

31

Environment and Its Pollution

31.1 INTRODUCTION

Earth is the only planet which can sustain life. Organisms require clean air, water and soil for survival. With progressive increase in human population and human activities, air, water, soil and other natural sources are being polluted and have become unfit for use by organisms. In this lesson you shall learn about the sources of pollutants and their effects on environment.

31.2 OBJECTIVES

After reading this lesson you will be able to :

- define environment
- define biosphere
- explain nature of threats to environment
- define pollutants
- list sources of pollutants
- explain the effects of pollutants on environment, organisms and humans in particular.

31.3 ENVIRONMENT

Organisms live in different types of surroundings such as water, soil and air. Different kinds of living organisms share these surroundings. The surroundings are the "environment" of organisms.

Environment includes (i) physical (non living) or abiotic components and (ii) living or biotic components.

Abiotic components are water, air, soil, energy radiation etc. Biotic components are microbes (such as bacteria, algae, fungi), plants, animals etc.

Environment is the sum total of living and non living components surrounding an organism.

Not all parts of earth are suitable for survival of organisms.

The part of earth on which organisms can survive and reproduce is called Biosphere.

31.4 NATURE OF THREATS TO ENVIRONMENT

Environment gets damaged in several ways. Mentioned below are some examples :

(i) The vehicular combustion of fossil fuels (petrol and diesel) releases carbon monoxide (CO), Carbon dioxide (CO₂) and Sulphur dioxide (SO₂) in the atmosphere. SO₂ combines with water droplets in the atmosphere to form sulphuric acid (H₂SO₄). Sulphuric acid causes acid rain in the atmosphere.

The environmental effects of acid rain include :

- a) leaching of nutrients such as calcium from soil and
- b) corrosion of basic material such as limestone and marble.

(ii) Pesticides, especially DDT (Dichloro diphenyl trichloro-ethane) and dieldrin used to control mosquitoes and agricultural pests, have become serious pollutants of water and air. Being long lasting under natural conditions, the pesticides remain in the soil and the amount goes on increasing in soil and water with successive applications.

(iii) Various industries like steel, non ferrous metals, fertilizers and petroleum are sources of toxic pollutants like lead (Pb), cadmium (Cd), zinc (Zn), arsenic (As), nickel (Ni) and mercury (Hg). These toxic metals pose a great threat to the environment.

(iv) The industrial waste contains suspended matter, dissolved solids, toxic metals, chemicals, strong acids, alkalies, oils and dyes. These substances deplete the dissolved oxygen of water and impair the biological activities, finally destroying aquatic life.

(v) Chloroflouro carbons (CFCs), used as refrigerants, and various kinds of sprays or soles (eg. perfumes, air freshner etc.) cause ozone holes in the ozone layer. Ultraviolet radiations reach the earth through these holes and the radiations are absorbed by CO₂ and water vapour. The absorbed radiations generate more and more heat resulting in the phenomenon of Global Warming and Green House Effect (you shall read about these in lesson 32). These problems are global. Two instances of environmental hazards due to pollution in our country are quoted below :

- (i) The effluents of Mathura refinery are posing a very serious threat to Taj Mahal.
- (ii) The mishap which took place due to leakage of MIC (methyl iso cyanate) on 2nd

December, 1984 from factories of Union Carbide at Bhopal. The accident killed thousands of people and have affected the health of those exposed to MIC.

INTEXT QUESTIONS 31.1

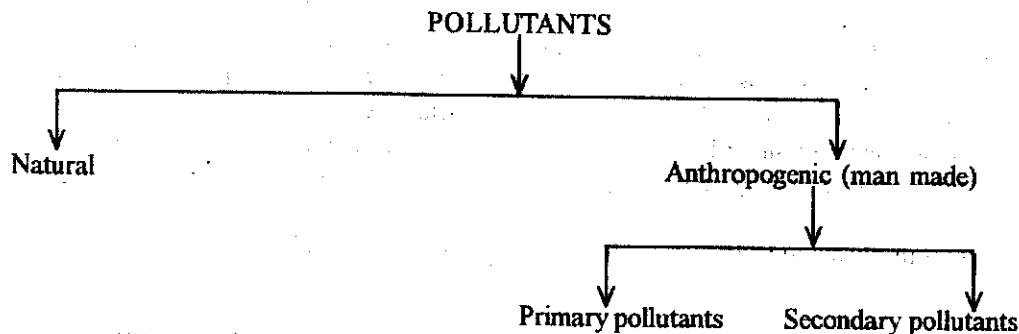
1. Define environment.
2. What are the components of environment?
3. List three biotic components?
4. Name two toxic metals which pollute water.
5. What is the effect of CFCs on the ozone layer?

