

CHAPTER 8

Pollution

PERFORMANCE OBJECTIVES

At the end of this chapter, students should be able to:

- **define pollution.**
- **name different types of pollutants and their sources.**
- **enumerate the harmful effects of pollutants.**
- **state the effects of detergents, insecticides, artificial fertilizers and herbicides on aquatic and terrestrial organisms.**
- **identify poor sewage system as a source of pollution.**
- **identify the decay of organic matter, e.g., dead animals** and plants, as a source of pollution.

INTRODUCTION

Pollution refers to human activities that adversely affect the world around us. Any process or activity that leads to a harmful increase in the quantity and volume of a substance in the environment is known as pollution. There are several types of pollution. These include air pollution, water pollution, heat pollution, radiation, soil pollution, noise pollution and light pollution. The agent of pollution is called a pollutant.

NATURE AND SOURCES OF AIR POLLUTANTS

AIR POLLUTION

It is a contamination of air resulting from mixture of gases and solid particles in the air. Air pollutants include oxides of carbon, sulphur and nitrogen such as carbon (IV) oxide and carbon (II) oxide, sulphur (IV) oxide and oxides of nitrogen, respectively. Others are ozone depletion; smoke, smog and dust particles released into the atmosphere by manufacturing units/industries, city traffic, motor vehicles, power stations and domestic fires. Combustion of fuels of automobiles and jet planes releases air pollutants. Ozone depletion is a type of air pollution that refers to the release of chlorofluorocarbon (CFCs) into the atmosphere that breaks down the ozone layer and allows the radiation (UV-B radiation) to reach the ground. When ozone forms air pollution, it is called smog.

Other sources of air pollution include forest and domestic fires, power stations, industries (e.g., cement factories or chemical industries), vehicles (motor and aeroplane), mines, city traffic and building construction sites,

volcanic eruption, wind erosion, pollen dispersal and evaporation of organic compounds.

EFFECTS OF AIR POLLUTION

Air pollutants damage a wide variety of valuable materials. They speed the erosion of statues and buildings, which in some instances, destroys works of art.

EFFECTS OF CARBON (II) OXIDE, SULPHUR (IV) OXIDE, OXIDES OF NITROGEN, SMOKE, SMOG AND DUST

CARBON DI-OXIDE: This gas readily combines with the haemoglobin of the blood to form a compound carboxyhaemoglobin, which reduces the oxygen-carrying capacity of the blood. The body metabolism is thereby damaged and may result in death within few minutes.

SULPHUR IV OXIDE: It is produced from burning of fossil fuels, petroleum refineries, etc.

- (i) It is poisonous to plants and lowers their yield.
- (ii) It reduces many plants' growth rates. For example, it prevents lichens from growing on tree trunks in polluted areas.
- (iii) It damages respiratory organs (e.g., lungs) and cause respiratory diseases.
- (iv) It forms tetraoxosulphate (VI) acid in rain water, which makes the soil highly acidic and adversely affects the plants' growth.
- (v) Being acidic in solution, it corrodes building surfaces, eroding the brick work.

OXIDES OF NITROGEN

- (i) These form substances that can poison animals and plants.
- (ii) They cause eye irritation in humans.
- (iii) They form acidic solutions with water, which corrodes metals and walls of brick buildings.
- (iv) In very high concentration, nitrogen (IV) oxide (NO₂) can cause the death of animals.

SMOKE

- (i) Its carbon particles can damage the lungs and may also cause discomfort in humans. It causes fog, which reduces visibility.

(ii) Smoke cover could reduce photosynthesis and plant yields can consequently be reduced.

(iii) It causes fog, which reduces visibility.

(iv) Smoke particles make streets and buildings dirty

SMOG: Smog is a mixture of smoke and fog. It is caused by a layer of warm air developing above a region of colder air. The warm layer prevents the colder air from escaping. This is called temperature inversion.

(i) Smog is unpleasant and dangerous.

(ii) The London Smog of 1952, which lasted five days, caused about 4,000 deaths.

(iii) It reduces visibility.

(iv) It reduces the hours of sunlight, thereby reducing photosynthesis and plant yield.

DUST

(i) Microorganisms, which cause diseases (e.g., bacteria and viruses), might be inhaled along with dust particles.

(ii) It may irritate the respiratory organs, e.g., lungs.

(iii) It may contain particles (e.g., pollen grains), which may trigger off bouts of lung disorders such as asthma.

(iv) Dust in water spoils the quality of drinking water.

(v) Dust in the atmosphere reduces visibility and intensity of sunlight.

The seriousness of the effects depends on duration of exposure and the concentration of the chemicals or pollutants.

The most serious impact of air pollution is its adverse short-term and long-term effects on human health.

(i) Short-term effects: It includes irritation to the eyes, nose and throat and upper respiratory infections such as pneumonia and bronchitis. Others include nausea, headache and allergic reactions. Diesel-driven trucks often emit thick black smoke that can blur vision of drivers behind them.

LONG-TERM EFFECTS

It includes chronic respiratory diseases, lung cancer, heart damage and even damage to the brain, nerves, liver or kidneys. For instance, it is esti-

mated that thousands of people die prematurely every year as a result of smoking cigarettes.

