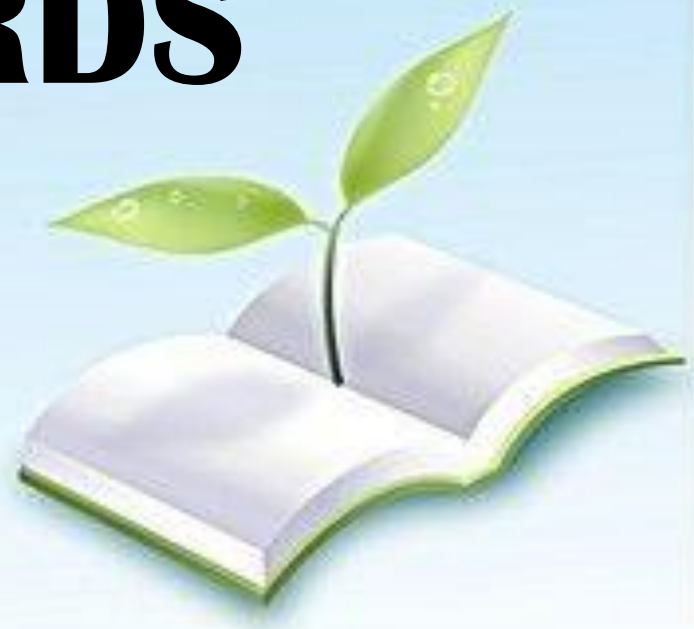
UNIT 3

ENVIRONMENTAL POLLUTION, HAZARDS AND DISASTER MANAGEMENT



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Environmental Degradation

Meaning of 'Environmental Degradation’:

The term 'Environmental Degradation' is a wide and comprehensive concept, meaning the overall lowering of the environmental qualities because of adverse changes brought in by natural and human activities in the basic structure of the components of the environment to such an extent that these adverse changes drastically affect all biological communities in general and human society in particular. Thus environmental degradation implies deterioration of the quality of the environment at the local, national and international levels.

Difference between Environmental 'Pollution' and 'Degradation’

The terms environmental pollution and environ -mental degradation are used interchangeably but these are different concepts and have different meaning. Pollution is the cause for the degradation of environment. The degradation of environment is caused by pollution and hazards / disasters. Environmental pollution is taking place due to slow arid gradual human activities, eg, increase of human population, establishing factories and industries,development of transportation facilities, etc. The pollution degrades the quality of the environment.

Causes of Environmental Degradation

1. The development of modern technologies.
2. The increase in the human population.
3. High pressure on natural resources.
4. Growing industries and factories.

Types of Environmental Degradation

(1) Slow Degradation resulting from man-induced environmental pollution
(2) Extreme adverse changes in environmental quality brought in immediately, by natural processes.

The huge damage and loss to the quality of environment and living organisms are called "Hazards" and "Disasters", Disasters include both man-induced hazards and natural hazards.

Environmental Pollution

Meaning and Definition of Pollution

Pollution has been defined as the deliberate or accidental contamination of the environment with man's waste. Pollution is anything that is released into the environment which degrades it. **Pollutants** are the residues of things which we make use of and throw away.

Environmental Pollutants

1. Deposited matter such as dust, smoke, tar, grit, soot etc.
2. Gases like Sulphur dioxide, Carbon dioxide, Carbon monoxide, Nitrogen Oxide, etc.
3. Chemical compounds such as aldehydes, fluorides, detergents etc.
4. Metals like lead, iron, zinc, mercury etc.
5. Sewage

From the eco-system viewpoint, these pollutants can be classified into two basic types.

(1) Non-degradable pollutants

(2) Biodegradable pollutants

(1) Non-degradable Pollutants

There are materials and poisonous substances like aluminium cans, mercurial salts, long chain phenolic chemicals like plastics, polythene, PVC etc. and DDT that either do not degrade or degrade only very slowly in nature.

(2) Biodegradable Pollutants

These are the domestic wastes like sewage, used paper cups etc, that can be rapidly decomposed under natural conditions. Problems arise with the biodegradable pollutants only when their input into the environment exceeds the decomposition or dispersal capacity.

Basis of Cost of Pollution

The following are the main bases for evaluating cost of pollution:

(1) Damage to crop production
(2) Loss of resources by unnecessary wasteful exploitation
(3) Medical care of health due to diseases
(4) Soiling of buildings and textiles

Types of Environmental Pollution

A) Land/Soil Pollution
B) Water Pollution
C) Air Pollution
D)Marine Pollution

Land or Soil Pollution

Definition of Soil Pollution

The contamination of soil with excess of chemicals, fertilizers, insecticides, herbicides is known as soil pollution." The decrease in the quality of soils either due to human activities or natural sources or by both is known as soil pollution or soil degradation.

