Lesson - 10

Natural Disasters and Management (Earthquakes and Landslides)

Natural Disasters

Change is a continuous process. Changes also occur continuously in nature. The changes which benefit the mankind are called as nature's boon. But the changes which play havoc in society are termed as natural disasters. For example, when it rains at suitable time and as per requirements of man, it is called a boon. When it rains heavily, it becomes a natural disaster in the form of flood. It is also known as excessive rain. When it rains scantily, it is a disaster in the form of a drought. The natural changes which have a negative effect on society, are termed as natural disasters.

Natural Disasters and Problems

There is a slight difference between natural disaster and problem. Natural disaster is a change which occur in nature within a short period of time. The adversities faced by the society as a consequence of the disasters are termed as problems.

In French language, **Dis** means bad and **Aster** denotes stars. Hence, the term disaster means bad or unfavourable stars. Natural disasters are also termed as natural hazards. In Bharat, it is perceived as wrath of nature. Natural hazards create several problematic and adverse situations. In ancient times, the natural disasters were considered as the punishment given by nature for disturbing it.

Causes of Natural Disasters

It is very difficult to determine the cause of natural disasters. As a matter of fact, combined effect of several factors causes natural disasters. Indogenetic and exogenetic forces of the earth directly affect some of the natural disasters like earthquake and volcanoes. Man has continued illogical exploitation of natural resources. Land use pattern has been disturbed in order to fulfil the needs of increasing population. The resultant problems like deforestation, land degradation and water scarcity have created environmental imbalance. It is contributing to the problem of global warming, which ultimately causing natural hazards like excessive rains and droughts. Natural disasters like landslides and sea-storms have increasing incidences in Bharat also. Man's attitude of consumerism and blind pursuit of development is disrupting natural equilibrium. These activities of man are inviting natural disasters indirectly.

Classification of Natural Disasters

Natural disasters can be classified under the following heads on the basis of their origin –

1. Seasonal disasters – Those natural disasters are included in this category which occur due to seasonal changes, e.g. cyclones, excessive rains, drought and snowfall.

2. Geomorphological disasters – In this category, are included those natural hazards which take place due to sudden changes in landforms e.g. landslides, snowdrift, earthquakes and volcanoes. There are no active volcanoes in Bharat.

3. Biotic disasters – In this category, such natural disasters are included which are caused by

creatures and bacteria, e.g. attack by swarm of locust, epidemics, dead animals, plague, malaria etc.

Natural Disasters and Management

Management is a work which is undertaken to solve the problem of disasters and calamities. The country and society has to share the responsibility honestly to face the hours of difficulties. Management means to perform time bound relief operations at every level in accordance with the assigned responsibilities. The character of a nation and society is seen in the performance of humanitarian services rendered by people after the occurrence of natural disasters. The following factors affect management process –

1. Economic conditions
2. Man's positive thinking
3. Feeling of cooperation
4. Social honesty and integrity
5. Geographical conditions
6. The status of means of transportation and communication.
7. Density of population.

Earthquake

An earthquake is a vibration in any part of the earth caused by any phenomena occurring in the interior of the earth. In simple terms, vibration or tremor of any part of the earth is called earthquake. It is very damaging among natural disasters. It causes devastating changes in a few moments. It seems as if the earth is shaking or oscillating with the movement of earthquake waves.

The intensity of earthquake is measured by seismograph. It continuously records the earthquake waves. These waves are measured on Richter Scale. This was devised by Charles Richter, so that this scale is known by his name. Its intensity is measured between 1 to 12 on Richter Scale. When the intensity of earthquake waves is upto 5, it is termed as normal earthquake. As the intensity increases, the earthquake takes a very destructive form.

Causes of Earthquakes

Earthquakes are mainly caused due to the tectonic movements. Movement of plates causes tectonic upheavals. Its latest example is the earthquake which occurred on 26th December, 2004 in South-East Asia when the Indian plate drifted towards the north. Earthquakes are also caused during the continuous process of isostatic equilibrium on the earth. Folds and faults occur on the earth's surface during the process. The continuous release of heat from the earth causes its contraction. Although it is a long term process, but this contraction also causes earthquake. Irrational exploitation of minerals and construction of dams in the weaker zones of the earth's surface are such human acts which cause earthquakes.

