

# ENVIRONMENTAL STUDIES

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**MEC 205****Environmental Science**

**Unit-I** Basic Concepts Meaning, Definition of Environmental Studies History of Ecology Nature, Scope and importance of Environmental Studies Guiding Principles of Environmental Studies

**Unit - II** Environmental Hazards Land Pollution: Air Pollution Water Pollution Noise Pollution Radiation Deforestation Soil Erosion ways of Protecting, Preserving & Restoring Environment

**Unit III** India and Environmental Issues & Policies Environmental Problems of India Policies Environmental movements in India Chipko movement, Narmadha valley movement - Green

**Unit IV** Environmental Awareness Stockholm conference 1972 Nairobi Conference 1982 Rio Summit 1992 Rio Declaration.

**Unit- V** Methods of Teaching and Environmental Education In School Curriculum In India Education Lecture, Demonstration, Discussion, Seminar, Workshop, Dialogue, Problems, Exhibition, Role of India Pre School Elementary, Secondary, Higher Secondary CBSE, State syllabus

**References:**

- Miller T.G. Jr., Environmental Science (Wadsworth Publishing Co.)
- Rao, M.N. and Datta, A.K. Wastewater Treatment (Oxford and IBH Publ.Co. Pvt. Ltd.)1987
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## UNIT I

## Components &amp; Types

## Definition

Three components

Non – living component

Living component

Energy component

Four segments

Atmosphere

Hydrosphere

Lithosphere

Biosphere

Two types of environments

Natural environment

Man - made environment

## 1. DEFINITION

The term environment literally means the surroundings. Before the 1960s, the term environment was used for the surroundings of an organism that included the physical factors, such as, temperature and light. After the 1960s, a need was felt to redefine the term environment. The reason for this new look at environment has been the rapid industrialization and agricultural development. Environmental pollution and related problems on the definition of environmental degradation necessitate dare thinking Organism (plant, Cal, biological on the activities of organism. Organism and environment are two inseparable factors. An organism depends upon its environment for its sustenance while the environment provides the organism with the medium (e.g., soil, water, or air) for its activities.

## 2.0. THREE COMPONENTS

Environment consists of three components, namely, the non-living, the living and the energy components.

## 2.1 Non - living component

Non - living component is otherwise called as abiotic component. It includes medium and climate.

also play an important role to maintain the life of organisms.

### 2.1. Types of energy in the energy component

Solar energy - Energy from the sun; the primary source of all energy forms on the earth; the recoverable form of energy.

Geothermal energy - Heat of the interior of earth.

Thermoelectrical energy - Conversion of heat energy into electrical energy.

Hydroelectrical energy - Generation of electricity by the pressure of falling water.

Nuclear energy - Energy released during nuclear reaction as a result of fission (splitting of atomic nucleus) or fusion (fusion of nuclei); also called atomic energy

### 3.0. FOUR SEGMENTS

Environment consists of four segments

atmosphere - the gaseous envelope surrounding the earth.

hydrosphere - the watery part of the earth's surface.

lithosphere- the rigid outer layer of earth's crust, consisting of rocks and soil.

biosphere- the realm of living things found in atmosphere, hydrosphere, and lithosphere

#### 3.1. Atmosphere

Atmosphere consists of nitrogen, oxygen, argon, carbon dioxide and other gases. It extends up to 20,000 km

Role of atmosphere

It is the source of oxygen for respiration

It is the source of carbon dioxide for photosynthesis.

It is the source of rainwater for sustaining life on earth It maintains the heat budget of the earth by absorbing the infrared radiation of the sun and re - emitting part of the heat back into outer space.

Ozone layer in the upper atmosphere protects living things by filtering out the tissue-damaging ultraviolet radiation.

#### 3.2. Hydrosphere

Hydrosphere includes oceans, seas, streams, rivers, lakes, polar icecaps, glaciers, and ground water. Of the total volume available, 97 % water is in the vast oceans and seas. 2% is stored in the form of polar icecaps and glaciers and 1% is available as freshwater which includes surface water (streams, rivers, lakes, ponds) and ground water (Table 2.1). Total mass of water in the earth is about  $1400 \times 10^{15}$  kg.

