Environmental Science

Ch-1 Introduction to Environment Science

The word "Environment" is derived from the French word "Environner" that means to encircle or surround. All the biological and non-biological things surrounding an organism are thus included in environment.

Environment can be defined as:

External surroundings and condition which is directly or indirectly affects the living organisms.

OR

Environment is sum total of water, air and land, interrelationship among themselves and also with the human beings, other living organisms and property.

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Environment is usually divided in to two parts

1. Biotic : Biotic environment is made up of all living organisms (plants, animals & microorganisms) including their reactions, interactions and interrelated actions.

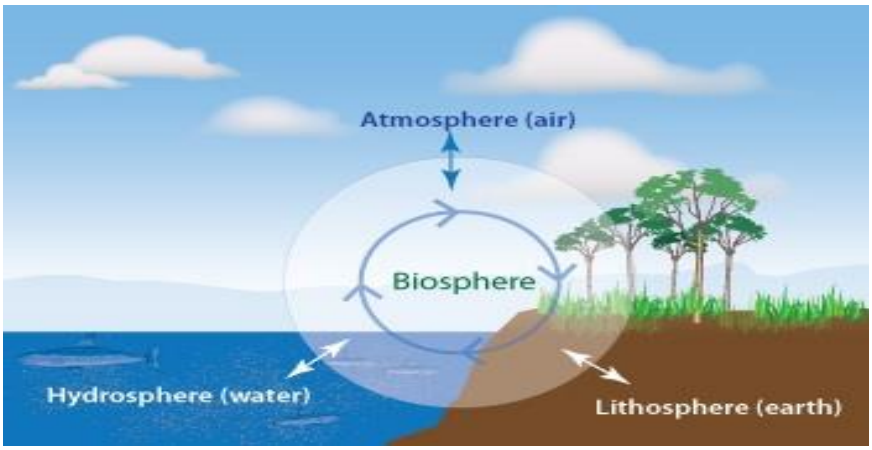
2. A Biotic : A biotic Environment or physical environment: It is composed of external physical factors like temperature, humidity, water, soil, minerals, gases etc. It provides both habitation and raw materials for the synthesis of organic food.

These biotic and a biotic component are in a dynamic state i.e. they constantly affect each other and cannot be isolated from each other.

Any constituents of the environment which directly or indirectly affects the growth and development of an organism is called environmental or ecological factor. Example of environmental factors are climatic factors, topographic factors, biotic factors, fire, (related to soil) factors.

COMPONENT OF ENVIRONMENT SCIENCE:

1. Atmosphere (Gases, vapors)
2. Hydrosphere (water)
3. Lithosphere (rock and minerals)
4. Biosphere (combination of above atmosphere, hydrosphere, lithosphere)



Atmosphere

The atmosphere is composed of nitrogen, oxygen and other gases or it is the air that is all around the earth. The compositions of various gases in the atmosphere.

Nitrogen- 78% by volume and 75.465% by weight
Oxygen- 20.99% by volume and 23.19% by weight
Carbon dioxide- 0.03% by volume and 0.05% by weight

