

SIXTH SEMESTER DIPLOMA EXAMINATION IN
ENGINEERING/TECHNOLOGY- MARCH, 2013

ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

(Maximum Mark:100)

(Time:3hr)

PART - A

1. What is deforestation

Deforestation is the removal of forest land and related ecosystem for non forest uses permanently by humans .this removal included urban uses and farm purpose in this case trees are never replanted .

2. Give two examples of successful Indian attempts in water conservation

1. India and Pakistan fight over the rights to water from the Indus.
2. India and Bangladesh are fighting for Bhrahmaputra river.

3. What is omnivores

An omnivores is a kind of animal that eats either other animals or plants. Some omnivores will hunt and eat their food, like carnivores, eating herbivores and other omnivores. Some others are scavengers and will eat dead matter. Many will eat eggs from other animals.

4. Write any two control measures of marine pollution

- Introduction of sewage treatment plants before discharging into sea.
- Cleaning oil from surface waters and contaminated beaches can be accelerated through the use of chemical dispersants which can be sprayed on the oil.

5. What are the flood mitigation measures

- Avoid residing on river banks and slopes on river sides and the sides of gorges.
- Build at least 250 meters away from the sea coast/river banks

PART - B

II. (Answer any five of the following questions, Each carries 6 marks)

1. Differentiate between water logging and salinity?

Water logging

- Over irrigation of croplands by farmers for good growth of their crop usually leads to water logging. Or in other words, it is the saturation of the soil with irrigation water so that the water table raises close to the surface.
- Inadequate drainage causes excess water to accumulate underground and gradually forms a continuous column with the water table.
- Under water logged conditions, pore spaces in the soil get fully drenched with water and the soil-air gets depleted.

Salinity problems

- Salinity is the quantity of salt dissolved in a given volume of water. Accumulation of salt in soil can eventually make the soil incapable of supporting plant growth.
- This is called salinization. At present one third of the total cultivable land area of the world is affected by salts .
- Saline soils are characterized by the accumulation of soluble salts like sodium chloride, sodium sulphate, calcium chloride, magnesium chloride.

3. Explain the different types of ecological pyramid?

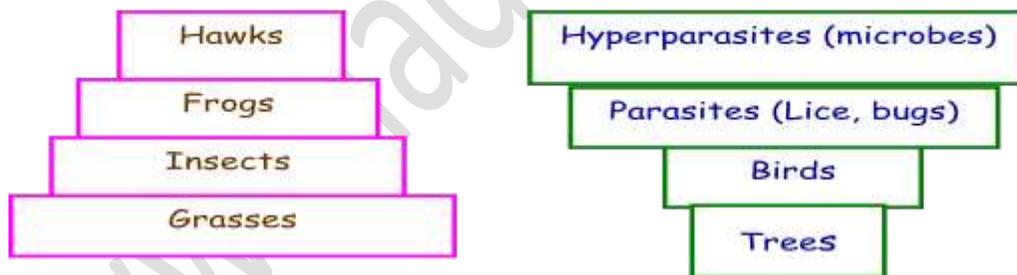
Different types of ecological pyramid

There are having mainly three types of ecological pyramid,they are

- Pyramid of numbers
- Pyramid of biomass, and
- Pyramid of energy or productivity

Pyramid of number

The pyramid of numbers shows the relationship between producers, herbivores and carnivores at successive trophic levels in terms of their numbers.



Pyramid of biomass

- If the numbers of consumers at each trophic level are multiplied by their weight, then, what we obtain is the pyramid of biomass.
- It indicates by weight or other measurement

Pyramid of energy

Of the ecological pyramids, the energy pyramid gives the best picture of the overall nature of an ecosystem. The pyramid of energy is based on the total energy content of each trophic level.

4. List and explain four fundamental noise control techniques .

Fundamental noise control techniques

There are 4 fundamental ways in which noise can be controlled.

- 1) Reduce noise at the source
- 2) Block the path of noise
- 3) Increase the path length and
- 4) Protect the recipient.

