India Physical Environment
Chapter-23 Narural Hazards and Disasters

Causes, Consequences and Management
This unit deals with

- Floods and droughts
- Earthquakes and tsunami
- Cyclones
- Landslides

Natural Hazards and Disasters
What is a Disaster?
“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 long time, disasters were considered as consequences of natural forces; and human beings were treated as innocent and helpless victims in front of the mighty forces of nature. However natural forces are not only the causes of disasters, but also they can be caused by human activities.There are some other activities of human begings that accelerate or intensityt disasters indirectly.Landslides and floods due to deforestation.The best way out is to emphasise on natural disaster mitigation and management.

What are the differences between disaster and natural hazard?

1. **Natural hazards** are elements of circumstances in the natural environment that have the potential to cause harm to people or property or both.These may be swift or permanent aspects of the respective environmental setting like currents in the oceans.
2. As compared to natural hazards, **disasters**, which are caused by natural forces or activities of human beings, are relatively sudden and cause large scale, widespread death, loss of property and disturbance to social life.

3. **Natural hazards** may be swift or permanent aspects of the respective environmental settings like currents in the ocean , steep slope and unstable structural features in the Himalayas or extreme climatic conditions in deserts or glaciated areas.

Any event can be classed as **disaster** when the magnitude of destruction and damage caused by it is very high. Every disaster is unique in terms of the local socio-economic factors that control it, the social response it generates and the way each social group negotiates with it.

Important things to remember about Disaster:

1. Firstly, the magnitude, intensity, frequency and damages caused by natural disasters have Increased over the years.
2. Secondly, 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. Finally, significant changes have taken place in the pattern of natural disasters over the years.

Modern changes in perception of natural disasters and hazards:

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 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.

Yokohama Strategy and Plan of Action for a Safer World:

Human interventions in the disaster prone areas are making them vulnerable to disasters. For e.g.., colonisation of flood plains of most of the rivers and development port towns like Mumbai and Chennai along the coast, make them vulnerable to the occurrence of cyclones, hurricanes and tsunamis. These observations can also be corroborated by the data given in table 7.1. Hence, this issue was raised at the U.N. General Assembly in 1989 and it was finally formalised at the World Conference on Disaster Management in May 1994 at Yokohama, Japan. This was subsequently called the Yokohama Strategy 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 23rd- 27th 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 disadvantageous groups the worst, particularly in the developing countries, which are ill-equipped to cope with them.
Hence, the conference adopted the Yokohama strategy as a guide to rest of the decade and beyond, to mitigate the losses due to these disasters.

Table 7.1: Some Natural Disasters Since 1948

Year	Location	Type
1948	The Soviet Union (now Russia)	Earthquake
1949	China	Floods
1954	China	Floods
1965	East Pakistan (now Bangladesh)	Tropical Cyclone
1968	Iran	Earthquakes
1970	Peru	Earthquakes
1970	East Pakistan (now Bangladesh)	Tropical Cyclone
1971	India	Tropical Cyclone
1976	China	Earthquakes
1990	Iran	Earthquakes
2004	Indonesia, Sri Lanka, India, etc.	Tsunamis
2005	Pakistan, India	Earthquake
2011	Japan	Tsunami

Source: United Nations Environmental Programme (UNEP), 1991

The resolution of the World Conference on Natural Disasters Reduction or Yokohama Strategy 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, landlocked 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 mobilisation of non-governmental organisations 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:
    a. human and institutional capacity-building and strengthening;
    b. technology sharing: the collection, the dissemination and utilisation of information; and
    c. mobilisation of resources.

It also declared the decade 1990-2000 as the International Decade for Natural Disaster Reduction (IDNDR).

Types of Disasters
Natural:

- Avalanches and landslides.
- Earthquakes.
- Sinkholes.
- Volcanic eruptions.
- Floods.
- Limnic eruptions.
- Tsunami.
- Blizzards.

Man Made Disasters

- Hurricanes and tropical storms.
- Landslides & debris flow.

- Thunderstorms and lighting.
- Tornadoes.
- Tsunamis.
- Wildfire.
- Winter and ice storms.
- Sinkholes.

Establishment of National Institute of Disaster Management, India, Earth Summit at Rio de Janeiro, Brazil, 1993 and the World Conference on Disaster Management in May 1994 at Yokohama, Japan, etc. are some of the concrete steps towards the mitigation and management of natural disasters initiated at different levels.