Sources of Soil Pollution

The major sources of soil pollution are:
Deforestation, Soil Erosion, Soil Eruption, Forest fires, Excessive use of chemical fertilizers, pesticides, Insecticides and herbicides, Dumping of Industrial and Urban wastes and Water-logging and seeping.

Categorization of the Sources of Soil Pollution

1) Physical sources: e.g., soil erosion, volcanic eruption, forest fire, deforestation.
2) Biological sources: e.g., the micro-organisms, bacteria and protozoa.
3) Air-born sources: e.g., thermal power plants, radiations from industries and factories, etc.
4) Biocides sources: eg, chemical fertilizers and pesticides destroy micro-organisms.
5) Urban and industrial sources: urban wastes such as paper, wood, plastic, polythene bags, etc.

Adverse Effects of Soil Pollution

1. Soil pollutants directly affect the micro- organisms in the land.
2. Chemical fertilizers and pesticides, plastic materials and rubber destroy the organic phosphate compounds in the soil, due to which the soil loses its normal texture.
3. Soil pollutants affect the ground water resources.
4. Soil pollutants lead to soil erosion which converts the fertile soil into waste land.

Measures to Control Soil Pollution

1) The garbage and night soil can be converted into compost manures by cobalt and nickel techniques.
2) Avoiding as far as possible chemical fertiliser pesticides and herbicides; resorting to organic farming using ‘green manures’ and ‘bio fertilisers.
3) Restricting the use of D.D.T.
4) Industries emitting smoke and ashes are to be identified and monitored by pollution control agencies.

Water Pollution

Meaning and Definition of Water Pollution

“The contamination of water with soluble sewage and industrial waste is called water pollution”. Water pollution may be defined as alteration in physical, chemical and biological properties of water which may cause harmful effects on human and aquatic life“.

Sources of Water Pollution

There are two main sources of water pollutions as follows:

1) **Natural sources:** Such water pollutants include soil erosion, volcanic eruption, land slides, coastal and cliff erosion, floods, decomposition of plants and animals.
2) **Man-induced sources:** Of water pollutants include industrial development, urbanization, agricultural sources, cultural sources

.**The main sources of water pollution are:**

a) Sewage and other wastes in cities
b) Industrial effluents and waste products
c) Agricultural discharge (uses of chemical fertilizers and pesticides)
d) Thermal power plant and nuclear plant wastes
e) Oil leakages and discharge

Types of Water Pollution

Water pollution may be divided on the **basis of storages of water** such as:

1) Surface water pollution
2) Lake water pollution
3) Ground water pollution
4) Sea water pollution and
5) River water pollution

Water pollution is also classified on the **basis of sources of water pollution** such as:

1) Sewage water pollution
2) Domestic waste pollution
3) Industrial waste water pollution
4) Solid waste water pollution.
5) Agricultural waste discharge (Chemical fertilizers, pesticides etc.)

Sewage Water Pollution

The primary source of sewage pollution is the discharge of untreated sewage in water bodies, sometimes due to improper sewage - handling processes of municipal bodies. Sewage is the waterborne waste derived from home (domestic waste) and animal or food processing plants. It includes human excreta, paper, cloth, soap, detergents, etc.

The following methods are to be used to check the water pollution through sewage waste:

a) The waste water must be treated before its discharge into lake or river.
b) To stimulate bacterial multiplication in order to reduce the amount of nutrients solubilized in water. This would help disruption of algal food-web.
c) To check recycle of nutrients into the water through harvest and removal of algal blooms upon their death and decomposition.

Water Pollution due to Industrial Effluents

A wide variety of both, inorganic and organic pollutants are present in effluents from dyeing textiles, paper and pulp mills, steel Industries, mining operations etc. The pollutants include oils, greases, plastics, plasticizers, metallic wastes, acids, salts, dyes, DDT, etc., many of which are not readily susceptible to degradation and thus cause serious pollution problems.

Thermal Pollution of Water

The two chief pollutants are heat and radiation substances. These are the wastes chiefly from power plants thermal and nuclear, which use large quantities of water. This waste water is returned after use at very high temperatures the streams - a river or lake. This affects the aquatic life in these water bodies. This is also called thermal pollution since heat acts as a pollutant. Similarly nuclear power plants also release waste heat. This also contributes to thermal pollution.

Water Pollution due to Agricultural Discharges

These Include chiefly the chemicals used as fertilizers and the pesticides used in disease-control. **Modern agriculture** rely heavily on a wide range of synthetic chemicals which include various types of fertilizers and biocides which are dangerous, harmful and disturb the natural ecosystem.

