



Sri
SAI RAM
ENGINEERING COLLEGE
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SAIRAM
DIGITAL RESOURCES

YEAR
II

SEM
IV

GE8291

ENVIRONMENTAL SCIENCE AND ENGINEERING

UNIT NO 2

ENVIRONMENTAL POLLUTION

2.5 DISASTER MANAGEMENT:

Floods, Earthquake, Cyclone
and Landslides.

Field study of local polluted site
– urban / rural / industrial /
agricultural.

SCIENCE & HUMANITIES



DISASTER MANAGEMENT:

Hazard: Hazard is a perceived natural event which threatens both life and property.

Disaster (Calamities): A disaster (or) calamities is the realization of this hazard.

Examples: Earthquakes, Avalanches, Floods, Cyclones, Droughts, Volcanoes are the different types of disasters.

Definition for Disasters (Calamities)

Disaster (or) Calamities is a geological process and it is defined as an event, concentrated in time and space, in which a society, or sub-division of a society undergoes severe danger and cause loss of its members and physical property.

Types of disaster (calamities):

Based on the origin, disaster is divided into 2 types:

- ❖ Natural Disasters.
- ❖ Man-made Disasters.

1) Natural Disasters (Calamities):

It refers to those disasters that are generated by natural phenomena.

Examples: Cyclones, Floods, Earthquakes, Landslides, etc.

2) Man-Made Disasters (Calamities):

It usually refers to the disasters resulting from man-made hazards.

Examples: Accidents, Pollution, Fire, etc.

IMPORTANT DISASTERS (CALAMITIES) AND THEIR FREQUENT OCCURRENCE REGIONS OF INDIA

Type	Location/Area	Affected population in million
Floods	8 major river valleys spread over 40 million hectares of area in the entire country.	260
Droughts	Spread in 14 states of Andhra Pradesh, Bihar, Gujarat, Haryana, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Goa, Karnataka, Kerala, Tamil nadu, Andhra Pradesh, Orissa and West Bengal and Union territory of Pondicherry besides Islands of Lakshadweep and Andaman and Nicobar	86

IMPORTANT DISASTERS (CALAMITIES) AND THEIR FREQUENT OCCURRENCE REGIONS OF INDIA

Type	Location/Area	Affected population in million
Earthquake	Nearly 55% of the total area of the country falling in the seismic zone IV and V.	400
Cyclones	Entire 5700 km long coastline of Southern, Peninsular India covering 9 states viz. Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil nadu, Andhra Pradesh, Orissa and West Bengal and Union Territory of Pondicherry besides Islands of Lakshadweep and Andaman and Nicobar.	10
Landslide	Entire sub-Himalayan region and Western Ghats.	10

FLOOD

DEFINITION:

Whenever the magnitude of water flow exceeds the carrying capacity of the channel within the banks, the excess of water overflows on the surrounding cause floods.

CAUSES OF FLOODS:

- 1) Heavy rain, rainfall during cyclones cause floods.
- 2) Sudden snow melt also raises the quantity of water in streams and causes flood.
- 3) Reduction in the carrying capacity of the channels, due to accumulation of sediments causes flood.
- 4) Sudden and excess release of impounded water behind dams.
- 5) Human activities like construction of roads, buildings and parking space, that covers the earth's surface, prevents infiltration of water into soil and speeds up the run off.
- 6) Clearing of forests for agriculture has also increased severity of floods.

EFFECTS OF FLOODS:

- 1) Floods cause heavy suffering to people living in low lying areas because the houses and properties are washed away.
- 2) Floods damage standing crops and livestock.
- 3) Floods cause a great economic loss and health related problems due to widespread contamination.



FLOOD MANAGEMENT (PREVENTIVE MEASURES):

Flood management involves the following activities:

- 1) Encroachment of flood ways should be banned.
- 2) Buildings walls prevent spilling out the flood water over flood plains.
- 3) Diverting excess water through channels or canals to areas like lake, rivers, etc., where water is not sufficient.

