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## ENVIRONMENTAL CONCERNS

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Notes

**Y**ou know that the Earth is the only planet which supports life. The earth has just the right kind of conditions of temperature range, air, water, soil for supporting life and is protected from harmful rays from the outer space by the ozone layer. With progressive increase in human population and human activities, the quality of air, water, soil and other natural sources get degraded and become unfit for use by organisms. It causes unwanted effects. In this lesson you shall learn about the sources of pollutants and their effects on environment. Thus the environmental pollution in many ways threaten the existence of many organisms including human being on the earth. Therefore, any threat of degradation or damage to the environment should be a matter of concern.



### Objectives

After reading this lesson you will be able to :

- define environment and biosphere;
- differentiate the various environmental segments;
- explain nature of threats to environment;
- define pollutants and its types;
- list sources of pollutants and
- explain the effects of pollutants on environment, organisms and humans in particular.

### 32.1 Components of Environment

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

Environment has two components

(i) physical or abiotic (non-living) components and

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(ii) living or biotic components.

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

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

Environment consists of four segments such as

(i) Biosphere (ii) Atmosphere (iii) Hydrosphere, and (iv) Lithosphere

**Biosphere** : All the parts of the earth are not suitable for survival of organisms. Some parts are too hot or very cold to support life.

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

Survival of organisms depend upon a delicate balance between themselves and with the various components of the environment. Any disturbance, damage or adverse change in the quality of environment poses a threat to the survival and well being of organisms. Therefore, any threat of degradation or damage to environment should be a cause of concern to all of us.

**Atmosphere** : Atmosphere is the only place where free oxygen and water vapour exist.

**Atmosphere is a thin layer of air (mixture of gases) around the earth which is a great source to all living organisms.**

**Hydrosphere** : Water plays an important role in the biosphere, without it life is impossible.

**Hydrosphere is the part of earth on which all types of water resources exists, viz., oceans, seas, rivers, lakes, glaciers, ice caps, ground water, etc.**

**Lithosphere** : Soil is a part of lithosphere which supports life.

**Lithosphere is the part of the earth where all types of minerals, metals, organic matters, rocks, soils, etc. exist**

### 32.2 Threats to Environment

Environment gets damaged due to several reasons. The damage may be in the small area or may affect a much larger area and its ill-effects may be felt all over the globe.

The environmental damages may be broadly classified as:

(i) Regional, and (ii) Global

Those environmental damages which affect the living and non-living things locally over a small area are termed as *regional environmental damages*.

The environmental damages which affect the living and non living things globally or wider part of the earth are called *global environmental damages*.

Some examples of both regional and global environmental damages are mentioned below.



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**Regional Environmental Damages :**

- (i) The vehicular combustion of fossil fuels (petrol and diesel) releases carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>) into the atmosphere. SO<sub>2</sub> combines with water droplets in the atmosphere to form sulphuric acid (H<sub>2</sub>SO<sub>4</sub>). Sulphuric acid causes acid rain in the atmosphere and damages the environment over a small area.

The environmental effects of acid rain include:

- (a) leaching of nutrients 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 air water and soil. Being long lasting (do not break down to other molecules that is non-biodegradable) under natural conditions. The pesticides remain in the soil and their amount goes on increasing in soil and water with successive applications. Their ill effects damage the environment locally.
- (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 local environment.
- (iv) The industrial waste contains suspended matter, dissolved solids, toxic metals, chemicals, strong acids, alkalis, oils, dyes, etc. These substances deplete the dissolved oxygen of water and impair the biological activities, finally destroying aquatic life.

Two instances of environmental hazards due to pollution in our country are quoted below:

- (i) The effluents like SO<sub>2</sub>, 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 killed thousands of people and have affected the health of those exposed to MIC.

**Global Environmental Damages**

Some example of global damages are discuss below.

- (i) Chloroflouro carbons (CFCs), used as refrigerants, and various kinds of sprays or sols (eg. perfumes, air freshner, etc.). CFCs cause ozone holes in the ozone layer. Ozone hole refer to depletion of ozone molecules in the ozone layer due to the reacton of CFCs. The holes in the ozone layer appear elsewhere and not where these chemicals are used.
- (ii) More ultraviolet radiations reach the earth through the ozone holes and the reflected radiations from the earth are absorbed by CO<sub>2</sub> water vapour, etc. The trapped radiations release more and more heat resulting in the phenomenon of **Global Warming**. This effect is also known as **Green House Effect**.

Global environment damage affects quality of environment over a much larger area and is not localised to the area where the damage is initiated. Global warming will cause ill



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effects and are not confined to the area causing the damage. It causes wide range of effects like melting of glaciers, polar caps, rise in water level of sea and flooding of costal plains, etc.



**Intext Questions 32.1**

1. Define environment.  
.....
2. What are the two components of environment?  
.....
3. List three biotic components?  
.....
4. Name two common toxic metals which pollute water.  
.....
5. How do CFCs affect the ozone layer?  
.....
6. What are the different segments of environment?  
.....