Organisms which compete with man for their food and inflict heavy damage to the economy are called '**pests**'. To eliminate the pests, chemical substances are used such as herbicides, insecticides, etc.

Other Sources of Water Pollution

A) **Ground water pollution** by septic tanks, seepage pits etc.
B) **Marine water pollution** on their way rivers receive huge quantity of sewage, garbage, etc.
C) **Mercury pollution**: It is through industrial effluents.
D) **Fluoride pollution**: It is naturally present in water. The arid and semi-arid soils is due to fluoride contents. It causes the bone diseases.

Adverse Effects of Water Pollution

1) Bacteria from sewage causes cholera, typhoid, hepatitis, dysentery etc. of water-borne diseases.
2) Nitrates contained in fertilizers, Infiltrates in drinking water anti inflict diseases like anemia.
3) Mercury from pesticides is toxic and causes foetal brain damage.
4) Chromium from industries is toxic and especially from tanneries is carcinogic.

Prevention and Control of Water Pollution

Control of water pollution requires several remedial measures and Central Water Control Acts. The following measures are suggested to control water pollution:

1) Maintaining stability of the eco-system – The basic principle is the reduction in waste. Contamination of water by the wastes could be controlled by following ways:
   A) Domestic and industrial wastes should be permitted to be discharged to canals, ponds, rivers or the sea only after duly treating them to safe limit. B) Water pollution could be controlled to a large extent, if appropriate legal measures are strictly enforced.
2) Reutilization and recycling of waste: The various types of wastes include industrial effluents and thermal pollutants which may be reutilized.
3) Removal of pollutants: There are various types of pollutants present in water bodies which can be removed by suitable methods, e.g.., absorption, electro dialysis, etc.
4) Management of water pollution.

Air Pollution

Meaning and Definition of Air Pollution

Due to some natural processes like volcanic eruptions, deflation of sand and dust etc. or human activities when the amount of solid waste or concentration of gases other than oxygen (0,) increases in the air, the air is said to be polluted. The contamination of air with smoke, dust, and harmful gases is called air pollution.

Sources of Air Pollution

There are two major sources of air pollution as follows:

1) **Natural Sources:** Such as volcanic eruptions, deflation of sand and dust, forest wild fires, natural vegetation, etc.,
2) **Man-made sources:** Or human activities. Such as industries, factories, urban centres, aircraft, nuclear experiments, automobiles, agriculture, power plants etc.

A variety of pollutants are released into atmosphere during air pollution which are Carbon compounds, Sulphur compounds, Nitrogen Oxides, Fluorocarbons, Hydrocarbons & metals.

Types of Air Pollution

Air pollution is classified on two bases as follows:-

1. On the basis of types of pollutants air pollution can be further divided into two categories:

(a) Gaseous pollution
(b) Particulate air pollution.

2. Air Pollution, on the basis of sources of pollution is sub- divided into six categories:

(a) Automobiles pollution
(b) Industrial pollution
(c) Thermal pollution
(d) Urban pollution
(e) Rural pollution and
(f) Nuclear pollution.

Automobile Air Pollution

During this period of technological development, there is very rapid increase of cars, trucks, buses and two wheelers. The vehicles create tons of gaseous pollutants into the air daily. The toxic vehicular exhausts are a source of considerable air pollution.

Industrial Air Pollution

The economic development is based on both agricultural and industrial development of nation. There are a number of industries which are source of air pollution. Petroleum refineries are the major source of gaseous pollutants. Stone crushers and hot mix plants also create a menace. There are many food and fertilizer Industries which emit gaseous pollutants. There are also chemical manufacturing industries which emit acid vapours in air.

Thermal Air Pollution

There are a number of thermal power stations and super thermal power stations in our country. The National Thermal Power Corporation (NTPC) has set up several coal-powered power stations to augment the energy generation. These are located in the States of Madhya Pradesh, Uttar Pradesh, Odisha, Chhattisgarh, Andhra Pradesh and West Bengal. The coal consumption of thermal plants is several million tons. The main pollutants are fly ash, sulphur oxide and other gases and hydrocarbons.

Nuclear Air Pollution

The four areas of concern in any nuclear power plant are radiation releases from the plants themselves and the nuclear fuel reprocessing plants, the possibility of accident, the disposal of radioactive wastes and the radiation problem associated with the mining of the nuclear fuel.

One of the classical cases of nuclear accidents is the Chernobyl Atomic Power Plant accident in Russia on April 26, 1986. The explosion that took place in this nuclear plant resulted in innumerable deaths. Another major nuclear accident was Fukushima nuclear disaster in Japan on 11th March 2011.