Role of hydrosphere

The history of ancient civilizations is closely associated with rivers.

It is essential for sustaining all forms of life.

Water in the form of ocean is responsible for moderating the temperature of earth.

### 3.3 Lithosphere

Lithosphere consists of minerals occurring in the rocks and soil

#### Role of soil

Soil is a natural basic resource.

Oman depends upon the soil for his food. Soil depends upon the microbes for its fertility. Agriculture is not possible in the absence of soil microbes. One gram of fertile soil contains about 200-500 billion of microbes.

### 3.4. Biosphere

Biosphere refers to the living organisms and their interactions with the environment, viz., atmosphere, hydrosphere and lithosphere. Biosphere is very large and complex. It is divided into smaller units called ecosystems, e.g., forest, pond, grassland, cropland, etc. Biosphere thus consists of many ecosystems. The living part of an ecosystem is the community.

Communities are made up of populations. Populations are made up of organisms (Fig 2.3). Biosphere is dependent on the environment and environment is affected by the biosphere.

## 4.0. TWO TYPES OF ENVIRONMENTS

Environment may be divided into two types, namely, natural environment and man-made environment.

### 4.1. Natural environment

Natural environment is that part of the planet earth which remains untouched and has not been invaded by man. It operates through self-regulating mechanism, i.e., any change in natural ecosystem brought about by natural processes is counterbalanced by changes in the other components of the environment, such as, air, water, soil, radiation, land, forest, wildlife, flora, and fauna.

### 4.2. Man-made environment

Man is the most powerful environmental agent. He is the transformer of his environment. Man has altered the natural environment by overpopulation, urbanization, agricultural revolution, industrial revolution, transportation, dam-building, revolution in communication and channelization of energy sources, such as hydro, thermal, and nuclear energy.

Every man is a trustee of his environment.

## INTRODUCTION

Soil is as important as air and water for the sustenance of life for both, the plants, and the animals. It is nature's home for plants to which all forms of life directly or indirectly depend for their nourishment.

Soil is a natural medium of inorganic and organic nutrients and has an inbuilt system of spontaneous recycling of matter. It is affected by changes in the atmospheric conditions as well as water contents and microbial population.

Soil pollution is defined as an undesirable change in the natural, physical, chemical or biological components of the soil.

## SOURCES OF SOIL POLLUTION

The various sources of soil pollution may be categorized into two groups: (i) Natural sources and (ii) Artificial sources

### I. Natural Sources

Natural pollutants are of plant and animal origin. They are:

1. Plant Residues: Normally plants, on death and decay, contribute organic matter to the soil and thereby increase soil fertility. Sometimes residues from crops, fields and orchards carry plant pathogens and pests. These on death and decay cause soil pollution. Naturally occurring or manmade fires of and crops which yields add create residues unwanted unfavourable with organic matter to leading the soil to and poller dean slaughter dead unhealthy conditions detrimental

### 2. Animal Wastes:

Excessive organic hypertonic conditions in the soil causing wilting or stunted growth of the plant

### Artificial Sources

Pollutants produced due to man's activities, i.e., artificial sources may be of the following types:

1. Industrial Wastes: Rapid industrialization has given birth to the problem of waste disposal. Most Indian industries release of their enriched effluents with inorganic directly into chemicals the surrounding that enhance fields. These salt effluents content turn is of the adversely soil.

### 2 Solid Wastes:

Solid wastes include all substances in a solid or in solid state disposed of in the soil. These are often garbage's from homes and commercial places, Major sources of solid wastes in our country come from domestic wastes, shops, offices, restaurants, hospitals, educational institution and small-scale industries. Often solid wastes contain hazardous substances that cause the degradation of soil leading to the level of harmful pollution.

3. Radioactive Wastes: Pollution resulting from radioactive wastes is perhaps the most dangerous and farfetched process. Sources of such pollutants are nuclear explosions, nuclear testing, nuclear reactors etc. Radioactive dust particles produced after an atomic explosion slowly settles down on the soil surface and gradually permeate the soil strata. When absorbed by the plants, these enter the human body via the food chain and cause serious damages.