Reduce noise at the source

Make sure that all openings are acoustically sealed. Noise, like water rushes out through any cracks or openings. Muffling vehicles and machinery to reduce the noise.

Block the path of noise

Planting of trees around houses can also act as effective noise barriers. Highly absorptive interior finish material for walls, ceilings and floors can decrease indoor noise levels significantly.

Increasing the path length

Increasing distance from the noise source and the recipient offers a passive means of control. Municipal land- use ordinances pertaining to the location of airports make use of the attenuating effect of distance on sound levels.

Protect the recipient

Use of earplugs and earmuffs, Specially designed earmuffs can reduce the sound level reaching the eardrum by as much as 40 dB

5. Explain the different types of ecological succession.

TYPES OF ECOLOGICAL SUCCESSION

There are having two types of ecological succession, they are :-

- i. Primary succession
- ii. Secondary Succession

Primary succession

- If the area has not been occupied previously, the process of initial invasion and then the progression from one biotic community, to the next is termed "Primary Succession".
- An example is the gradual invasion of a bare rock surface by what eventually becomes a climax forest ecosystem.

Secondary Succession

- When an area has been cleared by fire or by humans and then left alone, the surrounding ecosystem may gradually invade the area- not at once, but through a series of distinct stages termed secondary succession.
 - The major difference between primary and secondary succession is that secondary succession starts with the preexisting soil substance.
 - Therefore, the early prolonged stages of soil building are bypassed.
- 6. What is the significance of conducting medical camp?**
- Aware peoples about the disease
 - Give awareness about the threat to the peoples
 - Control measures of disease

7. Distinguish between environmental hazards and disaster?

Hazard :

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

There are two types of hazards:

1. Natural hazard.
2. Manmade hazard.

1.Natural hazard

Natural hazards are hazards which are caused because of natural phenomena (hazards with meteorological, geological or even biological origin).

Examples :- cyclones, tsunamis, earth- quake

2.Manmade hazards

Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc.

Disaster

The occurrence of a sudden or major misfortune which gives rise to casualties and / or damage or loss of property, infrastructure, essential services etc.

Disasters are often classified according to their:

- a) Causes – Natural disaster and Manmade disaster
- b) Speed of onset – Sudden and Slow

- **Natural Disasters**

These types of disaster naturally occur in proximity to, and pose a threat to, people, structures or economic assets.

Examples are Storm, Flood, Earthquake, Tsunamis

- **Manmade Disasters**

Accidents: Road, Rail, Air, Sea, Building collapse.

Industrial Mishaps: Gas leak, Explosion, Safety.

Fire: Building, Coal, Oil.

Forest Fire (In tropical counters, forest fires are often manmade)

- **Speed of onset**

i. Sudden onset: little or no warning, minimal time to prepare. For example, an earthquake, tsunami, cyclone, volcano, etc.

ii. Slow onset: adverse event slow to develop; first the situation develops; the second level is an emergency; the third level is a disaster.

For example, drought, civil strife, etc.

PART-C

(Answer on full question from each one. One question carries 15 mark)

Unit –I

III. Discuss role played by non conventional energy resources towards the protection of environment. (15)

NON-CONVENTIONAL ENERGY RESOURCES.

- A renewable resource is a natural resource with the ability to reproduce through biological or natural processes and replenished with the passage of time.
- Renewable resources are part of our natural environment and form our eco-system.
- Examples are trees in forests, grass in grass lands, fresh water in lakes, deposits of ground water, fresh air, and fertile soil.
- These are inexhaustible in nature. Solar radiation, tides, winds, geothermal, biomass and other natural elements are renewable resources of energy now called renewable energies because they can be used again and again.

Merits of renewable energy resources

- Unlimited supply.
- Provides energy security.
- Fits into sustainable development concept.
- Reliable and the devices are modular in size.
- Decentralized energy production.

Solar energy

- Sun is the prime source of energy. Sun daily spreads an enormous amount of energy; out of which our mother earth receives a very small fraction.
- The photovoltaic cells are used to turn sunlight directly into electricity.
- PV cells generate power through the interaction of tiny particles of light called “photons” with electrons in the cells. PV cells were originally developed for use in space program, PV cells have powered nearly every man made satellite sent into the orbit.