Adverse Effects of Air Pollution

1) Air pollution has very serious types of pathological effect on man and causes several types of diseases.
2) It causes obstruction to vision of pilots and has caused air craft accidents.
3) Air pollution has damaged both agricultural crops and natural plants and vegetation.
4) There has been injury to agricultural livestock.
5) Air pollution also affects weather and climate on regional, continental or global basis.
6) The increased amount of carbon dioxide in atmosphere, causes increase in the temperature of earth. It is known by the phrase **'Green house effect'**. The intensity of radiation will cause skin cancer.

Control and Prevention of Air Pollution

The steps to be taken to control air pollution at source and after the release of pollutants.

1) Automobiles Air Pollution:

a) To check pollutants emission from vehicular exhaust.

b) To control evaporation from fuel tank and carburettor.

c) To use the filters

d) To control through law-Motor Vehicles Act 1988 and other Amendments thereon.

2) Industrial Air Pollution: Air pollution by industry and power plants waste can be checked by devising measures for removal of the particulate matter and gaseous pollutants from the wastes. The three types of equipment or devices used are –

a) Cyclone collectors

b) Electrostatic precipitators and

c) Control through law Acts of industry.

3) Gaseous Pollutants: The following four methods can be used to control air pollution from gaseous pollutants:

a) Wet systems: The alkali liquid reacts with sulphur dioxide to produce a precipitate.

b) Dry Systems: Water in contact with sulphur dioxide produces sulphuric acid.

c) Wet dry systems: This method is very effective in dry cleaning plants, printing shops, paint factories, food processing plants, etc.

d) Control through Law: Acts for Industries are to be enforced strictly to prevent gaseous pollution

Role of Education in Controlling Air Pollution

Education is a powerful instrument to control social problems. Education can also play a significant role in the prevention and controlling of air pollution. It is very essential to provide the awareness and develop consciousness among students about air pollution and its resources and ways.

Formal, non-formal and adult education programmes should provide awareness and develop feelings and attitudes or consciousness about the problem which has the serious adverse effects on human health. Charts and mottos are to be prepared on air pollutions resources and remedial measures.

Marine Pollution

Marine pollution is defined as the discharge of the wastes and sewage into the sea resulting in harm to living organisms, hazards to human health, hindrance to fishery and impairment of quality of sea water for use. Marine organisms get seriously affected by the pollution of sea water.

Sources of Marine Pollution

1. The commonest pollutant of the sea water is raw or treated sewage.
2. Synthetic detergents which have widely been used now as a replacement of soap.
3. When sewage discharged in sea, serious sea pollution occurs.
4. Ships carrying crude oils when collide with other ships or rocks sink in the sea, causing oil spread over a vast surface area on the sea, which pollutes the sea water.

Control of Marine Pollution

1) Exhaust the oil from the sinking oil carriers (Ships) and help the oilslicks to reach the seashore by the action of tides.
2) Burn the thick layers of oilslicks.
3) Sinking oilships, could be made to immerse deep into the sea.
4) Emulsification of oilslicks to make them harmless.

Adverse Effects of Marine Pollution on Eco-System

1. Coral reefs, the natural habitats of marine life gets affected by excessive discharge of sewage and as a result of which marine species do not breed and get multiplied.
2. The solid and liquid wastes as well as oilslicks affect the plants and fishes in the sea.
3. Solid wastes discharged into the sea, block the penetration of sunlight into the sea water, and cripple photosynthesis.
4. Heavy metals and radioactive substances through 'biomagnification' pollute sea food.

Noise Pollution

Meaning and Definition of 'Noise Pollution'

Noise, defined as the unwanted high intensity sound, is an important type of urban pollution that is capable of not only causing annoyance and hearing loss but also in some cases adverse physiological and psychological effects.

Sources of Noise Pollution

Sources of noise could be broadly classified as

a) Natural Sources: These includes thunder bolts, noisy heavy downpour, whistling storms, icy rainfall etc.
b) Man made Sources: These, Include industrial noise, transport noise, neighbourhood noise and noise from construction work. Noise Pollution is included in air pollution.

They are explained briefly:-

1.Transport Noise: Main menace of noise, comes from transport which includes the Engine noise, Noise from exhaust pipe, Noise due to banging of car doors, sudden brake, horn, etc.

2. Aircraft Noise: Jet aircrafts generate more noise than other types of aircrafts.

3. Noise from Construction Work: Noise arises due to handling of tools, equipments and techniques used during the construction of houses and apartments, dams, industrial plants, etc.

4. Industrial Noise: Frictions, vibrations, air ejections, etc. that take place during the operation of machineries in industries produce noise.

