ENVIRONMENTAL EFFECTS

POLLUTION: Any change in the typical and ideal characteristics of atmosphere caused by the excessive discharge of unwanted and undesirable substances in the atmosphere that adversely affect the life is called pollution.

POLLUTANTS: The unwanted and undesirable foreign matters, which when added to the environment adversely affect it and causes pollution in the atmosphere are called pollutants.

CAUSE OF POLLUTION: The main causes of pollution are following:

i) Tremendous increase in human population.
ii) Rapid Industrialization.
iii) Fast growing urbanization.
iv) Deforestation.
v) Forest fires.
vi) Abuse of natural resources.
vii) Natural calamities.

TYPES OF POLLUTION: The different types of atmospheric pollution are following.

1. Air pollution
2. Water pollution.
3. Sound pollution or Noise pollution
4. Soil pollution

AIR POLLUTION: Any change in the ideal characteristics of air by the excessive discharge of unwanted and undesirable foreign matters that marks an adverse effect on life is called air pollution. Substances that are responsible for these changes are called air pollutants. The common air pollutants are following.

1) Gases such as CO, CO_2, SO_2, H_2S, NO, NO_2, H_2S, HF
2) Particulates like, Carbon, Pollens, aerosol etc.
3) Chlorofluoro Carbons. (CFCs)
4) Cl_2
5) Peroxyacyl nitrate (PAN)
6) Hydrocarbons, Aldehydes, Certain radicals
7) Volatile organic compounds (VOCs)

SOURCES OF AIR POLLUTION: The two broad sources of air pollution are following.

1. **NATURAL SOURCES**: This includes;
   a. Volcanoes
   b. Forest fires
   c. Dust storms
   d. Biogenic sources (such as smoky mountains)
2. **ANTHROPOGENIC SOURCES** (Man-made sources)**:** All the anthropogenic sources may be either (i) regular or process such as emission from chimneys and (ii) Fugitive or non-point that is non-regular. This includes;
   a. Industrial sources.
   b. Automobile or vehicular sources.
   c. Domestic sources.
   d. Area sources.

CAUSES OF AIR POLLOTION: Various causes of air pollution arises from different sources are following.

1. Exhaust from Industries
2. Automobile exhaust
3. Incomplete combustion
4. Radioactive wastes
5. Deforestation
6. Unprotected burning
7. Forest fire
8. Natural calamities

EFFECTS OF AIR POLLUTION: The common effects of air pollution are following.

1. Human health problem.
2. Effect on vegetation.
3. Climate problem such as global warming, greenhouse effect, acid rain.
4. Destruction and deterioration of materials.

SOURCES AND EFFECTS OF AIR POLLUTANTS:

Pollutant	Sources	Effects
SO_2	Thermal power plants, petroleum industries, Oil refineries, Sulphuric acid plants	Respiratory disorders like Asthma, Bronchitis.
SO_3	Oxidation of SO_2,	Irritation to respiratory tract, Acid rain, Corrosion of iron and steel,
CO	Obtained by partial combustion of fuel in automobiles, industries and oil refineries, smokes	It causes headache, -visual difficulty, paralysis, reduces oxygen carrying capacity of blood, leads to laziness, headache, and serious effects on cardiovascular system

CO_2	Burning of fuels such as coal, wood etc. respiration of plants, animals and by deforestation.	It is non -poisonous, non-corrosive excess in atmosphere causes pollut Respiratory disorders and suffocati
Nitrogen oxides (NO,	Combustion of fuels (Coal, diesel, petrol), explosive industry, pickling plants.	Causes respiratory illness among children, irritation of eyes and even lungs congestion, formation of smog
Dust	Mines, quarries, furnaces, power houses, vehicular traffics, house cleaning, pottery and ceramics factory stacks, agriculture, combustion operations etc.	Causes allergy and respiratory diseases, Silica dust causes silicosis, corrosion and soil erosion
Smoke	Incomplete combustion of fuels, Chemical reactions, locomotives, diesel engines, automobile petrol engines, furnaces etc.	Loss of calorific value, Possibility of cancer disease, Spoiling of clothing, exterior finishes of buildings.
Smog	It is the combination of smoke and fog. It is a natural phenomenon in which liquid particles remain suspended in air.	Smog has same effects as smoke, but somewhat prolonged one.
Lead dust	The main source is lead mining & smelting works, lead batteries, lead base alloys, automobile exhausts.	Causes lead poisoning as it settles down on plants and food stuffs.

