

18

NATURAL DISASTERS

Humans have been coping with natural disasters since time immemorial. There are so many disaster which can not be controlled by human intervention. They are destined to bring their tragic consequences of human destruction. Due to human intervention in the natural processes, the destructive power and frequency of natural disasters have increased considerably. According to U N statistics, natural disasters kill 1,00,000 persons on an average and cause property damage of Rs 20,000 crores world wide per year. Among the top ten natural disaster-prone countries, India stands second after China. Therefore, there is a need for creating awareness among all sections of the people about it's causes, consequences as well as preventive measures so that they can handle as an individual, and as a members of society.

In this chapter we will study five natural disasters i.e. earthquakes, land slides, droughts, floods and cyclones.



OBJECTIVES

After studying this lesson you will be able to:

- explain the meaning of the words natural 'Hazard' and 'Disaster'.
- differentiate between hazard and disaster
- recognize and describe some disaster-prone areas from each physical division of India.
- describe some adverse effects of natural disasters.
- give example of some other nuturological disasters.
- suggest measures to mitigate or reduce the problems and sufferings arising before, during or after the disaster.



18.1 DISASTERS IN INDIA – A BACKGROUND

India is struggling with disasters from many years. How can we forget the day when killer waves (tsunami) struck the coastal parts of India on 26th December 2004 or the morning of 26th January 2001, when western part of India was badly affected by earthquake. These are just few examples. We always listen such kind of news in print or electronic media that one part of India is affected by flood where as another faces drought.

Due to vulnerability of different kinds of disasters, it is said that India is a disaster prone country, the reasons are:

1. Over 55% of the land area is vulnerable to earthquakes,
2. 12% is flood prone,
3. 8% is vulnerable to cyclones and
4. 70% of the land under cultivation is drought prone.

18.2 NATURAL HAZARDS AND DISASTERS

The vulnerability of environment has been increasing continuously due to human activities. But this is not one sided relationship. Humans are also the components of the environment. Hence they can't escape from the effects of environmental change processes. When local, regional or global processes of environment pose danger to humans or their property, they are simply natural events. For example, the blizzard blowing in the Antarctica is a natural event. But if this blizzard poses dangers to our lives and property, then it becomes a disaster.

For instance, tsunami was caused by an earthquake that occurred in the sea near Sumatra (Indonesia) on 26 December, 2004. It turned into a disaster for India, Srilanka and some other countries of Southeast Asia. It caused wide spread loss to human life and property in Andaman and Nicobar Islands and on the coasts of Andhra Pradesh and Tamil Nadu.

Table 18.1: Difference between Natural Hazard and Disaster

Hazard	Disaster
1. A hazards is a dangerous physical condition or event.	1. A disaster disrupts the normal function of the society caused by a hazard.
2. Earthquakes, floods, volcanic eruption, land slides, droughts etc are called natural hazards before they cause loss of life and damage to property.	2. It causes damage to property and loss of life but it disrupts the opportunities of employment also.

Natural Disasters

- | | |
|---|--|
| 3. Small number of people are affected. | 3. A large number of people are affected by it. |
| 4. It may cause injury, loss of life or damage of property. | 4. It causes wide spread loss to life and property. |
| 5. Earthquakes, floods, volcanoes, tsunami, land slide, drought etc. are natural hazards. | 5. It affects the society to such an extent that external aid becomes, necessary to compensate the losses. |

- Nearly 6 crore people are effected by natural disasters every year.
- Natural events, when pose danger to humans, are called hazards.



INTEXT QUESTIONS 18.1

1. When do natural events become natural hazards?

2. What is a tsunami?

18.3 FLOODS

With the arrival of Monsoon, people living in 4 crore hectares area of the country become extremely nervous. No one knows when there will be a flood in the river and their hard earned belongings will be washed away. In comparison to other disasters flood cause more damage to life and property. Twenty percent of deaths caused by floods in the world, occur in India.

What is a flood

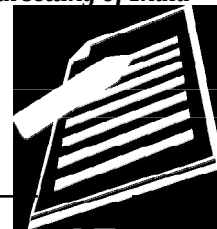
The inundation of an area by water is called a flood. In other words, when a river over flows its banks and water spreads in the surrounding areas is a flood. Various causes of flood, losses by flood and flood control measures are described below:

Cause of flood

The causes of flood in India are as follows:

MODULE - 6

The Physical setting of India



Notes



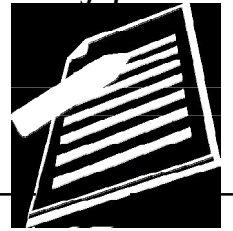
- (i) **Heavy rainfall** : Heavy rain in the catchment area of a river causes water to over flow its banks, which results in the flooding of nearby areas.
- (ii) **Sediment deposition** : River beds become shallow due to sedimentation. The water carrying capacity of such river is reduced. As a result the heavy rain water over flows the river banks.
- (iii) **Deforestation** : Vegetation hampers the flow of water and forces it to percolate in the ground. As a result of deforestation, the land becomes obstruction free and water flows with greater speed into the rivers and causes flood.
- (iv) **Cyclone** : Cyclone generated seawaves of abnormal height spreads the water in the adjoining coastal areas. In October 1994 Orissa cyclone generated severe floods and caused unprecedented loss of life and property.
- (v) **Interference in drainage system**: Drainage congestion caused by badly planned construction of bridges, roads, railway tracks, canals etc. hampers the flow of water and the result is flood.
- (vi) **Change in the course of the river**: Meanders and change in the course of the river cause floods.
- (vii) **Tsunami** : Large coastal areas are flooded by rising sea water, when a tsunami strikes the coast.

Losses by flood : Humans and animals both are affected by flood. People are rendered homeless. Houses are damaged or collapse. Industries are crippled. Crops are submerged in flood water. Domestic as well as wild animals die. Boats and fishing nets etc. are lost or damaged in coastal areas. Out break of epidemics like malaria and diarrhoea etc. are common after flood. Potable water is contaminated and sometimes becomes scarce. Food grains are lost or spoiled, their supplies from outside become difficult.