Noise Limits

Our country has the distinction of having three of the noisiest cities in the world - Mumbai, Kolkata and Delhi. In Mumbai on non-festive days the noise level is 70 dB, more than the WHO prescribed standard of 55 dB, during the day and 45 dB, at night.

Effects of Noise Pollution

Medical authorities feel that constant occupational exposure to noise levels of 90 decibels in the range of human hearing are dangerous. Noise also produces annoyance in human beings and can affect proper rest and sleep. Noise can affect verbal communication and concentration to work. Noise also interferes with tasks requiring a high degree of concentration, such as office work and learning in schools.

Noise also affects the physiological function of the human body. One important effect is constriction of the small blood vessels, resulting in the reduction of blood-flow. As noise reduces the depth and quality of sleep, it affects one's health. Though noise does not make a person awake from sleep, it does alter his state of sleep.

Control of Noise Pollution

1) Source Control: Gadgets (Silencer and devices) are to be developed to control or reduce noise at source. Redesigning the noisy machines and manufacturing process could be undertaken.
2) Transmission Control: The room walls can be covered with sound absorbers, providing shields and barriers.
3) To protect exposed persons or workers: Devices as ear plugs and ear muffs can be provided to workers of industries.
4) Plantation or vegetation: Trees should be planted along high ways and other noisy places like schools, hospitals, etc, big trees such as neem, coconut etc. are good for this purpose.

Measures to Reduce Thermal Pollution

1) Letting out the hot industrial effluents into artificial ponds and allow them to cool before discharging into rivers, streams and lakes.
2) Arranging for cooling towers in large industries
3) Channeling of thermal effluents to power generating plants.

Radiation Pollution

The use of radiation and nuclear devices for constructive purposes have also been responsible for rapidly increasing the radiation pollution.

Radiation Sources

The radiation sources are either natural or man- made.

Natural radiation is produced by naturally occurring radioactive elements. Cosmic radiation is another important source of natural radiation.

Among the man-made sources of radiation are the medical procedures. An average chest X-ray, gastrointestinal tract examination, etc. Radioactive fallout of nuclear weapon tests is another major source of radiation pollution.

Effects of Radiation Pollution

A) Direct Effects i.e. fragmentation of biological molecules like DNA in the cell nucleus.
B) Indirect Effects i.e. fragmentation of biologically less vital molecules like water.
From the biological point of view the effects can also be classified as

A) Somatic Effects i.e. the effects on the body itself being of direct concern to the person exposed to the radiation.
B) Genetic Effects i.e, the effects that involve mutations of the chromosomes or genes in sex cells, posing a potential hazard to the descendants of the person exposed to the radiation.

Reduction of Nuclear Pollution

1) Reducing the number of nuclear power plants in a phased manner.
2) Removing and storing of radio active wastes with high safety and security must be ensured.
3) Nuclear pollution could be controlled by implementing multi level safeguarding systems employing advanced techniques and devices.
4) Safety measures are to be implemented with determination allowing no excuse or compromise.

Light Pollution

Concept of Light Pollution

Light pollution is also known as Photo-pollution or luminous pollution. All intruding light which affects the natural light level of a place are considered as a photo-pollute.

Sources of Light Pollution

i) Lighting arrangements done in building exterior and Interior.
ii) illuminating advertisement boards
iii) using glow lights in commercial complexes
iv) powerful lights used in offices and factories.

Adverse Effects of Light Pollution

1) Light pollution competes with star light in the night sky and interferes with astronomical observation.
2) Light pollution disrupts eco-systems.
3) It affects the sleep of people, makes them irritated and feel mental and physical fatigue.
4) Electricity is needlessly wasted.

Types of Light Pollution

Light Pollution is dived into two main types:

1) Unpleasant light that intrudes on an otherwise natural or low-light setting.
2) Excessive light (generally indoors) that leads to discomfort and adverse health effects.

Light Trespass

Light trespass occurs when unwanted light enters one's property, for instance, by shining over a neighbor's fence.

Over Illumination

Over-illumination is excessive use of light. [(e.g.) Illuminated advertisement boards, illuminated sporting venues, cinema studios, factories, outdoor decorations etc.) This results in the enormous wasting of valuable electric energy.

Reasons for Over-illumination

a) Not using timers, occupancy sensors or other controls to extinguish lighting when not needed.
b) Improper design, especially of workplace spaces, by specifying higher levels of light than needed for a given task.
c) Incorrect choice of fixtures of light bulbs, which do not direct light into areas as needed.
d) Inadequate lighting maintenance resulting in Increased stray light and energy costs;

Glare

1) Binding glare describes effects such as that caused by staring into the Sun.
2) Disability glare describes effects such as being blinded by oncoming car lights, or light scattering in fog or in the eye, etc.