Table 7.2: Classification of Natural Disasters

Atmospheric	**Terrestrial**	**Aquatic**	**Biological**
Blizzards Thunderstorm Lightning Tropical Cyclone Drought Hailstorm Frost. Heat Wave or Loo, Cold Waves. Etc.	Earthquakes Volcanic Eruptions Landslides Avalanches Subsidence Soil Erosion	Floods Tidal Waves Ocean Currents Storm Surge Tsunami	Plants and Animals as colonisers (Locusts. Etc. Insects infestation-fungal, bacterial and viral diseases such as bird flu, dengue, etc.

India is one of those countries which has experiences most of the natural disasters mentioned in Table 7.2. Every year it loses thousands of lives and property worth millions of rupees due to these natural calamities.

Natural Disasters and Hazards in India

Reasons for more Disasters in India

1. India is vast and diverse in terms of its physical and socio-cultural attributes.
2. It is largely due to its vast geographical area,
3. Environmental diversities and cultural pluralities that scholars often described it using two meaningful adjectives like the ‘Indian-subcontinent’ and the ‘land of unity in

diversity'.

4. Its vastness in terms of natural attributes combined with its prolonged colonial past, continuing various forms of social discriminations.
5. It has large population which have enhanced its vulnerability to natural disasters.

Earthquakes: Earthquakes are by far the most unpredictable and highly destructive of all the natural disasters.Earthquakes that are of tectonic origin have proved to be the most devastating and their area of influence is also quite large.