Generally, some air pollutants outside and inside buildings are poisonous. People with heart or lung disease, older adults and children are a greater risk from air pollution. Places like Mexico City and Sao Paulo have some of the most deadly pollution levels in the world.

NOISE POLLUTION

Any unpleasant or unwanted sound in the air is called noise. Road traffic, factories, cannon and artillery gun fires, loud music, foundries, mines, electronic sound gadgets, electric generators, sounds from some churches and mosques, etc. are some of the sources of high-intensity noises.

- (i) High-intensity noise can cause headache and discomfort.
- (ii) It may prevent some people from sleeping properly.
- (iii) High-intensity noise, after a prolonged period of time, can permanently damage the eardrums and cause deafness.
- (iv) Noise pollution quickens heartbeat and blood circulation, thereby causing restlessness.

WATER POLLUTION

It is the contamination of water caused by living organisms from the deposition of diverse materials. Water in estuaries, lakes, rivers and seas may be polluted by detergents, insecticides, artificial fertilizers, herbicides, domestic refuse, industrial and agricultural wastes, oil spillages and untreated sewage. Other sources include oil spills.

The major biological effects of water pollution pose a great danger to our water supplies. Pesticides such as insecticides and herbicides washed into water sources can damage crops, kill vegetations and poison birds, animals and fishes. This is partly because most pesticides are non-selective. They kill or damage life forms other than those intended.

EFFECTS OF OIL SPILLAGE

Oil spillage occurs when oil tankers are being loaded or unloaded. It is liberated into the seas and seashores in great quantities when an offshore rig explodes or an oil tanker is wrecked. It can cripple the economic life of fishermen and farmers in the affected areas. It coats shore structures and boats. Oil spills require costly clean up operations.

Oil usually kills most animals and plants living in areas of oil spillage. In 1980, a large oil spillage occurred near Akassa in Rivers State of Nigeria and killed fishes in nearly all creeks on which the local fishermen depended for their livelihood. It also contaminated the drinking water resources, thereby causing discomfort and disruption of normal life.

SOIL POLLUTION

The soil is polluted primarily by the dumping of garbage or refuse. This comprises discarded household materials like bottles, plastics, cans, metallic containers, paper and food remnants, and in some cases, human and animal faeces.

Refuse dumps are sources of unpleasant odours and breeding places for many disease vectors and disease causing microorganisms.

The soil might also be polluted by some air pollutants, e.g., compounds of lead, industrial and agricultural wastes such as herbicides, fungicides, insecticides and pesticides.

EFFECTS OF SOIL POLLUTION

Sometimes, these substances contaminate the soil and may harm or kill the plants grown on such soils. These substances might be passed on to humans when contaminated crops grown on polluted soil are consumed.

CHAPTER SUMMARY

â- Pollution is any activity that increases the quantity of harmful substances in the environment.

â- Sulphur (IV) oxide, carbon (II) oxide, oxides of nitrogen, smoke, smog and dust are the main air pollutants that have adverse effects on animals and plants.

â- Motor vehicles, industries, mines, domestic fires and power stations are the main sources of air pollution.

â- The main water pollutants are agricultural wastes (such as herbicides, pesticides, insecticides and fertilizers), industrial wastes and untreated sewage, all of which adversely affect plants and animals.

â- The seriousness of the effects depends on the duration of exposure and concentration of the pollutants.

â- The most serious impact of pollution is its adverse short-term and long-term effects

â- Noise pollution can cause headache, discomfort and prevent people from sleeping properly

â- Oil spillage can contaminate drinking water and kill most animals and plants living in the affected areas.

â- Soil pollution is primarily caused by dumping of garbage or refuse and agricultural wastes such as pesticides, fungicides and insecticides.

â- Contaminated soil may harm or kill the plants grown on such soils

REVISION QUESTIONS

Choose the correct options to the following questions.

1. Which of the following is an air pollutant?

a. Detergent b. Crude oil c. Untreated sewage d. Smoke

2. Which of these is not an air pollutant?

a. Carbon (II) oxide b. Sulphur (IV) oxide c. Carbon (IV) oxide d. Oxides of nitrogen

3. Which of these causes noise pollution?

a. Smoke b. Any high intensity and unpleasant noise c. Industrial wastes d. Fertilizers

4. Which of these is false?

a. Soil is polluted by clearing refuse dumps.
b. Oil spillage cripples economic life of fishermen. c. Water pollution is dangerous to our water supply. d. Noise pollution may cause restlessness.

5. Long-term effects of air pollution does not include

a. chronic respiratory diseases b. lung cancer c. heart damage d. imitation of the eye

ESSAY QUESTIONS

1. (a) Define the term pollution.

(b) List four common types of pollution.

(c) List two sources of each types of pollution.

2. Discuss the effects of air pollution as a result of oxides of sulphur and nitrogen and dust.

3. (a) What are the common effects of noise pollution?

(b) Name four domestic and industrial wastes that pollute land and water.

4. State the effects of detergents and pesticides and artificial fertilizers on

terrestrial and aquatic animals.

5. (a) Discuss the effects of oil spillage.

(b) What are the effects of soil pollution?