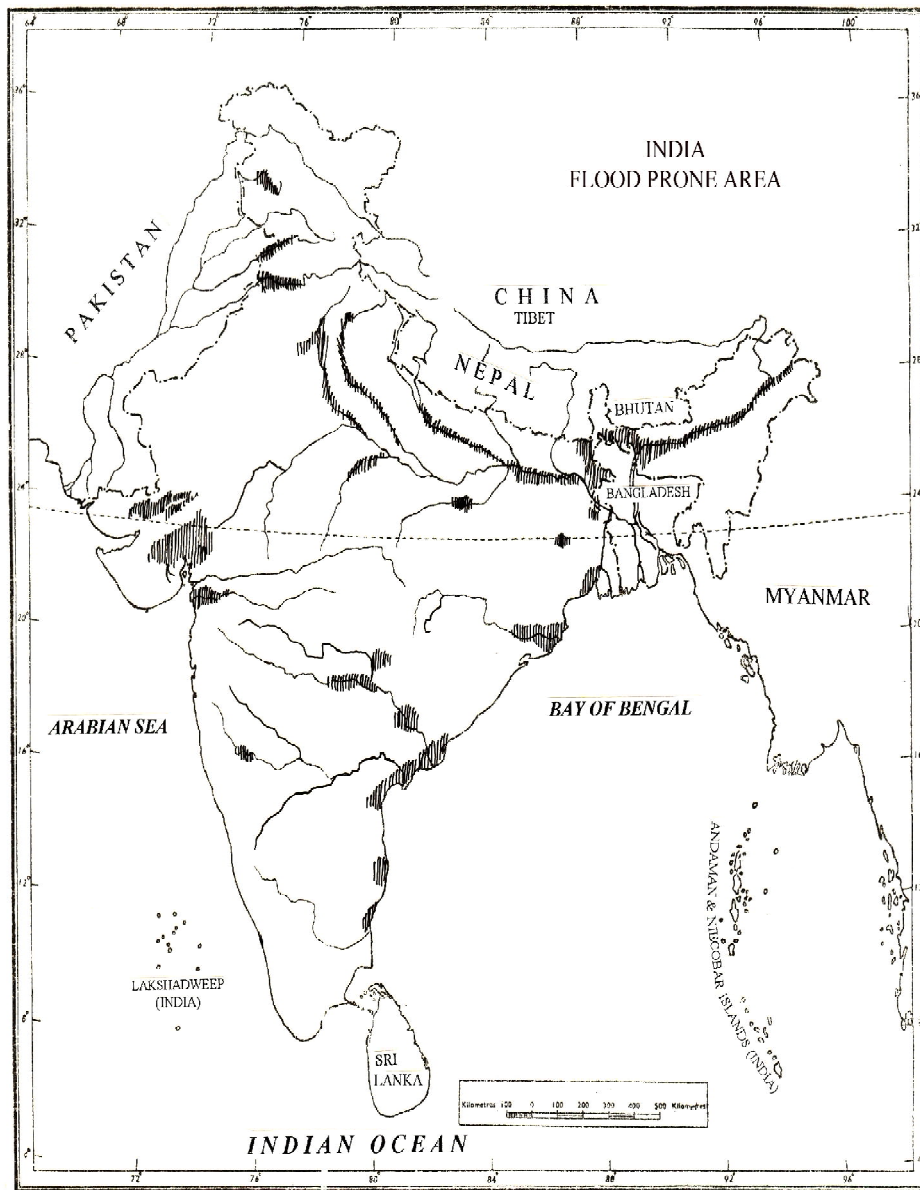
Losses by annual floods, instead of decreasing are increasing every year. In 1953 2.43 crores of people were affected. By 1987 the number of flood affected people rose to 4.83 crore.

According to an estimate on an-average property worth Rs. 210 crores is lost in floods every year. Flood affects about 6 crore people and crops of one crore hectare are damaged.

Flood prone areas : About 4 crore hectare area of our country is flood-prone, which is one eighth of the total area. The most flood prone areas are the Brahmaputra, Ganga and Indus basins. As far as states are concerned, Uttar Pradesh, Bihar, West Bengal and Orissa are the most flood affected states followed by Haryana, Punjab and Andhra Pradesh. Now a days Rajasthan and Gujarat also feel the fury of floods. Karnataka and Maharashtra are no-longer immune to floods.



Notes



Based upon Survey of India Outline Map printed in 1996.
The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
Responsibility for correctness of internal details shown on the map rests with the publisher.

© Government of India copyright 1996.

Fig. 18.1 INDIA : Flood Prone Areas

Flood control measures

- (i) **Reservoirs** : By constructing reservoirs in the courses of rivers could stores extra water at the time of flood. Such measures adopted till now however, have not been successful. Dams built to control floods of Damodar could not control the flood.
- (ii) **Embankments** : By building flood protection embankments, floods water can be controlled from overflowing the banks and spreading in near by areas.



Building of embankments on Yamuna, near Delhi, has been successful in controlling the flood.

- (iii) **Afforestation** : The fury of flood could be minimized by planting trees in catchment areas of rivers.
- (iv) **Restoration of original drainage system** : Drainage system is generally choked by the construction of roads, canals railway tracks etc. Floods could be checked if the original form of drainage system is restored.

Flood Management : About 4 crore hectare area is flood prone. Out of this, 1.44 crore hectare areas has been made secure to some extent from the devastation by floods. To achieve this goal, embankments and drainge channels have been constructed. Protection of towns and cities have been adopted. Villages are relocated on comparative by higher ground. By the end of Ninth Plan 8000 crore rupees have been spent on flood management.

Some do's and donts before, during and after the flood

- (i) Listen to the radio for advance information and advise.
- (ii) Disconnect all electrical appliances, move all valuable household goods and clothing out of reach of flood water. Adopt such measures only when there is a forecast of flood or you suspect that flood water may reach the house.
- (iii) Move vehicles, farm animals and moveable goods to the higher ground.
- (iv) Prevent dangerous pollution.
- (v) Keep all insecticides, pesticides etc. out of the reach of flood water.
- (vi) Switch off electricity and gas, in case you have to leave the house.
- (vii) Lock all door and windows if you have to leave the house.
- (viii) Do not enter flood water on foot or in a vehicle as far as possible.
- (ix) Never wander in the flooded area on your own.

- The inundation of an area by rain water is called flood.
- The basins of Indus, Ganga and Brahamaputra rivers are the most flood prone areas.



INTEXT QUESTION 18.2

1. Name any two causes of flood.

- (i) _____
- (ii) _____

2. How much area of the country is flood prone?

3. Name any two measures of flood control.

(i) _____

(ii) _____

18.4 DROUGHT

The tragedy caused by drought affects the people slowly and vastly. This is different type of agony but painful. To see domestic animals to die of hunger and thirst before ones own eyes; to send beloved members of the family in search of employment to far off places in extremely uncertain and exploitative conditions, reduction in diet to reduce the already meager diet, to wander in search of work all day long in relief works and return rejected and empty-handed in the night, these are some of the heart rending scenes from the drought affected areas of India.

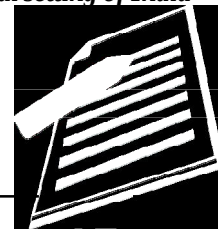
What is a drought ? According to meteorologists the rainfall deficiency during a long period over a large area is called a drought. Some times in Hindi language famine *Akal* and *Anavrishty* are also used for drought. Drought can also occur when ground water level is not within reach of agricultural communities. The government also declares on area affected by drought, if more than 50 percent crop loss happens in an area due to meteorological condition.

