

Chapter: 5 Environmental Pollution.

* Pollution

Refer unit test-2 notes p.g. 4

* Air pollution

* Water pollution

Refer unit test-2 notes p.g. 1

* Soil pollution

p.g. 7

Control of soil pollution

- Before disposal, industrial effluents should be properly treated.
- Solid waste from industries, domestic as well as commercial sources properly segregated & treated using proper method before disposed in environment.
New technique like bioremediation should be used for the proper treatment of toxic wastes.
- Use of artificial fertilisers, pesticides & unscientific irrigation methods are avoided.
Instead of using these methods, biofertilisers, biopesticides are applied in field for achieving sustainable agriculture development.
Application of these materials will not harmful to soil but it helps in improving the soil fertility.
- Covering the soil with trees & grass to protect from rain & wind.
- When mining finished the site should be immediately reclaimed by plantation to avoid soil erosion.
- Radioactive pollutants should be disposed very carefully.
- Environmental (Protection) Act, 1986 has guidelines & rules to protect the various environmental segments including soil resource.

* Marine Pollution

One third of the earth's surface is covered by oceans. The oceans play significant role in chemical & biological balance of life.

Defⁿ Marine pollution can be defined as the changes in the physical, chemical & biological properties of sea water due to discharge of waste material or heat into the sea resulting harm to marine life, hazards to human health, fishery & impairment of quality for use of sea water.

Sources

1. Industries: Many industries situated in the coastal area directly or indirectly pollute the oceans by discharging different residues of toxic chemicals, colours, heavy metal residues, oil & grease etc.

2. Domestic waste: World's largest population resides on the coastal areas in small towns, cities etc. The domestic pollution includes the disposal of community sewage, garbage etc. Most of the coastal cities are not having their own sewage treatment plants.

3. Agricultural runoff: Variety of agrochemicals are used in the field which enter in marine environment along with runoff water & river flows. Many persistent chemical pesticides enter in the food chain & leads to bioaccumulation & biomagnification.

4. Power Plant Effluent: A large amount of water is required for cooling purpose, in thermal power plants & nuclear power plants. This high temperature waste water is discharged into sea.

The ash from the coal fired thermal plant is discharged into coastal waters which affect the flora & fauna. The marine flora & fauna get badly affected by such thermal pollution in sea.

5. Oil spills: The sources of oil in the oceans are accidental release from tankers, ship accidents, washing of oil tankers, effluent from oil refineries, leakages from pipelines, oil transportation etc.

6. Ballast water: The sea water used for balancing the weight of ship is called as ballast water. The water is taken from one coast & discharged in another coast. The exotic organisms act as biological pollutants, damaging the local biodiversity.

7. Nonbiodegradable waste: The synthetic nets used for fishing purpose, plastic bottles, plastic bags, glass etc. dumped into sea takes long time to degrade due to its chemical properties.

Effects of Marine Pollution

1. The domestic sewage has high organic content, which leads to depletion of oxygen from the sea water.
2. Different pathogens are spread in the ocean environment through sewage discharge.
3. The detergents present in the sewage & residues of chemical fertilisers. The diversity of flora & fauna get reduced.
4. The chemical pesticides like DDT, BHC, heavy metals like mercury get accumulated in food chain & finally leads to biomagnification.
5. Oil pollution is the major threat to the oceans. Oil spreads on the water surface & reduces the light penetration, depletes oxygen & oil forms coating on surface of aquatic animals & birds.
6. The nonbiodegradable plastic nets, ropes, plastic bags, thermocol interferes in swimming & movement of aquatic animals.

Control Measures

1. Proper treatment to the domestic sewage & industrial effluent before disposal into the sea.
2. Ban on disposal of refuse like plastic bags, nets, ropes, thermocol, etc.
3. Precautionary measures for oil transportation.

4. Recycling & reuse of disposed hot water from thermal power plants.
5. Ban on transport & discharge of ballast water.
6. Preventing entry of oil through washing of vehicles, pipelines.
7. The legal provisions like CRZ & other acts can be used for protection of coastal areas.

4. Noise Pollution

The word 'noise' is derived from the Latin word 'nausea' meaning a feeling of sickness at stomach with an urge to vomit.

Noise is defined in the number of ways -

- ① Noise is sound without value.
- ② Noise is unwanted, unpleasant or disagreeable sound that causes discomfort.
- ③ Noise is wrong sound, in the wrong place at wrong time.
- ④ Noise is that sound is undesired by the recipient.

Def Unwanted sound dumped forced into environment, which causes adverse effect on living & non-living things.

Measurement of Noise:

Instruments - Sound level meter (SLM), Octave bands analyzer, Magnetic tape recorder, Noise analyzer.