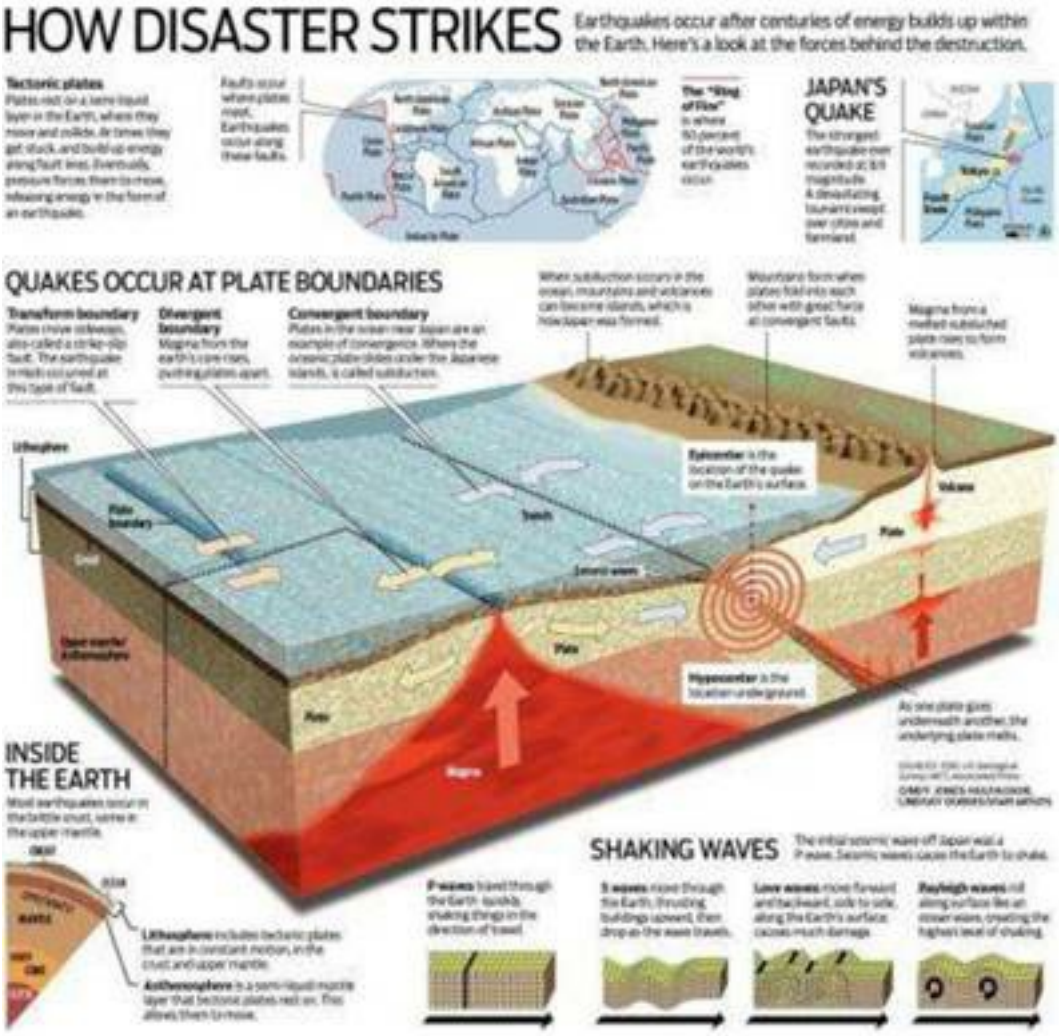
Causes of Earthquake

1. NATURAL

A. tectonic B. volcanic C land slides

2. MAN MADE

1. mining 2. Nuclear explosion 3. Dam induced



These earthquakes result from a series of earth movements brought about by a sudden release of energy during the tectonic activities in the earth's crust. As compared to these, the

earthquakes associated with volcanic eruption, rock fall, landslides, subsidence, particularly in the mining areas, impounding of dams and reservoirs, etc. have limited area of influence and the scale of damage.

Earthquakes in India: National Geophysical Laboratory, Geological Survey of India, Department of Meteorology, Government of India, along with the recently formed National Institute of Disaster Management, have made an intensive analysis of more than 1,200 earthquakes that have occurred in India in different years in the past, and based on these, they divided India into the following five earthquake zones:

(i) Very high damage risk zone
(ii) High damage risk zone
(iii) Moderate damage risk zone
(iv) Very low damage risk zone.

1. Out of these, the first two zones had experienced some of the most devastating earthquakes in India. As shown in the Figure, areas vulnerable to these earthquakes are the North-east states, areas to the north of Darbhanga and Araria along the Indo-Nepal border in Bihar, Uttarakhand, Western Himachal Pradesh (around Dharamshala) and

Kashmir Valley in the Himalayan region and the Kuchchh (Gujarat). These are included in the Very High Damage Risk Zone.

2. Similarly, the remaining parts of Jammu and Kashmir, Himachal Pradesh, Northern parts of Punjab, Eastern parts of Haryana, Delhi, Western Uttar Pradesh, and Northern Bihar fall under the High Damage Risk Zone.
3. Remaining parts of the country fall under moderate to very Low Damage Risk Zone.
4. Most of the areas that can be considered safe are from the stable landmass covered under the Deccan plateau.

Socio-Environmental Consequences of Earthquakes

The idea of an earthquake is often associated with fear and horror due to the scale, magnitude and suddenness at which it spreads disasters on the surface of the earth without discrimination. It becomes a calamity when it strikes the areas of high density of population. It not only damages and destroys the settlements, infrastructure, transport and communication network, industries and other developmental activities but also robs the population of their material and socio-cultural gains that they have preserved over generations. It renders them homeless, which puts an extra-pressure and stress, particularly on the weak economy of the developing countries.

Effects of Earthquakes

Earthquakes have all encompassing disastrous effects on the area of their occurrence. Some of the important ones are listed in Table 7.3.

Table 7.3: Effects of Earthquakes

On Ground	On Manmade Structure	On Water
Fissures Settlements Landslides Liquefaction Earth Pressure Possible Chain-effects	Cracking Slidings Overturing Buckling Collapse Possible Chain-effects	Waves Hydro-Dynamic Pressure Tsunami Possible Chain-effects

Apart from these , earthquakes also have some serious and far-reaching environmental