Tidal energy

- Ocean tides, produced by gravitational forces of sun and moon, contain enormous amount of energy.
- The tidal energy can be harnessed by constructing a tidal barrage.
- During high tide, the sea-water is allowed to flow into the reservoir of the barrage and rotates the turbine, which intern produces electricity by rotating the generators.
- During low tide, when the sea level is low, the sea water stored in the barrage reservoir is allowed to flow into the sea and again rotates the turbine.
- Tidal power is tapped by placing a barrage across an estuary and forcing the tidal flow to pass through turbines.

Wind energy:

- Energy recovered from the force of the wind is called wind energy.
- The energy possessed by wind is because of its high speed.
- The wind energy is harnessed by making use of wind mills.

Geothermal energy

- Temperature of the earth increases at a rate of 20-75⁰C per km, when we move down the earth surface.
- High temperature and high pressure steam fields exists below the earth’s surface in many places.
- The energy harnessed from the high temperature present inside the earth is called geothermal energy.

Biomass energy

- Biomass is organic material which has stored sun light in the form of chemical energy.
- Because plants and trees depend on sunlight to grow, biomass energy is a form of stored solar energy.
- Although wood is the largest source of biomass energy.
- Biomass can be converted to energy by burning it or capturing gases from it. Biomass can be converted to electricity by collecting material like scrap wood and bringing it to a biomass processing plant. The material is burned in large furnaces and the heat is used to provide steam to drive turbines and power generators

OR

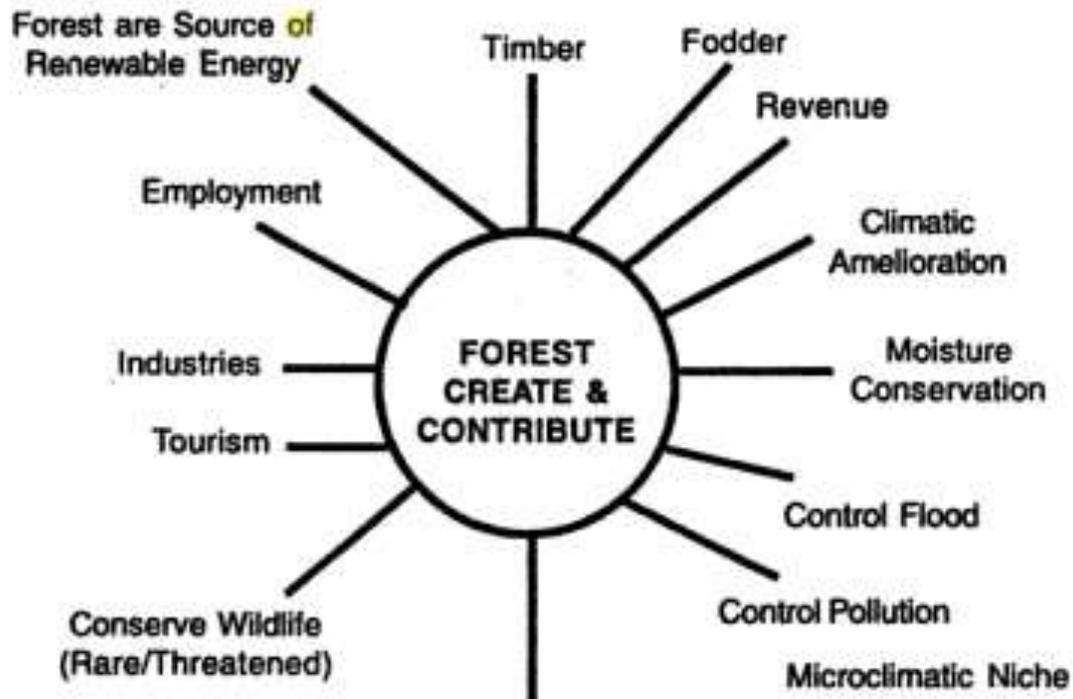
IV. Discuss the economic importance of forest.

