



Environmental studies

UNIT I

Introduction to Environmental studies

Definition and Concept of Environment

The word environment is derived from the French word ‘environ’ meaning external conditions or surroundings that favour the growth of flora and fauna, human beings and their properties and protect them from the effects of pollution.

The term environment can be defined as a sum total of all the living and non-living elements and their effects which influence human life. While all living or biotic elements are animals, plants, forests, fisheries, and birds, etc. The non-living or abiotic elements include water, land, sunlight, rocks, and air, etc.

Functions of Environment

1. Supply of Resources
 - The environment offers resources for production.
 - It includes both renewable and non-renewable resources.
 - Example: Wood for furniture, soil, land, etc.
2. Sustains Life
 - The environment includes the sun, soil, water, air which are essential for human life.
 - It sustains life by providing genetic and biodiversity.
3. Assimilation of Waste
 - Production and consumption activities generate waste.
 - This occurs mostly in the form of garbage.
 - The environment helps in getting rid of the garbage.
4. Enhances Quality of Life
 - Environment enhances the quality of life.
 - Man enjoys natural beauty like rivers, mountains, deserts, etc.
 - These add to the quality of life.

Multidisciplinary Nature of Environmental Studies

- The Environment studies is a multi-disciplinary science because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.
- It is the science of physical phenomena in the environment. It studies about the sources, reactions, transport, effect and fate of physical and biological species in the air, water, soil and the effect of from human activity upon these.
- As the environment is complex and actually made up of many different environments like natural, constructed and cultural environments, environmental studies is inter disciplinary in nature including the study of biology, geology, politics, policy studies, law, religion engineering, chemistry and economics to understand the humanity’s effects on the natural world.
- This subject educates the us to appreciate the complexity of environmental issues in many fields.

- By studying environmental science, we may develop a breadth of the interdisciplinary and methodological knowledge in the environmental fields that enables us to facilitate the definition and solution of environmental problems.

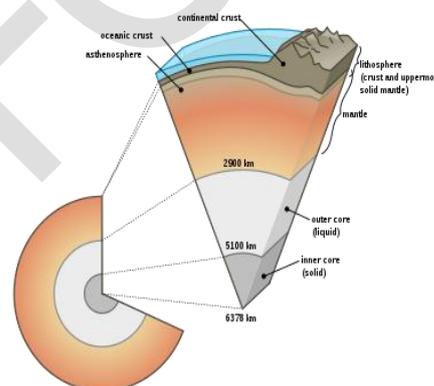
Environment and its components

- The term environment has been derived from a French word “Environ” means to surround. It refers to both abiotic (physical or non-living) and biotic (living) environment.
- The word environment means surroundings, in which organisms live. Environment and the organisms are two dynamic and complex component of nature.
- Environment regulates the life of the organisms including human beings.
- Environment is the sum total of conditions in which an organism has to survive or maintain its life process. It influences the growth and development of living forms.

Four Components of Environment

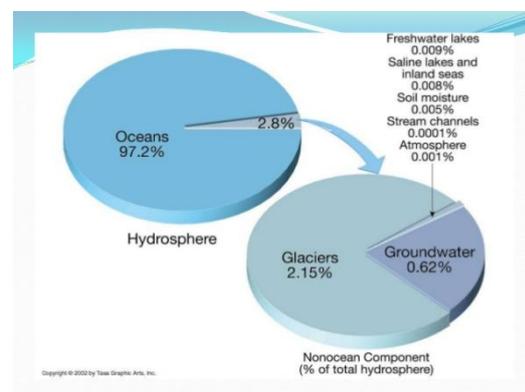
The four major components of environment include lithosphere, hydrosphere, atmosphere and biosphere, corresponding to rocks, water, air and life respectively.

- 1) **Lithosphere** is the outermost layer of earth called crust, which is made of different minerals. Its depth can reach up to 50 kilometres and is found on both land (terrestrial crust) and oceans (oceanic crust). The main component of lithosphere is earth's tectonic plates. The earth's crust is not a homogeneous substance; it has different layers of rocks including sedimentary rocks on top, granitic and metamorphic rocks in the middle, and basaltic rocks on the bottom.



Structure of Lithosphere

- 2) **Hydrosphere** comprises of all forms of water bodies on earth including oceans, seas, rivers, lakes, ponds, streams etc. It covers 70% of earth's surface. 97.5% of water found on Earth is in the oceans in the form of salt water. Only 2.5 % of water on Earth is fresh water. Out of this, 30.8% is available as groundwater and 68.9% is in frozen forms as in glaciers. Amount of 0.3% is available in rivers, reservoirs and lakes and is easily accessible to man.



Distribution of Water

- 3) **Atmosphere** is gaseous layer enveloping the Earth. The atmosphere with oxygen in abundance is unique to Earth and sustains life. It mainly comprises 78.08% nitrogen, 20.95% oxygen, 0.93% argon, 0.038% carbon dioxide, and traces of hydrogen, helium, and noble gases. The amount of water vapour present is variable.

