

Syllabus

Pollution: Types — air, water (fresh and marine), soil, radiation and noise.

The term '**pollution**' refers to any change in the natural quality of the environment brought about by chemical, physical or biological factors. Thus, Environmental pollution refers to any unfavourable alteration of our surroundings, wholly or largely as a byproduct of man's actions. These changes may affect man and other organisms.

Pollutants

Pollutants are the products which are released into the biosphere in large quantities and which affect the normal functioning of ecosystems and have an adverse effect on plants, animals and man. Thus, the pollutant is a substance present in the environment in harmful concentration which contaminates air, water or soil. It affects adversely the environment, human beings and other organisms.

TYPES OF POLLUTANTS

(A) On the basis of degradation, pollutants are divided into two categories:

- (i) **Biodegradable pollutants:** The pollutants which can be degraded by biological or microbial actions are known as **biodegradable pollutants**, e.g. sewage, domestic garbage, etc.
- (ii) **Non-biodegradable pollutants:** The pollutants which are not degraded by

microbes or degrade at a very slow rate, are known as **non-biodegradable pollutants**, e.g. glass, plastics, radioactive substances, pesticides etc.

(B) On the basis of origin in environment, pollutants are classified into the following two categories:

- (i) **Primary pollutants:** The pollutants which are directly introduced by their sources into the environment are known as **primary pollutants**, e.g., ash, smoke, fumes, dust, Carbon dioxide (CO_2), Sulphur dioxide (SO_2) and hydrocarbons like Methane, Acetylene and Benzene.
- (ii) **Secondary pollutants:** The pollutants which are formed from the chemical reaction of primary pollutants in the environment are known as **secondary pollutants**, e.g., Nitrogen oxides and hydrocarbons are the two primary pollutants which are released from the automobiles. These pollutants react in the presence of sunlight to form Peroxyacetyl Nitrate (PAN) and Ozone, two secondary pollutants, which are far more toxic than the primary pollutants from which they are derived.

(C) On the basis of existence in nature, pollutants are also divided into two categories:

- (i) **Quantitative pollutants:** These substances exist in nature but they act as pollutants when their concentration or quantity increases up to a critical level in the atmosphere, e.g., Carbon dioxide, Nitrogen oxide, etc.

- (ii) **Qualitative pollutants:** These pollutants do not exist in environment. They are introduced into the environment through man's activities, e.g., pesticides (DDT), chemical fertilizers, herbicides, etc.

TYPES OF POLLUTION

Pollution can be classified as follows: On the basis of the part of environment where it takes place — atmosphere, hydrosphere and lithosphere, it is known as *air pollution*, *water pollution* and *soil pollution*, respectively.

On the basis of origin, pollution may be *natural* (e.g. volcanic eruptions), or *anthropogenic* or *man-made* (e.g. industrial pollution).

On the basis of the physical nature of the pollutants, the categories include: gases, particulate matter, temperature, noise, radioactivity, etc. These are known as: gaseous pollution, dust pollution, thermal pollution, noise pollution, etc.

AIR POLLUTION

Air pollution is defined as the excessive concentration of foreign matter in the air which adversely affects the well-being of human beings, animals, plants and their environment.

The elements of the definition are:

- (i) concentration of foreign matter in the air; and
- (ii) which adversely affects the living and non-living things.

Causes of Air Pollution

Air pollution takes place through the pollutants of gas, solid and liquid particles of both organic



Fig. 16.1. Vehicles—Air and Noise Pollution

and inorganic chemicals. Gases such as sulphur dioxide, carbon monoxide, hydrogen sulphide, pollens from plants, etc., are continuously added to the air, thereby, lowering its quality. Thus, the natural composition of the air is disturbed by natural or by man-made sources.

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. WHO has defined water pollution as any foreign material either from natural or other sources that may contaminate the water supply and make it harmful to life. Pollution of water leads to reduction of normal oxygen level of water, causes aesthetically unpalatable effects and spread of epidemic diseases. Water pollution impacts the entire food chain and affects human health as toxins from contaminated fishes, prawns etc., get deposited in human tissues. This leads to cancer, birth defects or long term health problems.

Freshwater: The freshwater bodies are polluted by domestic, industrial and agricultural effluents. Polluted freshwater is unsafe for drinking. Polluted lakes are unfit for swimming and fishing. All the effluents from the freshwater sources together with their pollutants finally join the oceans.

Marine water: Marine pollution or Ocean Pollution is the spreading of harmful substances such as oil, plastic, industrial and agricultural waste and chemical particles into the ocean. Eighty per cent of marine pollution comes from land. Mining for materials such as copper and gold is a major source of contamination in the ocean. The saline water in the oceans also get affected by thermal pollution and other water pollutants such as oil spills and nuclear waste.

As a result of marine pollution all levels of oceanic life (plants and animals) are affected and in worst cases 'dead zones' are created.

SOIL POLLUTION

Soil is the upper layer of the earth's crust which is formed by weathering of rocks. Organic matter in the soil makes it suitable for living organisms.