Layers of Atmosphere

1. Troposphere
2. Stratosphere
3. Mesosphere
4. Thermosphere
5. Exosphere

Hydrosphere

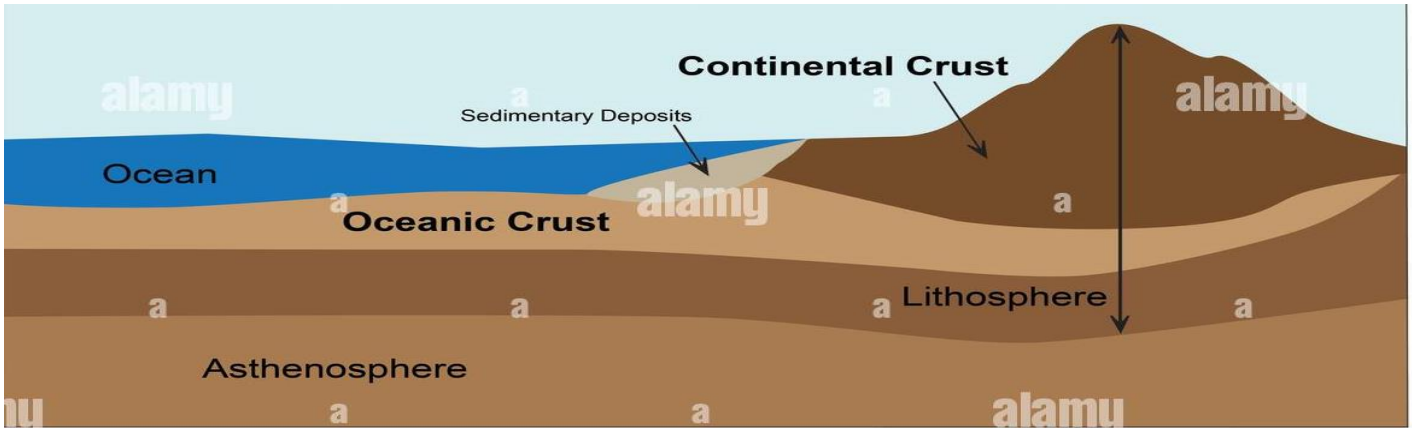
Hydrosphere includes all types of water resources like oceans, seas, rivers, glaciers and all ground water. It is the collective term used for different forms of water. 70% of earth is covered by water and 30% is covered by land surface. the major problem with global water supply is its non-uniform distribution.

Lithosphere

The lithosphere is the solid rock that covers the planet. this includes crust and uppermost part of the mantle. All mountains and sea floors are included in lithosphere. Lithosphere is divided into tectonic plates which move relatively to each other. There are two components of lithosphere -

1. Oceanic lithosphere
2. Continental lithosphere

1. Oceanic lithosphere: It is associated with oceanic crust and exist in the ocean basin. It is about 50-100 km thick.
2. Continental lithosphere: its thickness ranges from 40km to 200km.



Biosphere

Biosphere is the combination of atmosphere, lithosphere and hydrosphere.

Biosphere is absent at North and South poles.

The energy required for life in biosphere come from sun and nutrients comes from air, water and soil. The same sources are recycled again and again to continue life.

The extreme range of biosphere is

1. 10 km above sea level.
2. 8 km depth in oceans

Environmental Issues and Challenges:

Unpolluted or clean environment has a specific composition. When this composition gets changed by addition of harmful ~~substances~~ objects, the environment is called polluted environment and the ~~substance~~ object polluting it is called pollutant Environmental pollution can therefore be define as "any undesirable change in the physical, chemical or biological characteristics of any components of the environment (air, water, soil) which can cause harmful effects on various forms of life or property.

Causes for Environmental pollution can be mainly classified as natural and man made

(a) Natural (volcanic eruption, forest fire)

(b) Man made

Causes of manmade environmental pollution are:

(1) Rapid Industrialization

(2) Population growth.

(3) Unplanned urbanization.

There are various types of environmental issue:

1. Air pollution
2. Water pollution
3. Noise pollution.
4. Land pollution
5. Thermal pollution
6. Environmental Degradation

Over the centuries we, Indians, have worshiped nature. We have lived in harmony with nature.

However, of late, we have followed western countries past of conflict with nature.

The result is that today, we observe and experience, over all environmental degradation.

Any objective view of state of environment, of India or any Developing countries would clearly show that:

- Soils are eroding.
- Forests retreat.
- Water quality is unsatisfactory.
- Urban air quality is worse.
- Watersheds are losing storage capacity.
- Reservoirs are filled up with sediments.