The sound is measured in decibel (dB).

The quality of unpleasantment of sound waves depends upon the certain factors like, frequency of sound waves, intensity of sound waves, time of exposure of sound waves, intermitted of sound waves.

Sources

- ① Natural - thunder, windstorm, heavy rain, lightening.
- ② Manmade -
 - ① Non-industrial sources.
 - ② Industrial sources.

③ Non-industrial sources

It includes noise from domestic sources, aircraft's, motor vehicles, horns, railway traffic, crowded market noise.

Domestic sources of noise includes television, radio, kitchen appliances such as mixer, grinder etc, washing machines.

④ Industrial sources

In industry noise could be generated from various machines which involves in crushing of different materials grinding, drilling, cutting, weaving.

The Central Pollution Control Board (CPCB) recommended the permissible level of noise at various places.

	Day 6-9am	Night 9-6pm
1. Industrial area	75	65
2. Commercial area	65	55
3. Residential area	55	45
4. Silence or Silent Zone	50	45

Effects

The various effect of noise pollution on human being is classified into two groups as auditory & non-auditory effects.

- Auditory effect includes auditory fatigue & deafness i.e. cause some defect in hearing capacity of man.

- Non-auditory effect includes

- Contraction of blood vessels & muscles make the skin pain & also responsible for high blood pressure.

- It causes muscles to contract leading to nerve breakdown, tension & even insanity.

- It affect the health efficiency & person behaviour, it may cause damage to heart, brain, kidney, liver & also produce emotional disturbance.

- Physiological disorders are also developed due to continuous exposure to noise.

Control measures

- ① Reducing noise at source level: Includes use of silencing devices, change in operation process, replacement of noise machines.
- ② Reduction at receiver level: Use of personal protective equipments such as earplugs, noise helmets.
- ③ Control along transmission path: To reduce the intensity of noise by increasing distance between source & receiver.
- ④ Creating Awareness: Creating the awareness within the people through newspaper, television, radio, workshops.

✶ Thermal Pollution

The term is related to pollution due to heat. Broadly the term is used to indicate degradation of water quality by a process that change ambient water temperature.

It is associated with harmful effects of sudden increase in ambient temperature in a stream, lake or ocean due to discharge of heated water or effluent from industrial process.

The problem is mainly related to aquatic environment only because of aquatic plants & organisms are very sensitive to change in temperature.

Source

Heat & hot water result from many industrial process is basic cause of thermal pollution. Thermal power plant, coal fired plant require huge amount of cooling water for heat removal. Condenser coil of this type industries are cooled with water from nearby lake, river or suitable water supply station. After the cooling process hot water is discharged back into water system which increase the temperature of water to about $10-15^{\circ}\text{C}$.

There are many industries like sugar, paper, textile are also responsible for thermal pollution.

Effects

- change in dissolved oxygen & redistribution of organism in the local community.
- Cold water contain more oxygen than hot water. An increase in temperature decrease the oxygen carrying capacity of water.
- Increase in temperature lower the dissolved oxygen level & the low dissolved oxygen level lead to anaerobic conditions.
- Thermal pollution also affect the ecosystem composition.

Control measures

- Outlet water must be cool before discharge in water bodies.
- Simplest method to control thermal pollution is cooling ponds.
- Cooling pond water is exposed to atmosphere to decrease the temperature.
- Cooling tower have been used extensively at various industries. The disadvantage of cooling tower is change in local meteorological conditions.

* Nuclear Hazards

Radiations are the most damaging invisible killers released from the radioactive substances present in nature.

Though it is a cheapest source of energy, waste disposal is observed to be a great problem to the modern society.

Nuclear disintegration of atoms release energy from the nucleus in the form of radiations.

The radiations are highly energetic & have a strong capacity to penetrate deep into nonliving as well as living cells.

Four types1. Alpha Radiations

Alpha radiations are heavy, very short-range particles & are actually an ejected helium nucleus. Characteristics of alpha radiations are:

- most alpha radiations are not able to penetrate human skin.
 - Alpha-emitting materials can be harmful to humans if the materials are swallowed or absorbed through open wounds.
 - alpha radiations travel only a short distance in air.
 - α are not able to penetrate clothing.
- e.g. Radium, Radon, Uranium, Thorium.

2. Beta Radiations

Beta radiations are light, short-range particles & are actually an ejected electron.

- May travel several feet in air & are moderately penetrating.
 - Can penetrate human skin, where new skin cells are produced.
 - Harmful if deposited internally within the tissues.
 - clothing provides some protection against beta radiation.
- e.g. Carbon-14, Sulfur-35.

