Name of Unit	The multidisciplinary nature of environmental studies
Subject Name	Environmental Science
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Class	II
Faculty	Mrs. Sandeep Kaur
Teacher Mobile No.	8360643277
Email Id	sandeepsarao@gmail.com

Learning Outcomes of module 01

LO	Learning Outcome (LO)	Course Outcome Code
LO1	To learn multidisciplinary nature of environmental studies	BP206T.1
LO2	To learn Meaning, Definition and Components of Environment.	BP206T.1
LO3	To learn about natural resources.	BP206T.1
LO4	To learn about role of individual in conservation of natural resources.	BP206T.1

Content Table

Topic
• Introduction to Environment • The multidisciplinary nature of environment • Natural resources • Segments of environment • Public awareness about environment

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

The multidisciplinary nature of environmental studies

The multidisciplinary nature of environmental studies includes various disciplines of study; each contributing to a *holistic* understanding of the processes and phenomena occurring on our planet, in our solar system and universe.

In some cases, there is a distinction between environmental studies, and environmental sciences. I won't make that distinction here; instead, I will treat the two as the same course of academic inquiry.

To begin with, you need to have an understanding of the disciplines making up the core sciences of chemistry, physics and biology (and the associated mathematics needed in some of these courses). Here, chemistry is the most crucial of the three in regards to environmental studies and serves as the central science bridging into both physics and biology. Organic chemistry, biochemistry, molecular biology and microbiology are all also highly relevant to environmental studies and will become extremely crucial later on as one progresses into chemical and biochemical cycling within ecological systems or the effects of environmental stressors on biological systems.

The next set of disciplines will be the Earth Sciences. These will include but are not limited to geology, hydrology, oceanography, geophysics, astronomy, meteorology and climatology.

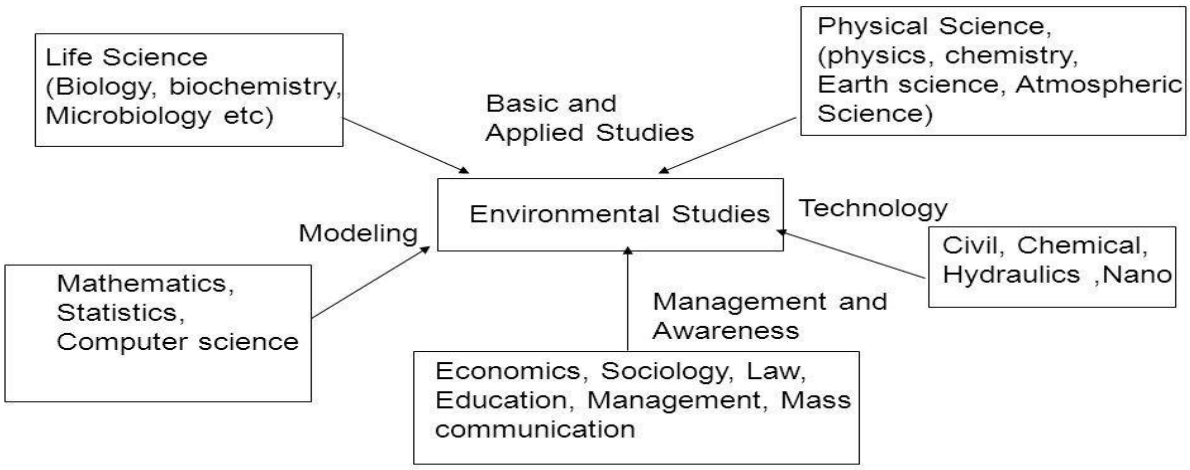
More specialized scientific disciplines can include: aquatic pollution, geo-biochemical cycling, planetary geophysics, pedology, marine biology, etc.

From the formal sciences, mathematics and statistics are crucial disciplines that are necessary for the collection, study, analysis and interpretation of data and phenomena pertaining to environmental studies. From these disciplines, qualitative language can be translated into quantitative information and used to abstract further information normally inaccessible to the senses and at first altogether unseen within the models and constructs used to appropriate our understanding of the systems and phenomena under evaluation.

From the social sciences, everything pertaining to the study and behaviour of humans is necessary as this behaviour is the basis to understanding how we come to interact with our environment. Disciplines include but are not limited to: economics, law, geography, anthropology, sociology, philosophy, demography, policy, resource management, waste management, etc.

