Unit 1: INTRODUCTION TO ENVIORNMENTAL STUDIES

- Multi-disciplinary nature of environmental studies

An environmental study is a 'multi-disciplinary academic field which systematically studies human interaction with its environment. Environmental studies have a broader canvas. It includes not only the study of physical, chemical and biological characters of the environment but also social, economic, cultural and even political aspects of the environment which makes it a very dynamic academic field.

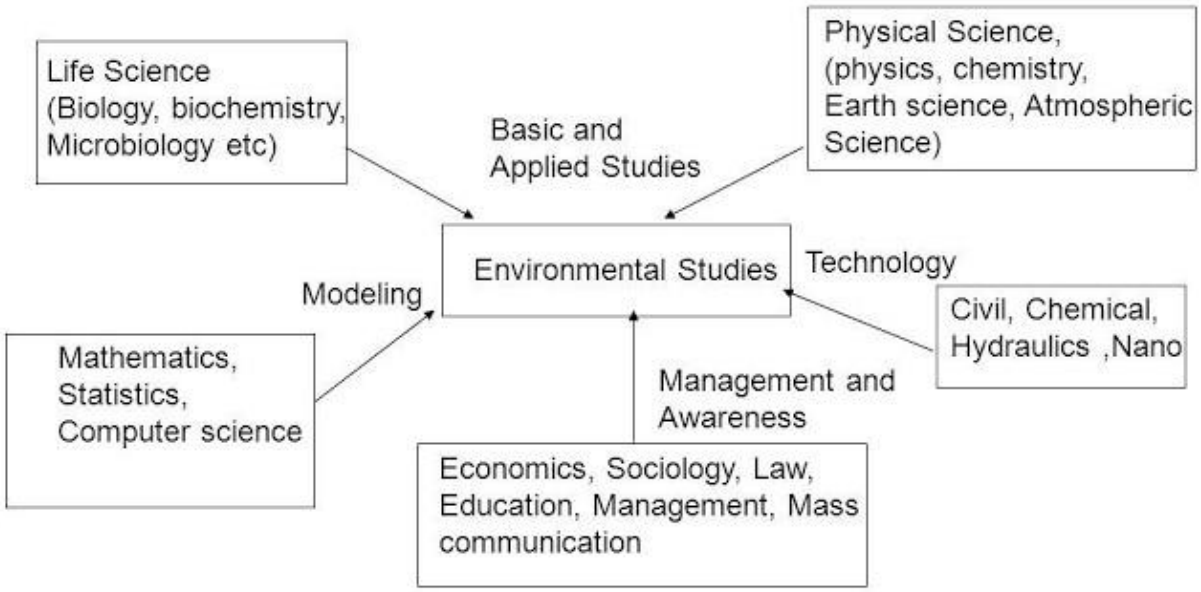


fig1. The multi-disciplinary nature of environmental studies

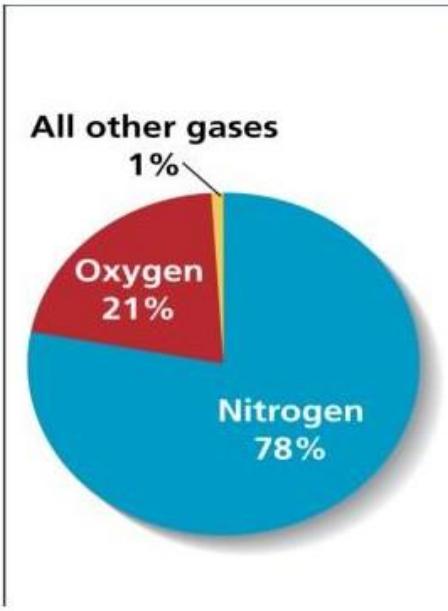
- Components of natural environment

Earth has mainly four natural components- Atmosphere, Hydrosphere, Lithosphere and Biosphere

Atmosphere

It is the air blanket which surrounds the planet and upheld by the gravity of that planet. The atmosphere of earth has highest density as it is composed of different gases. The most abundant gas in the atmosphere is nitrogen, with oxygen second. Argon, an inert gas, is the third most abundant gas in the atmosphere. The atmosphere is composed of a mix of several different gases in differing amounts. The permanent gases whose percentages do not change from day to day are nitrogen, oxygen and argon. Nitrogen accounts for 78% of the atmosphere, oxygen 21% and argon 0.9%. Gases like carbon dioxide, nitrous oxides, methane, and ozone are trace gases that account for about

a tenth of one percent of the atmosphere. Water vapor is unique in that its concentration varies from 0-4% of the atmosphere depending on where you are and what time of the day it is. In the cold, dry artic regions water vapor usually accounts for less than 1% of the atmosphere, while in humid, tropical regions water vapor can account for almost 4% of the atmosphere. Water vapor content is very important in predicting weather.