3. Gamma Radiations

Are highly penetrating electromagnetic radiation.

- Able to travel many feet in air & many inches in human tissue.
- Are electromagnetic radiations like visible light, radiowaves & ultraviolet light.
- Dense materials are needed for shielding from gamma radiation.

Causes

1. Nuclear explosion tests are generally conducted in the air, on or below the ground.
2. The radioactive dust that falls to the earth after atomic explosion is known as radioactive fallout. It mainly contains harmful radioactive elements & easily gets mixed with soil, water & vegetation.
3. Produces low level, medium level & high level wastes.
4. Atomic explosives used in war release out radioactivity in the environment in large proportion.

Effects

1. The atomic bombings of Hiroshima & Nagasaki were nuclear attacks during World War II.
2. Strontium has a strong ability to react with air, water, soil that comes into the body of human beings through food chain.
3. Radioactive Iodine-131 causes cancer of thyroid glands.
4. The nuclear blast can result in the immediate death of cells & organisms.

Control measures

1. Each state Party undertakes not to carry out any nuclear weapon test explosion.
2. Use of modern technology, trained workers, well planned management activities & construction of nuclear power plant away from residential areas.
3. Radioactive wastes are normally stored in underground sealed tanks made of stainless steel & deposited deep in earth.

* Solid waste

Solid waste is the waste material produced by household, commercial, institutional, industrial activities.

Defn Any unwanted, discarded material other than gas & liquid waste is organic & inorganic matter in a wide variety of forms.

Sources

1. Urban waste:

- Domestic waste - contains a variety of discarded materials like polyethylene bags, empty, metal & aluminium cans, glass bottle, waste paper, food wastes.

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- Wastes from shops - mainly consists of waste papers, packaging material, cans, bottles, tea leaves etc.
- Bio chemical waste - includes anatomical waste, pathological waste infections waste.
- Construction & demolish waste - includes debris of rubbish wood concrete.
- Horticulture waste & waste from slaughterhouses includes vegetable parts, residues of slaughtered animals resp.

2. Industrial waste

Includes large number of materials including organic wastes, metals, packing materials, factory rubbish etc.

The composition of the waste generated in the industry is diverse in nature ranging from organic to inorganic & also includes hazardous waste.

Problems

1. Due to improper disposal system, it causes bad odour in surrounding environment.
2. Improper handling of urban as well as industrial solid waste will be the source of land, water & soil pollution.
3. Open dumping of solid waste is responsible for spreading of diseases.
4. The leachate from solid waste dumping site contains pathogenic microbes, toxic chemicals that causes soil pollution.
5. Air pollution causes due to burning of solid waste.

Management of solid waste.

- 5 Major steps
1. Segregation of waste at source
 2. Collection & storage
 3. Transportation
 4. Reuse & recovery
 5. Treatment & disposal.

1. Implementation of three 'R's

'R's are important are reduce, reuse & recycle before disposal & safe storage of waste.

- Reduce in use of raw materials will correspondingly reduce generation of solid waste.
- Reuse the materials, which are discarded as the solid waste.
- Recycling means reprocess the discarded materials into new useful products.

2. Composting

In this process, biodegradable waste is allowed to degrade or decompose in an oxygen rich medium. Through this process we get good quality of manure which helps in improve fertility of soil.

3. Vermicomposting

This technique is same as like the composting only here used the earthworm for the degradation of waste.

4. Landfilling

Solid waste spread out in thin layers compacted & covered with clay or plastic foam.

5. Incineration

Incineration are combustion process means burn a unwanted waste at higher temperature. During burning process, the various gases are release into the environment.

* Disaster management

Natural disasters are produced by processes that have been operating since the origin of earth.

e.g. throughout Earth's history, volcanism has been responsible for producing much of the water present on its surface & for producing the atmosphere.

Earthquakes are one of the processes responsible for the formation of mountain ranges.

Defⁿ Those extreme events either natural or man induced which exceed the tolerable magnitude within or beyond certain time limits, make adjustment difficult.

Types of disasters

1. Natural disaster

Natural disaster that occur as a result of nature's extremities in the environment.

Geologic Disaster - includes earthquakes, volcanic eruptions, tsunamis, landslides, floods, subsidence, impacts with outer space objects etc.

Atmospheric disaster - Tornadoes, droughts, lightning etc. are major atmospheric disaster.

Other natural disaster - insect infestations, disease, wildfires are other natural disasters.

2. Anthropogenic Disaster

These are disasters which occur as a result of human interaction with the environment.