Causes of drought

Major cause of drought in India is scarcity of rain. But humans have interfered in the environment processes by their activities. People have filled up the natural resources like ponds and lakes. They have destroyed the vegetation cover. Vegetation cover impedes the flow of rainwater and force it to percolate in the ground. Humans have dug lakhs of tube wells and depleted the ground water reservoirs.

Impact of drought : Droughts cause scarcity of food and water. Hungry and thirsty people cry for help. People die of hunger, malnutrition and epidemics. People are forced to migrate from their area of residence. Crops fail due to scarcity of water. Cattle because fodder and water are not easily available.

Farmers are deprived of their employment. People leave their villages with their families for a long, unknown and uncertain journey in the pursuit of food, water, green fodder and employment.



The Physical setting of India

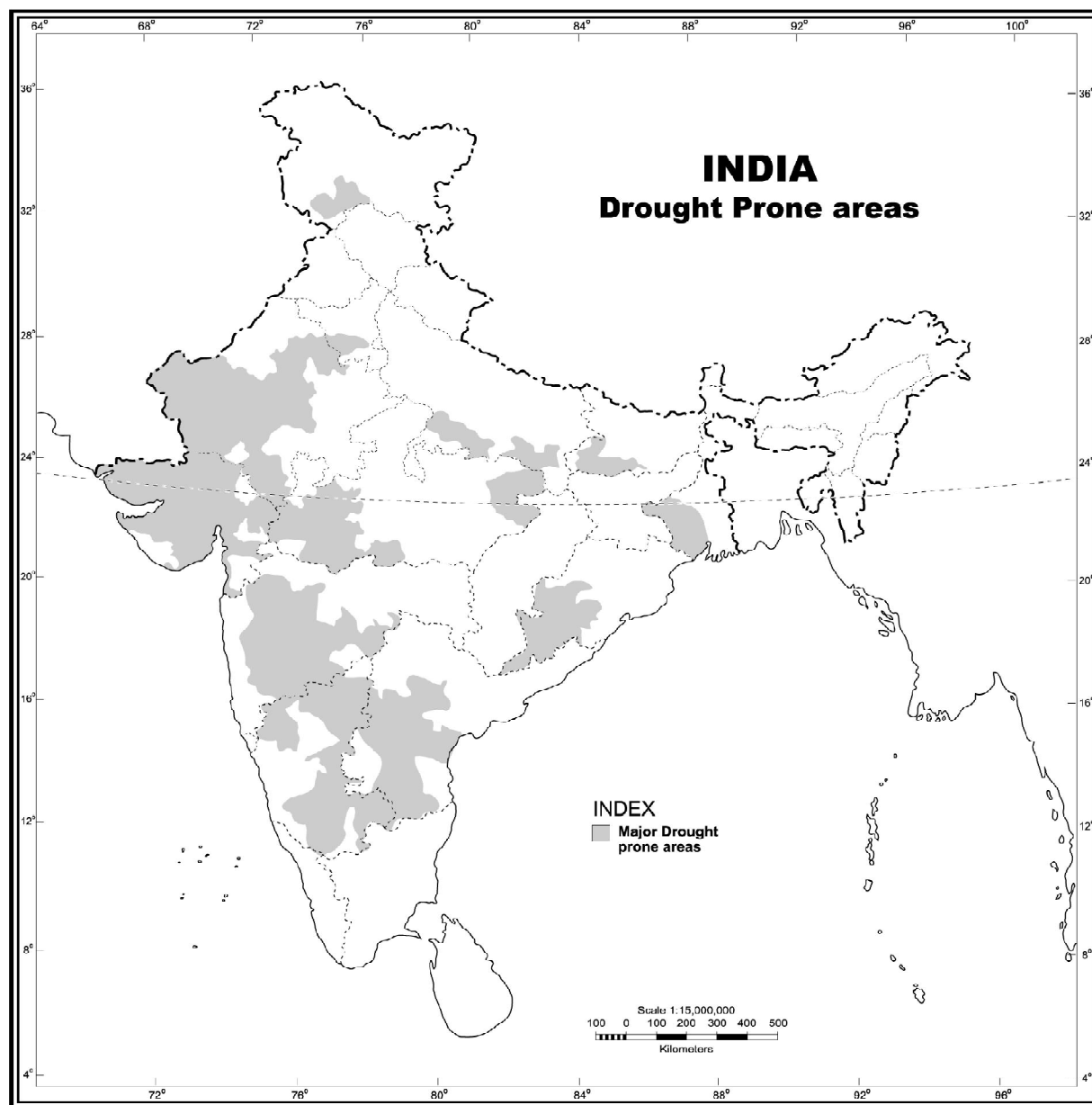


Notes

Drought prone areas of India

Study the map carefully given below. There is a major reason that lies between South Rajasthan and Tamilnadu. It includes west south Rajasthan and Tamilnadu. It includes areas of west Madhya Pradesh, central Maharashtra, Andhra Pradesh and Karnataka.

Due to deficiency in Monsoon rainfall and environmental degradation, Rajasthan and Gujrat are generally affected by drought. Out of 593 districts in India, 193 districts are severely drought prone. In 2003 most parts of Rajasthan experienced drought for the fourth consecutive year.



Based upon Survey of India Outline Map printed in 1990
The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
The boundary of Meghalaya shown of this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified
Responsibility for correctness of internal details shown on the map rests with the publisher.

© Government of India copyright, 1996

Measures to cope with Drought

- (i) **Suitable farming methods for arid areas :** By adopting the following methods it is possible to mitigate the intensity of drought. The methods are: Production of coarse and hardy cereals; conservation of soil moisture by deep ploughing, storing water behind small dams, collecting water in ponds and tanks and use of sprinklers for irrigation.
- (ii) **Sowing drought resistant crops:** By sowing drought resistant crops of cotton, Moong, pearl millet, wheat etc, the impact of drought could be mitigated to a certain extent.
- (iii) **Rain water harvesting :** Collection of each and every drop of rain could help in coping with the drought.
- (iv) By making high bunds around the fields, adoption of terrace cultivation, planting trees on the bunds of fields, the use of rainwater can be maximised.
- (v) Water can also be conserved by taming the irrigation canals with mortar and bricks.
- (vi) Small quantity of water can irrigate comparatively larger area by using drip irrigation method.

Drought prone area programme

This programme was initiated in 1973. The objectives of the programme are as follows:

- (i) To minimise the adverse impact of drought on crops, domestic animals, productivity of land, water and human resources. This could be done by integrated development by using appropriate technologies as it was done for the natural resources of Gujrat.
- (ii) By developing, conserving and suitably using the rainwater, the ecological balance could be maintained for a longer period.
- (iii) To improve the economic and social conditions of the section of society who do not have access to resources and facilities.