Further specialization can be done in the social, physical and earth sciences depending on where one's interests trend. More specialization can be given to any area within the field of environmental studies, and as you can see, is often the case due to the relatively large breadth that the discipline covers. There are also many additional tracts not mentioned here, as a complete and inclusive list would need to cover nearly each and every science, as each and every science is an exploration into the phenomenon of our environment or of ourselves to begin with. In this way, the multidisciplinary approach of environmental studies provides the basis for a *holistic* method to further understand, study and investigate natural environmental and anthropogenic phenomena, as well as a way to protect our environment and ecological systems from impactful activities through policy and programs, while providing proper management and stewardship of our natural resources.

The multidisciplinary nature of environmental science is illustrated in following diagram



Meaning, Definition and Components of Environment

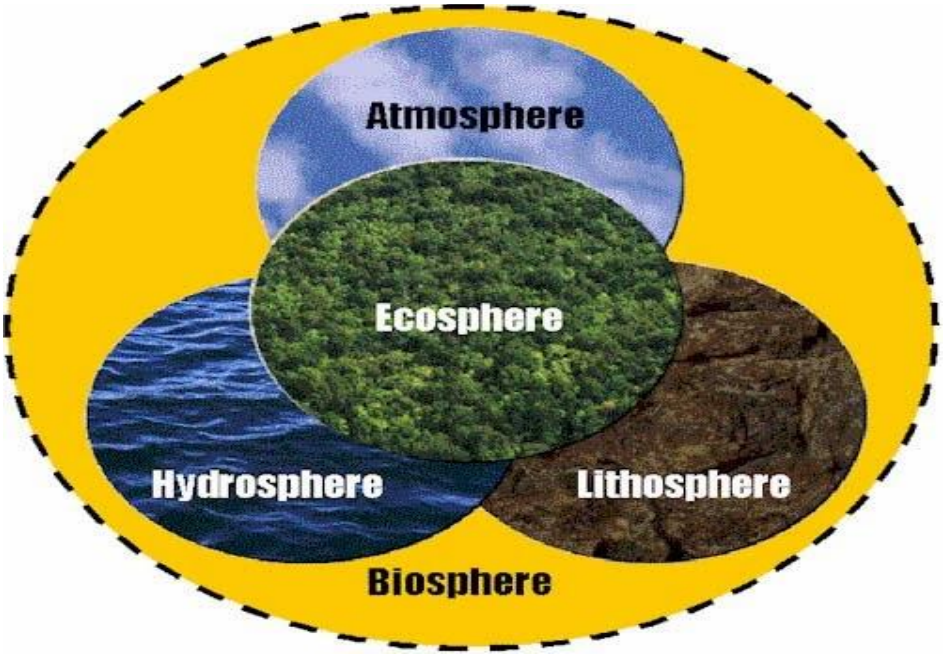
The term environment has been derived from a French word "***Environia***" means to surround. It refers to both abiotic (physical or non-living) and biotic (living) environment. The word environment means surroundings, in which organisms live. Environment and the organisms are two dynamic and complex component of nature. Environment regulates the life of the organisms including human beings.

Components of Environment:

Environment mainly consists of atmosphere, hydrosphere, lithosphere and biosphere.It can be divided into two other types such as (a) Physical and (b) biotic environment.

Physical environment refers to all abiotic factors or conditions like temperature, light, rainfall, soil, minerals etc. It comprises of atmosphere, lithosphere and hydrosphere.

Biotic environment includes all biotic factors or living forms like plants, animals, Micro-organisms.



SCOPE OF ENVIRONMENT

The environment consists of four segments of the earth namely atmosphere, hydrosphere, lithosphere and biosphere:

Atmosphere: The Atmosphere forms a distinctive protective layer about 100 km thick around the earth. A blanket of gases called the atmosphere surrounds the earth and protects the surface of earth from the Sun's harmful, ultraviolet rays. It sustains life on the earth. It also regulates temperature, preventing the earth from becoming too hot or too cold. It saves it from the hostile environment of outer space. The atmosphere is composed of nitrogen and oxygen besides, argon, carbon dioxide and trace gases.

The atmosphere has a marked effect on the energy balance at the surface of the Earth. It absorbs most of the cosmic rays from outer space and a major portion of the electromagnetic radiation from the sun. It transmits only ultraviolet, visible, near infrared radiation (300 to 2500 nm) and radio waves. (0.14 to 40 m) while filtering out tissue-damaging ultra-violate waves below about 300 nm.

