



ENVIRONMENT & ECOLOGY

Subject Code: BCY-04

Course category : Basic Sciences & Maths (BSM)

Contact hours/week: Lecture : 2, Tutorial : 1 , Practical: 0

Number of Credits: 3

Course Outcomes

The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will acquire basic knowledge in Environment and Ecology, which allows students to gain qualitative and quantitative skills.
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Course Outcomes....

2. Students will be aware of environmental pollution and control methods along with quality standards of air, water etc. along with waste management.
3. Students will able to give systematic account of natural resources their use of exploitation and environmental awareness.
4. Students will able to know how to achieve sustainable development through strategies and its threats.



UNIT-I

The 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

(a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining.

(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.



UNIT-I...

(c) **Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources,

(d) **Food resources**: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

(e) **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.



UNIT-II

• **Ecosystems**

- Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:
(a) Forest ecosystem (b) Grassland Ecosystem (c) Aquatic ecosystems (ponds, rivers, oceans)



UNIT-II...

Biodiversity

- Introduction- Definition : genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, Endangered and endemic species of India, Conservation of biodiversity



UNIT-III

Environmental Pollution

Causes, effects and control measures of

- Air Pollution.
- Water Pollution.
- Soil Pollution
- Marine Pollution.
- Noise Pollution.
- Thermal Pollution.



UNIT-III...

Environmental Pollution

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Global warming and green house effect
- Acid Rain
- Ozone Layer depletion



UNIT-IV

Environmental Protection

- Role of Government, Legal aspects
- Initiatives by Non-governmental Organizations (NGO)
- Environment Protection Act,
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act,
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation, Public awareness.



UNIT-IV...

Human Population and the Environment

Population growth

Population explosion

Family Welfare Programme

Environment and human health

Environmental Education

Women Education

Women and Child Welfare



Books & References

- Perspectives in Environmental Studies by Anubha Kaushik, C. P. Kaushik, 6th edition, New Age International
- A Textbook of Environmental Studies by Shashi Chawla, McGrawHill India, 2012
- Environmental Studies - D.L. Manjunath, 9788131709122 Pearson Education India, 2007
- Environmental Studies - J Krishnawamy , R J Ranjit Daniels, Wiley India
- Environmental Science - Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall
- Environmental Science – 8th edition ISV, Botkin and Keller, 9788126534142, Wiley India



Definition of Environmental Studies

- The word environment is derived from the French word 'environ' meaning surroundings. All the living and non-living things surrounding an organism are included in environment. Therefore, everything surrounding us is called "ENVIRONMENT".
- Every organism is surrounded by materials (Air/ water/ land) and forces that constitute its environment. Every organism derives the requirements for its living from the environment. The environment creates favourable conditions for the existence and development of living organisms.



Environmental Studies

- The survival of any organism requires a steady supply of materials and removal of waste products from its environment
- The degradation of the environment has become a serious problem for the existence of human beings. Pollution of soil, water and air causes harm to living organisms as well as loss to valuable natural resources.
- **Environmental studies** involves educating the people for preserving the quality of environment.



Components of Environment

- Biotic or Living component
 - It consist of plants & animals
- Abiotic or Non-living component
 - It includes soil, water, air & other organisms
 - Energy component
 - It includes mainly solar energy.