These also disrupt the growth and multiplication of soil microorganisms.

The great problem with radioactive elements is that they cannot be destroyed once they have been created and it is only the passage of time which can reduce their harmful properties. Once these are discharged into the ground, these are held physically and chemically in the soil particles.

4. Detergents: In developing nations, use of detergents is becoming increasingly common. Wastes water from domestic sources is usually rich in detergents. It is allowed to flow unchecked into the ground. Presence of detergents in the soil increases its alkalinity and phosphate contents which affect root growth of the plants and depresses the growth of soil micro-organisms.

5. Agrochemicals: Several chemicals are used in agriculture to boost the crop productivity to keep pace with the ever-increasing population of human beings. These chemicals contribute soil pollution considerably. Some of these chemicals are:

(i) Fertilizers: Increase in crop yield requires the use of inorganic and organic fertilizers. Common fertilizers are urea, NPK, super phosphate, bone meal etc. Accumulation of excessive fertilizers particularly inorganic types misbalances the nutrient contents of the soil. Excess phosphorus and nitrogen affect adversely the plant growth and soil flora and fauna.

(ii) Herbicides: Herbicides are chemicals applied to kill herbs or crop weeds. These are basically of two types (a) selective herbicides such as 2,4-D, 2,4,5-T and growth regulating substances that kill only certain types of plants and (b) non-selective herbicides such as sodium arsenate, sodium chlorate etc. that kill all herbs. Herbicides are poisonous in nature and their indiscriminate use completely wrecks the ecosystem of soil.

(iii) Pesticides: contain trichloroethane), toxic plants. Pesticides heavy Commonly malathion are metals chemicals which used dichlorophens, pesticides increased

6. Acid Rains –percolation of air Bourne sulfuric and nitric acid along with rainwater changes PH of the soil

## EFFECTS OF SOIL POLLUTION

Some important effects of soil pollution are:

1. Soil pollution decreases soil fertility. Loss of soil fertility makes the soil inhabitable for plants and other organisms.
2. Soil pollution has adverse effects on soil microbial population that plays important role in soil formation and keeping it fertile.
3. Indiscriminate use of agro chemicals destroys the soil flora and fauna and soil properties.
4. SO<sub>2</sub>, SO<sub>3</sub> and oxides of nitrogen of the atmosphere are washed down .by rain in the form of H<sub>2</sub>SO<sub>4</sub> (sulphuric acid), HNO<sub>2</sub> (nitrous acid) and HNO<sub>3</sub> (nitric acid) which reach the soil and increase the acidity. Increased acidity develops unhealthy conditions for plant growth.
5. Dumping of radioactive wastes onto the soil is lethal to plants and microbial life. Such pollution has far reaching effects and even human beings are not spared.

## CONTROL OF SOIL POLLUTION

Some common measures adopted for controlling soil pollution are:

1. Control of pesticide pollution can be carried out by:

- Lowering its use in agriculture. -Use of degradable insecticides like organic phosphates.
- Use of short-lived chemical pesticides.
- Adopting biological control, e.g., use of predators or parasites of pests into practice in place of insecticides.
- Releasing sterile males into the natural population of insects of pests and
- Rotation and diversification of crops etc.

2. Control of fertilizer pollution can be practiced by using long planning of agriculture. Natural procedures to boost soil fertility. fallowing of fields, growing leguminous crops (to increase Soil nitrogen), crop rotation, use of organic fertilizers or farmyard manures or bio fertilizers etc. should be encouraged.

3. Control of pollution due to garbage and other resistant material dumped on land can be adopted by control tipping methods or sanitary land fill methods. Another method is burning of garbage and utilizing heat to warm residential units and for generation of electricity. Organic wastes can be used for preparing manure and biogas.

4. Control of acid rains can be achieved by controlling air pollution.

5. Control of radioactive based soil pollution can be achieved by controlled disposition of radioactive isotopes and minimization of their use.

6. Discharge of hot liquids and oil leakage in the soil should be avoided.

7. Sewage should be biologically treated and converted into manure instead of its uncontrolled release into the soil