(15)

FOREST RESOURCES

- A forest can be defined as a biotic community predominant of trees, shrubs or any other woody vegetation usually in a closed canopy.
- India's Forest Cover is 6,76,000 sq.km (20.55% of geographic area).
- Scientists estimate that India should ideally have 33% of its land under forests.
- Today we only have about 12% thus we need not only to protect our existing forests but also to increase our forest cover.

Uses of forest



Commercial Uses of forests

- Man depends heavily on a larger number of plant and animal products from forests for his daily needs.
- The chief product that forests supply is wood, which is used as fuel, raw material for various industries as pulp, paper, newsprint, board, timber for furniture items, other uses as in packing articles, matches, sports goods etc.
- Indian forests also supply minor products like gums, resins, dyes, tanning, fibers, etc.
- Many of the plants are utilized in preparing medicines and drugs; Total worth of which is estimated to be more than \$300 billion per year.
- Many forests lands are used for mining, agriculture, grazing, and recreation and for development of dams

Ecological Uses of forests

- Production of Oxygen
- Reducing of Global Warming
- Wild Life Habitat
- Regulation of Hydrological Cycle
- Soil Conservation
- Pollution Moderators

Forest Functions:

- Protective and ameliorative functions.
- Productive functions
- Recreational and educational functions
- Development functions

Ecological significance of forests

- Balances CO₂ and O₂ levels in atmosphere.
- Regulates earth temperature and hydrological cycle
- Encourage seepage and reduces runoff losses, prevents drought
- Reduces soil erosion (roots binding), prevents siltation and landslides thereby floods

Over exploitation of Forests

- Man depends heavily on forests for food, medicine, shelter, wood and fuel.
- With growing civilization the demands for raw material like timber, pulp, minerals, fuel wood etc. shot up resulting in large scale logging, mining, road-building and clearing of forests.
- Our forests contribute substantially to the national economy.

Unit - II

V. Explain structure and function of Desert ecosystem.

(15)

Abiotic Component:

The abiotic component includes the nutrients present in the soil and the aerial environment. The characteristic feature of the abiotic component is lack of organic matter in the soil and scarcity of water.

(B) Biotic Component:

The various biotic components representing three functional groups are:

(a) Producer organisms:

The producers are mainly shrubs or bushes, some grasses and a few trees. Surprisingly, there are many species of plants that survive in the desert. Most of them are succulents, which mean they

store water. Others have seeds that lay dormant until a rain awakens them. Regardless, these plants find a way to get water and protect themselves from the heat.

The most famous desert plant is the cactus. There are many species of cacti. The saguaro cactus is the tall, pole shaped cactus. The saguaro can grow up to 40 feet tall. It can hold several tons of water inside its soft tissue. Like all cacti, the saguaro has a thick, waxy layer that protects it from the Sun.

Other succulents include the desert rose and the living rock. This strange plant looks like a spiny rock. It's disguise protects it from predators. The welwitschia is a weird looking plant. It has two long leaves and a big root. This plant is actually a type of tree and it can live for thousands of years.

DESERT ECOSYSTEM

- One can find at least one desert on every continent except Europe and Antarctica.
- Each desert is different in some way, but they all have one thing in common.
- In order for an area of land to be considered a desert, it must receive less than 10 inches of water a year. How come deserts get such little water?
- Clouds are scarce in these regions and we all know that without clouds, there can't be rain, snow or any other precipitation.
- But clouds also serve another purpose – they block out some of the Sun.
- The desert gets mighty hot during the day because the sun beats down on the sand.
- At night, the deserts get very cold, because there aren't clouds around to keep the heat from escaping to the atmosphere.
- There are plenty of differences between the deserts of the world. Some deserts are made of very fine, red sand, others consist of sand mixed with pebbles and rocks.
- The desert sand started out as rock, but years of weathering by wind and water has created dunes in the deserts.
- These sands are mostly minerals, and sometimes oil can be found hidden deep within the rocks.