Earthquake Prone Areas

Delimitation of earthquake prone areas in Bharat was treated to be very simple. But Latur earthquake of 30th September, 1993 demanded reconsideration of the delimitation. By reviewing the table of main earthquakes occurred in India, it becomes obvious that the maximum earthquakes have occurred in northern mountain region and its foothills (Table 13.1). Himalayas are newly folded mountains which are still in the stage of upliftment. The state of isostatic equilibrium is not yet attained in the Himalayan region, hence earthquakes occur frequently. In the northern plain region, the earthquakes of moderate intensity occur and their number of occurrence is also very small. Previously the Peninsular Plateau was considered to be a stable landmass, but after the Koyna and Latur earthquakes, this region is also considered to be earthquake prone. The continuous movement or drifting of the Indian plate towards north also causes earthquakes in this region. Based on the study of 1200 earthquakes occurred in Bharat, it has been divided into three earthquake zones. These have been shown in Fig. 10.1.

Earthquake - An Adversity

Earthquake is such a natural adversity that heart-shaking scenes are created within a few moments. It may cause loss of thousands of lives, buildings collapse and turn into heap of earth, the means of transportation are disrupted, bridges,

Table - 10.1
Major Earthquakes in India

Sr. No.▼	Place	Deaths	Date, Time, and Year	Magnitude	Epicenter
1	Indian Ocean	> 283,106	08:50, December 26, 2004	9.1–9.3	West coast of Sumatra, Indonesia
2	Kashmir	130,000	08:50:38, October 8, 2005	7.6	Muzaffarabad, Pakistan-administered Kashmir
3	Bihar and Nepal	> 30,000	14 :13, January 15, 1934	8.7	South of Mount Everest
4	Gujarat	20,000	08:50:00, January 26, 2001	7.7	Kutch, Gujarat
5	Kangra	> 20,000	06:10, April 4, 1905	7.8	Himalayas
6	Latur	> 9,748	22:25, September 30, 1993	6.4	Killari, Latur
7	Assam	1,526	19:39, August 15, 1950	8.6	Rima, Tibet
8	Assam	1,500	17 :11, June 12, 1897	8.1	Exact location not known
9	Uttarkashi	>1,000	Unknown time, October 20, 1991	6.8	Garhwal, Uttarakhand
10	Koynanagar	180	04:21, December 11, 1967	6.5	Koyna

Source : Geological Survey of India.

dams and canals are damaged, faults are formed on the earth's surface, rivers change their courses due to landslides and lakes are also formed at many places. These changes increase the probabilities of flooding in future.

Nearly 3 lakh people died in the earthquake of 11th October, 1937 in Kolkata. Thousands of people died and rendered homeless due to landslides in the Kashmir caused by earthquake on 30th May, 1985. Morvi town was destroyed on 11th December, 1967 due to the earthquake which damaged Koyna dam. The Tsunami waves caused by an earthquake near Java in South-Eastern Asia on 26th December, 2004, took lives of about 5000 persons in the coastal regions of Bharat, situated thousands of kilometres away from the Tsunami source area.

Relief Operations and Management

1. At Government and Social level – All governments provide relief and help immediately to overcome the problem arising out of natural disasters. In a country like Bharat, where the density of population is very high, such disasters cause heavy loss of human life and such probabilities always remain. Hence it is essential to install a network of seismographic centres in the country in order to enable to know about the tectonic movements of the earth's interior, so that people of the risk area may be timely alarmed through communication and media.

2. At individual level – When a person suspects the occurrence of earthquake, certain decisions should be taken immediately, e.g. ask everyone to vacate the house and go out in open space, and if it is not possible to go out one should stand on the door. Electric and gas supply should be switched off. Pets should be freed. If travelling by transport, vehicles should be stopped and the passengers should come out in the open. These steps are possible because prior to the occurrence of an earthquake of high magnitude, a few mild tremors are experienced. The mild tremors give an indication of a probable severe earthquake.

During such an emergency, people should be united. Physical, emotional and financial assistance should be extended on humanitarian grounds without any caste, creed or communal bias. Human bonds get stronger by such assistance. Whenever such critical situations have arisen in Bharat, the citizens, voluntary organizations, institutions and students have presented unique example of extending assistance to the victims.