- The rainfall deficiency during a long period over a large area is called a drought.
- States of Rajasthan and Gujrat are comparatively more drought-prone than other states.



INTEXT QUESTIONS 18.3

1. What is a drought?

2. Fill in the blanks with appropriate words out of these given in the brackets.
 - (i) The most drought prone state of India is _____ (Assam, Rajasthan, Chhatisgarh)
 - (ii) In drought prone areas the impact of drought can be minimised by adopting _____ (Flood irrigation, sprinkler irrigation)



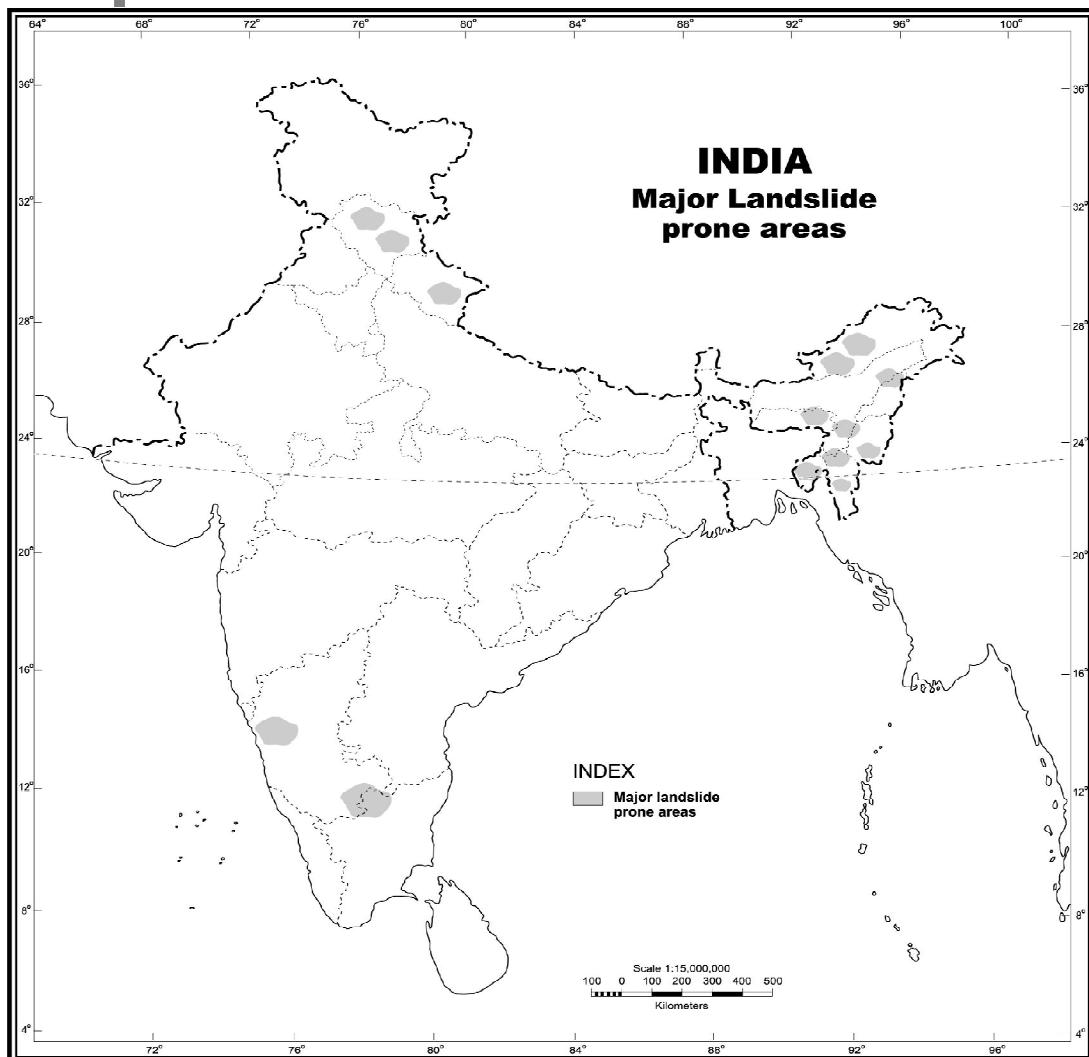
Notes

18.5 LANDSLIDES

A major landslide occurred in the midnight in a place called Lamari on the foot path leading to Kailash Mansarovar about 60 km away from Dharchula, in August 1998. Lamari is situated between Bendi and Malpa. The debris of this landslide slipped into river Kali and blocked its flow. The water of the river spread over an area of 1½ square km. Thus a lake was created in which the water was flowing. Some pilgrims going to Kailash Mansarovar were resting here in this fateful night. This landslide killed 60 pilgrims.

What is a Landslide

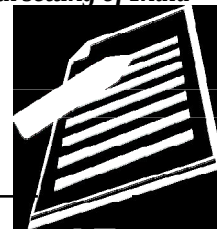
The slipping of masses of rocks, earth or debris downwards on the mountain slopes or banks of the rivers is called a landslide. The occurrence of landslides in mountainous areas is increasing day by day. The impact of landslides on the people in the mountains is clearly visible.



Based upon Survey of India Outline Map printed in 1990
The territorial waters of India extended into the sea to a distance of twelve nautical miles measured from the appropriate base line.
The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified
Responsibility for correctness of internal details shown on the map rests with the publisher.

© Government of India copyright, 1996

Fig. 18.3 India : Major landslide prone areas



Landslide prone areas : The landslides are a common feature in Himalaya, Western ghats and in river valleys. The state of Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and all the seven states of North East India, are most vulnerable to landslide. In southern India Maharashtra, Karnataka, Tamil Nadu and Kerala bear the brunt of landslides.

Causes of landslides

1. **Heavy rain :** Heavy rain is the main cause of landslides.
2. **Deforestation :** Deforestation is another major cause of landslides. Tree, brushes and grasses keep the soil particles compact. Mountain slope loses their protective cover by felling of trees. The rain water flows on such slopes with unimpeded speed.
3. **Earthquakes and volcanic explosions :** Earthquake is a common feature in the Himalaya. Tremors destabilize the mountains and the rocks tumble downwards. Volcanic explosions also trigger landslides in the mountainous areas.
4. **Building of roads:** Roads are built in mountainous areas for development. During the process of the construction of road, a large amount of rocks and debris has to be removed. This process dislodges the rock structure and changes the angle of slopes. Consequently landslides are triggered.
5. **Shifting agriculture :** In the North Eastern part of India, the number and frequency of landslides has increased due to the practice of shifting agriculture.
6. **Construction of houses and other buildings :** For giving shelter to the ever-increasing population and promotion of tourism more and more houses and hotels are being built. In building processes large amount of debris is created. This causes the landslides.