The Desert ecosystem contains:-

i. Abiotic components

- High pressure
- Low rain fall
- Dry climate

ii. Producers

- Shrub
- Bushes

- Grasses
- Few trees

ii. Consumers

- Insects
- Reptils
- Birds
- Camels

iii. Decomposes

- Fungi
- Bacteria

General characteristics of Desert

1. Deserts are subjected to high wind velocity
2. There is low annual rain fall.
3. The desert air is dry and climate is hot.
4. Temperature variations is large (days are hot and nights are cold)
5. It doesn't have vegetation or rare vegetation and the animals face shortage of food. .
6. Soil is loose, sandy, devoid of organic carbon, nitrogen and moisture etc.
7. Biological soil, which is the soil penetrates the plant roots is absent in most deserts, though the soil in a geological sense exists everywhere.
8. Low humidity during the day and high in night.
9. Solar radiation very intense.
10. Absence of water vapour in air.
11. Scarcity of water in hot deserts.
12. Human population is very small.
13. The number of sunshine hours are very large.
14. Drought in other words, the effective aridity, is long in the extreme arid zone.
15. Precipitation deficiency is the main feature of deserts.

Unit - III

VII .Explain :-

(a) Effect of water pollution. (6)

(b) Control measures of preventing water pollution. (9)

(a) EFFECT OF WATER POLLUTION

Now that you are familiar with water pollutants and their sources, how is the pollutants effect

- i. water bodies,
- ii. aquatic organisms and human health.

Effect on Water Bodies

- Let us first see how organic wastes containing phosphates, nitrates and other nutrients affect normal functioning of water bodies.
- Most aquatic, organisms respire with oxygen dissolved in water. The quantity of dissolved oxygen(DO) in a unit volume of aerated water is only .0084g which is about one thirtieth of that present in the same volume of air at 25⁰C. The quantity decreases further with the increase of temperature.

Effects on Aquatic Organisms

- Toxic water pollutants such as metals, pesticides, insecticides and chemicals affect aquatic species directly whereas the non-toxic organic load may eliminate some aquatic species indirectly by reducing the DO of water.
- The aquatic flora of lakes and ponds is also affected by slight variations in sustaining elements, thus affecting the whole ecological system.

Effects on Health

- Water pollution deteriorates the quality of water used for drinking, bathing, swimming, recreation and irrigation.
- Drinking water polluted with sewage is a source of viruses, bacteria, protozoa and worms.

(b) CONTROL MEASURES FOR PREVENTING WATER POLLUTION(Waste water treatment)

- (i) Preliminary treatment
- (ii) Primary treatment
- (iii) Secondary treatment
- (iv) Tertiary Treatment.

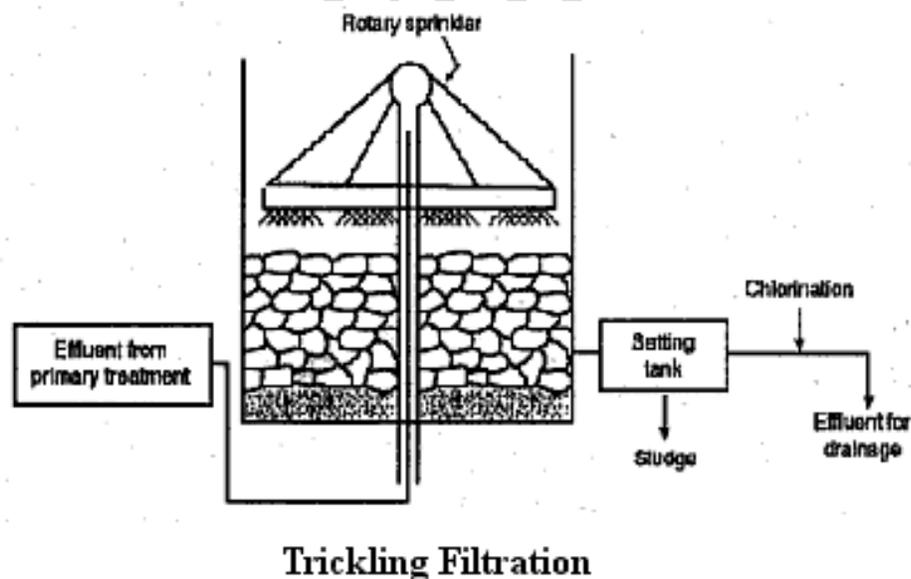
Preliminary Treatment

It involves the following processes

- a) Screening
 - b) Grinding
 - c) Skimming tank.
- Screening process removes the larger aggregates of floating and suspended solid matter. It may also include prechlorination to prevent odour.
 - The large solid particles may be ground using "Comminutors" into small pieces.
 - The water then passes through a skimming tank and is allowed to be detained for about 3 minutes and skimmed or agitated by sending compressed air through air diffusers located at the bottom.

