

# Environmental pollution: air and water

6<sup>th</sup> sem

Paper 6.1

Air

Chapter : Environmental Pollution : air, water & land

Definition of pollution :

A favourable unpolluted environment is required by all the living beings for normal and healthy living. Such an environment has a specific composition. When this composition gets changed due to addition of harmful substances, the environment is said to have been polluted. Environmental pollution can, therefore, be defined as any undesirable change in the physical, chemical or biological characteristics of any component of the environment (such as air, water, soil etc), which can cause harmful effects on various forms of life or property.

Air Pollution

It is an atmospheric condition in which certain substances are present in concentrations which can cause undesirable effects on man and his environment. These substances include gases, particulate matter, radioactive substances etc.

Gaseous pollutants include oxides of sulphur, oxides of nitrogen, carbon monoxide, volatile organic compounds etc. Particulate pollutants include smoke, dust, soot, fumes, aerosols, liquid droplets, pollen grains etc.

Radioactive pollutants include rado-222, iodine-131, strontium-90, plutonium-239 etc.

Sources of air pollution: Sources of air pollution are natural and man-made (anthropogenic).

Natural Sources: The natural sources of air pollution are volcanic eruptions, forest fires, sea salt sprays, biological decay, photochemical oxidation of terpenes, marshes, extra terrestrial bodies, pollen grains of flowers, spores etc. Radioactive minerals present in the earth crust are the sources of radioactivity in the atmosphere.

Man-made: Man made sources include thermal power plants, industrial units, vehicular emissions, fossil fuel burning, agricultural activities etc. Thermal power plants have become the major source for generating electricity in India. The main pollutants emitted are fly ash and oxides of sulphur ( $SO_2$ ). Metallurgical plants also consume coal and produce similar pollutants. Fertilizer plants, smelters, textile mills, tanneries, refineries, chemical industries, paper and pulp mills are other sources of air pollution. Automobiles releases gases such as carbon monoxide, oxides of nitrogen and hydrocarbons.

Effects of air pollution: Air pollution has adverse effects on living organism and materials. They are:

- a) Long exposure to air pollutants (including cigarette smoke) can result in lung cancer, asthma, chronic bronchitis and several other diseases.
- b) Air pollutants affects plants by entering through stomata (leaf pores through which gases diffuse), destroy chlorophyll and affect photosynthesis.

c) When rain water comes down through the polluted atmosphere it may become laden with sulphuric acid and nitric acid. This acid rain may be injurious to plants and animals. It is also harmful for the buildings made of marbles.

d) Air pollutants mixing up with rain can cause high acidity in fresh water lakes. This adversely affects aquatic life, especially fish.

e) Because of their corrosiveness, particulates can cause damage to exposed surfaces. Presence of sulphur dioxide ( $\text{SO}_2$ ) and moisture can accelerate corrosion of metallic surfaces.

f) Smog occurs over the urban areas due to the gases and smokes emitted by the vehicles.

### Control of air Pollution:

Some of the methods through which air pollution can be minimised are as follows:

a) Planting more trees

b) Using non-conventional sources of energy.

c) Shifting to less polluting fuels (Hydrogen gas).

d) Using mass transport system, bicycles etc.

e) Vehicular pollution can be checked up by —

- i) regular tuning-up of engines;
  - ii) replacement of more polluting old vehicles;
  - iii) installing catalytic converters.
- f) Industrial pollution can be checked by
- i) removing sulphur from coal (by washing or with the help of bacteria)
  - ii) removing oxides of nitrogen (NOx) during the combustion process.
- g) Siting of industries after proper Environmental Impact Assessment studies.