Impact of landslide

- (i) **Degrading of environment :** Landslides are degrading the environment of mountains. Natural beauty is diminishing slowly and slowly.
- (ii) Sources of water are drying up.
- (iii) Flooding in rivers is increasing.
- (iv) Roads are blocked.
- (v) Life and property are lost

Measures to control landslides and to mitigate their impact

- (i) **Afforestation :** Trees and brushes help in binding the soil particles.
- (ii) **New technology in road construction :** Roads should be constructed in such a way, that lesser amount of debris is generated.
- (iii) Ban on quarrying of stones and mining of minerals



Notes

- (iv) Instead of exploitation of forests, they should be used scientifically.
- (v) Permanent crops like orchards of fruits should replace the seasonal or annual crops.
- (vi) By controlling the surface flow of water, seepage of water should be minimised.
- (vii) Retaining walls can be built on mountain slopes to stop land from slipping.
- (viii) Hazard mapping should be done to locate areas commonly prone to landslides. Building and construction activities may be banned in such areas.

- The slipping of masses of rocks, earth or debris downwards on the mountain slopes or banks of rivers is called a landslide.
- During rainy season landslides are a common feature in Himalaya, Western Ghat and deep river valleys.



INTEXT QUESTIONS 18.4

1. Name any two causes of landslide.
 - (i) _____
 - (ii) _____
2. Name two most landslide prone areas.
 - (i) _____
 - (ii) _____
3. Choose the correct answers given in the brackets.
 - (i) Which state of South India is landslide prone? (Andhra Pradesh, Tamil Nadu)
 - (ii) Which measure is adopted to control landslide (Levelling of slope, construction of strong wall on the slope).

18.6 EARTHQUAKE

In simple words sudden shaking or trembling of the earth's surface is an earthquake. Most earthquakes are a minor tremor. Larger earthquakes usually begin with slight tremors but suddenly they turn into violent shocks and after that the intensity of shocks diminishes. Tremors or shocks are felt for a few seconds only.

Earthquake is a hazard that strikes suddenly. A Hindi poet described the earthquake in these words. "Earthquake strikes without pre-information but the breathing stops without informing the man."

Earthquake can occur at any time of the year, day or night. Its impact is very sudden. There are no warning signs of earthquakes. Extensive and sincere research has been conducted but success has eluded humans in the forecast or prediction of earthquake.

High risk earthquake prone areas: Bureau of Indian Standard has prepared a

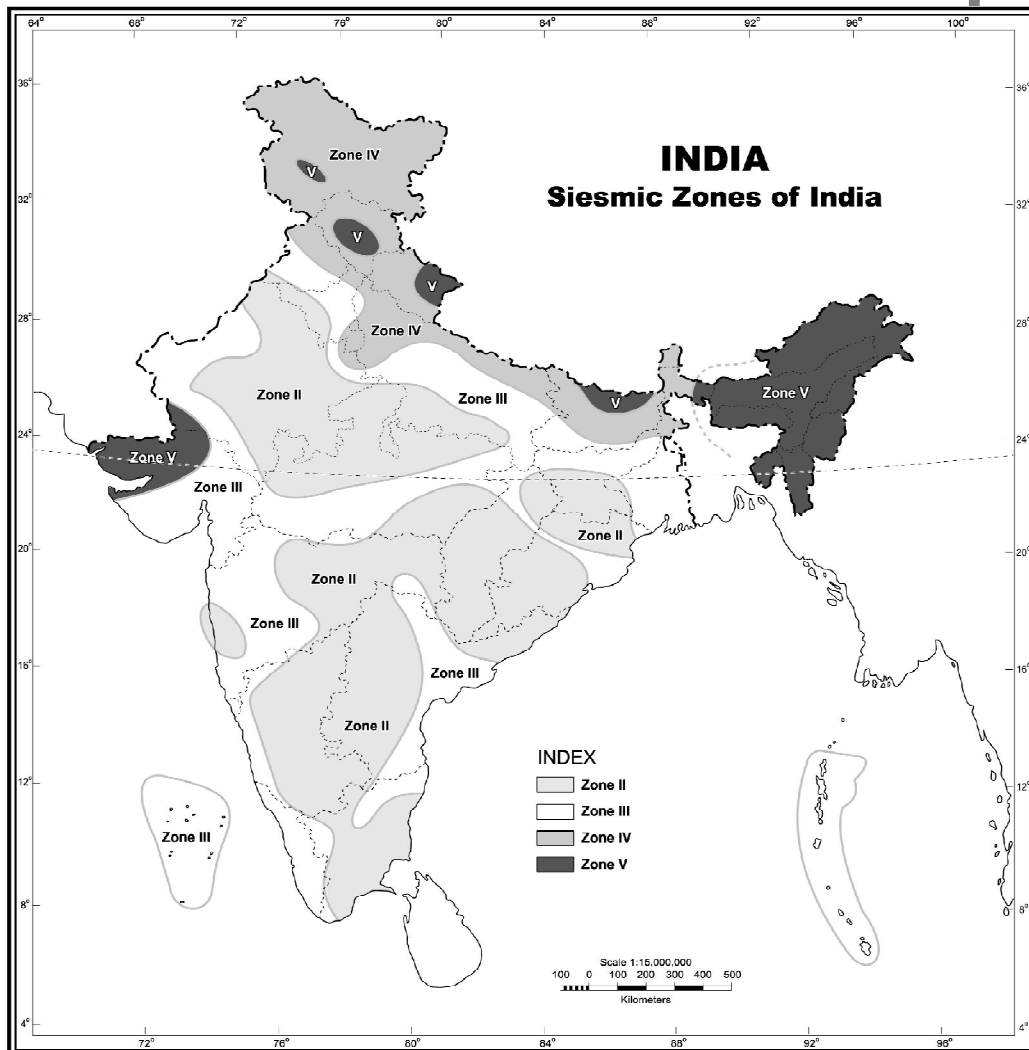
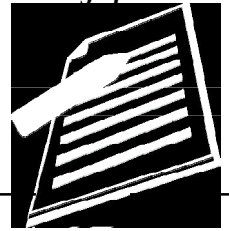
map of India, showing earthquake seismic zones of different intensity. Its revised edition has been published in 2002. India has been divided into four zones. The intensity of each zone, result and losses caused by earthquake are described below:

Zone II - The earthquake is felt by all, some people run outdoor. Heavy furniture may possibly move a little small pieces of plaster fall. Cracks in chimneys.

Zone III - Everyone runs out of doors, slight damage is there even in better designed and strongly built building. More breakage in ordinary bridges houses etc. Considerable damage to poorly designed and sub-standard buildings bridges etc.