- 4) Build check-dams on small streams, move building off the flood plains.
- 5) Restore wetlands, replace ground cover on water-course.
- 6) Instead of raising buildings on flood plain, it can be used for wildlife habitat, parks, recreational areas, which are not susceptible to flood damage.
- 7) River-networking in the country also reduce food.
- 8) Satellite pictures of pre-flood, flood and post flood with other information contribute to the flood management process.
- 9) Optical and microwave data from IRS is also used for flood management process.
- 10) Flood forecasts and flood warning are also given by the central water commission.
- 11) Reduction of runoff by increasing infiltration through appropriate afforestation

INDIA SCENARIO – FLOODS:

Next to Bangladesh, India is the most flood-affected country in the world. Nearly 40 million hectares are affected by annual floods in India. 20% of which present only in UP. Next to UP, Odisha, Andhra Pradesh, Bihar, Tamil nadu, West Bengal, Assam are also flood-prone areas.

CASE STUDIES:**Flood in Bangladesh – 1974**

Every year, in Bangladesh, large areas are submerged during the monsoon season. In 1974, flooding extended nearly one-half of the country and stagnated for more than one month.

Nearly 1500 people died in the floods and 2,80,000 people died from subsequent disease and starvation. Approximately 4,50,000 houses were destroyed and a total of 35 million people have lost their belongings due to floods.



EARTHQUAKE:

DEFINITION:

An Earthquake is a sudden vibration caused on the earth's surface due to the sudden release of tremendous amount of energy stored in the rocks under the earth's crust.

OCCURRENCE:

The earth's crust has several tectonic plates of solid rock. These plates move slowly along their boundaries. When friction prevents these plates from slipping, stress develops and results in sudden fractures along the fault lines within the plates. This causes earthquakes and the violent vibrations in the Earth.

CAUSE OF EARTHQUAKES:

- 1) Earthquakes are caused due to disequilibrium in any part of the earth crust. This disequilibrium is caused by volcanic eruptions, hydrostatic pressure of man-made water bodies like reservoirs, dams, and lakes, which in turn causes movements of plates.

- 2) Underground nuclear testing.
- 3) Decrease of underground water level.

SEVERITY OF AN EARTHQUAKE:

The severity of an earthquake is generally measured by its magnitude on Richter Scale as shown in the table.

Richter Scale	Severity of Earthquake
Less than 4	Insignificant
4-4.9	Minor
5-5.9	Damaging
6-6.9	Destructive
7-7.9	Major
More than 8	Great

EFFECTS OF EARTHQUAKE:

1. The shocks produced by earthquakes in hilly and mountainous area may cause landslides, which damage the settlements and transport systems.
2. It also collapses houses and other structures due to poor construction and the people die in thousands depending on the severity of the quake.
3. Severe earthquake results in deformation of ground surface.
4. Tsunami, the seismic waves caused by earthquakes travel through sea water and generates high sea waves called tsunami. This causes great loss of life and property.

EARTHQUAKE MANAGEMENT (OR) STEPS TO MITIGATE EARTHQUAKE (PREVENTIVE MEASURES):

- Damage to property and life can be prevented by constructing earthquake – resistant buildings in the earthquake prone areas.
- Wooden houses are preferred in earthquake prone areas as in Japan.
- Seismic hazard map should give the information about the magnitude of intensity of anticipated earthquakes and Seismologist and indicate the possibility of occurrence of earthquakes in a potential area.

CASE STUDIES:

EARTHQUAKE IN CHILE:

The largest earthquake occurred in May 22nd, 1960 in Chile with the magnitude of 9.5 on Richter scale, affecting 90,000 square miles and killing 6,000 people.

EARTHQUAKE IN BHUJ TOWN:

The earthquake occurred on Bhuj town in Gujarat had caused massive damage. Nearly 20,000 – 30,000 people were killed and leaving many injured. The intensity of the earthquake is 6.3 on the Richter scale.