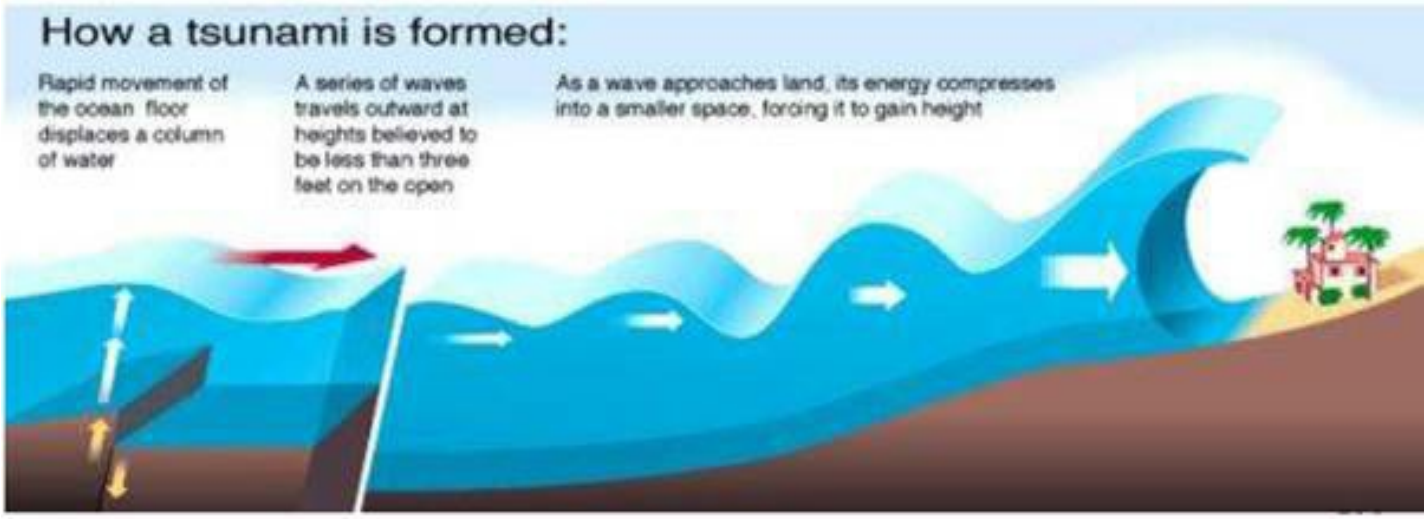
consequences.Earthquakes are also responsible for landslides and often these cause obstructions in the formation of reservoirs.

Earthquake Hazard Mitigation

Methods to decrease the effects of Earthquake

1. Establishing earthquake monitoring centres (seismological centres) for regular monitoring and fast dissemination of information among the people in the vulnerable areas. Use of Geographical Positioning System (GPS) can be of great help in monitoring the movement of tectonic plates.
2. Preparing a vulnerability map of the country and dissemination of vulnerability risk information among the people and educating them about the ways and means minimising the adverse impacts of disasters.
3. Modifying the house types and building designs in the vulnerable areas and discouraging construction of high-rise buildings, large industrial establishments and big urban centres in such areas.
4. Finally, making it mandatory to adopt earthquake-resistant designs and use light materials in major construction activities in the vulnerable areas.

Tsunami: A tsunami is a series of waves caused by an earthquake, underwater volcanic eruption, landslide or other abrupt disturbance. The most common cause of atsunami is an earthquake, which is a sudden shifting of the earth's crust, which releases energy.A tsunami can travel as fast as a jet plane in the deep ocean waters.



How is Tsunami formed?

A tsunami is a series of waves generated in an ocean or other body of water by a disturbance

such as an earthquake, landslide, volcanic eruption, or meteorite impact. ... Undersea earthquakes, which typically occur at boundaries between Earth's tectonic plates, cause the water above to be moved up or down.

Regions affected by Tsunami: Tsunamis are frequently observed along the Pacific ring of fire, particularly along the coast of Alaska, Japan, Philippines, and other islands of Southeast Asia, Indonesia, Malaysia, Myanmar, Sri Lanka, and India etc.

Effects of Tsunami: After reaching the coast, the tsunami waves release enormous energy stored in them and water flows turbulently onto the land destroying port cities and towns, structures, buildings and other settlements. The effect of tsunami is more along the coast because the density of population is high.

Mitigation: It is beyond the capacity of individual state or government to mitigate the damage. Hence, combined efforts at the international levels are the possible ways of dealing with these disasters as has been in the case of the tsunami that occurred on 26th December 2004 in which more than 300,000 people lost their lives. India has volunteered to join the International Tsunami Warning System after the December 2004 tsunami disaster.