Zone IV - Slight damage in specially designed and well built building bridges etc. Heavy damage to poorly designed and badly built structures. Chimneys, poles, memorials, walls etc. fall down.

Zone V - Severe damage to even well built bridges, buildings, foundations are displaced. Cracks and fissures develop in the ground. Practically all structures fall or small are greatly damaged or destroyed.



Based upon Survey of India Outline Map printed in 1990.
The territorial waters of India extended into the sea to a distance of twelve nautical miles measured from the appropriate base line.
The boundary of Meghalaya shown of this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified.
Responsibility for correctness of internal details shown on the map rests with the publisher.

© Government of India copyright, 1996



Delhi and Mumbai are situated in high risk zone no. IV. The whole of North East India, Kachchh, Gujarat, Uttarakhand, Himachal Pradesh and Jammu & Kashmir are in the very high risk zone no. V. Now peninsular plateau is not safe from earthquakes. Earthquake of Latur (1993, intensity on Richter scale 6.4) and Koyana (1967 intensity 6.5) in Maharashtra testify it.

Impact of Earthquake

- (i) **Damage of property :** when earthquake occurs, all buildings from cottage to palaces and stronger skyscrapers are greatly damaged or totally destroyed. Underground pipelines and railway lines are damaged or broken. Dams on river collapse, resultant floods cause havoc. The earthquake in 1967 in Koyana damaged the Dam.
- (ii) **Human loss -** Duration of tremors of earthquake is normally of only few seconds, but thousands of people may die in this short period. Five severely devastating earthquakes have occurred in India between 1988 and January 26, 2001. Nearly 31000 people lost their lives prematurely. Bihar earthquake of 1934 and Kangra earthquake of 1905, 10,000 and 20,000 people died respectively. Numerous people lost their shelter and many became orphans. The earthquake that occurred in Gujarat on 26 January, 2001 was devastating and disastrous. More than 25,000 people died due to the impact of this earthquake. The destruction of property was tremendous and could not be estimated properly and exactly.
- (iii) **Changes in river courses:** Sometimes river channels are blocked or their courses are changed due to the impact of earthquake.
- (iv) **Tsunamis :** are caused by earthquake. This is a Japanese word, meaning extremely high sea wave. It wreaks havoc on settlement of coastal areas. It sinks large ships. Tsunami that occurred on 26-12-2004 near coast of Sumatra (Indonesia) property worth billions of rupee. More than two lakh people lost their lives in Southeast Asia, India and Sri Lanka.
- (v) **Fountains of mud :** Due to the intense impact of earthquake hotwater and mud appear on the surface and take a form of fountains. In Bihar earthquake of 1934 some cracks and fissures had developed. The fields of farmer were covered by knee-deep mud and the crops were destroyed.
- (vi) **Cracks and fissures :** Sometimes cracks and fissures develop in roads railway tracks, and fields, making them useless. Well known San Andreas fault formed during the earthquake of San Francisco (California).
- (vii) Landslides and avalanches are triggered

Some Do's and Don't during and after the earthquake:

Inside the house

- Don't run outside, set your family into-doorways, under table or if they are bedridden, more them under the beds; keep away from windows and chimneys.

Outside the house

- Don't go near the buildings, high walls, or electric wires.

While driving

If an earthquake occurs stop driving and keep sitting in the vehicle.

To be done immediately

- (i) Put off domestic fire, and all electrical switches.
- (ii) Leave the house if possible and go to open space.
- (iii) Leave the house if a gas leak is detected after the gas is turned off.
- (iv) Save water
- (v) Untie and free pets and domestic animals (dogs, cats and cattles)

- Sudden shaking or trembling of the earth surface is an earthquake.
- The whole North East India, Kachchh area of Gujarat, Himachal Pradesh, Uttaranchal and Jammu and Kashmir are in the very high risk zone No. 5.



INTEXT QUESTION 18.5

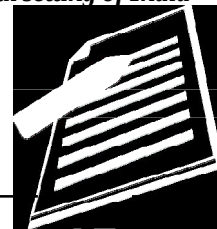
1. In which state did the earthquake occur on the occasion of Republic Day of 2001?