Hydrosphere: The Hydrosphere comprises all types of water resources oceans, seas, lakes, rivers, streams, reservoirs, polar icecaps, glaciers, and ground water. Oceans represent 97% of the earth's water and about 2% of the water resources is locked in the polar icecaps and glaciers. Only about 1% is available as fresh water as surface water in rivers, lakes, streams, and as ground water for human use.

Lithosphere: Lithosphere is the outer mantle of the solid earth. It consists of minerals occurring in the earth's crusts and the soil e.g. minerals, organic matter, air and water.

Biosphere: Biosphere indicates the realm of living organisms and their interactions with environment, viz atmosphere, hydrosphere and lithosphere.

The scope of environmental studies is very wide and it deals with many areas like i) Conservation of natural resources, ii) ecological aspects, iii) pollution of the surrounding natural resources, iv) controlling the pollution, v) social issues connected to it, and vi) impacts of human population on the environment.

Elements of Environment

Environment is constituted by the interacting systems of physical, biological and cultural elements inter-related in various ways, individually as well as collectively. These elements are:

(1) Physical elements

Physical elements are space, landforms, water bodies, climate, soils, rocks and minerals. They determine the variable character of the human habitat, its opportunities as well as limitations.

(2) Biological elements

Biological elements such as plants, animals, microorganisms and men constitute the biosphere.

(3) Cultural elements

Cultural elements such as economic, social and political elements are essentially man- made features, which make the cultural background.

ENVIRONMENT STUDIES: IMPORTANCE

The environment studies make us aware about the importance of protection and conservation of our mother earth and about the destruction due to the release of pollution into the environment. The increase in human and animal population, industries and other issues make the survival cumbersome. A great number of environment issues have grown in size and make the system more complex day by day, threatening the survival of mankind on earth. Environment studies have become significant for the following reasons:

1. Environment Issues are being of Global:

It has been well recognized that environment issues like global warming and ozone depletion, acid rain, marine pollution and biodiversity are not merely national issues but are global issues and hence require international efforts and cooperation to solve them.

2. Development and Environment: Development leads to Urbanization, Industrial Growth, Telecommunication and Transportation Systems, Hi-tech Agriculture and Housing etc. However, it has become phased out in the developed world. The North intentionally moves their dirty factories to South to cleanse their own environment. When the West developed, it did so perhaps in ignorance of the environmental impact of its activities. Development of the rich countries of the world has undesirable effects on the environment of the entire world.

3. Explosive Increase in Pollution: World census reflects that one in every seven persons in this planet lives in India. Evidently with 16 per cent of the world's population and only 2.4 per cent of its land area, there is a heavy pressure on the natural resources including land.

Agricultural experts have recognized soil health problems like deficiency of micronutrients and organic matter, soil salinity and damage of soil structure.

NATURAL RESOURCES

Natural resources are components that exist in the world without the input of humans. These natural resources are diverse ranging from **renewable resources** to non-renewable resources, living to non-living resources, tangible to intangible resources. Natural resources are essential to the survival of humans and all other living organisms. All the products in the world use natural resources as their basic component, which may be water, air, natural chemicals or energy. The high demand for natural resources around the world has led to their rapid depletion. As a result, most nations are pushing for proper management and sustainable use of natural resources.

Types of Natural Resources

Natural resources could be classified into different categories such as:

Renewable Natural Resources (inexhaustible resources)

Renewable resources refer to resources that can naturally regenerate after use. They include resources such as wind, water, natural vegetation, solar energy, and animals. These resources exist in nature in abundance. There is little concern about depleting renewable resources because their rate of production exceeds the rate of human consumption. Conservationists throughout the world advocate for the use of renewable resources because they are readily available and less costly to the environment.

Difference between Renewable and Non-Renewable Resources

Renewable resource	Non-renewable resource
It can be renewed as it is available in infinite quantity	Once completely consumed, it cannot be renewed due to limited stock
Sustainable in nature	Exhaustible in nature
Low cost and environment-friendly	High cost and less environment-friendly
Replenish quickly	Replenish slowly or do not replenish naturally at all

Non-renewable Natural Resources (exhaustible resources)

Non-renewable resources are components that take too long to replenish after use or exist in limited quantities. Non-renewable resources include products such as crude oil, precious metals, minerals, and rocks. Some endangered animals are also classified as non-renewable resources because their mortality rate is much higher than their reproduction rate. These non-renewable resources need to be protected and to be used responsibly to stop their depletion.