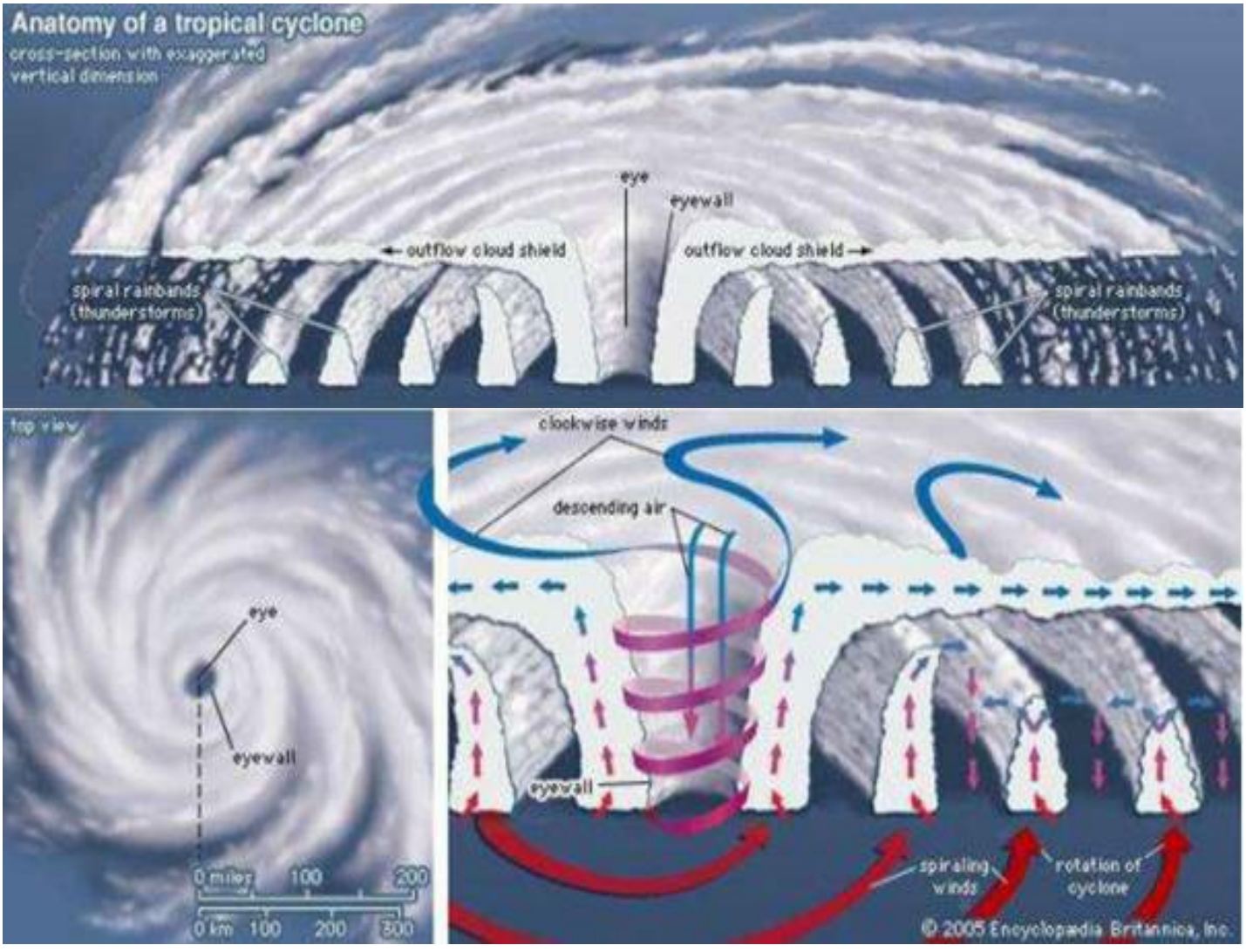
Tropical Cyclone:

Tropical cyclones are intense low- pressure are as confined to the area lying between 30° N and 30° S latitudes, in the atmosphere around which high velocity winds blow. Horizontally, it extends up to 500- 1,000 km and vertically from surface to 12-14 km. A tropical cyclone or hurricane is like a heat engine that is energised by the release of latent heat on account of the condensation of moisture that the wind gathers after moving over the oceans and seas.