Landslides

Creeping, sliding and falling of soil and rocks dowslope is termed as landslide. If landslide occurs on a large scale, the rumbling sound starts in the beginning and gradually it increases with the falling of rock materials.

Causes of Landslides

A single cause cannot be attributed for landslide. As a matter of fact, several factors together give rise to disastrous landslides. The factors responsible for landslides can be classified

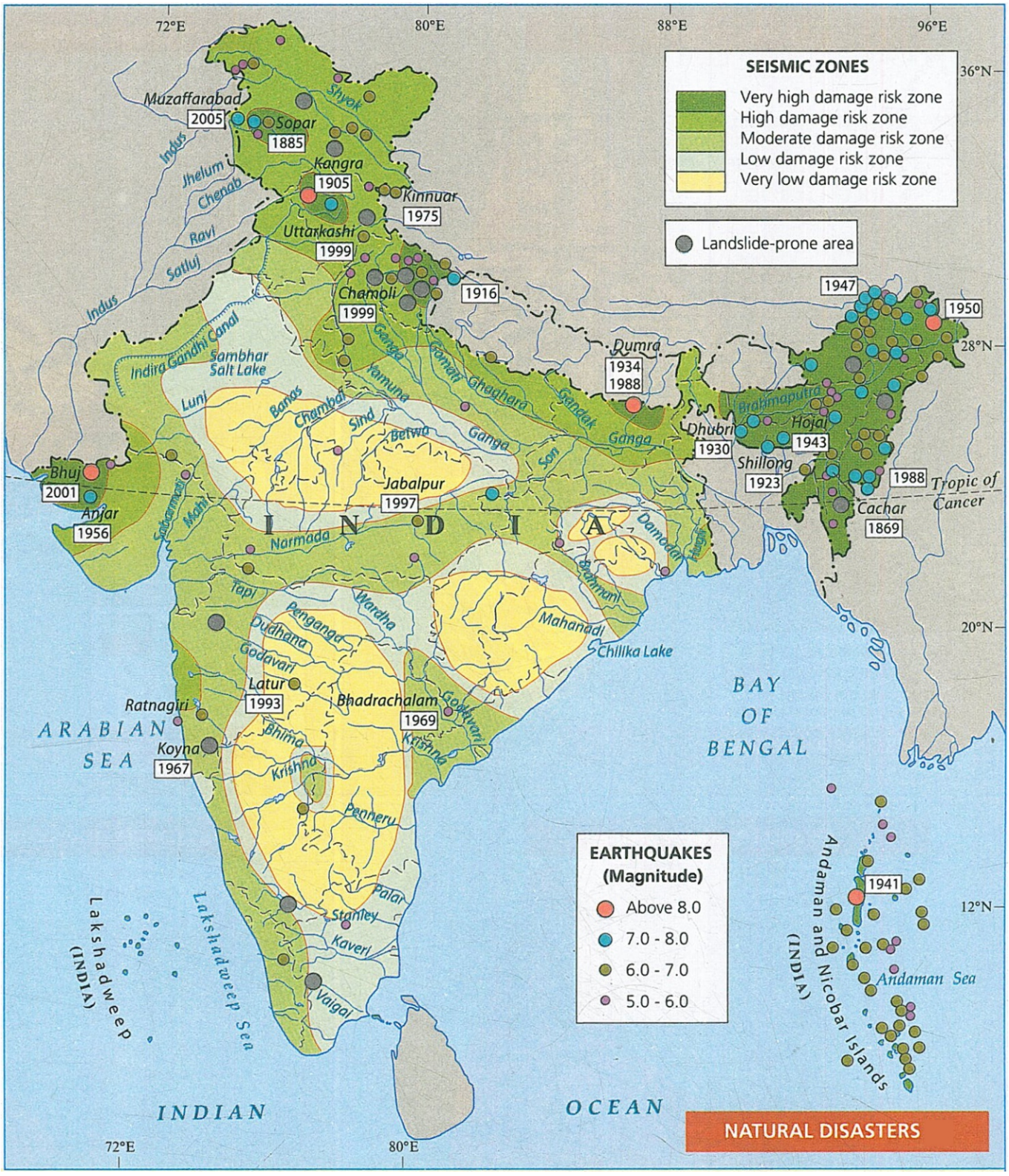

Fig.10.1 : India : Natural Disasters (Earthquake)