2. What names is given to the high sea-wave triggered by earthquake?

3. In which earthquake zone Delhi has been included on the basis of the intensity of the earthquakes?

18.7 CYCLONES

Cyclones are centers of low atmospheric pressure, in which the air pressure in-



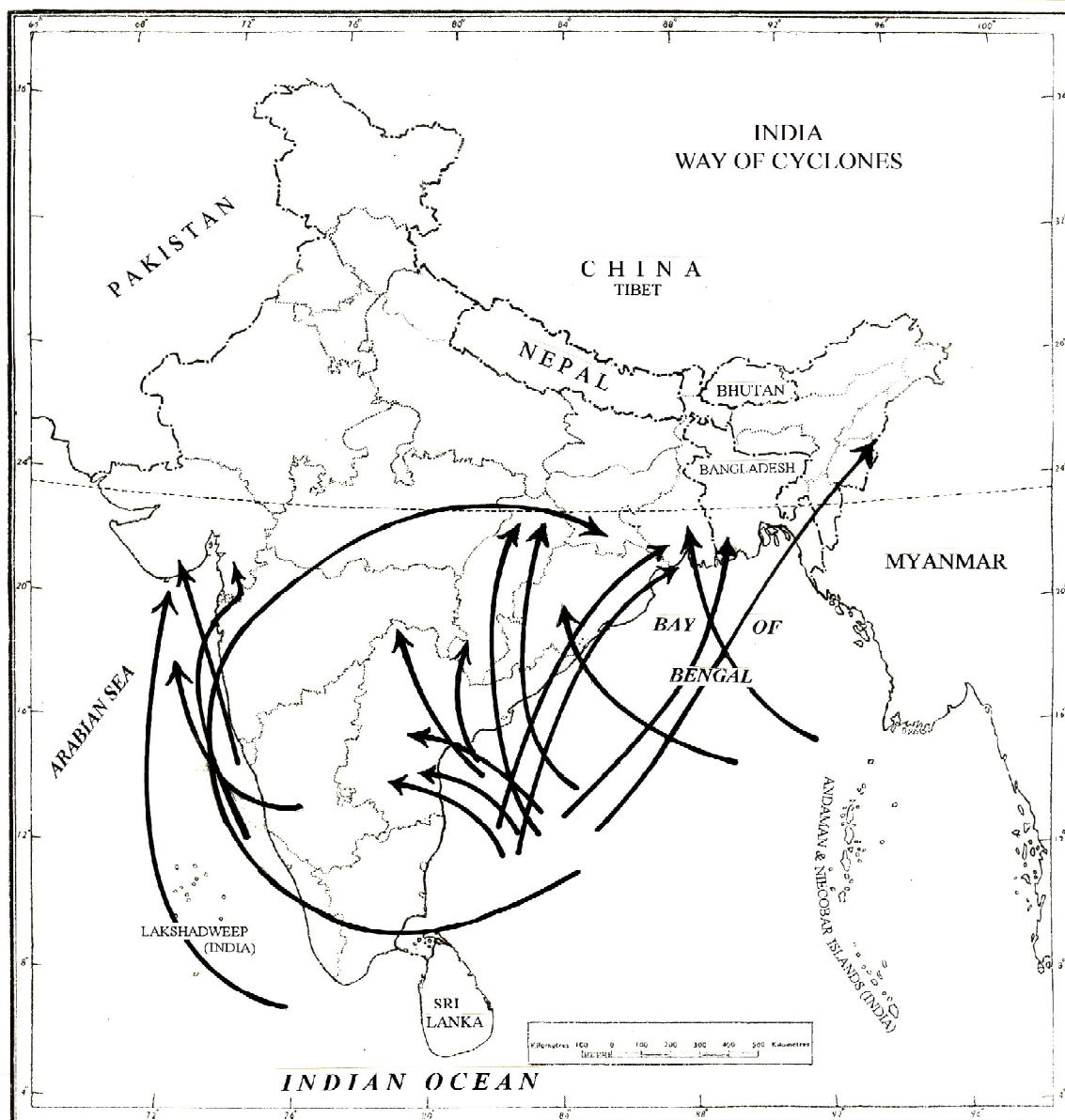
The Physical setting of India



Notes

creases from the centre to the outer areas. Consequently winds flow from outside to the centres. In cyclones winds blow in an anticlock-wise direction in the northern hemisphere and in clock-wise in the southern hemisphere.

On the basis of their location and physical properties cyclones are of two types; temperate cyclones and tropical cyclones. Here a description of only tropical cyclone is given. The use of word 'cyclone' is implied for tropical cyclone here onwards.



Based upon Survey of India Outline Map printed in 1996.

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 19/71, but has yet to be verified.

Responsibility for correctness of internal details shown on the map rests with the publisher.

© Government of India copyright, 1996.

Fig. 18.5 Way of Cyclones

Cyclone is a violent circular stormy, in which high velocity winds blow from outside to the centre and are associated with torrential rain. Cyclones play an important role in the general circulation of the atmosphere. A fully developed cyclone can transfer 3.5 billion tons of warm humid air within an hour.

When do cyclones occur?

Cyclone is a phenomenon. It is concentrated to certain seasonal cyclic segment. In India, most of the cyclones occur in the post monsoon season, i.e. from October to December or in pre-monsoon season from April to May. The life span of a cyclone is generally from 7 to 14 days.

The Movement of Cyclones

The cyclone, with its whole system, moves forward from east to west (in Bay of Bengal) with a speed of 15 to 30 km per hour. The cyclone that struck Orissa, originated near Andaman & Nicobar Islands and reached Orissa on 29-10-1999 after many days. The movement of cyclone in a direction is like the movement of a spinning top. Cyclones originate over the sea surface and dissipate as they reach land.

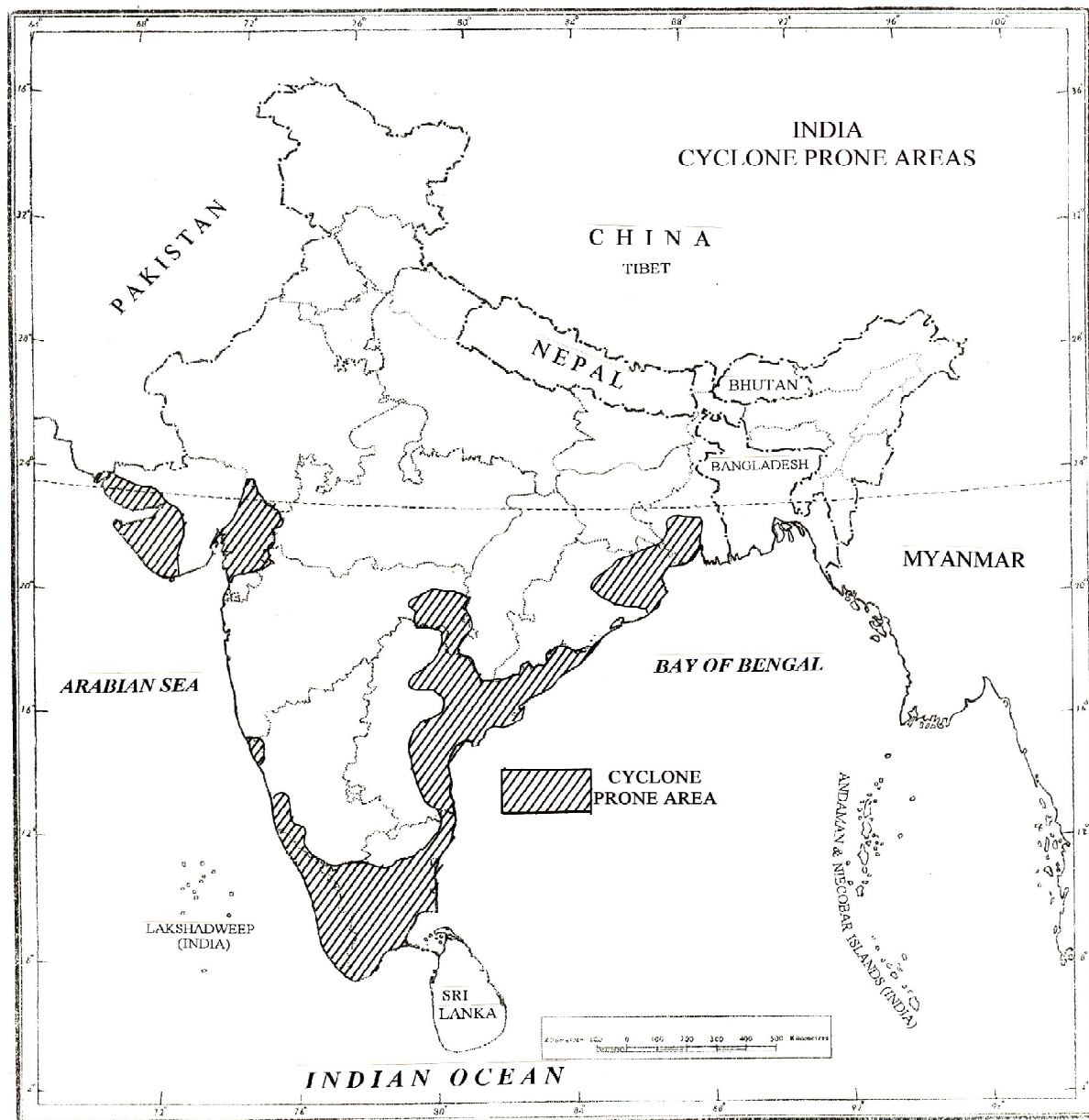
Where do the cyclones strike in India

The eastern coast of India is the most cyclone affected region. The cyclone prone states are; West Bengal, Orissa, Andhra Pradesh and Tamil Nadu. Western coast is affected by the cyclones which originate in the Arabian Sea. Gujarat on the west coast, is most affected by cyclones. The coastal areas and interior of Maharashtra are affected by cyclones too. More cyclones originate in the Bay of Bengal and the Arabian Sea than any other seas of the world.