The 5 Most Important Natural Resources are:

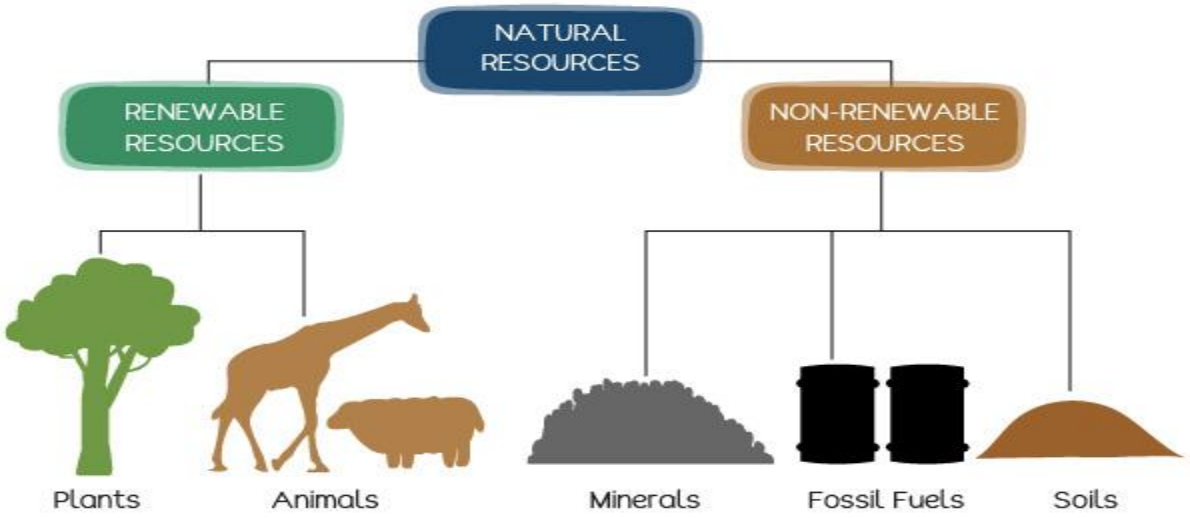
1. **Air:** Clean air is important for all the plants, animals, humans to survive on this planet. So, it is necessary to take measures to reduce air pollution.
2. **Water:** 70% of the Earth is covered in water and only 2 % of that is freshwater. Initiative to educate and regulate the use of water should be taken.
3. **Soil:** Soil is composed of various particles and nutrients. It helps plants grow.
4. **Mineral:** It is made from silica and is used to build strong weapons, transportation and buildings
5. **Forests:** As the population increases, the demand for housing and construction projects also increases. Forests provide clean air and preserve the ecology of the world.
6. **Energy resources:** Energy is required for the evolution of life forms on earth. Energy is obtained from different sources. Everything that we use today – clothes, cooking gas, furniture, food, notebooks, vehicles, house, fuel, roads, toys, utensils, etc. are obtained from resources on the earth.
7. **Food resources:** Food sources are the different sources that provide food for the survival of humans and animals. The major sources of food on earth are plants and animals.