31.5 POLLUTION

In older days, human settlements were along river banks which provided humans some basic facilities. As human population started growing, people moved to other places. They started utilising natural resources such as trees and soil to build shelters. Waste material started collecting at places they inhabited. Humans themselves created conditions for disposal of waste (sanitation). Humans then started industries to manufacture goods for their own comfort. Pesticides and chemical fertilisers were manufactured in factories and used to grow more food for the growing population. Industries generated waste. Pesticides and chemicals were washed into natural water bodies such as sea, river, lakes and ponds and affected the health of aquatic organisms. Potable (safe for drinking) water diminished. All such waste generated through human activities and spoiling the natural environment is termed "pollutants". Damaging the natural environment by pollutants is termed "pollution"

Substances added to natural surroundings mainly due to human activities are called "pollutants". Deterioration in the quality of natural resources such as water, air and earth due to addition of pollutants is called "pollution".

31.6 TYPES OF POLLUTANTS



31.6.1 Natural Pollutants

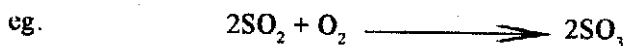
There can be several natural sources which create pollution. Some of them are listed below :

- (i) Sometimes forest fire is caused when lightning strikes. Trees burn and CO_2 is released in the atmosphere.
- (ii) Soil erosion suspends particulate matter and dust in air. These may even enter water bodies as they are washed down by natural water falls.
- (iii) Volcanic eruptions also add pollutants to the environment.
- (iv) Volatile organic compounds from leaves, trees, dead animals naturally enter the atmosphere.
- (v) Natural radioactivity and the other natural pollutants have been entering the environment since ages. But the low level of pollution that they cause has never endangered lives of organisms.

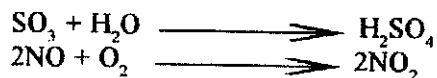
31.6.2 Anthropogenic Pollutants

Human activities have released such a large amount of pollutants to the environment that their own survival is threatened today. Pollutants added to the environment through human activities are termed anthropogenic pollutants. These are of two kinds.

- (i) **Primary pollutants** : Primary pollutants are added directly to the atmosphere. eg. CO_2 and CO from burning of fossil fuel; SO_2 and oxides of nitrogen from vehicular combustion and thermal power station.
- (ii) **Secondary Pollutants** : Secondary pollutants are products of reaction between the primary pollutant and atmospheric oxygen.



SO_3 reacts with water vapour present in the atmosphere and forms H_2SO_4 whereas NO reacts with O_2 and forms NO_2 .



Depending on the sources, anthropogenic pollutants may be classified further into

- (i) **Industrial Pollutants** : Paper and textile industries, tanneries and distilleries throw various effluents like oil, grease, plastic and metallic wastes into the environment.
- (ii) **Domestic Pollutants** : Detergents, fluoride toothpastes, edible colours, food flavouring agents, polythene bags and wrappers find their way into the environment as pollutants.

Methane is produced in Cattle stomach and in stagnant paddy fields.

INTEXT QUESTIONS 31.2

1. Define a pollutant.
.....
2. Name two sources of natural pollution.
.....

31.7 SOURCES OF POLLUTANTS

Table 31.1 shows the various pollutants of air, their sources and effects.