Devastation by cyclones

The violent winds of a cyclone destroy whatever come in their way from; thatched cottage to the palaces, forts built of concrete, iron and stones. Trees are uprooted. Lines of electricity and communication are destroyed. Torrential rains cause floods. Floods wreak havoc all around. High sea waves are generated in the sea by speedy cyclonic winds. They strike the coastal areas like high wall of water and flood the areas upto 10-15 km from the coast. In these areas houses, crops, roads, buildings, villages and cities one and all are submerged. Landslides triggered by cyclonic rains are more devastating.

Developed countries have evolved measures to mitigate the fury of cyclones. The warning of cyclone is issued. They are broadcasted and telecasted at right time. This saves the life of people. On the contrary the people in developing countries get premature deaths. In USA, a fierce hurricane named Hugo struck in September 1989. Only 21 people lost their lives due to its impact, because a timely warning was issued, but contrary to this 1,39,000 people lost their lives in Bangladesh when a cyclone struck the country in 1991.



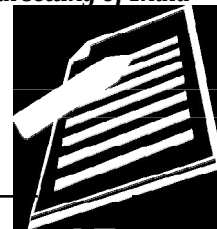
Based upon Survey of India Outline Map printed in 1996.
 The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
 The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified.
 Responsibility for correctness of internal details shown on the map rests with the publisher.

© Government of India copyright, 1996.

Fig. 18.6 INDIA: Cyclone prone areas

Some do's and don'ts before, during and after the cyclone

- Listen to the radio for advance information and advice
- Keep considerable margin of time for safety.
- A cyclone may change direction, speed, or intensity within a few hours, so stay tuned to the radio for updated information.



If high velocity winds or severe gales are forecasted for your area:

- Store or secure loose boards, corrugated iron sheets, old tin boxes, anything else that could become dangerous.
- Close the windows tightly to prevent them from breakage.
- Move to the safe shelter built for this purpose, or leave the area on the advice of some authoritative government agency.

When the storm strikes.

- Stay in the house and take shelter in the stronger portion of your house.
- Listen to the radio and follow instructions.
- Open windows of the safe portion of the house if the roof begins to lift.
- Find shelter if you are in open at the hitting time of the cyclone.
- Do not go out of your house or to a beach during or lay down along an elevated footpath in open field the storm. Cyclone often generates large surges in these oceans or lakes.

- Cyclone is violent circular storm. In its centre the air pressure is extremely low. High velocity winds flow towards the centre.
- Most cyclone prone states of India are: West Bengal, Orissa, Andhra Pradesh and Tamil Nadu.



INTEXT QUESTIONS 18.6

1. Which are the most cyclone prone months?

2. Which state was hit by the seriously devastating cyclone on 29th of October, 1999?

3. Which state is most valuable to cyclone on the western coast of India?



WHAT YOU HAVE LEARNT

Among the top ten disaster prone countries, India stands second after China. More than 6% of the total population bear the brunt of natural disasters. Natural hazard, which devastates life and property, are called disasters. More than 20%



of the deaths caused by floods in the world, occur in India. Floods are caused by heavy rain, deposition of sediment and tsunami. 65% of cultivated area of India is rain fed. This is the area where droughts are common. Degradation of environment caused by human activities is also responsible for drought. By adopting some measures, the impact of drought could be mitigated. 191 districts, out of the 593 (2001) districts of India, are vulnerable to drought. Landslides cause heavy damage on mountainous slopes in rainy season. Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and all the seven states of North East India are landslide prone. Landslides are caused by deforestation, earthquakes, construction of roads and buildings, and shifting agriculture. A very severe earthquake occurred on 26 January, 2001 in Gujarat. Earthquakes not only destroy life and property, but also changes the courses of rivers. Tsunami, mud fountains, cracks and fissures are also caused by severely devastating earthquakes. The quake prone areas are North East India, Gujarat, Uttarakhand, Himachal Pradesh and Jammu and Kashmir. Cyclones originate in the Bay of Bengal and affects the states of eastern coasts. Cyclones that originate in the Arabian Sea have a devastating impact over Maharashtra and Gujarat coast. If some precise precautions are taken, the impact of cyclones could be minimised.

**TERMINAL QUESTIONS**

1. Differentiate between natural hazard and natural disaster.
2. What is a flood ? Explain the causes of flood and its destruction.
3. Describe the drought prone areas of India.
4. What is a landslide? What activities of human being have increased the frequency of landslides.
5. What is an earthquake? Describe its impact on humans.
6. When do cyclones occur in India? Describe the measures adopted for protection from the cyclones.

**ANSWERS TO INTEXT QUESTIONS****18.1**

1. When physical events pose danger to humans and their property, they are called hazards.

2. Tsunami is large sea waves caused by earthquake below sea water.

It causes heavy destruction to life and property on coastal areas thousands of kilometers away from its place of origin.

18.2

1. Heavy rains, deforestation, cyclones, tsunami (any two).
2. 4 crore hectare.
3. Construction of reservoirs and embankments, tree plantation, restoration of natural drainage system.

18.3

1. The rainfall deficiency during a long period, over a large area is called a drought.
2. Rajasthan.
3. Sprinkler irrigation.

18.4

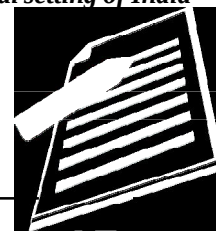
1. Earthquakes, volcanic explosions, heavy rain, deforestation, road construction, shifting agriculture (any two).
2. Himalaya and Western Ghats.
3. (i) Tamil Nadu
(ii) Construction of strong wall on the slope.

18.5

1. Gujarat
2. Tsunami
3. Zone No. IV

18.6

1. October, November, December, April and May
2. Orissa
3. Gujarat.



**Notes****HINTS TO TERMINAL QUESTIONS**

1. Refer to table No. 18.1
2. Refer to 18.3
3. Refer to 18.4
4. Refer to 18.5
5. Refer to 18.6
6. Refer to 18.7