Principles and Scope:

- Principles of environmental education:
- Environmental education considers environment in totality.
- It is not a one shot learning process but it requires a holistic approach as it is multidisciplinary in nature
- Environmental hazards are controllable and every citizen has a moral obligation and responsibility towards this.
- Education must be given to all sections of the society Promote the value and necessity of cooperation at personal, local and National level in the prevention
- Of environmental problems and solution for it. Help learner to discover the systems and causes of environmental problems
- Concerns of environment are concerns of several agencies and everybody should work together.
- Realizing the importance environmental education the Supreme Court of India has directed all national organizations like UGC which regulates higher education in India to offer environmental education as a paper in the curriculum or syllabus of various degree courses. Also to increase the awareness among the common people 5th June is celebrated as World Environment Day.

Scope of Environmental Science

Environmental science is a multidisciplinary science whose basic aspects have a direct relevance to every section of the society. Its main aspects are:

- Conservation of nature and
- Natural resources.
- Conservation of biological diversity.
- Control of environmental pollution.
- Stabilization of human population and environment

- Social issues in relation to development and environment.

Environmental Education: Objectives

- Increase awareness of total environment.
- Increase the knowledge of environment.
- Improve attitude towards environment.
- Provide motivation for environmental protection.
- Development of a non-polluting renewable energy system and providing a new dimension to the nation's security.

e) **Concepts of Ecology and Ecosystem:**

ECOLOGY:

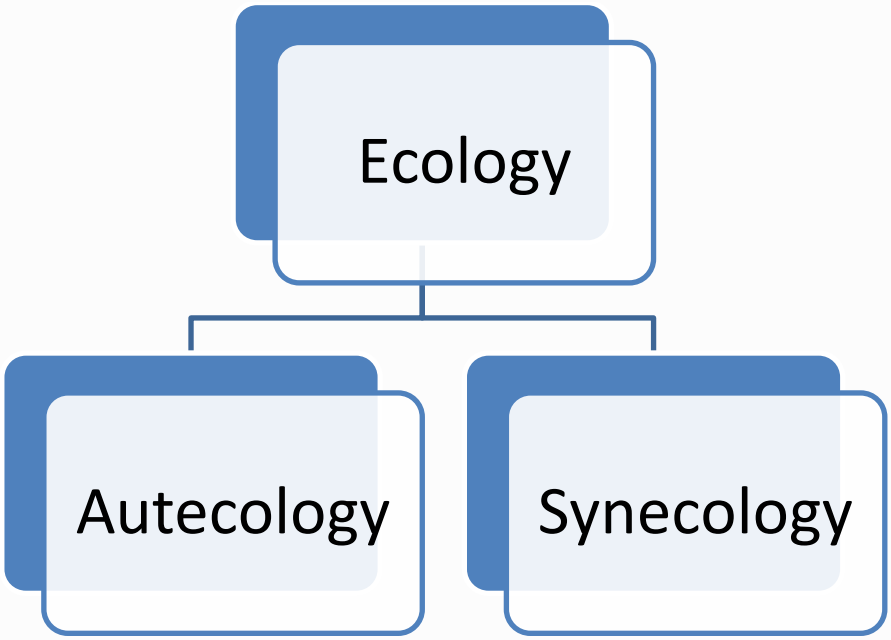
The word ecology is derived from two Greek words "oikos" meaning house, habitation or place of living and "logos" meaning 'study'

Definition:

Ecology is the study of the interrelationship between living organisms and their physical and biological environment. (The physical environment includes light and heat or solar radiation, moisture, wind, oxygen, carbon dioxide nutrients in soil, water and atmosphere. The biological environment includes organisms of the all kind as well as plants and animals

Ecology is studied at many levels including organism, population, community ecosystem and biosphere.

Classification of Ecology:



AUTECOLOGY

Autecology is the study of individual organism or individual species.

It is also known as population ecology.

SYNECOLOGY

It deals with study of groups of organisms of different species which are associated together as a unit in the from of community. It is also known as community ecology.

Ecosystem:

The organisms of any community besides interacting among themselves, always have functional relationship with the environment. This structural and functional system of communities and environment is called ecological system or ecosystem.