Control of water pollution

Control of water pollution is a multi-faceted task. It involves the implementation of various measures to prevent and reduce the discharge of pollutants into water bodies. Key strategies include:
 

- 1. **Regulation and Legislation:** Enforcing strict laws and standards for industrial effluents, municipal sewage, and agricultural runoff.
- 2. **Wastewater Treatment:** Investing in advanced treatment technologies such as biological treatment, membrane filtration, and advanced oxidation processes to remove contaminants before discharge.
- 3. **Source Control:** Implementing measures to reduce pollution at the source, such as using cleaner production techniques in industries and promoting sustainable agricultural practices.
- 4. **Public Awareness and Education:** Educating the public about the importance of water conservation and proper disposal of household waste and chemicals.
- 5. **Monitoring and Enforcement:** Establishing a robust monitoring system to track water quality and enforce compliance with regulations.

water

## Water Pollution:

Water pollution can be defined as alteration in physical, chemical or biological characteristics of water making it unsuitable for designated use in its natural state.

### Sources of Water Pollution:-

Water is an essential commodity for survival. We need water for drinking, cooking, bathing, washing, irrigation, and for industrial operations. Most of water for such uses comes from rivers, lakes or ground water sources. Water has ~~been~~ the property to dissolve many substances in it, therefore, it can easily get polluted. Pollution of water can be caused by point sources or non-point sources. Point sources are specific sites near water which directly discharge effluents into them. Major point sources of water pollution are industries, power plants, underground coal mines, offshore oil wells etc. The discharge from non-point sources is not at any particular site, rather, these sources are scattered, which individually or collectively pollute water. Surface run-off from agricultural fields, overflowing small drains, rain water sweeping roads and fields, atmospheric deposition etc. are the non-point sources of water pollution.

### Ground Water Pollution:

Ground water forms about 6.2% of the total water available on planet earth and is about 30 times more than surface water. Ground water seems to be less prone to

pollution as the soil mantle through which water passes helps to retain various contaminants due to its cation exchange capacity. However, there are a number of potential sources of ground water pollution. Septic tanks, industry (textile, chemical, tanneries), deep well injection, mining etc. are mainly responsible for ground water pollution, which is irreversible. Ground water pollution with arsenic, fluoride and nitrate are posing serious health hazards.

### Sources of Surface water Pollution:

The major sources of surface water pollution are:

- 1) Sewage: Pouring the drains and sewers in fresh water bodies causes water pollution. The problem is severe in cities.
- 2) Industrial effluents: Industrial wastes containing toxic chemicals, acids, alkalis, metallic salts, phenols, cyanides, ammonia, radioactive substances, etc. are sources of water pollution. They also cause thermal (heat) pollution of water.
- 3) Synthetic detergents: Synthetic detergents used in washing and cleaning produce foam and pollute water.
- 4) Agrochemicals: Agrochemicals like fertilizers and pesticides washed by rain-water and surface run-off pollute water.
- 5) Oil: Oil spillage into sea-water during drilling and shipment pollute it.
- 6) Waste heat: Waste heat from industrial

discharges increases the temperature of water bodies and affects distribution and survival of sensitive species.

### Effects of Water Pollution:

Following are some important effects of various types of water pollutants:

- a) Organic matters which reaches water bodies is decomposed by micro-organisms present in water. This results in lowering of the oxygen dissolved in water. Lower dissolved oxygen may be harmful to aquatic animals, especially fish population.
- b) Water borne diseases like cholera, dysentery, typhoid, jaundice, etc, are spread by water contaminated with sewage.
- c) Addition of compounds containing nitrogen and phosphorus helps in the growth of algae and other plants which when die and decay consume oxygen of water.
- d) Pollutants such as heavy metals, pesticides, cyanides and many other organic and inorganic compounds are harmful to aquatic organisms.
- e) Pesticides in drinking water ultimately reach humans and are known to cause various health problems.

### Control of Water Pollution:

Water pollution can be controlled by adopting following measures:

- i) People must refrain themselves from throwing human and animal excreta and garbage into any water body.
- ii) The industrial units must treat industrial effluents before discharging them into water bodies.
- iii) The municipal corporation must arrange for sewage treatment plants.
- iv) Government should provide adequate funds for water pollution control programmes. It must bring in force effective laws for its control measures.