Secondary Treatment

- The effluent from the primary sedimentation tank still contains unstable organic substances in the colloidal and dissolved form.
- These substances have to be removed by further treatment called secondary treatment, in which microorganisms are employed.
- This can be done by trickling filtration and activated sludge process.



Tertiary Treatment

- If the effluent from a secondary treatment plant is not satisfactory, tertiary treatment may be required. This consists of many processes including the following:
 - i. Coagulation
 - ii. Membrane separation processes
 - ii. Filtration

iii. Co-precipitation etc.

- Coagulation is the process of addition of coagulant such as inorganic metal salt and organic polymers to water and result in the formation of insoluble products of reaction between the coagulant and the impurity to be removed.
- Membrane can be used to concentrate and separate soluble ions and molecules, colloidal species, particulates and micro organisms in waste water.
- In co-precipitation an ion is removed from the solution phase with a precipitate (Carrier), even though its solubility is not exceeded.

OR

VIII. Explain:-

(a) Role of an individual in prevention of pollution (9)

(b) Discuss the sources of thermal pollution (6)

(a) ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION

- Try to plant trees wherever you can and more importantly take care of them. They reduce air pollution.
- Reduce the use of wood and paper products wherever possible. Manufacturing paper leads to pollution and loss of forests which releases oxygen and takes up carbon dioxide. Try to recycle paper products and use recycled paper wherever possible.
- From the mail you receive reuse as many envelopes that you can.
- Do not buy furniture, doors, window frames made from tropical hardwoods such as teak and mahogany. These are forest based.
- Help in restoring a degraded area near your home or join in an afforestation program.
- Advocate organic farming by asking your grocery store to stock vegetables and fruits grown by an organic method. This will automatically help to reduce the use of pesticides.
- Reduce the use of fossil fuels by either walking up a short distance using a car pool, sharing a bike or using public transport. This reduces air pollution.
- Shut off the lights and fans when not needed.
- Don't use aerosol spray products and commercial room air fresheners. They damage the ozone layer.
- Do not pour pesticides, paints, solvents, oil or other products containing harmful chemicals down the drain or on the ground.
- Buy consumer goods that last, keep them as long as possible and have them repaired as far as possible instead of disposing them off. Such products end up in landfills that could pollute ground water.
- Buy consumer goods in refillable glass containers instead of cans or throwaway bottles.
- Use rechargeable batteries.
- Try to avoid asking for plastic carry bags when you buy groceries or vegetables or any other items. Use your own cloth bag instead.
- Use sponges and washable cloth napkins, dish towels and handkerchiefs instead of paper ones.

- Don't use throwaway paper and plastic plates and cups when reusable versions are available.
- Recycle all newspaper, glass, aluminum and other items accepted for recycling in your area. You might have to take a little trouble to locate such dealers.
- Set up a compost bin in your garden or terrace and use it to produce manure for your plants to reduce use of fertilizers.
- Try to lobby and push for setting up garbage separation and recycling programs in your localities.
- Choose items that have the least packaging or no packaging.
- Start individual or community composting or vermicomposting plants in your neighborhood and motivate people to join in.

(b) SOURCES OF THERMAL POLLUTION

Industries:

A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers.

- i) Hydro-electric power plants
- ii) Coal fired power plants
- iii) Nuclear power plants
- iv) Industrial effluents from power, textiles, paper and pulp industries

Urban runoff :

Storm water discharged to surface waters from roads and parking lots can also be a source of elevated water temperatures.