Gas	Percentage by Volume
Nitrogen (N_2)	78.084
Oxygen (O_2)	20.946
Argon (Ar)	0.934
Carbon dioxide (CO_2)	0.037
Neon (Ne)	0.00182
Helium (He)	0.00052
Methane (CH_4)	0.00015
Krypton (Kr)	0.00011

Fig2. Atmospheric composition of earth

The atmosphere is comprised of layers based on temperature. These layers are the troposphere, stratosphere, mesosphere and thermosphere. A further region at about 500 km above the Earth's surface is called the exosphere.

- Troposphere
  This is the lowest part of the atmosphere - the part we live in. It contains most of our weather - clouds, rain, snow etc. In this part of the atmosphere the temperature gets colder as the distance above the earth increases, by about 6.5°C per kilometre. The actual change of temperature with height varies from day to day, depending on the weather.

  The troposphere contains about 75% of all of the air in the atmosphere, and almost all of the water vapour (which forms clouds and rain). The decrease in temperature with height is a result of the decreasing pressure. The top of the troposphere is called the tropopause. This is lowest at the poles, where it is about 7 - 10 km above the Earth's surface. It is highest (about 17 - 18 km) near the equator.

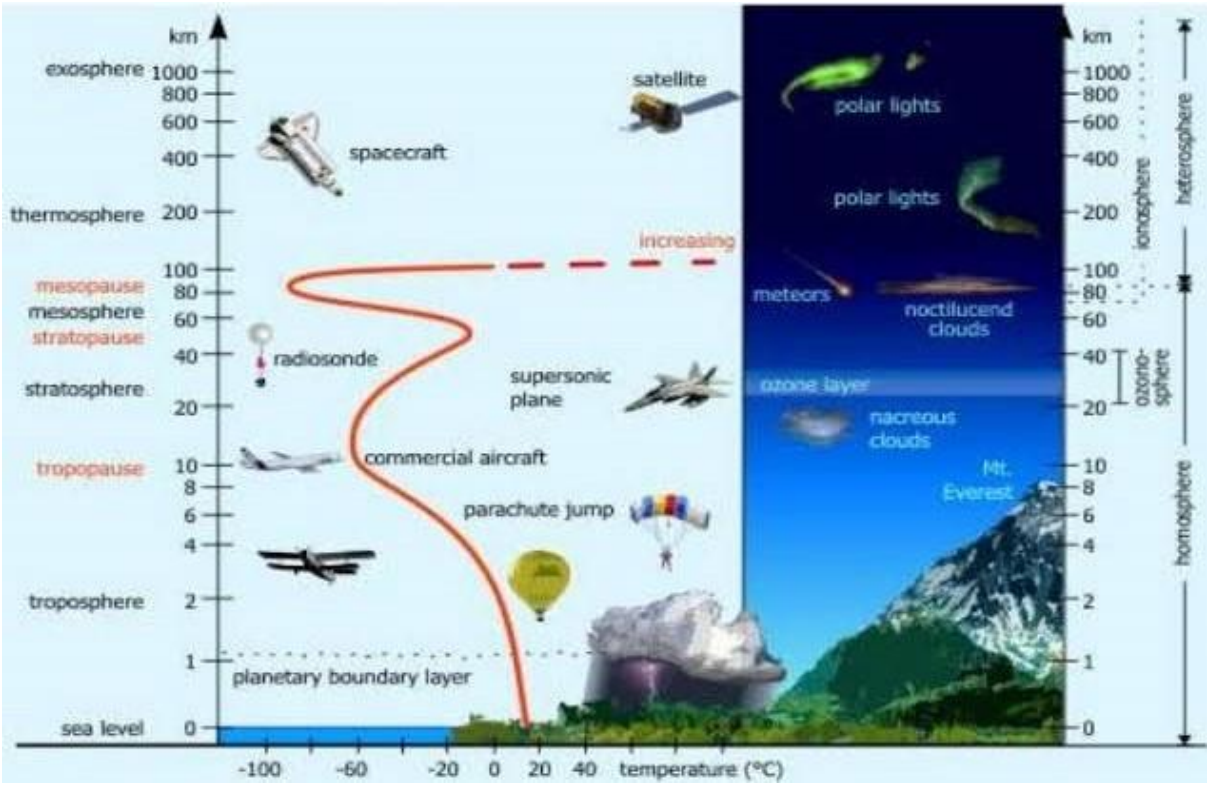


Fig3. Atmospheric stratification

Stratosphere

This layer is 22 miles (35 kilometres) thick. The stratosphere consists of ozone layer which protects us from harmful Ultra Violet (UV) radiations. This layer is important for survival of life on earth.

Mesosphere

The mesosphere is a layer of Earth's atmosphere. The mesosphere is directly above the stratosphere and below the thermosphere. It extends from about 50 to 85 km (31 to 53 miles) above our planet. Temperature decreases with height throughout the mesosphere. The coldest temperatures in Earth's atmosphere, about -90° C (-130° F), are found near the top of this layer. Most meteors vaporize in the mesosphere. Some material from meteors lingers in the mesosphere, causing this layer to have a relatively high concentration of iron and other metal atoms.