Glare from bad lighting is a public-health hazard, especially for the old people. Glare light scattering in the eye causes loss of contrast and leads to unsafe driving conditions,

Light Clutter

Light clutter refers to excessive groupings of lights. Groupings of lights may generate confusion, distract from obstacles (including those that they may be intended to illuminate), and potentially cause accidents.

Skyglow

Skyglow refers to the glow effect that can be seen over populated areas. It is the combination of all light reflected from what it has Illuminated escaping up into the sky and from all of the badly directed light in that area that also escapes Into the sky, being scattered (redirected) by the atmosphere back toward the ground. Rayleigh Scattering dominates in such clear air, making the sky appear blue in the daytime.

Solid Waste Pollution and Management

Solid waste substance are those materials which become useless and hence waste after short period of their use, such as news papers, bottles, plastic bags, polythene, packing materials and garbage. The solid wastes are those that are discarded after their uses.

Sources of Solid Wastes

The solid waste materials may be classified in two categories. Production of solid waste material

1) at production centres.
2) at consumption centres after the use.

Categories of Solid Wastes

Types of Solid Waste Substances: These types of pollutants are divided into several types based on their sources.1) Mining wastes2) Agricultural wastes3) Industrial wastes 4) Municipal wastes 5) Packing wastes 6) Human wastes 7) Animal wastes and 8) Radioactive waste.

1. Domestic Wastes: Most of the households are swept clean daily and the solid wastes like left out food, bottles, papers, plastic bags, containers, etc. are thrown over the compound wall onto the street. There, they pile up, rot, stink and breed flies, mosquitoes and bacteria, causing pollution and disease.

2. Municipal Wastes: This Includes discarded materials from houses, shops, commercial establishments, business complexes, eateries, etc. collected dally by the municipal sanitary staff.

3. Construction Wastes: Builders, contractors and house owners deposit the debris and other construction wastes just outside the houses and buildings on the roads, which narrows down the carriage way for the vehicles causing obstruction to traffic.

4. Industrial Wastes: Used up packing materials from the business houses and industries, wastes emerging out from textile, scraps etc. Are industrial wastes which produce severe pollution.

5. Agricultural Wastes: Cattle shed wastes and crop residues are the main agricultural wastes. Human excretions also are included in this category.

6. Mining Wastes: "Tailings", slag heaps, culm piles at coal mines etc. Are the mining wastes which cause high pollution and health hazard.

Solid Waste Pollution

Disposal of solid wastes has emerged as a very big challenge today. It is easier to recycle substances like paper cups, newspapers etc. but recycling heavy metals proves to be complex and problematic.

Controlling of Solid Waste Pollution

i) Removal of Solid Wastes for Open-dumping. Solid wastes removal involves three steps: (a) Collection (b) Transportation and (c) Disposal.
ii) Sanitary Land Filling: In this method, solid wastes are collects transported and buried in deep trenches safely.
iii) Incineration: In this method solid wastes are put in the incineration plants and burnt.
iv) Composting: Agricultural wastes could be subjected to composting and turn them into manures. There are three techniques involved in composting:-

A) Anaerobic composting is done in the absence of air. It takes a long time of 4 to 8 months.
B) Anaerobic composting is done in the presence of air. It is completed in 2-3 weeks.
C) Vermi-composting is done in the presence of air and earthworms.

v) Organic wastes could be fermented to generate biogas that could be used for the production of electricity and as a fuel as well.
vi) Decomposable solid wastes could be turned into substances that find alternate applications or recycled into other useful products.

Managing the Garbage Problem

Solid waste management involves the following techniques:

(1) Reducing the generation of solid wastes- Reducing the use of packing materials like plastic and cardboard boxes, paper wrappers etc, instead of paper cups and plates, metal tumblers and plates are to be preferred to avoid generation of paper wastes, Reducing the use of plastic and polythene materials.

(2) Repeated utilization of substances- Substances like glass bottles, tin cans, steel (ever silver) drums, jars, tumblers and utensils could be used. Repeatedly.

(3) Recovery and recycling techniques- Paper could be recycled to prepare paper boards, cardboard boxes, wall boards etc, Like metal wastes, plastic and rubber wastes could also be recycled, etc.

(4) Finding alternate uses / applications for solid wastes- ashes emitted by coal-fired power plants could be utilised in the preparation of cement and bricks, Using the old tyres, plastic materials and construction debris, sturdy roads that withstand water corrosion could be laid.