Domestic sewage:

Municipal sewage normally has a higher temperature.

Unit - IV

IX.(a) Explain the three stages of disaster management (9)

(b) What are the general causes for land slide (6)

(a) THREE STAGES OF DISASTER MANAGEMENT

1. Pre-disaster stage
2. Emergency stage and
3. Post-disaster stage.

1. Pre-disaster stage

This stage includes preparedness and mitigation for the disaster. The preparedness for disaster in general consists of:-

- Preparing hazard zonation maps, predictability/forecasting and warning.
- Preparing disaster preparedness plan
- Land use zoning.
- Preparedness through IEC

2. Emergency stage

- This stage of disaster management comprises of rescue and evacuations, shelter for victims, relief for livestock, disposal of dead and finally damage assessment survey.
- The stage requires a "Rapid Action Task Force", that is aware of the contextual social norms and conditions and is psychologically attuned to face the abnormal human conditions.
- With the limited resources, the administration can hardly perform these operations effectively.
- To deal with this, it is required that local people are trained to handle the emergency situation.
- The formulation of disaster management committees at local level may be another alternative. If various NGOs, local bodies (Panchayaths),
- National Social Service Core, and other voluntary organizations are given adequate responsibility and resources to tackle emergency situation, the result will be better and satisfactory.

3. Post Disaster stage

1. Rehabilitation and reconstruction

Specifically, rehabilitation is the actions taken in the aftermath of a disaster to enable basic services to resume functioning, assist victims' self-help efforts to repair dwellings and community facilities, and facilitate the revival of economic activities (including agriculture).

2. Political administrative Aspect

Recovery from major disaster events necessitates large quantities of material and human resources and good organizational/institutional capacity.

3. Economic Aspect

Governments face a dilemma following any disaster that causes extensive damage to both the local economy and to the physical environment.

4. Environmental impacts

Disasters almost always have negative environmental impacts, ranging from damage to ecosystems to the production of vast quantities of waste.

(b) GENERAL CAUSES FOR LAND SLIDE

- Geological Weak material: Weakness in the composition and structure of rock or soil may also cause landslides.
- Erosion: Erosion of slope toe due to cutting down of vegetation, construction of roads might increase the vulnerability of the terrain to slide down.
- Intense rainfall: Storms that produce intense rainfall for periods as short as several hours or have a more moderate intensity lasting several days have triggered abundant landslides. Heavy melting of snow in the hilly terrains also results in landslide.
- Human Excavation of slope and its toe, loading of slope/toe, mining, deforestation, irrigation, vibration/blast, Water leakage from services.
- Earthquake shaking has triggered landslides in many different topographic and geologic settings. Rock falls, soil slides and rockslides from steep slopes involving relatively thin or shallow dis-aggregated soils or rock, or both have been the most abundant types of landslides triggered by historical earthquakes.
- Volcanic eruption Deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion and frequent mud or debris flows triggered by intense rainfall.

OR

X. Explain:-

(a) The causes and effect of Tsunami ? (9)

(b) What are the causes of Draughts ? (6)

(a) THE CAUSES OF TSUNAMI

- Seismic activities like earthquakes, landslides, volcanic eruptions, explosions, can generate tsunami.
- Deformation of the sea floor due to the movement of plates.