Initial conditions for the emergence of a tropical cyclone:

1. Large and continuous supply of warm and moist air that can release enormous latent heat.
2. Strong Coriolis force that can prevent filling of low pressure at the centre (absence of Coriolis force near the equator prohibits the formation of tropical cyclone between 0°-5°latitude).
3. Unstable condition through the troposphere that creates local disturbances around which a cyclone develops.
4. Finally, absence of strong vertical wind wedge, which disturbs the vertical transport of latent heat.

Structure of Tropical Cyclone



Tropical cyclones are characterised by large pressure gradients. The centre of the cyclone is

mostly a warm and low-pressure, cloudless core known as eye of the storm. Generally, the isobars are closely placed to each other showing high-pressure gradients. Normally, it varies between 14- 17mb/100 km, but sometimes it can be as high as 60mb/100km. Expansion of the wind belt is about 10-150 km from the centre.

Spatio-temporal Distribution of Tropical Cyclone in India

The tropical cyclones in India originate in Arabian sea in the west and Bay of Bengal in the east. Though most of the cyclones originate between 10°-15° north latitudes during the monsoon season, yet in case of the Bay of Bengal, cyclones mostly develop during the months of October and November. Here, they originate between 16°-2° N latitudes and to the west of 92° E. By July the place of origin of these storms shifts to around 18° N latitude and west of 90°E near the Sunderban Delta.

Consequences of Tropical Cyclones

1. It was mentioned that the energy to the tropical cyclone comes from the latent heat released by the warm moist air. Hence, with the increase in distance from the sea, the force of the cyclone decreases. In India, the force of the cyclone decreases with increase in distance from the Bay of Bengal and the Arabian Sea. So, the coastal areas are often struck by severe cyclonic storms with an average velocity of 180 km/h.
2. Often, tropical cyclone results in abnormal rise in the sea level known as Storm Surge. A surge is generated due to interaction of air, sea and land. The cyclone provides the driving force in the form of very high horizontal pressure-gradient and very strong surface winds. The sea water flows across the coast along with strong winds and heavy downpour. This results in inundation of human settlements, agricultural fields, damaging crops and destruction of structures created by human beings.

Floods: Floods occur commonly when water in the form of surface run-off exceeds the carrying capacity if the river channels and streams and flows into the neighbouring low-lying flood plains

Causes of Floods

A flood occurs when a river bursts its banks and the water spills onto the floodplain. Flooding tends to be caused by heavy rain: the faster the rainwater reaches the river channel, the more likely it is to flood.

Regions affected by Floods: Floods in the South, Southeast and East Asian countries, particularly in China, India and Bangladesh are frequent and equally disastrous.

Areas of India frequently affected by floods

Rashtriya Barh Ayog (National Flood Commission) identified 40 million hectares of land as flood- prone in India.

1. Assam, West Bengal and Bihar are among the high flood- prone states of India.
2. Most of the rivers in the northern states like Punjab and Uttar Pradesh are also

vulnerable to occasional floods.
3. States like Rajasthan, Gujarat, Haryana and Punjab are also getting inundated in recent decades due to flash floods.
4. Tamil Nadu experiences flooding during November- January due to the retreating monsoon.
5. **Consequence and Control of Floods**

Frequent inundation of agricultural land and human settlement, particularly in Assam, West Bengal, Bihar and Eastern Uttar Pradesh (flooding rivers), coastal areas of Orissa, Andhra Pradesh, Tamil Nadu and Gujarat (cyclone) and Punjab, Rajasthan, Northern Gujarat and Haryana (flash floods) have the following consequences:

1. Floods seriously affect the national economy and society.
2. Floods destroy valuable crops every year.
3. Floods also damage physical infrastructure such as roads, rails, bridges and human settlements.
4. Millions of people are rendered homeless and are also washed down along with their cattle in the floods.
5. Spread of diseases like cholera, gastro-enteritis, hepatitis and other water-borne diseases spread in the flood-affected areas.
6. The only positive consequence of Flooding is deposition of fertile silt over agricultural fields which is good for the crops, every year. Majuli (Assam), the largest riverine island in the world, is the best example of good paddy crops after the annual floods in Brahmaputra.

Methods to Control the Floods

In many countries, rivers prone to floods are often carefully managed. Defences such as levees, bunds, reservoirs, and weirs are used to prevent rivers from bursting their banks. When these defences fail, emergency measures such as sandbags or portable inflatable tubes are used. Coastal flooding has been addressed in Europe and the Americas with coastal defences, such as sea walls, beach nourishment, and barrier islands.