AIR POLLUTION DUE TO INTERNAL COMBUSTION ENGINES: Internal combustion engine is used in automobiles and is one of the major source of air pollution. In this a mixture of gasoline vapour and air bums in the cylinder of the engine. Gasoline which is a mixture of various hydrocarbons produces pollutants like CO_2, CO, unburnt carbon, SO_2, CH_4, acids, alcohols, NO_2 etc. which enter into the atmosphere during combustion. Photochemical smog can be formed due to reactions of hydrocarbons and petrochemical oxidants in presence of sunlight, which is harmful to human life.

CONTROLLING AIR POLLUTION DUE TO AUTO-EMISSION: Air pollution due to auto emission can be controlled as follows.

i) By using engines with better and superior design.
ii) By using a suitable catalyst.
iii) By ensuring complete combustion.
iv) By supplying adequate quantity of air for combustion.
v) By improving the quality of the gasoline by adding TEL

ACID RAIN: Various acidic oxides, such as CO_2, SO_2, NO_2, HC1 produced by the industries automobiles, dissolves in the moisture of atmosphere to from corresponding acids, which then fall on earth along with rain called acid rain.

$$CO_2 + H_2O \longrightarrow H_2CO_3$$
$$SO_2 + H_2O \longrightarrow H_2SO_3$$
$$2SO_2 + O_2 + 2H_2O \longrightarrow H_2SO_4$$
$$4NO_2 + 2H_2O + O_2 \longrightarrow 4HNO_3$$

EFFECTS OF ACID RAIN:

1) Decrease is the pH of rain water
2) Damage of fresh water life
3) Direct damage of plant leaves
4) Changes in the metabolic rate of organism
5) Irritation of eye and muscular membrane
6) Increase is the rate of corrosion
7) Weathering of building and rocks
8) Deterioration of national monuments, lamp posts, towers etc.

DEFORESTATION: The cutting of trees and green plants because of rapid industrialization is called deforestation and is one of the important causes of atmospheric pollution. Green Plants use CO_2 for the manufacture of food by photosynthesis and give out oxygen, thereby;

a) Purifying the atmospheric air.
b) Maintain O_2 - CO_2 balance in atmosphere.
c) Plants also control H_2S, HNO_3 and chlorine.

Thus plants help in controlling air pollution. Excess cutting of trees, consequently, causes indirect pollution.

EFFECTS OF CHLOROFLUORO CARBON ON OZONE LAYER OF ATMOSPHERE: Chlorofluoro carbons (CFCs) are the exhaust of supersonic air Crafts and jumbo jets flying in the upper atmosphere. These are accumulated at high attitude and undergo decomposition, under the influence of ultraviolet radiations to form chlorine

as one of the product. Each atom of chlorine so released, react .more than 10^{15} molecules of ozone converting it into O_2. Consequently a gradual depletion of ozone layer takes place. Thus capacity of ozone layer to stop U. V. radiation

GREEN HOUSE EFFECT: Different greenhouse gases are CO_2, Water vapour, CH_4, Chlorofluorocarbon etc. The CO_2 gas in the lower atmosphere perform major role of heating up the atmosphere, due to trapping of IR rays called greenhouse effect. The Ozone (O_3) layer absorbs most of the U.V. rays and allows visible and IR radiations to pass through towards earth. IR rays easily passed the CO_2 in the atmosphere and causes heating effect on earth. The CO_2 here acts a barrier against the flow of heat from earth to atmosphere and thus causes global warming.

EFFECTS OF GREEN HOUSE EFFEC: The important consequences of greenhouse effect are following.

1. The evaporation of surface water becomes faster which may cause draught.
2. Melting of ice in the polar region and at the peaks of mountains.
3. Flood in the low level coastal region
4. Decrease in biological productivity.
5. Scarcity of food production due to crop damage and crop failure.

WATER POLLUTION: Any change in the typical quality and ideal characteristics of water that adversely affect the life such as human, animals, plants etc. is called water pollution. Thus water is said to be polluted for specific purpose if it contains substance and quantities much different from the prescribed tolerance limit for the purpose.

CAUSES OF WATER POLLUTION:

1. Sewage and the-other oxygen demanding wastes which are discharged into the nearby rivers.
2. Infections agents from the township and human habitats pollute water that may cause disease.
3. Plant nutrients like fertilizers.
4. Organic chemicals.
5. In-organic chemicals.
6. Use of pesticide and insecticides.
7. Industrial wastes.
8. Industrial effluents and oils.
9. Radioactive wastes.
10. Excess deforestation.