Thermosphere

The thermosphere is directly above the mesosphere and below the exosphere. It extends from about 90 km (56 miles) to between 500 and 1,000 km (311 to 621 miles) above our planet. Temperatures climb sharply in the lower thermosphere (below 200 to 300 km altitude), then level off and hold fairly steady with increasing altitude above that height. Solar activity strongly influences temperature in the thermosphere. The space shuttle and the International Space Station both orbit Earth within the thermosphere. The auroras (the Southern and Northern Lights) primarily occur in the thermosphere. Charged particles (electrons, protons, and other ions) from space collide with atoms and molecules in the thermosphere at high latitudes, exciting them into higher energy states. Those atoms and

molecules shed this excess energy by emitting photons of light, which can be seen as colorful auroral displays.

Exosphere
The exosphere is the uppermost region of Earth's atmosphere as it gradually fades into the vacum of space. Air in the exosphere is extremely thin - in many ways it is almost the same as the airless void of outer space.

Lithosphere

Lithosphere is the rigid, rocky outer layer of the Earth, consisting of the crust and the solid outermost layer of the upper mantle. It extends to a depth of about 60 miles (100 km). It is broken into about a dozen separate, rigid blocks, or plates (see plate tectonics). Slow convection currents deep within the mantle, generated by radioactive heating of the interior, are believed to cause the lateral movements of the plates (and the continents that rest on top of them) at a rate of several inches per year. There are two types of lithosphere:

Oceanic lithosphere- which is associated with oceanic crust and exists in the ocean basins.
Continental lithosphere- which is associated with continental crust.