under two groups –

1. Natural Factors – Rock structure, gradient, folds and faults in rocks, amount of rainfall, vegetative cover are the main factors responsible for landslides. Incidence of landslides are frequent in folded mountain regions because continuous process of upliftment there weakens rock joints and the gradient is also steep. In such a situation, heavy rains act as additional powerful factor causing landslides. The rocks begin to slide down from weak joints with heavy flow of rain water. Gravitational force also enhances the process of landslides. Where the slope is steep, the force of gravity increases. Landslides are frequent where the gradient is more than 45°. This is experienced in the Western Ghats on Konkan railway route. Erosional capacity of rivers is higher in mountainous region. Lateral erosion causes landslides from higher slopes.

2. Human Factors – Man has increased the possibility of natural disasters like landslides by his endeavours for uncontrolled development. There has been speedy deforestation for obtaining raw material for pulp and paper, and timber. Due to speedy deforestation, tree roots loosen their grip over soils and rocks, so that soil erosion is enhanced. Continued soil erosion finally increases landslides. Man has also encouraged landslides by the construction of roads, railway tracks, tunnels and uncontrolled mining. Construction of transport routes in mountainous areas, require cutting of trees and removal of soils in huge quantity. The process increases possibilities of landslides.

Landslide Prone Areas

In Bharat, landslides are more frequent in the Himalayan region. Next in frequency comes western Ghats region. In these areas, landslides are more frequent where rivers flow. In the north-east Bharat and Jammu and Kashmir where new roads have been constructed, landslides are more frequent. Landslides also occur due to erosion by waves along the seacoast. This can be seen on the Konkan coast. The landslide prone areas in Bharat have been shown in Fig. 10.2.

Landslide - A Distress

Although not as damaging as an earthquake, yet it causes destruction. Sometimes it blocks river courses and sometimes transportation routes are blocked, which disturbs the normal life. It also disturbs the equilibrium of demand and supply of goods. Therefore, the transportation routes are opened with first priority to restore supplies and movement of traffic.

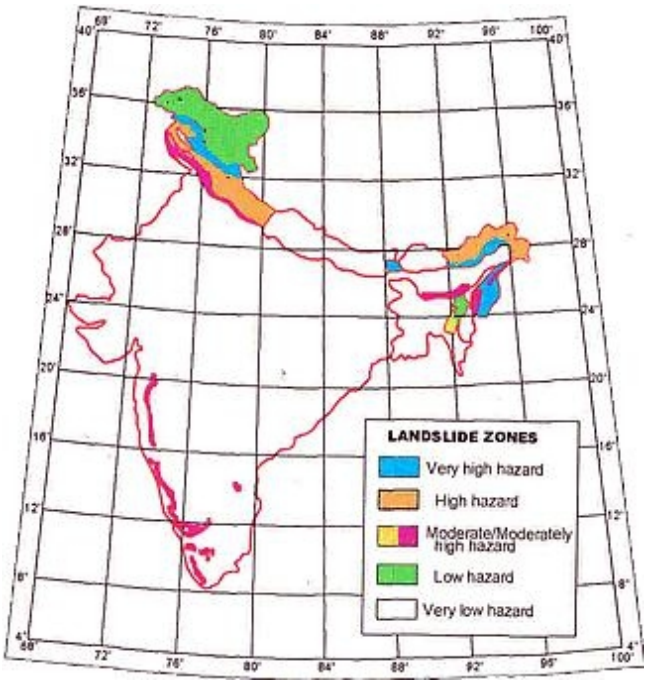

Fig.10.2 : India : Landslide Zones

Whenever landslides occur in populated areas, there is a loss of life and property both. People are buried under debris of their homes. Landslides in Nilgiris in 1993 killed 40 persons. The roads and houses collapsed. During the same year, there was a heavy loss of life and property in Uttaranchal due to landslides.

Many a times, river courses are blocked due to landslides and temporary lakes are formed. Breaking of such lakes results into heavy loss of life and property by flooding. One such temporary lake was formed in the valley of Alaknanda river (Uttaranchal) by landslides in 1971. Whole of Belakuchi village was washed away when the lake broke. Table 10.2 represents the effects of main landslides occurred in Bharat.