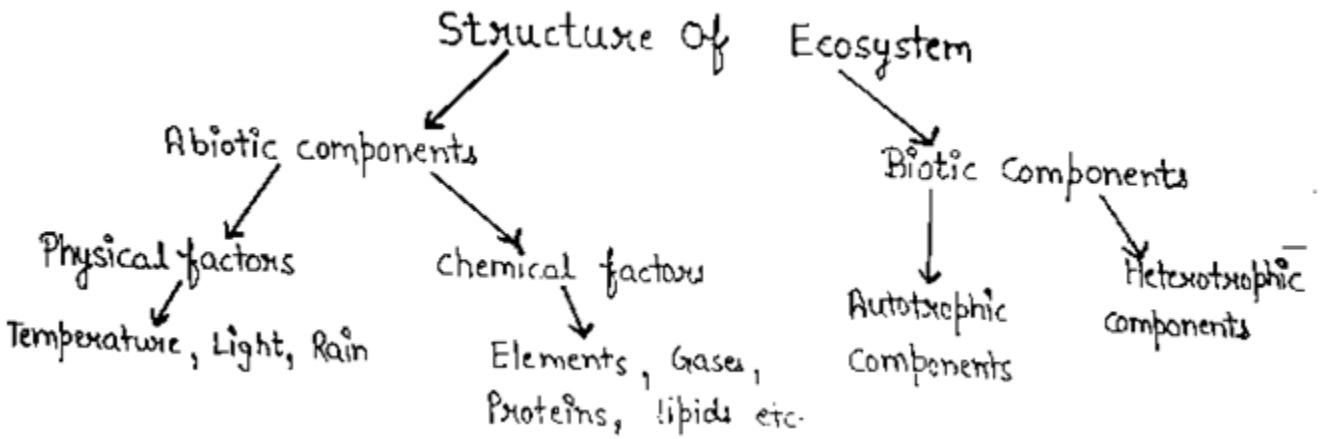
It is a community of interdependent organisms together with the environment.

Any unit that includes all of the organisms in a given area interacting with the physical environment, so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles within the system.

Ecosystem is made up of two words "eco" and "system" eco means environment and system means and interacting and interdependent complex. Food chain, Food Web, Biogeochemical Cycles.

Ecosystem is an aggregate system formed as a result of Interaction between biotic and abiotic factor

The term ecosystem was first of all proposed by A.G-Tansley in 1935



1. **A biotic Component**

   I. **Physical factors:** Those physical factors which affect the biotic activates in any way, from the physical environment.

   Example: Temperature, Rain, humidity and Light.

   II. **Chemical factors:**

   a. Inorganic substances object

   b. Organic substances.

Inorganic substances: It indults includes water, Elements and gases.

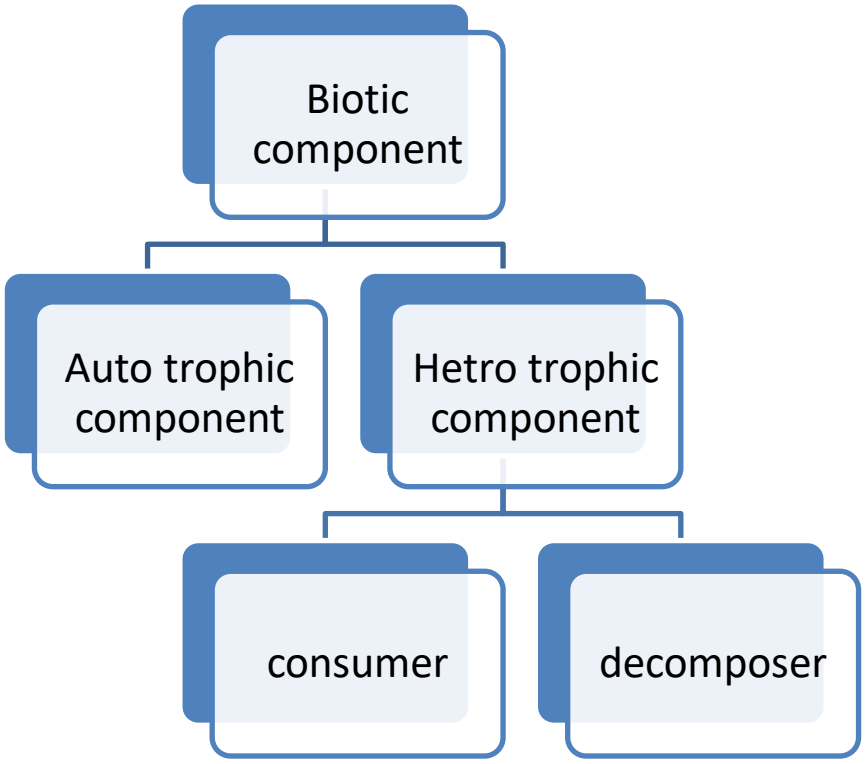
Elements: - Carbon, Oxygen, Nitrogen, Phosphorus, Cobber etc. zinc,