Soil pollution is defined as the change in physical, chemical and biological conditions of the soil through man's intervention resulting in

degradation in quality and productivity of the soil. The pollutants enter the food chain at the plant level and get magnified as we move up the food chain. Also soil pollution differs from water and air pollutions in the sense that the pollutants remain in the soil for relatively longer periods.

RADIOACTIVE POLLUTION

Radioactive pollution is defined as the increase in natural background radiation, emerging from the activities of man using naturally occurring or artificially produced radioactive materials.

Environmental radiation is divided into two types: (i) natural, and (ii) man-made radiation.

Radiations from nature are: (a) cosmic radiations from the outer space reaching the earth's surface, and (b) terrestrial radiation from natural radioisotopes from the earth's crust.

Man-made radiations originate from the use of radioactive materials. These materials are used in the production of nuclear weapons and nuclear fuel. The radioactive material used in atom bombs is very destructive. We are aware of the impact of radioactivity on man and environment during the Second World War when the US dropped atom bombs on Hiroshima and Nagasaki in Japan in August 1945.

Nuclear fuels in atomic reactors produce pollution. The heat given out during fission is converted into electricity. During this process two types of wastes are formed: (i) the fission products remaining in both the primary and

secondary fuels, and (ii) waste products in the coolant.

The disposal of radioactive wastes causes pollution. The high level products of nuclear wastes remain in the environment for several hundred years. Leakage in nuclear reactors causes environmental pollution. The leakage may result in the death of a number of people as happened at Chernobyl Atomic Reactor in the erstwhile USSR on April 26, 1986.

NOISE POLLUTION

Noise pollution is defined as an unwanted sound that is an irritant and a source of stress. Sound is the means of communication and entertainment. A low sound is pleasant but a loud sound is unpleasant and is often referred to as noise. Noise is a physical form of pollution which is not directly harmful to the life supporting systems namely air, soil and water. Its effects are more directly felt by the receiver i.e. man.

Although noise pollution is not fatal to human life, yet its effects cannot be overlooked because (i) repeated exposure to noise reduces the sleeping hours (ii) productivity or efficiency of a human being (iii) it affects the peace of mind and invades the privacy of a human being.

Most of the noise originates from modern industrialised urban life. The main sources of noise pollution are: (i) Industrial Sector (ii) Transport Sector (iii) Household Sector (iv) Defence Sector (v) Loud Speakers (vi) Miscellaneous Sources.

EXERCISES

I. Choose the correct option:

- Any change in the natural quality of the environment brought about chemical, physical or biological factors:
(a) Pollution (b) Dust (c) Humidity (d) Pollutants
- The products which are released into the biosphere in large quantities and which affect the normal functioning of ecosystems:
(a) Pollution (b) Dust (c) Humidity (d) Pollutants
- Any unfavourable alteration of our surroundings, wholly or largely as a byproduct of man's actions:
(a) Pollution (b) Environmental Pollution
(c) Humidity (d) Pollutants
- The alteration in characteristics of water, making it unsuitable for designated use in its natural state:
(a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Radioactive Pollution

5. The pollutants which are formed from the chemical reaction of primary pollutants in the environment:
 (a) Biodegradable pollutants (b) Secondary pollutants
 (c) Quantitative pollutants (d) Non-Biodegradable pollutants
6. The excessive concentration of foreign matter in the air which adversely affects the well-being of human beings, animals, plants and their environment:
 (a) Air Pollution (b) Pollution (c) Soil Pollution (d) Radioactive Pollution
7. The pollutants which are not degraded by microbes or degrade at a very slow rate:
 (a) Biodegradable pollutants (b) Primary pollutants
 (c) Quantitative pollutants (d) Non-Biodegradable pollutants
8. Unwanted sound that is an irritant and source of stress:
 (a) Air pollution (b) Radioactive pollution
 (c) Noise pollution (d) Soil pollution
9. Which of the following is an example of soil pollution?
 (a) Disposal of solid waste in the open (b) Dumping sewage in the open
 (c) Overuse of fertilizers (d) All of the above.
10. Nuclear fuels produce pollution by
 (a) heat (b) end products (c) wastes in coolants (d) All of the above.

II. Short Answer Questions

1. What is environmental pollution? What is a pollutant?
2. Give the difference between natural and man-made pollutants.
3. What is air pollution? Give a source of air pollution.
4. Define water pollution.
5. What is soil pollution? Why should we avoid soil pollution?
6. What is radioactive pollution?
7. What is noise pollution?

III. Structured Questions

1. (a) With reference to pollution, explain the following:
 (i) Air pollution (ii) Water pollution.
 (b) Explain what is radioactive pollution.
 (c) What are man-made causes of radioactive pollution? Why is radioactive pollution more harmful than other types of pollution?
 (d) How is noise a source of pollution? Why do we need to look at the problem of noise pollution seriously?

IV. Thinking Skills

1. Which type/types of pollution is/are more prominent in the city where you live? List the causes and possible remedies?
2. Environmental pollution is an incurable disease which can only be prevented. Justify this statement giving examples.

V. Practical Work

Write down five harmful effects of using non-biodegradable products like plastic bags. Suggest measures that can help to replace plastic bags with eco-friendly products.