Earthquakes

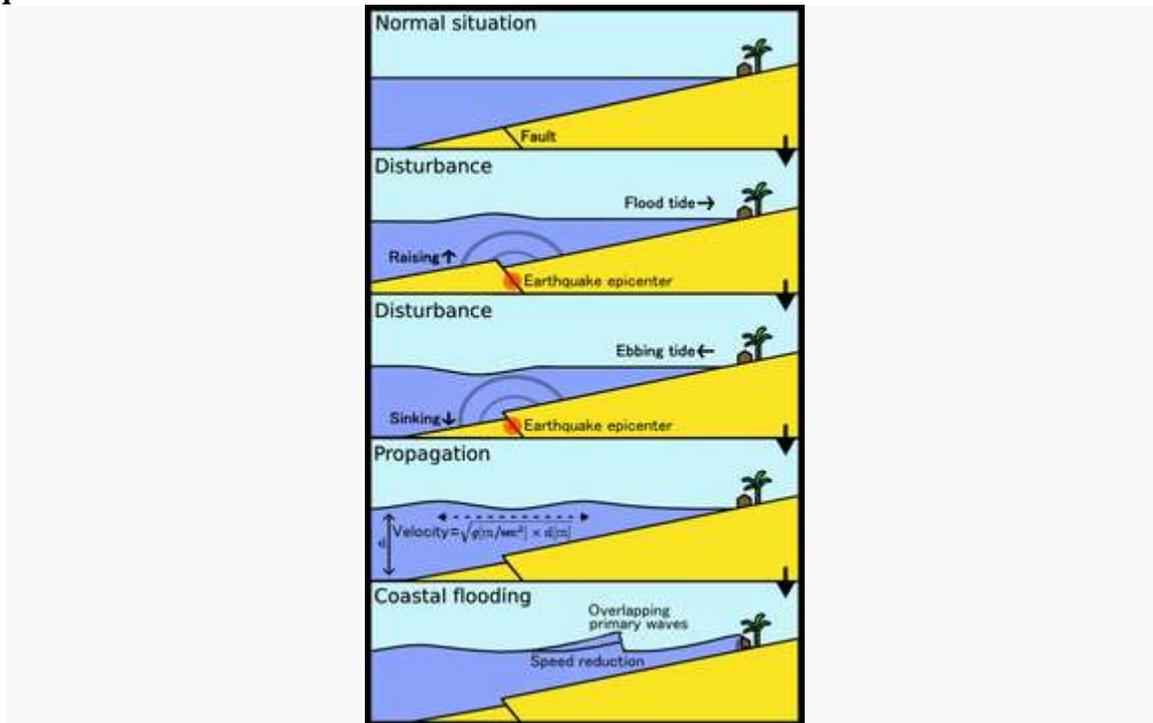


Diagram showing how earthquakes can generate a tsunami.

Tsunamis in lakes can be generated by fault displacement beneath or around lake systems. Faulting shifts the ground in a vertical motion through reverse, normal or oblique strike slip faulting processes, this displaces the water above causing a tsunami (Figure 1). The reason strike-slip faulting does not cause tsunamis is because there is no vertical displacement within the fault movement, only lateral movement resulting in no displacement of the water. In an enclosed basin such as a lake, tsunamis are referred to as the initial wave produced by coseismic displacement from an earthquake, and the seiche as the harmonic resonance within the lake.^[1]

Sub-aerial mass flows

Sub-aerial mass flows (landslides or rapid mass wasting) happen when a large amount of sediment becomes unstable, this can happen for example from the shaking from an earthquake, or saturation of the sediment initiating a sliding layer. This volume of sediment then flows into the lake giving a sudden large displacement of water. Tsunamis generated by sub aerial mass flows are defined in terms of the first initial wave being the tsunami wave and any tsunamis in terms of sub aerial mass flows are characterised into three zones.

EFFECTS OF TSUNAMI

- Tsunami attacks mostly the coastlines, causing devastating property, damage and loss of life.
- Tsunami can kill lot of human beings, livestock's.
- Tsunami may also spread lot of water borne diseases.

(b) CAUSES OF DRAUGHTS

- Though drought is basically caused by deficit rainfall, which is a meteorological phenomenon, it manifests into different spheres because of various vulnerability factors associated with them
- Some of these factors are human induced.
- Though drought is a natural disaster, its effects are made worst in developing countries by over population, over grazing, deforestation, soil erosion, excessive use of ground and surface water for growing crops, loss of biodiversity.
- As discussed the draught may be due to the lack of rainfall. or it could be a lack of snowfall from mountains far away (not in India but in colder regions of the world); or It could be caused when water supplies are not sufficient to meet every body's needs.
- Human activity can directly trigger exacerbating factors such as over farming, excessive irrigation, deforestation, and erosion adversely impact the ability of the land to capture and hold water.
- Along with drought in some areas, flooding and erosion will increase in others.

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