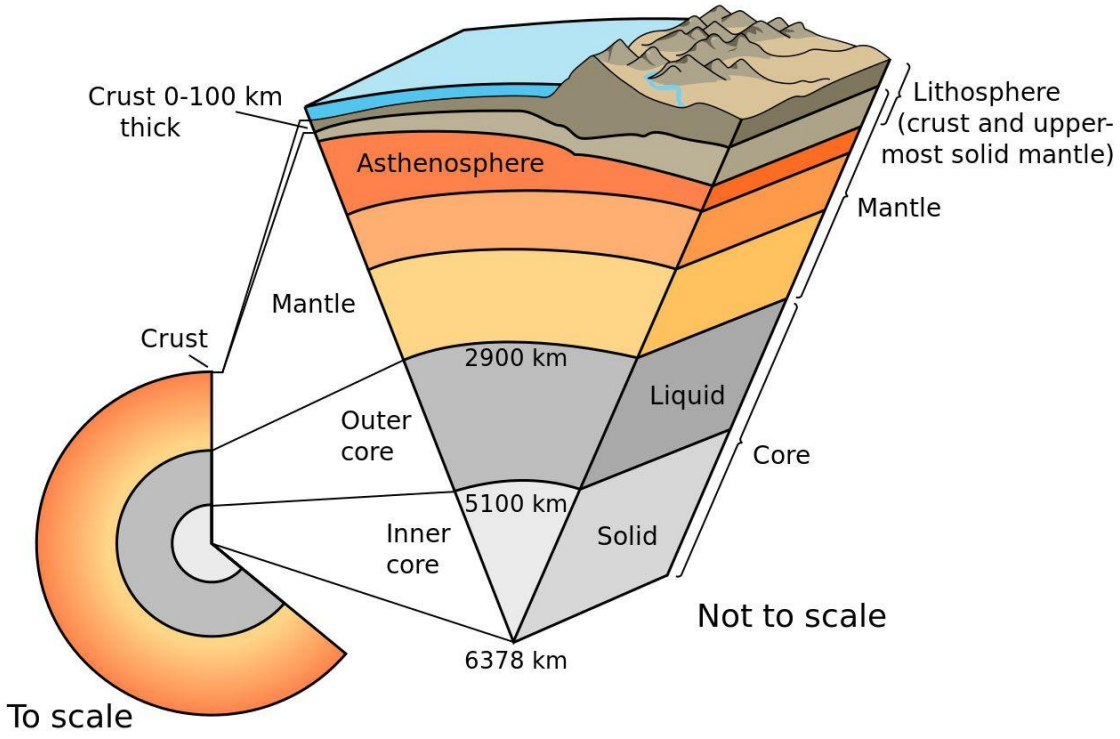
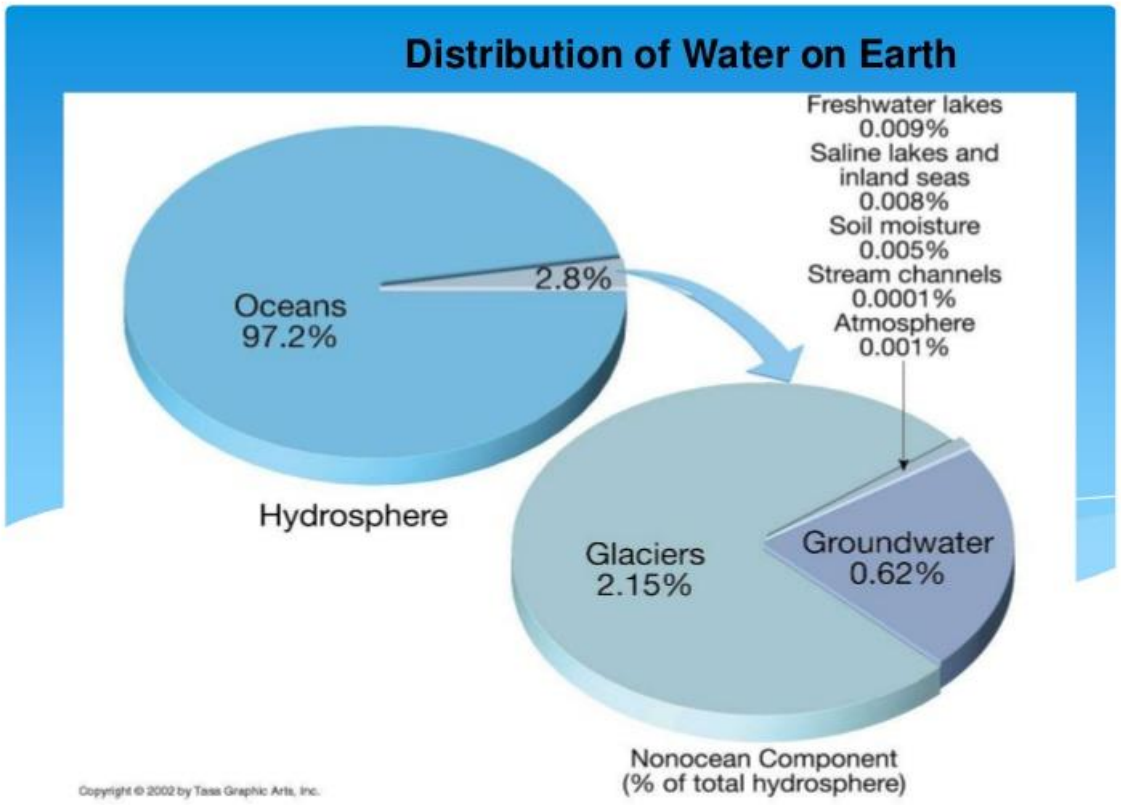


Fig4.