(5) Pre-cycling- It implies that we should consider the end-result of everything we buy and their impact on environment at the end.

Role of Individual in Preventing Environmental Pollution

1. Preserving and protecting local water resources like tanks and lakes.
2. Finding alternate uses for solid wastes.
3. Restraining from throwing solid wastes in the drains.
4. No dumping of construction wastes and animal wastes on the roadside.
5. Burying the medical wastes safely.
6. Helping for 'recovery and recycle' of solid wastes; impressing everyone to buy recycled goods.
7. Controlling the volume of sound emerging out from television sets and radios to be within safe limits.

Disaster Management

Meaning and Definition of Environmental Hazards

The terms environmental hazards, environment stresses and environmental disasters are used extreme events such as earthquakes, floods, volcano eruptions etc., which are caused by natural process or human activities. The environmental hazards are the abnormal processes which cause environmental disasters.

The Intensity of environmental disasters are assessed it terms of damages done to the human society. The environmental or ecological balance is disturbed; the resultant state of the highly disturbed natural environment is called 'Environmental Stress

Types of Environmental Hazards and Disasters

The extreme events are divided into two categories, on the basis of causative factors:

(1) Natural Hazards

(2) Man-induced Hazards

Natural Hazards and Disasters

These involve rare high-intensity processes and extreme events caused by 'terrestrial or endogenous hazards and 'atmospheric or exogenous hazards'. Thus natural hazards are of two types. They are:

a) Endogenous Hazards:- Volcanic Eruptions, Earthquakes, Landslides, Tsunami

b) Exogenous Hazards:- Cyclones, Foods, Drought, Cold Waves, Heat Waves

Earthquake

(A) Occurrence of Earthquake: An earthquake is the violent shaking of the Earth's surface caused by rapid movement of the Earth's rocky outer layer.

The place of origin of an earthquake I called 'focus". The point on the Earth's surface vertically above the focus is called the 'epicentre'. The resultant energy waves spreading on all sides from the focus are called 'seismic waves'.

(B) Causes of Earthquake

1) Earthquakes are caused by tectonic forces.
2) Earthquakes are generally due to the sudden movement of the rocks strata, along faults or fractures in the crust.
3) Earthquakes are also caused by volcanic eruptions.

(C) Adverse Effects of Earthquake

i) Many villages and towns are destroyed and there is considerable loss of life and property.
ii) Some places are submerged under the sea.
iii) Big cracks and fissures are developed on the earth surface which disrupt communication.

(D) Beneficial Effects of Earthquake

1. New springs are formed which help irrigation.
2. Submerged coastal land emerge out of water and makes fertile plain.
3. Precious metal and mineral come up to the surface.

(E) Some Symptoms of Earthquake

1. Seawater recedes from the seashore; water level in wells may either significantly fall or rise.
2. Cracks will be developed in the surface of the earth near the earthquake region.
3. Radio active radon gas may emerge from wells.
4. Level of hydrogen gas on land may increase.

(F) Precautionary Measures

i) Stay In open spaces where there are no buildings or trees in the nearby.
ii) Inside the house, take shelter under the tables.
iii) Standing under the lintel above the doors saves us to some extent from building debris, if the building crashes.
iv) Fire is not to be used during earth quakes.

G) Rehabilitation Measures to be Undertaken in Earthquake

(1) Searching
(2) Rescuing and Saving the Victim.
(3) Those who have been rescued should be offered first aid immediately and then sent to medical camp to provide necessary medical car.
(4) Arranging provision for medical and food facilities.
(5) Dead bodies are to be retrieved and reached out to the Kith and kin of the dead

Tsunami

(A) Occurrence of Tsunami: The term 'Tsunami' originated from Japan, which is prone to frequent earthquakes. It is derived from the Japanese word 'Tsu' meaning port and 'nami' meaning wave-attack. Tsunami refers to gigantic waves rising to a height of 20 to 30' attacking coastal regions of even far off places and inflicting massive destruction, are mainly caused by severe earthquake or volcanic eruptions.

(B) Tsunami Information Centre: In 1965, with the efforts of UNESCO, a 'Tsunami Information Centre' was established at Honalulu in the Howall Island to get in constant touch with Science Research Centres, Institutions of Higher Education, Military Head Quarters etc. share Tsunami related data with member countries, and provide advance notifications and warnings.

(C) Measures to Manage Tsunami

1) Before the Occurance of Tsunami, Knowing whether one's apartment, office or educational Institution is located in the tsunami - prone region.
2) Avoiding buildings and apartments within a distance of 150 ft from the sea shore.
3) Knowing in advance, the safe quick routes for exit to escape from tsunami, if at all it occurs.