Table - 10.2
Major Landslides in India

Guwahati landslide, Assam: The landslide took place on September 18, 1948 due to heavy rains. Over 500 people died in the landslide and according to the reports, the landslide buried an entire village

Darjeeling landslide, West Bengal: The landslide happened around October 4, 1968. The landslide was triggered by floods and the 60 km long highway was cut in 91 parts. As per reports, thousands of people died in the landslide

Malpa landslide, Uttarakhand: Consecutives landslides occurred between August 11 and August 17 in 1998 in the village of Malpa where over 380 people died as the entire village washed away in the landslide. The landslide is one of the worst landslides in India

Mumbai landslide, Maharashtra: The landslide was caused in July 2000. The landslide took place in the suburbs of Mumbai due heavy rains which was followed by land erosion. As per reports around 67 people died and the local trains were also stricken

Amboori landslide, Kerala: The landslide was known as the worst landslide in Kerala's history. The landslide occurred on November 9, 2001 due to heavy rains and around 40 people died in the incident

Kedarnath landslide, Uttarakhand: The landslide took place on June 16, 2013 and was the result of Uttarakhand floods. Over 5700 were reported dead and over 4,200 villages had been affected by the floods and post-floods landslide

Malin landslide, Maharashtra: The landslide occurred on July 30, 2014, in a village in Malin. The landslide occurred due to heavy rainfall and around 151 people died and 100 people went missing after the disaster.

Landslides and Management

1. At Government and Social level – While studying the occurrence of landslides in Bharat, it becomes clear that more than 90% of landslides occur in rainy season. Therefore, in mountainous regions, there should be proper drainage for rain water on both sides of roads. The debris, with more than 45° gradient, should be removed simultaneously with the construction of roads. If its removal is not possible, a support wall should be constructed along side the debris. Villages should be developed in the areas which are free from the risk of landslides. Warning signals must be established along roadsides on the landslide prone spots.

2. At individual level – While travelling by own vehicles, if the rain starts in landslide prone areas, vehicles should be parked along road side. Houses must be constructed on firm grounds in mountainous regions. Houses should not be built along river sides in mountainous regions. During road blockades, full help should be extended to the held up people. Citizens should inform the concerned departments if the landslide has occurred along transportation routes.

Important Points

1. Changes in nature occur continuously. The natural changes which adversely affect human society are termed as natural disasters.
2. In Bharat, natural disasters are also known as wrath of nature.
3. Management here means the actions, decisions and responsibilities undertaken to ward off the severity of disasters and get ready to face the situation successfully.
4. The earth's tremors are termed as earthquake.
5. The intensity of earthquake is measured on Richter scale.
6. Earthquakes are more frequent in northern mountainous region of Bharat.
7. Seaquakes create the danger of Tsunami waves which bring disaster in coastal regions.
8. As soon as it appears that an earthquake is about to occur, we should come out in the open space.
9. The process of rocks and soil falling downwards is known as landslide.
10. Landslides are more frequent in rainy season. The rain water increases possibilities of landslides.
11. In Bharat, the incidence of landslides are more

in the Himalayan and Western Ghats regions.
12. Landslides obstruct transportation routes and river courses.

Exercise
Multiple Choice Questions

1. The natural disaster not associated with Bharat, is–
   (A) Earthquake (B) Flood
   (C) Landslide (D) Volcano.

2. The region of Bharat where earthquakes occur more frequently is –
   (A) Deccan Plateau (B) Himalaya
   (C) Central Bharat (D) Coastal Bharat.

3. The mountainous region where landslides occur frequently in Bharat, is –
   (A) Aravalli (B) Himalaya
   (C) Satpura (D) Vindhyachal.

Very Short Answer Type
4. What is meant by natural disaster?
5. What is an earthquake?
6. What do you understand by landslide?
7. In which season landslide occur more?

Short Answer Type
8. What is meant by management?
9. In which region of Bharat, earthquakes occur more frequently and why?
10. Explain about landslide management.

Essay Type
11. Explain the causes of an earthquake.
12. How can natural disaster of an earthquake be dealt with?
13. Which factors affect management?
14. Classify the factors that causes landslides.

Skill
15. Mark earthquake prone areas on an outline map of Bharat.
16. Mark landslide prone areas on an outline map of Bharat.

Answer Key
1. (D), 2. (B), 3. (B).