term like Hazard, Vulnerability, Risk and Capacity.

- **Hazard** may be defined as” a dangerous circumstance which has the potential to cause damage to the life, property or both”. The word Hazard owes its origin to the word **hasard** in old French and ‘**az-zahr**’ in Arabic meaning chance or luck.



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- **Risk** is the potential of loss of life, injury, damaging of properties which is likely to occur over a particular region during a specific time period.

The level of risk depends upon:

1. Nature and exposure to the Hazard.
2. Vulnerability of the elements to be affected.
3. Capacity of the community to cope up.
4. Economic and social values associated with the elements at risk.

Disaster risk management includes all those measures which can reduce the loss of life, injury or the loss of properties by reducing the hazard or vulnerability of the elements at risk.

❖ **Vulnerability** is the state of being exposed to a possible threat posed by a hazard.

It can be categorized in to the following:

1. **Physical Vulnerability:** Physical vulnerability is based on the physical condition of the area such as the presence of a dam, nuclear power plant, high rise building, industrial complex and high density of housing are under risk. For example, settlements made up of light materials along the coastal belt are highly vulnerable to cyclones.
2. **Social Vulnerability:**  
Social vulnerability refers to the extent of inability based on the socio economic and demographic factors of the society, to recover from the disaster. Studies have shown that socially vulnerable are more likely to be affected by the disaster. For example, a poor agricultural labourer residing in a flood plain is likely to get affected during a severe flood. Such vulnerable places are mostly occupied by poor people. Similarly, small children, pregnant women, disabled and old people are the most sufferers.
3. **Economic Vulnerability:** Economic vulnerability depends on the economic conditions of the people living there and also the assets possessed by the people in the region. If the area affected is a centre of economic activity, loss will be very high.
4. **Environmental Vulnerability:** Economic vulnerability refers to natural resource depletion, contamination of the resources and environmental degradation etc.

❖ **Capacity** is the strength of the community, organization or society in terms of resources, infrastructure, and technology, social and financial power to overcome any situation arising out of a disaster.

Capacity is determined by several factors such as physiographical structure of the region, infrastructure available, socio-economic conditions of the people, Institutional support, knowledge to deal with it, leadership, technology, skill etc. It is a very

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important component of disaster risk reduction as it determines the time taken by the community to get back to the normal life.

Hence a disaster is the outcome generated by the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk.

## Disaster Management

**Disaster management includes all those concerted efforts to reduce the impact of disaster by coordinating with the available resources efficiently through preparedness, response and recovery mechanism to minimize fatalities.**

Disaster management involves various steps such as preparing, supporting and rebuilding society after the occurrence of a disaster.

### Components of Disaster Management

- A. Mitigation
- B. Preparedness
- C. Response
- D. Recovery

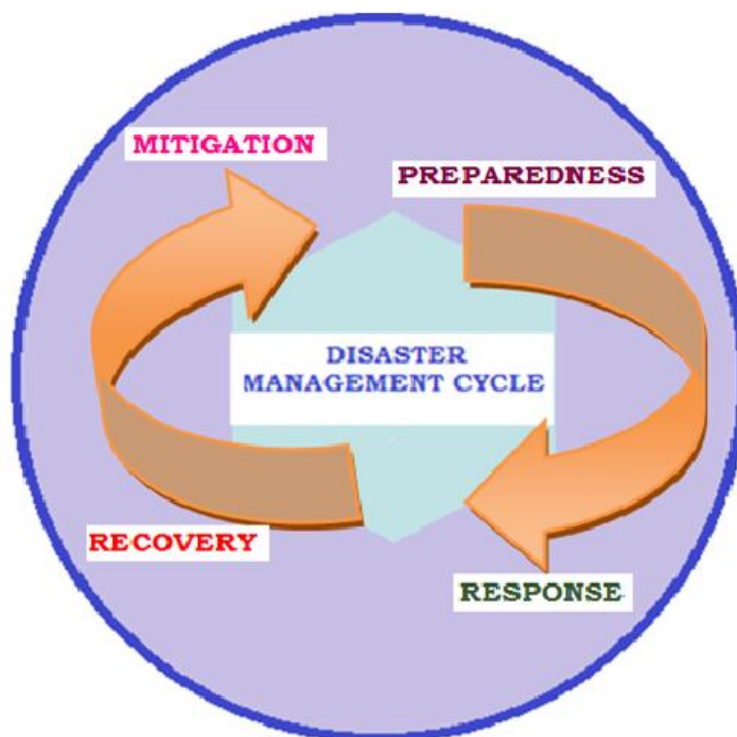


Image 3: Disaster Management Cycle

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## **A. Mitigation**

It includes all those measures which can be undertaken to prevent hazards developing in to disasters or to reduce the impact of disaster when they occur.

It requires proper:

- 1. Land use planning**
- 2. Disaster resistant buildings**
- 3. Creating Community awareness**
- 4. Educating children about disaster and its management**
- 5. Identifying and reducing the risk associated with a disaster.**

## **B. Preparedness**

Preparedness is making people ready to face any challenges thrown open to them by a hazard. It consists of knowledge and capacity development of all concerned authorities of government at different levels, communities, and also individuals to effectively respond and recover from the effect of any disaster. This stage includes contingency plan, Early warning systems, hazard mapping, developing disaster management plans, conducting mock drills, giving training to the people to prepare themselves for a disaster, educating children, resource inventory etc.

- 1. Community awareness and Education**
- 2. Preparation of disaster management plans for community/school/Individual.**
- 3. Mock drill, Training and Practice**
- 4. Inventory of resources both material resources and human skill resources**
- 5. Proper warning system**
- 6. Medical aid arrangement**
- 7. Identifying the vulnerable groups**

## **C. Response**

Response includes those actions taken up to reduce the aftermath of a disaster. Primary goal of response is to save lives, reduce health impacts, ensure public safety and also to support affected people to cope with the situation.

- 1. Implementing disaster management plans**
- 2. Deployment of Search and rescue teams**
- 3. Evacuation**
- 4. Activate emergency cell.**
- 5. Arranging medical assistance to the affected people.**
- 6. Dissemination of information**
- 7. Mobilising resources**

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- 8. Providing shelter and toilet facilities**
  - 9. Setting up of community kitchen with the help of the local community.**
  - 10. Coordination of people from different levels.**

#### **D. Recovery**

Effective post –disaster recovery includes the following aspects:

- 1. Physical aspects recovery -**
  - **Restoration and reconstruction of damaged infrastructure.**
  - **Restoring essential services**
- 2. Economic aspects of recovery-**
  - **Livelihoods**
  - **Productive activities**
  - **Providing financial support**
  - **Market services**
- 3. Social recovery-**
  - **Social and Psychological wellbeing of the person, family and community.**
  - **Counseling programme for those who have lost their dear ones.**
  - **Awaring community about the health and safety measures.**
  - **Rehabilitating to safer places.**

Hence Disaster management is a series of activities undertaken to reduce the loss of people and property. It calls for short term and long term planning, management and execution of tasks with proper coordination.