A dike is another method of flood protection. A dike lowers the risk of having floods compared to other methods. It can help prevent damage; however it is better to combine dikes with other flood control methods to reduce the risk of a collapsed dike.

A weir, also known as a lowhead dam, is most often used to create millponds, but on the Humber River in Toronto, a weir was built near Raymore Drive to prevent a recurrence of the flooding caused by Hurricane Hazel in 1954, which destroyed nearly two fifths of the street.

Droughts: The term ‘drought’ is applied to an extended period when there is a shortage of water availability due to inadequate precipitation, excessive rate of evaporation and over-utilisation of water from the reservoirs and other storages, including the ground water. Drought is a complex phenomenon as it involves elements of meteorology like

1. Precipitation
2. Evaporation,
3. Evapotranspiration,
4. Ground water,
5. Soil moisture,
6. Storage of water,
7. Surface run-off,
8. Agricultural practices, particularly the types of crops grown,
9. Socio-economic practices
10. Ecological conditions.

Types of Droughts

- **Meteorological Drought:** It is a situation when there is a prolonged period of inadequate rainfall marked with mal-distribution of the same over time and space.
- **Agricultural Drought:** It is also known as soil moisture drought, characterised by low soil moisture that is necessary to support the crops, thereby resulting in crop failures. Moreover, if an area has more than 30 per cent of its gross cropped area under irrigation, the area is excluded from the drought-prone category.
- **Hydrological Drought:** It results when the availability of water in different storages and reservoirs like aquifers, lakes, reservoirs, etc. falls below what the precipitation can replenish.
- **Ecological Drought:** When the productivity of a natural ecosystem fails due to shortage of water and as a consequence of ecological distress, damages are induced in the ecosystem

Drought Prone Areas in India

Droughts and floods are the two accompanying features of Indian climate.

According to some estimates, nearly 19 per cent of the total geographical area of the country and 12 per cent of its total population suffer due to drought every year. About 30 per cent of the country's total area is identified as drought prone affecting around 50 million people.

It is a common experience that while some parts of the country reel under floods, there are regions that face severe drought during the same period. Moreover, it is also a common sight to witness that one region suffers due to floods in one season and experiences drought in the other. This is mainly because of the large-scale variations and unpredictability in the behaviour of the monsoon in India.

On the basis of severity of droughts, India can be divided into the following regions:

Extreme Drought Affected Area: Most parts of Rajasthan, particularly areas to the west of the Aravali hills, i.e.. Marusthali and Kachchh regions of Gujarat fall in this category. Included here are also the districts like Jaisalmer and Barmer from the Indian desert that receive less that 90 mm average annual rainfall.

Severe Drought Prone Area: Parts of eastern Rajasthan, most parts of Madhya Pradesh, eastern parts of Maharashtra, interior parts of Andhra Pradesh and Karnataka Plateau, northern parts of interior Tamil Nadu and southern parts of Jharkhand and interior Orissa are included in this category.

Moderate Drought Affected Area: Northern parts of Rajasthan, Haryana, southern districts of Uttar Pradesh, the remaining parts of Gujarat, Maharashtra except Konkan, Jharkhand and Coimbatore plateau of Tamil Nadu and interior Karnataka are included in this category. The remaining parts of India can be considered either free or less prone to the drought.

Consequences of Drought:
Droughts have both immediate as well as long term disastrous consequences on the social and physical environments.

1. Crop failure leading to scarcity of food grains (akal) and fodder (trinkal),
2. inadequate rainfall, resulting in shortage of water (jalkal), and often shortage in all the three, i.e. food grains, fodder and water (trikal) is most devastating.
3. Large-scale death of cattle and other animals.
4. Migration of humans and livestock are the most common sight to be seen in the drought affected areas.
5. Scarcity of water compels people to consume contaminated water resulting in spread of many waterborne diseases like gastro-enteritis, cholera, hepatitis, etc.

Mitigation

1. Provision for the distribution of safe drinking water,
2. Medicines for the victims,
3. Availability of fodder and water for the cattle
4. Shifting of the people and their livestock to safer places,
5. Identification of ground water potential in the form of aquifers,
6. Transfer of river water from the surplus to the deficit areas,
7. Planning for inter-linking of rivers
8. Construction of reservoirs and dams,
9. Remote sensing and satellite imageries can be useful in identifying the possible river-basins that can be inter-linked and in identifying the ground water potential.