CONTROL OF WATER POLLUTION: The water pollution can be controlled by the following

from entering the environment decreases.

$$CFCl_3(g) \longrightarrow CFCl_2(g) + \cdots$$
$$CFCl_2(g) \longrightarrow CFCl(g) + \cdots$$
$$O_3(g) + Cl(g) \longrightarrow ClO(g) + O_2(g)$$
$$O_3(g) + Cl(g) \longrightarrow ClO(g) + O_2(g)$$

methods.

1. By proper treatment of waste water before discharging into rivers, lakes, ocean etc. The treatment can be carried out physically, chemically and biologically, such as:
   a. Filtration of solid particles.
   b. Neutralization of acids or alkalies.
   c. Removal of organic toxic compounds.
   d. Biological process involving biodegradation of hydrocarbons and other organic compounds either by anaerobic (without oxygen) or by aerobic (with oxygen) bacteria.
2. By Stabilization of the Ecosystem: The technique involved is reduction of the waste at source, harvesting and removal of biomass etc.
3. By Reutilization and Recycling of the waste.
4. By proper treatment of wastes.
5. By use of suitable chemicals such as chlorination.
6. By aeration and exposure to sun light.

B.O.D. (Biological Oxygen Demand): It is defined as the amount of free oxygen required for bacteria which consume organic matter under aerobic conditions at 20 ^{0}C for and for a period of 5 days. The B.O.D. is measured in mg/litre or ppm. An average sewage has a B.O.D of 100 to 150 mg/litre.

Significance of B.O.D:

1. B.O.D. is important for sewage treatment, it indicates the amount of decomposable organic matter in the sewage.
2. Larger the concentration of decomposable organic matter greater is the B.O.D.
3. B.O.D. always determines the degree of pollution in the sewage.

Chemical Oxygen Demand (COD): It is defined as the amount of oxygen required in mg/litre or ppm for the chemical oxidation of organic matter in sewage. The COD is a measure of oxidisable impurities present in the sewage.

Significance of COD:

1. This is a quickly measured parameter for industrial waste studies & control of waste

treatment plants.
2. COD is a measure of oxygen equivalent of organic material in a sample which is susceptible to oxidation by strong chemical oxidant.

BIOMEDICAL WASTE: Biomedical waste includes a variety of items that may carry disease-causing germs. It includes live vaccines, laboratory samples, cultures, sharp needles, sharps that have been used to puncture, cut or scrape the body of humans. Biomedical waste originates from pathology laboratory, hospitals & medical clinic etc. This waste is mostly infectious waste.

CONTROL MEASURES:

1. Proper incineration of biomedical waste.
2. Use of autoclave.
3. Effluent treatment.
4. Use of microwave.
5. Deep burial of biomedical waste.

E-WASTE: E-waste includes computers, entertainment electronics, mobile phones and other electronic items that have been discarded by their original users. In addition to this large appliances like ovens, refrigerators, small appliances like toasters, vacuum cleaners, office equipment like PCs, printers, phones, faxes etc. lighting equipment like fluorescent tubes, sports and leisure equipment, medical appliances and instruments etc. are all belonging to E-waste.

EFFECT OF E-WASTE:

1. E-waste is toxic if treated and discarded improperly.
2. Uncontrolled burning and disposa[illegible] environmental problems.
3. E-waste presents difficulties for recy[illegible] to the complexity of each item.
4. There is lack of viable recycling systems foe E-wastes.
5. There are many toxic heavy metals present in e-waste.

PREVENTIVE ENVIRONMENTAL MANAGEMENT (PEM):

The purposes of environmental management are;

1. Regulating the exploitation of natural resources like minimizing the cutting of trees, natural phenomena like strong winds, forest fires, radioactivity etc.
2. Preserving the biological diversity.
3. Controlling of population.
4. Protecting environmental degradation and maintaining environmental quality
5. Balancing of ecosystem.
6. Adopting engineering technology without creating adverse effects on environment.
7. Formulation of suitable environmental laws and regulation and its effective implementation.
8. Introducing education and training at different education levels.
9. Industries should be instructed to minimize solid and hazardous waste.
10. Frequent inspection of public pools, water parks and natural swimming areas.

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