Technological disaster

It occurs due to exposure of hazardous substances such as radium, mercury, fibers & coal dust. They also include other disaster that have formed only through human interaction, such as acid rain & contamination of the atmosphere or surface waters.

Floods

Floods mean the overwhelming of usually dry land by a large amount of water that comes from an overflowing river or lake, exceptionally high tide, melting snow or sudden excessive rain.

The floods are natural disaster which is a response to rain fall but it becomes hazards when it causes colossal loss to human lives & property.

Causes

- Caused by both natural & man-made factors.
- The natural factors river floods are mainly due to prolonged high intensity rainfall, extensive flood plains break in slope in long profile, volcanic eruptions, earthquake.
- Also due to cloud burst, cyclones, storms, high tides.
- Man-made factors such as urbanisation, channel manipulation & diversion, construction of bridges, large scale deforestation, land use changes.

Control measures

To hasten the discharge of water, to reduce the volume of water, to divert the flow of water, to reduce the impact of floods by reforestation, construction of artificial levees, flood wall & storage reservoirs.

In certain river basins flood control storage reservoir has been constructed.

Flood management

The management of floods implies not letting the excess runoff water suddenly & intensely in the drainage network. The various ways in which this can be done by reduction in runoff, reduction of water volume

4 Flood peak & by reduction of flood level.

The most effective way of flood management is the reduction of runoff by inducing & increasing infiltration into the ground in the river catchment area by increasing the forest canopy.

The volume of water can be controlled by construction of resorting storage reservoir & dams along the river course. The excess water of flood can also be controlled by diversion of water to lakes to other basin of river, or to artificial channels etc.

* Earthquake

Earth is a planet of continuous changes that started billions of years ago. Most of the great changes on earth take place along the interfaces between the lithosphere, hydrosphere & atmosphere.

Earthquake is one of such forces, which is continuously changing the earth surface.

Earthquakes are inevitable & unpredictable forces of nature, which marks a continuous adjustment of the thin & unstable crust of the earth.

The waves generated by an earthquake are recorded by an instrument called seismograph or seismometer.

Causes

Caused basically due to 'disequilibrium' in any part of the crust of the earth. There are various causes for disequilibrium of earth crust such as volcanic eruptions, faulting & folding, hydrostatic pressure of man-made water bodies like reservoirs & lakes.

As per the theory of plate tectonics, the crust of the earth is composed of solid & moving plates having either continental crust or oceanic crust.

The earth's crust consist of six major plates & 20 minor plates. These plates are constantly moving.

Some anthropogenic factors may also result in earthquake such as quarrying, mining, blasts, explosions, dams or construction activities etc.

* Cyclone

Cyclone is taken from Greet word 'Kuklos' meaning circle.

1. Temperate cyclones

The low pressure system of temperate latitudes is known as temperate cyclone. This cyclone system is also called as depression, wave depression.

In size these cyclones are 150 to 3000 km in diameter & move at a rate of 500 to 2000 km per day.

These develops between 30° to 65° north & south latitudes in both hemispheres. In this cyclone the rainfall is light to moderate, which occurs in the form of light shower.

2. Tropical cyclones

The tropical cyclone is a system of low pressure occurring in tropical latitudes. These cyclones originate in the ocean.

The differential heating over land & sea probably cause a small area of low atmospheric pressure to develop.

Most of the tropical cyclone originates in the equatorial belts.

These cyclone have a diameter of about 150 to 300 km. These cyclone are known by various names in different regions of the world.

Control of cyclone

Cyclone is one of the natural phenomena & it is developed by various complex climatic changes in land & over ocean in combination.

Controlling cyclone is difficult, but one can minimise the effects of cyclone by adopting suitable measures. These include forestation along the coastal belt to control the damage due to wind velocity, construction of artificial embankment.

In some of the western countries cloud seeding is undertaken in order to reduce the wind speed & rainfall & as a result the rainfall occurs before it reaches the land area.

* Tsunami

Tsunami is a series of extra large waves of extremely long wavelength, usually generated by a violent, impulsive under sea disturbance or activity near the coast or in the ocean.

When a sudden displacement of a large volume of water occurs or if the sea floor is suddenly raised or dropped by an earthquake, big tsunami waves are formed by the forces of gravity. The waves travel out of the area of origin & can be extremely dangerous & damaging when they reach the shore.

The word 'Tsunami' is composed of the Japanese words 'Tsu' & 'nami'.

The most destructive tsunamis are generated from large, shallow earthquakes with an epicentre or fault line near or on the ocean floor.

Tsunami waves in the deep ocean can travel at high speeds for long periods of time for distances of thousands of kilometers & lose very little energy in the process. The deeper the water, the greater the speed of tsunami waves will be.