10. Dissemination of knowledge about drought-resistant crops and proper training to practice the same can be some of the long-term measures that will be helpful in drought-mitigation.
11. Rainwater harvesting can also be an effective method in minimising the effects of drought.

Landslides:

1. landslides are largely controlled by highly localised factors. Hence, gathering information and monitoring the possibilities of landslide is not only difficult but also immensely cost-intensive.
2. It is always difficult to define in a precise statement and generalise the occurrence and behaviour of a landslide.

Controlling Factors :

1. Geology
2. Geomorphic agents
3. Slope,
4. Land-use
5. Vegetation cover and
6. Human activities

Landslide Vulnerability Zones of India:

India has been divided into a number of zones.

1. **Very High Vulnerability Zone:** Highly unstable, relatively young mountainous areas in the Himalayas and Andaman and Nicobar, high rainfall regions with steep slopes in the Western Ghats and Nilgiris, the north-eastern regions, along with areas that experience frequent ground-shaking due to earthquakes, etc. and areas of intense human activities, particularly those related to construction of roads, dams, etc. are included in this zone.
2. **High Vulnerability Zone:** Areas that have almost similar conditions to those included in the very high vulnerability zone are also included in this category. The only difference between these two is the combination, intensity and frequency of the controlling factors. All the Himalayan states and the states from the north-eastern regions except the plains of Assam are included in the high vulnerability zones.

3. **Moderate to Low Vulnerability Zone:** Areas that receive less precipitation such as Trans Himalayan areas of Ladakh and Spiti (Himachal Pradesh), undulated yet stable relief and low precipitation areas in the Aravali, rain shadow areas in the Western and Eastern Ghats and Deccan plateau also experience occasional landslides. Landslides due to mining and subsidence are most common in states like Jharkhand, Orissa, Chhattisgarh, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Goa and Kerala.
4. **Other Areas:** The remaining parts of India, particularly states like Rajasthan, Haryana, Uttar Pradesh, Bihar, West Bengal (except district Darjiling), Assam (except district Karbi Anglong) and Coastal regions of the southern States are safe as far as landslides are concerned.

Consequences of Landslides

1. Roadblock,
2. Destruction of railway lines,
3. Channel-blocking due to rock-falls have far-reaching consequences,
4. Diversion of river courses due to landslides can also lead to flood,
5. Loss of life and property,
6. Difficult spatial interaction which adversely affects the developmental activities in these areas.

Mitigation

1. Restriction on the construction and other developmental activities such as roads and dams,
2. Limiting agriculture to valleys and areas with moderate slopes,
3. Control on the development of large settlements in the high vulnerability zones,
4. Promoting large-scale afforestation programmes
5. Construction of bunds to reduce the flow of water.
6. Terrace farming should be encouraged in the northeastern hill states where Jhumming (Slash and Burn/Shifting Cultivation) is still prevalent.

Disaster Management

Disaster Management refers to how we can protect or preserve many lives and property. India has been traditionally vulnerable to the natural disasters on the account of its unique

geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides would have been a recurrent phenomena.The steps that can help in minimising the damages of cyclones are-

- Construction of cyclone shelters, embankments, dykes, reservoirs,
- Afforestation to reduce the speed of the winds,
- implementation of The Disaster Management Bill, 2005.

Conclusion

Mitigation and Preparedness

There are three stages involved in disaster mitigation and management:

(i) Pre-disaster management involves

1. generating data and information about the disasters,
2. preparing vulnerability zoning maps,
3. spreading awareness among the people about the disasters,
4. disaster planning,
5. preparedness and preventive measures are other steps that need to be taken in the vulnerable areas.

(ii) During disasters, Rescue and relief operations such as evacuation, construction of shelters, relief camps, supplying of water, food, clothing and medical aids etc. should be done on an emergency basis.

(iii) Post-disaster operations should involve

- rehabilitation
- recovery of victims.
- concentrate on capacity building in order to cope up with future disasters.

These measures have special significance to a country like India. Introduction of the Disaster Management Bill, 2005 and establishment of National Institute of Disaster Management are some examples of positive steps taken by Government of India.