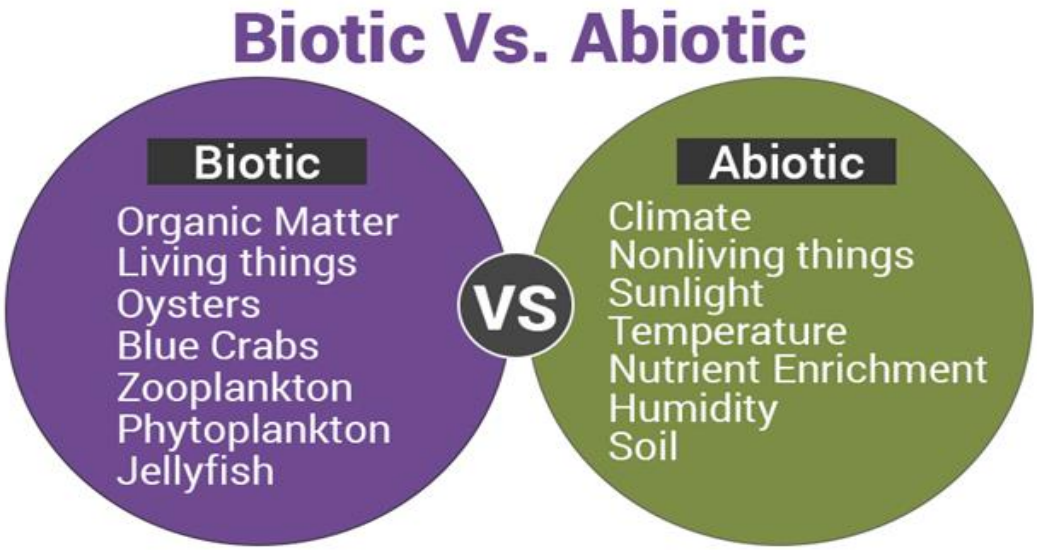
Biotic Natural Resources

Biotic natural resources refer to living resources that exist naturally in the environment. Such resources include forests, wildlife, and fossil fuels, which are all listed as biotic natural resources.

Non-biotic Natural Resources

Non-biotic natural resources are natural products in the environment that are non-living. These resources include water, rocks, metals, and minerals among many others.





Stock Natural Resources

The world has numerous resources some of which are yet to be exploited. Humans lack the skills and technology to extract and use some of the naturally occurring resources like rare gases and some radioactive materials. As a result, these resources are classified as stock resources to be utilized in the future.

Threats to Natural Resources

Most natural resources exist in limited quantities. Unfortunately, various factors have led to the exploitation of these resources. Some of the components are at the risk of depletion, environmental pollution, high population, uncontrolled development, climate change, and modern lifestyles are some of the threats to natural resources.

CONSERVATION OF NATURAL RESOURCES - ROLE OF AN INDIVIDUAL

Different natural resources like forests, water, soil, food, mineral and energy resources play a vital role in the development of a nation. While conservation efforts are underway at National as well as International level, the individual efforts for conservation of natural resources can go a long way.

I. Conserve Water

- Don't keep water taps running while brushing, shaving, washing or bathing.
- Check for water leaks in pipes and toilets and repair them promptly. A small pin-hole sized leak will lead to the wastage of 640 liters of water in a month.
- Use drip irrigation and sprinkling irrigation to improve irrigation efficiency and reduce evaporation. Install a small system to capture rain water and collect normally wasted used water from sinks, cloth-washers, bathtubs etc. which can be used for watering the plants
- Build rain water harvesting system in your house. Even the President of India is doing this.

II. Conserve energy

- Turn off lights, fans and other appliances when not in use.

- Obtain as much heat as possible from natural sources. Dry the clothes in sun instead of drier if it is a sunny day.
- Use solar cooker for cooking your food on sunny days which will be more nutritious and will cut down on your LPG expenses.
- Grow deciduous trees and climbers at proper places outside your home to cut off intense heat of summers and get a cool breeze and shade. This will cut off your electricity charges on coolers and air-conditioners.
- Try riding bicycle or just walk down small distances instead of using your car or scooter.

III. Protect the soil

- While constructing your house, don't uproot the trees as far as possible. Plant the disturbed areas with a fast growing native ground cover.
- Make compost from your kitchen waste and use it for your kitchen-garden or flower-pots. Do not irrigate the plants using a strong flow of water, as it would wash off the soil.
- If you own agricultural fields, do not over-irrigate your fields without proper drainage to prevent water logging and salinization.
- Use mixed cropping so that some specific soil nutrients do not get depleted.

IV. Promote Sustainable Agriculture

- Do not waste food. Take as much as you can eat Reduce the use of pesticides.
- Fertilize your crop primarily with organic fertilizers.
- Eat local and seasonal vegetables. This saves lot of energy on transport, storage and preservation. Control pests by a combination of cultivation and biological control methods.

Long answer questions (10 marks)

1. Discuss environmental problems and their effective solution.
2. Differentiate between Inexhaustable and exhaustable resources.
3. Discuss the segments of environment in detail.
4. Write the scope and importance of environmental studies.
5. Discuss the uses of forest resources in detail.

Short answer questions (05 marks)

1. What are the two main components of environment? Explain in detail.

2 Discuss the effects of modern agriculture methods.

3 What is biosphere? Explain its parts.

4 What is overgrazing? How does it contribute of environmental degradation.

Very short answer questions (02 marks)

1. Explain the term environment.
2. Explain the term habitat.
3. Explain the term biodiversity.
4. What are renewable resources?
5. What are non-renewable resources?
6. Write the two components of environment.
7. What are natural resources?
8. What is hydrosphere?