**32.3 Pollution**

In ancient times human settlements began and flourished along river banks as rivers provided them basic facilities. Growth of population forced people to move to other places. They started utilising natural resources such as trees and soil (mud) to build shelters. More 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 comforts. Pesticides and chemical fertilisers were manufactured to grow more food for the growing demand by population. Industries also generated wastes, which ultimately finds its way to water sources. Pesticides and chemicals were washed into natural water bodies such as sea, river, lakes and ponds and affected the aquatic organisms. Supply of potable (safe for drinking) water diminished. All this badly affects life of organism including humans. All such waste generated through human activities and spoiling the natural environment is termed as **pollutants**. Damaging the natural environment by pollutants is termed as **pollution**.

**Pollution** refers to deterioration or unclean objectionable conditions in the quality of natural resources such as air, water and soil because of the action or presence of unwanted substances beyond a certain limit.

**32.4 Pollutants**

Pollutants are the substances or effect introduced into the environment in significant amounts in solid, semi solid, liquid gas or sub molecular particle form which has a detrimental (bad) effect on the environment.



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The pollutants may be classified in the following ways (Fig.32.1).

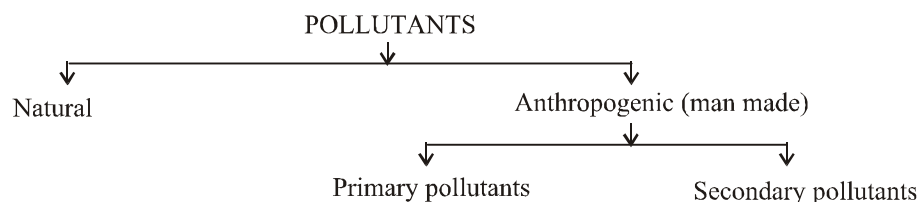


Fig. 32.1 : Classification of pollutants

### 32.4.1 Natural Pollutants

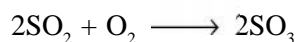
There can be several natural sources which are the cause of pollution. Some of them are listed below :

- (i) Fires in forests may be caused when lightening strikes the trees. Burning of tree produces a lot of  $\text{CO}_2$  which is released to the atmosphere.
- (ii) Soil erosion increases suspended particulate matter and dust in air. These may even enter water bodies as they are washed down by rain or natural water falls.
- (iii) Volcanic eruptions also add pollutants like  $\text{SO}_2$  and solid particles to the environment.
- (iv) Volatile organic compounds from leaves, trees and 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 has rarely endangered lives of organisms).

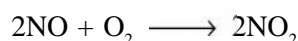
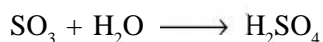
### 32.4.2 Anthropogenic Pollutants

Increased human activities releases a large amount of pollutants to the environment and poses a threat to the human life. 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 in a harmful form to the atmosphere. eg  $\text{CO}_2$  and CO from burning of fossil fuel;  $\text{SO}_2$  and oxides of nitrogen from vehicular combustion, thermal power stations, etc.
- (ii) **Secondary Pollutants:** Secondary pollutants are the products of reaction between the primary pollutants and normal environmental constituents.



Thus,  $\text{SO}_2$  a primary pollutant which reacts with oxygen of air to give  $\text{SO}_3$ . Further,  $\text{SO}_3$  reacts with water vapour present in the atmosphere and forms  $\text{H}_2\text{SO}_4$ . Thus  $\text{SO}_3$  and  $\text{H}_2\text{SO}_4$  are secondary pollutants.



Nitric oxide (NO), a primary pollutant reacts with oxygen to give  $\text{NO}_2$  which is a secondary pollutant.



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

- (i) Industrial Pollutants
  - (ii) Domestic Pollutants
- (i) **Industrial Pollutants:** Paper, textile industries, tanneries and distilleries dispose 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 is also a domestic pollutant.



### Intext Questions 32.2

1. Define a pollutant.  
.....
2. Name two sources of natural pollution.  
.....
3. Define a secondary pollutant.  
.....
4. What do you mean by environmental pollution?  
.....

### 32.5 Sources of Pollutants

Many of the pollutants in our environment have natural as well as human related origins. For example, the natural origin of pollutants includes the release of sulphur dioxide (SO<sub>2</sub>) from volcanic eruptions, erosion of soil by wind and water, dissolved minerals carried on to rivers and ocean by surface run off, etc.

The sources of pollutants are also classified :

- (i) Stationary and
- (ii) Mobile sources

**Stationary Sources :** The pollutants released from a fixed location or a well defined area is known as stationary source. e.g. smokestacks of power plants, smelters, surface mines, etc.

**Mobile Sources :** The pollutants released from diffused sources or the sources that move from place to place is termed as a mobile source. e.g. automobiles, buses, aircrafts, ships, trains, etc.