EARTHQUAKE IN IRAN:

In Iran, an earthquake in 1971 killed 25,000 people, in 1990, 50,00 people were killed and in 2003, many thousands were killed.

CYCLONE

DEFINITION:

Cyclone is a meteorological phenomenon, intense depressions forming over the open oceans and moving towards the land. On reaching the shores, it moves into the interior of the land or along the shore lines.



Thus, the cyclones are the most powerful, destructive, dangerous atmospheric storms on the earth. The cyclone once formed may be active from days to weeks and their speed varies between 180-500 km/hour.



OCCURRENCE:

Tropical cyclones in the warm oceans are formed because of heat and moisture. The main requirement of formation of tropical cyclone is the sea surface temperature (SST) must be below 25 °C. The tropical cyclones move like a spinning top at the speed of 10-30 km/hour.

In India, cyclones originating from Bay of Bengal and more in number and intensity. But they are relatively less in south west Indian ocean and Arabian sea. In India cyclone occurs during October – December (or) April – May.

Different name of Cyclones

Name of Cyclone	Place
Hurricanes	In Atlantic, Caribbean, Eastern Pacific, USA.
Typhoons	In Western Pacific and Southern Coast of China & Japan.
Cyclones	In Bangladesh and Eastern Coastal areas of India.
Willy Willies	In Australia.

EFFECTS OF CYCLONE:

- The damage depends on the intensity of cyclone. The damage to human life, crops, roads, transport, communications, tanks, canals, livestock could be heavy.
- Cyclone occurrence slow down the developmental activities of the area.

CYCLONE MANAGEMENT (PREVENTIVE MEASURES):

- Satellite images are used by meteorological departments for forecasting the weather conditions, which reveal the strength and intensity of the storm.
- Radar System is used to detect the cyclone and is being used for cyclone warning.
- For observing the exact location of cyclone, every half an hour satellite pictures are analysed.
- It is difficult to stop the formation of cyclones, but the effect of which can be minimized by planting more trees on the coastal belt, construction of dams, dykes, embankments, wind breaks.

CASE STUDY:**CYCLONE IN ODISHA – 1999:**

Two cyclones in Orissa occurred on 18th and 29th of October 1999. In the coastal area of Orissa, a powerful cyclone storm hit with a wind velocity of about 260 km/hour. Nearly 14 of 30 districts of Orissa were in severe damage.

It has been reported that nearly 15 million people were affected and 90 – 95 % of the crop yield was affected. About 11,500 local schools have been damaged.



LANDSLIDES

DEFINITION:

The movement of earthly materials like coherent rock, mud, soil and debris from higher region to lower region due to gravitational pull is called landslides.

CAUSES OF LANDSLIDES:

- Downhill movement of earth is mainly caused by rain, forces either increasing the top material weight, lubricating the various layers, or making the slope too steep.
- Movement of heavy vehicles on the unstable sloppy regions create landslides.
- Earthquake, shocks, vibrations and cyclone create landslides.
- Erosion in the hilly tract due to runoff water during rainy period also leads to landslides.
- Underground caves and underground mining activities may also lead to subsidence.
- Unconsolidated sediments exposed due to logging, road and house building also cause landslides.

EFFECTS OF LANDSLIDES:

- 1) Landslides block the roads and diverts the passage.
- 2) Erosion of soil increase.
- 3) Sudden landslides damage the houses, crop yield, livestock, etc.

LANDSLIDE MANAGEMENT (PREVENTIVE MEASURES):

It is very difficult to control landslides. However, these can be minimized by:

- I. Unloading the upper parts of the slope.
- II. Improving the cultivation in the sloppy region, the roots of which provide cohesion and retards the flow of water and its erosion capacity.
- III. Steepness of the slope can be reduced by developing benches.
- IV. Concrete support can be made at the base of the slope.
- V. Draining the surface and subsurface water from the weak sloppy regions.
- VI. Soil stabilization using some chemical [quick lime] is also effective in weak areas.