Hydrosphere

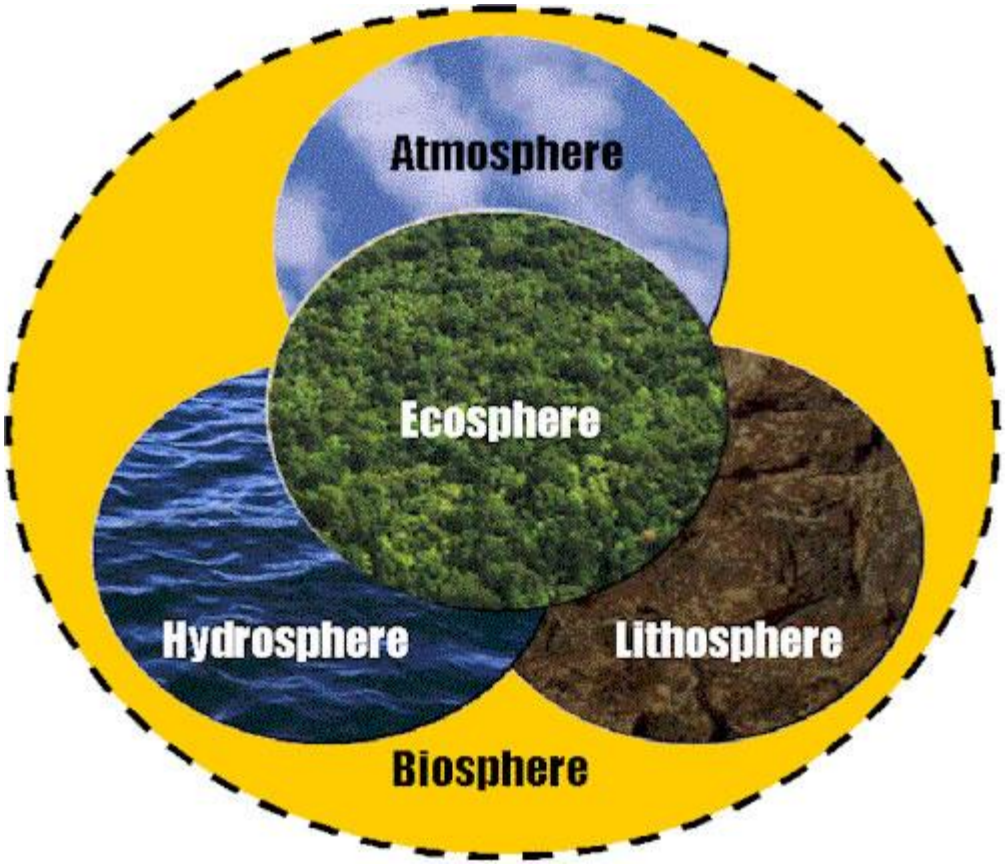
A hydrosphere is the total amount of water on a planet. The hydrosphere includes water that is on the surface of the planet, underground, and in the air.



Water is a basic necessity of life. Since 2/3 of the Earth is covered by water, the Earth is also called the blue planet and the watery planet.[notes 1] The hydrosphere plays an important role in the existence of the atmosphere in its present form. Oceans are important in this regard. When the Earth was formed it had only a very thin atmosphere rich in hydrogen and helium similar to the present atmosphere of Mercury. Later the gases hydrogen and helium were expelled from the atmosphere. The gases and water vapour released as the Earth cooled became its present atmosphere. Other gases and water vapours released by volcanoes also entered the atmosphere. As the Earth cooled the water vapours in the atmosphere condensed and fell as rain. The atmosphere cooled further as atmospheric carbon dioxide dissolved in to rain water. In turn this further caused the water vapours to condense and fall as rain. This rain water filled the depressions on the Earth's surface and formed the oceans. It is estimated that this occurred about 4000 million years ago. The first life forms began in the oceans. These organisms did not breathe oxygen. Later, when cyanobacteria evolved, the process of conversion of carbon dioxide into food and oxygen began. As a result, Earth's atmosphere has a distinctly different composition from that of other planets and allowed for life to evolve on Earth.