The various pollutants of water, their sources and effects are given in Table 32.1

Table No. 32.1 : Major Air Pollutants their Sources and Effects

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



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The various pollutants of water, their sources and effects are summarised in Table No. 32.2

Table 32.2 : Major Water Pollutants their Sources and Effects

Major Pollutants of Water	Some of the Sources	Some of the Effect
Pesticides and insecticides like DDT, BHC	Improper use in agriculture, mosquitos repellants	Toxic to fishes, predatory birds and mammals.
Plastics	Homes and industries	Kills fishes and animals like cows.
Chlorine compounds	Water disinfection with chlorine, paper and bleaching powder	Fatal for plankton (organisms floating on the surface of industries water) foul taste and odour, can cause cancer in humans.
Lead	Leaded gasoline, paints, etc.	Toxic to organisms
Mercury	Natural evaporation and 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.

The general effects of pollutants are produced due to interactions of pollutants among themselves.

### Contamination :

Contaminations refer to the mere presence of undesirable materials to a medium like air, water, soil, etc. making it unfit for a particular use. For example, contamination of air by hazardous exhaust from automobiles. It becomes a pollutant if its concentration exceeds the level which can cause harmful effect.



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### 32.6 Noise Pollution

Any unwanted sound is defined as noise. You know that the noises come from traffic, vehicles, especially at peak hour everyday, loud speakers and building construction work. Industries expose their workers to a high level of noises for long period of work everyday.

Prolonged exposure to high level of noise is harmful. Noise is measured in terms of 'decibel' (db) - a scale expressing intensity of the sound.

A very quiet room has a sound level of 20 db, cars and household gadgets - 70 db while a truck horns produces a noise of 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 the 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.

#### Legislative Measures to Prevent Pollution

The best protection of the environment is not to generate pollutants in the first place. Thus, the legislative measures have been introduced to deal specifically with environmental pollution caused by industries. (Table 31.3) The basic feature of the legislative measures is to empower the Central Government to correct differences of policy making and enforcement in the States through action not specifically permitted under earlier laws.

**Table 32.3 : Pollution control Legislations in India**

Acts	Year
Indian Forest Act	1927
Wildlife Protection Act	1972
The water (Prevention and control of Pollution) Act	1974
The air (Prevention and control of Pollution) Act:	1981
The Environmental (Protection) Act	1986
The National Environmental Tribunal Act	1995

The pollution related laws like the Water Act (1974), Air Act (1981), and the Environmental Protection Act (1995) do not give the right to an individuals to move the court under the environment laws for damages caused to them by pollution. The right has been vested only in the agencies of the State Government.



#### Intext Questions 32.3

1. Mention one bad effect each of SO<sub>2</sub> and CO on humans.

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2. Name one source of each pollutant lead and CFC.  
.....
3. Name the two major sources of anthropogenic sources of pollutants in the environment.  
.....
4. Give two examples of stationary sources of pollution.  
.....



**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.
- There are two major sources of pollutants - stationary and mobile.
- Pollutants have adverse effects on environment and living organisms.
- SO<sub>2</sub>, CO<sub>2</sub>, CO, smoke, Pb, Hg, CFC, etc. pollute air. Their sources and effects are varied.
- Pollution in simple words is the unhealthy and harmful condition for living organisms and non-living things.
- Pesticides, plastic, detergents, chlorine, mercury, etc. pollute water and endanger life of aquatic organisms.
- Unwanted sounds are termed as noise. Sounds is measured in decibels. Beyond 70 decibels noise has harmful effects on humans.
- The Government of India has set up various environmental laws and judiciary system to punish the polluters.



**Terminal Exercise**

1. What is environment?  
.....
2. Explain the term anthropogenic pollutants.  
.....
3. Write four major pollutants of water, their sources and effects.  
.....
4. Differentiate between the Primary and Secondary Pollutants.  
.....



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5. Name any three legislative measures (Acts) to protect the environment.
- .....



### Answers to Intext Questions

#### 32.1

1. The air, water, earth and living beings in a joint form is called environment.
2. There are two components of environment namely biotic and abiotic.
3. Living organisms such as plants, animals, microbes, etc.
4. Lead and Mercury.
5. Causes holes in the ozone layer.
6. Atmosphere, biosphere, hydrosphere and lithosphere.

#### 32.2

1. Any substance which is present in its excess concentration such as  $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{SO}_2$ .
2. Volcanic eruptions and run-off from surface mines.
3. Secondary pollutants are the products of reaction between the primary pollutant and the normal environmental constituents.
4. Environmental pollution is the deterioration or unclean objectionable conditions in the quality of natural resources such as air water and soil because of the action or presence of unwanted substances in undesirable concentration.

#### 32.3

1. Irritation to eyes by  $\text{SO}_2$  and difficulty in breathing.
2. Lead from exhaust of automobiles running on gasolene (petrol). CFC from refrigerants.
3. Industrial waste and automobile exhaust
4. Smokestacks of power plants, run-off from surface mines.