CASE STUDY:**LANDSLIDES IN UP – 1998**

Due to landslide in Malpa village, Pithoragarh district, UP, on 18th August 1998, nearly 180 people including 60 police personnel were killed.



FIELD STUDY OF LOCAL POLLUTED SITES:**TIRUPUR IN TAMILNADU:**

A field of study was carried out with a group of students. A nearby textile unit in Tirupur, Tamilnadu, was visited. The observations noted are given below.

The textile units in Tirupur district produce cotton, cotton blended with manmade fibers like polyester, nylon, rayon, etc.,

VARIOUS PROCESSES IN TEXTILE MILLS ARE:

- a) Opening, blending and mixing.
- b) Carding.
- c) Combing.
- d) Spinning.
- e) Weaving and knitting.
- f) Designing.
- g) Bleaching and dyeing.

The textile processes require large volumes of water of high purity and generate equally large volumes of waste water which are discharged into rivers or streams.

CHARACTERISTICS OF WASTE WATER:

- 1) Waste water from textile industries is generally coloured, high in BOD, COD, suspended solids, highly alkaline and have a fairly high temperature.
- 2) They also contain toxic metals and chemicals like sulphides, chlorides, chromium salts, etc.,

EFFECT OF TEXTILE WASTES:

- 1) The suspended and colloidal matter clog the pores of the soil and reduce its permeability.
- 2) The high alkalinity and salinity are harmful to texture of the soil and retards its water holding capacity.
- 3) The high sodium content of waste water hardens the texture of the soil and retards its water holding capacity.

- 4) The most serious effect of textile wastes on receiving water will be depletion of dissolved oxygen which affects the aquatic life.
- 5) The soluble dyes and colours in waste water inhibits the process of sunlight penetration and photosynthesis.

TREATMENT AND DISPOSAL OF TEXTILE WASTEWATER:

The control of water pollution by textile wastes is best achieved by the following methods:

- 1) Segregation of concentrated waste water from stream.
- 1) Application of counter current systems of washing helps towards economy in water consumption.
- 2) Practising the reuse of water.
- 3) Biological treatment methods is also employed.
- 4) Extended aeration method.
- 5) Oxidation ponds are used.

PALLAVARAM IN CHENNAI:

A field study was carried out with a group of students. A nearby town Pallavaram, Tamilnadu, was visited. The observations noted are given below.

Pallavaram in Chennai, is the place in which a number of leather factory and tanneries are situated. These factories and tanneries, process the raw leather items and convert them into useful products.

THE VARIOUS PROCESS INVOLVED ARE:

- 1) Tanning.
- 2) Washing.
- 3) Neutralising.
- 4) Finishing operation.

THE SOURCES OF AIR POLLUTION ARE:

- 1) Products of combustion from heating plants.
- 2) Incinerators.
- 3) Automobile flue gases.
- 4) Fumes and smokes from industrial processes

IMPORTANT AIR POLLUTANTS ARE:

- 1) Carbon monoxide.
- 2) Oxides of sulphur.
- 3) Particulate matter.
- 4) Oxides of nitrogen.
- 5) Hydrocarbon.

EFFECT OF AIR POLLUTION:

- 1) *Material damage.*
- 2) *Vegetation damage.*
- 3) *Damage to human health and animals.*
- 4) *Reduction in visibility and darkening of sky.*
- 5) *Acid rain, greenhouse effect, ozone layer depletion, photochemical smog, etc.,*

CONTROL MEASURES:

- 1) *Selecting proper raw materials and equipment.*
- 2) *Recovering or recycling the waste.*
- 3) *Use of granites settling chamber, cyclone separators, wet scrubber, filters and electrostatic precipitators.*

Thank You