Biosphere

The biosphere is made up of the parts of Earth where life exists. The biosphere extends from the deepest root systems of trees to the dark environment of ocean trenches, to lush rain forests and high mountaintops. Biosphere is relatively thin life-supporting stratum of Earth's surface, extending from a few kilometres into the atmosphere to the deep-sea vents of the ocean. The biosphere is a global ecosystem composed of living organisms (biota) and the abiotic (nonliving) factors from which they derive energy and nutrients. Biosphere is the universal sum of total ecosystem or the zone of life for plants, animals and microbes on the Earth's crust controlled by natural self-regulating system.



Fig

The biosphere, also known as the ecosphere is the worldwide sum of all ecosystems. It can also be termed the zone of life on Earth, a closed system (apart from solar and cosmic radiation and heat from the interior of the Earth), and largely self-regulating. By the most general bio-physiological definition, the biosphere is the global ecological system integrating all living beings and their relationships, including their interaction with the elements of the lithosphere, geosphere, hydrosphere, and atmosphere. The biosphere is postulated to have evolved, beginning with a process of bio-poises (life created naturally from non-living matter, such as simple organic compounds) or biogenesis (life created from living matter), at least some 3.5 billion years ago.

Sustainable development

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" as defined in ‘our common future’ in 1987. In 2012, the United Nations Conference on Sustainable Development met to discuss and develop a set of goals to work toward; they grew out of the Millennium Development Goals that claimed success in reducing global poverty while acknowledging there was still much more to do. The Sustainable Development Goals (SDG) eventually came up with a list of 17 items that included amongst other things:

- the end of poverty and hunger
- better standards of education and healthcare, particularly as it pertains to water quality and better sanitation
- to achieve gender equality
- sustainable economic growth while promoting jobs and stronger economies
- sustainability to include health of the land, air, and sea
  Finally, it acknowledged the concept of nature having certain rights, that people have stewardship of the world, and the importance of putting people at the forefront of solving these global issues.

Thus, sustainable development recognizes that growth must be both inclusive and environmentally sound to reduce poverty and build shared prosperity for today’s population and to continue to meet the needs of future generations. It is efficient with resources and carefully planned to deliver both immediate and long-term benefits for people, the planet, and prosperity. The three pillars of sustainable development–economic growth, environmental stewardship, and social inclusion carry across all sectors of development, from cities facing rapid urbanization to agriculture, infrastructure, energy development and use, water availability, and transportation.

CHAPTER-1
MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition – Scope and importance – Need for public awareness

NATURAL RESOURCES

Renewable and Non-renewable resources- Natural resources and Associated problems-Forest resources:-Use and over – Exploitation – Deforestation – Case studies – Timber extraction – Mining – Dams and their ground water – Floods – Drought – Conflicts over water – Dams – Benefits and Problems – Mineral Resources:- Use Effects on Forests and Tribal People – Water Resources:- Use and Over-Utilization of Surface and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies – Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging, salinity, Case Studies – Energy Resources:- Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources, Case Studies

1.1 MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

1.1.1 INTRODUCTION

- The word environment is derived from the French word **'environner'** which means to **'encircle or surround'.**
- Thus our environment can be defined **as "the Social, Cultural and Physical conditions that surround, affect and influence the survival, growth and development of people, animals and plants"**
- This broad definition includes the natural world and the technological environment as well as the cultural and social contexts that shape human lives.
- It includes all factors (living and nonliving) that affect an individual organism or population at any point in the life cycle; set of circumstances surrounding a particular occurrence and all the things that surrounds us.

1.1.2 SEGMENTS OF ENVIRONMENT

Environment consists of four segments.

1. Atmosphere- Blanket of gases surrounding the earth.
2. Hydrosphere- Various water bodies present on the earth.
3. Lithosphere- Contains various types of soils and rocks on the earth.
4. Biosphere- Composed of all living organisms and their interactions with the environment.

1.1.3 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 students to appreciate the complexity of environmental issues and citizens and experts in many fields.
- By studying environmental science, students may develop a breadth of the interdisciplinary and methodological knowledge in the environmental fields that enables them to facilitate the definition and solution of environmental problems.

1.1.4 SCOPE OF ENVIRONMENTAL STUDIES

Environmental studies as a subject has a wide scope. It includes a large number of areas and aspects, which may be summarized as follows:

- **Natural resources**- their conservation and management
- **Ecology and Biodiversity**
- **Environmental pollution and control**
- **Human population** and environment
- **Social issues** in relation to development and environment