Organic Substances: These substances help to establish relation between biotic and a biotic components.

Example: - Proteins, lipids, Carbohydrates etc.

2. **Biotic Components:**

On the basis of nutrient relations of organisms, divided into two types.



Autotrophic components: Also called producers.

Example: Green plant photosynthetic bacteria.

• Synthesize complex substances from simple substances by fixing solar energy.

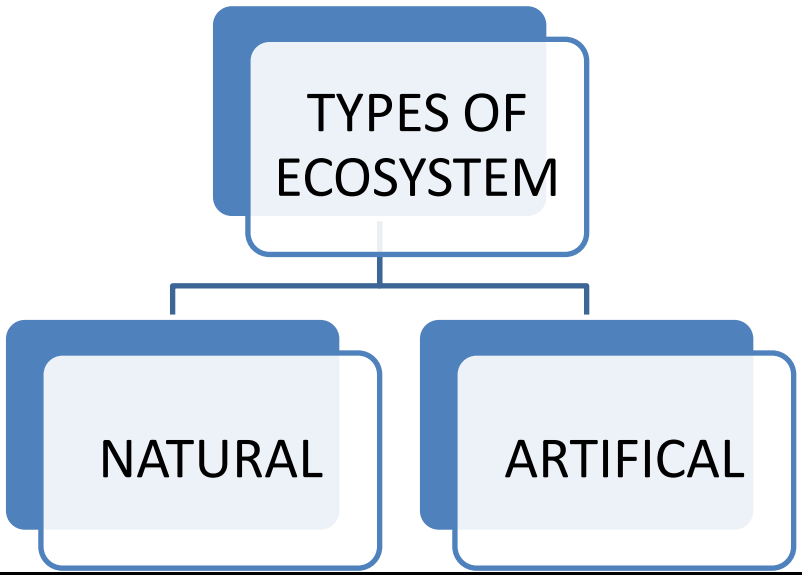
Heterotrophic components:

These components utilize and decompose the Complex substances synthesized by autotrophy.

1. **Consumers:** Those organisms that consume food substances synthesized by producers AME Called consumer
    A. **Primary Consumer:** Deer, Goat, Rabbit, insects etc.
    B. **Secondary consumers:** frogs, Birds Lizard etc.
    C. **Tertiary consumers:** Large fishes, lion.
2. **Decomposers:**

They are saprophytic such as Dead bodies of animals, plants parte bacteria, fungi etc. Bacteria, fungi simple components.

TYPES OF ECOSYSTEM



Ecosystem are natural : There is no interference of man

Artificial ecosystem : Constructed artificially by man. i. e. Agricultural land, aquarium.

Aquatic ecosystem

Fresh water ecosystem (river, water fall). Marine ecosystem

(Sea, Ocean marines)

Terrestrial ecosystem

Grassland ecosystem Forest ecosystem Desert ecosystem

Functions of Ecosystem

1. A biotic and biotic components of ecosystem help to maintain the equilibrium on earth.
2. Helps in increasing the productivity.
3. Biotic components of the ecosystem help in energy flow in food chain.
4. Both biotic and a biotic components of the ecosystem are involve in the nutrient cycling
5. A biotic component of the ecosystem helps the plant in their food preparation by the process of photosynthesis.