Table 31.1 Air Pollutants

Major Pollutants of Air	Sources	Effects
SO ₂	Vehicular combustion, fossil fuel burning	Irritation to the eyes, acid rain
CO, CO ₂	Vehicular combustion and burning of other hydrocarbons	Global warming, green house effect. CO has great affinity for haemoglobin and forms the toxic compound carboxy haemoglobin.
Smoke, fly ash and soot	Thermal power stations	Respiratory diseases.
Lead, mercury	Auto exhaust from gasoline, paints, storage batteries, fossil fuel burning	Affects the nervous system & circulatory system causing nerve and brain damage.
CFCs	Refrigerants	Kidney damage, ozone depletion.

Table 31.2 shows the various pollutants of water, their sources and effects.

Table 31.2 Water Pollutants

Major Pollutants of Water	Sources	Effects
Pesticides and insecticides like DDT, BHC	Agriculture, mosquito repellants	Toxic to fishes, predatory birds and mammals.
Plastic	Homes and industries	Kills fishes and animals like cows.
Detergents	Homes and industries	Overgrowth of algae and aquatic weeds, depletion of dissolved oxygen.
Chlorine compounds	Water disinfection with chlorine, paper and bleaching powder factories	Fatal for plankton (organisms floating on the surface of water), foul taste & odour, can cause cancer in humans.
Lead	Leaded gasoline	Toxic to organisms
Mercury	Natural evaporation & dissolved industrial wastes, fungicides.	Highly toxic to humans
Acids	Mine drainage, industrial wastes	Kills organisms
Sediments	Natural erosion, run off from fertilizer and other factories, mining and construction activities.	Reduces ability of water to assimilate oxygen.

31.8 NOISE POLLUTION

Any unwanted sound may be defined as noise. Cities are now full of noises which come from traffic vehicles, especially at peak hours everyday, loud speakers and building construction work. Industries expose their workers to a high load of noises for long periods of work everyday.

Noise is measured in 'decibel' (db) - a scale expressing intensity of sound. Example, very quiet room has a sound level of 20 db, cars and household gadgets - 70 db, truck horns - 110 db.

Noise has harmful effects on human body. Noise of 70 - 80 db causes annoyance and irritation. Above this level, breathing rate may be affected, blood vessels may constrict, movement of digestive canal is disturbed, glandular secretions may be affected. Long exposure to high noise levels can impair hearing.

Standards have now been laid down for different areas. Silence zones are areas 100 meters around hospitals, courts, schools and other institutes. Honking of vehicle horns, cracker bursting, loud speakers and loud voice of hawkers selling their wares is prohibited. The noise level has to be kept within 50 db. Similar restrictions have been laid down for industries and commercial organisations.

INTEXT QUESTIONS 31.3

1. Mention one effect each of SO_2 and CO on humans.
.....
2. Name one source each of lead and CFC.
.....
3. What is the effect of detergents polluting a pond?
.....

31.9 WHAT YOU HAVE LEARNT

- Surroundings in which we live is our environment.
- There are two components of environment : physical or abiotic and living organisms or biotic
- Pollutants may be defined as substances added to natural surroundings.
- Pollutants have adverse effects on environment and living organisms.
- SO_2 , CO_2 , CO, smoke, Pb, Hg, CFC etc. pollute air. Their sources and effects are varied.
- Pesticides, plastic, detergents, chlorine, mercury pollute water and endanger life of aquatic organisms.
- Unwanted sounds are termed noise. They are measured in decibels. Beyond certain decibels, noise has harmful effects on humans.

31.10 TERMINAL EXERCISE

1. What is environment?
.....
2. Explain anthropogenic pollutants.
.....
3. Write four major pollutants of water, their sources and effects.
.....

CHECK YOUR ANSWERS**Intext Question 31.1**

1. Environment : The air, water, earth and living beings in a joint form is called environment.
2. Components of environment. There are two components of environment namely biotic and abiotic components.
3. Biotic components : microbes, plants, animals including humans.
4. Toxic metal : lead, mercury.
5. Refer to section 31.4.

Intext Questions 31.2

1. Pollutants : Any substances which is present in its excess concentration such as CO_2 , CO , SO_2 .
2. Refer to section 31.6.1.

Intext Questions 31.3

1. Refer to table 31.1.
2. Refer to table 31.1.
3. Refer to table 31.2.

Terminal Exercise

1. Refer to section 31.3.
 2. Refer to section 31.6.2.
 3. Refer to table 31.2.
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