During Tsunami

1) On coming to know about the impending tsunami, one should inform about it to all his family members.
2) On getting the warning news broadcast by television and radio and messages through several media, people in the tsunami prone regions should move away quickly to places of safety.
3) People living in coastal regions, if happen to feel massive land vibrations should try to move to places located in the high regions in that area.

After the Tsunami Attack

1) Trying to know about the events that are taking place after the attack of tsunami through mass media like television and radio.
2) Coming forward voluntarily to safeguard children, the handicapped and old people by helping them to move out to places of safety.
3) Visiting the places of disaster should be avoided as it may cause bacterial attack.
4) Getting the required medical care.

Landslides

A landslide is the descent of a mass of earth and rock down a mountain slope, under the influence of gravitational force.

(A) Causes of Landslides

1) Earth tremors and incessant rains are the major factors of landslide.
2) Buildings constructed on the upper reaches of slopes cause heavy pressure underneath due to which landslide may occur.
3) Due to soil erosion when base layers become thin, vacuum is created, towards which bedrock as well as over burden rush causing landslide

(B) Preventing Human Activities Causing Landslides

1) Denying permission for construction of building on rock and mountain slopes.
2) Constructing a strong concrete blocking wall at the bottom of the slope.
3) Strengthening bedrocks with gravel.

Volcano Explosion

In hot places, under a depth of 120 to 160 K.M. below the surface of earth, molten rocks in the form of liquid, called 'Magma' with hot gas exist. Due to pressure changes when it rises up and is at a depth of 40 K.M. from earth's surface, greater pressure surrounding 'Magma' further pushes it up, during which it melts rocks on its way and get stabilised at a depth of 3 K.M. depth from earth's surface in the form of a conical chamber, from which it ejects out with great force through weak spots on the surface of earth as an explosion with thunderous noise

(A)Destructive Effect of Volcanoes

1) Lava flowing down a volcano destroys the human settlement and render the land useless.
2) Disrupts air traffic.
3) Inflicts heavy loss of life and property.

Floods

Floods are rising level of water along a river channel or coast leading to inundation of land that is not normally submerged.

Floods in coastal areas are due to the rise in the level of sea water due to the following reasons:

1) Unusual meteorological conditions
2) Due to volcanic explosion and earthquake under the sea.

The causes for floods due to swollen rivers are many of which the following are the important ones:

1) Continuous heavy rainfall during the monsoons and cloud bursts.
2) Excessive melting of snow and ice at the upper reaches of mountains where the river originates.
3) Bursting of dams built across the rivers.

(A) Effects of Flood: Floods affect the normal life of people and livestock; Crops, buildings and roads are damaged; communication gets disrupted; capacity of rivers gets decreased due to excessive siltation, raising the river bed.

(B) Measures to Control Flood

1) Strengthening the river banks and raising their height.
2) Soil protection is ensured in catchment areas of rivers.
3) Constructing more number of dams and check dams across the rivers.

Cyclone

A) Meaning of Cyclone: Cyclone is a region of low atmospheric pressure surrounded by a wind system, in a counter clockwise direction. As storms in desert rains sand, they are called '**sand-storms**'; similarly in high altitude mountain regions, due to severe atmospheric pressure changes, storms rain snow and ice. The are called '**snow-storms' or 'blizzards'.**

B) Damages Caused by Cyclone: Due to cyclonic storms, villages and towns located on the coastal areas are flooded with water; trees are uprooted; crops, bulidings, roads, communication structures and equipment get damaged. Sometimes land slides too occur. Thus cyclonic storm greatly affects the environment.

C) Measures to Control Cyclone Damages

1. It is advised to grow vegetative bushes and tree covers on the sea coasts and estuaries.
2. It is better to construct buildings on the plain in the hilly regions than on high rise areas near the top (where the speed of wind is usually high).
3. Impact of cyclone on buildings constructed in circular or polygon shape will be less.

Oil Spills

An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the ocean.

Generally **oil spills harm ocean life in two ways:** Fouling or Oiling and Oil Toxicity. Fouling or Oiling occurs when oil physically harms a plant or animal. Oil consists of many different toxic compounds These toxic compounds can cause severe health problems and even death to sea and ocean living plants, birds and animals.

The trained experts **use different equipment and tactics to contain or remove oil spill** from the environment. Booms are floating physical barriers to oil, which help keep the oil spill contained and away from sensitive areas like beaches, mangroves and wetlands. Skimmers are used to "skim" oil from the sea surface. In-situ burning or setting fire to an oil slick can burn the oil away at sea and chemical dispersants can break up oil slicks from the surface. Clean up activities can never remove100% of the oil spilled.

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Thank You