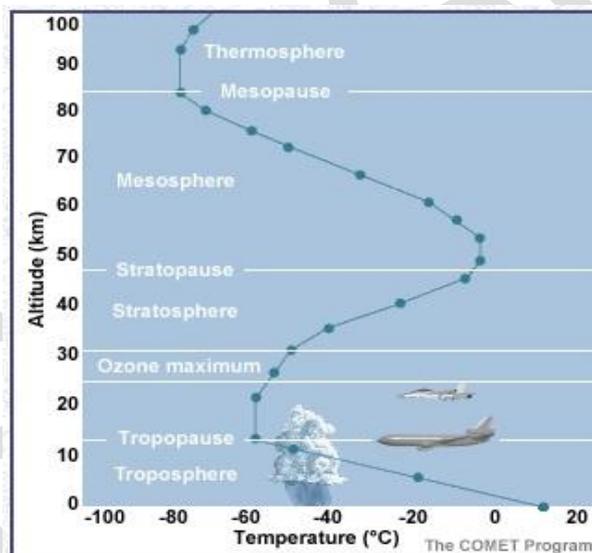
Layers of Atmosphere

The atmosphere consists of 4 layers:

- Troposphere,
- Stratosphere,
- Mesosphere, and
- Thermosphere.

Figure below shows the placement of the different layers of the atmosphere and how the temperature changes with height as you go from the ground up to space.

The troposphere is the lowest layer of the atmosphere. This is the layer where we live and where weather happens. Temperature in this layer generally decreases with height. The boundary between the stratosphere and the troposphere is called the tropopause. The jet stream sits at this level and it marks the highest point that weather can occur. The height of the troposphere varies with location, being higher over warmer areas and lower over colder areas. Above the tropopause lies **the stratosphere**. In this layer the temperature increases with height. This is because the stratosphere houses the ozone layer. The ozone layer is warm because it absorbs ultraviolet (UV) rays from the sun. **The mesosphere** is the layer above the stratosphere. The temperature decreases with height here just like it does in the troposphere. This layer also contains ratios of nitrogen and oxygen similar to the troposphere, except the concentrations are 1000 times less and there is little water vapor there, so the air is too thin for weather to occur. **The thermosphere** is the uppermost layer of the atmosphere. In this layer the temperature increases with height because it is being directly heated by the sun.

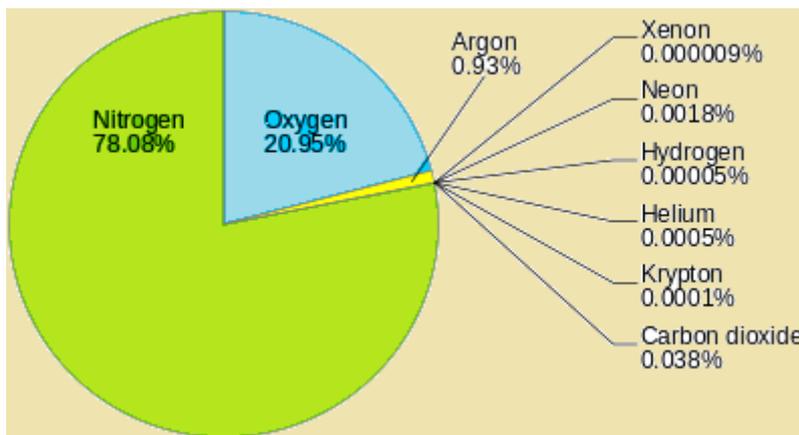


Layers of Atmosphere

Composition of Atmosphere

- Atmosphere consists of various gases, water vapour and dust particles.
- The presence of oxygen becomes negligible at the height of 120 km from the surface of earth with regards to the composition of atmosphere.
- Carbon dioxide and water vapour occur only up to 90 km.
- Carbon dioxide is meteorologically very important as it is transparent to incoming solar radiation but opaque to outgoing terrestrial radiation. It is also responsible for greenhouse effect.
- Ozone gas: 10-50 km above earth surface and acts as filter, absorbing ultraviolet rays from the sun. Ozone prevents the rays from reaching the surface of earth.
- Water vapour is variable gas, decreases with altitude.
- It also decreases from equator towards the poles.

- Acts like blanket allowing the earth to neither to become too cold nor too hot. Also contributes to the stability and instability in the air.
- Dust particles: are in higher concentration in subtropical and temperate regions due to dry winds in comparison to equatorial and polar regions.
- Dust particles act as a hygroscopic nuclei over which water vapour of atmosphere condenses to produce clouds.



Composition of Atmosphere

- 4) **Biosphere** refers to all the regions on Earth where life exists. The ecosystems that support life could be in soil, air, water or land. The term Biosphere was coined by Geologist Edward Sues who used this term for place on Earth where life can be found. Biosphere refers to the sum total of all living matter, the biomass or biota. It extends from the polar ice caps to the equator, with each region harbouring some life form suitable to the conditions there.



Components of Biosphere

Environmental Sustainability and Sustainable Development

Sustainable development is the overarching paradigm of the United Nations. The concept of sustainable development was described by the 1987 Brundtland Commission Report as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

There are four dimensions to sustainable development – society, environment, culture and economy – which are intertwined, not separate. Sustainability is a paradigm for thinking about the future in which environmental, societal and economic considerations are balanced in the pursuit of an improved quality of life. For example, a prosperous society relies on a healthy environment to provide food and resources, safe drinking water and clean air for its citizens.

One might ask, what is the difference between sustainable development and sustainability? Sustainability is often thought of as a long-term goal (i.e. a more sustainable world), while sustainable development refers to the many processes and pathways to achieve it (e.g. sustainable agriculture and forestry, sustainable production and consumption, good government, research and technology transfer, education and training, etc.).

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