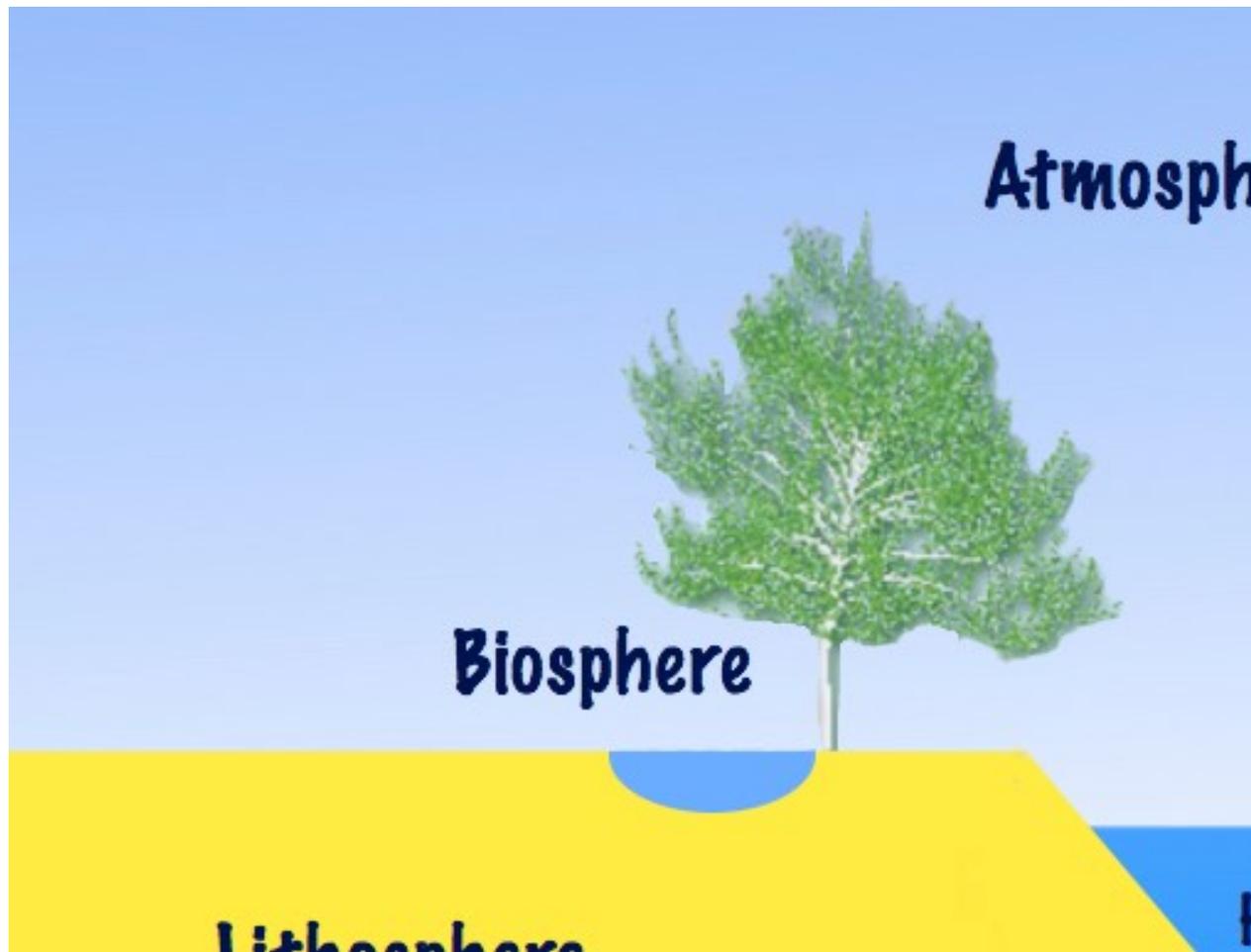
Segments of Environment

Environment consist of 4 segments

- Atmosphere
- Hydrosphere
- Lithosphere
- Biosphere

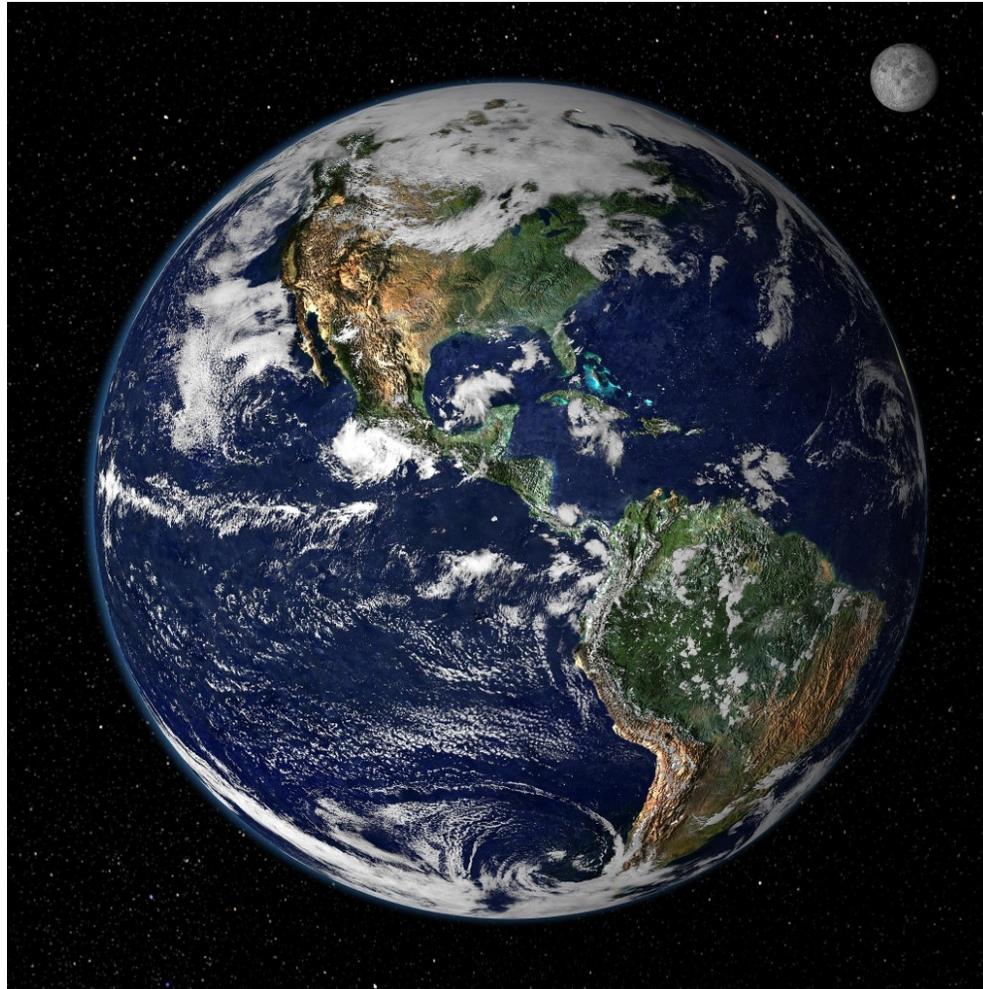


Segments of Environment





Photograph of Earth from Space





Atmosphere

The gaseous envelope surrounding the earth extends upto 20,000 km from the surface

- Source of oxygen for respiration
- Source of CO₂ for Photosynthesis
- Source of rainwater for sustaining life
- Maintains heat of the earth
- Ozone layer blocks harmful UV radiation



Functions of atmosphere

- It sustains life on the earth.
 - It observes the cosmic rays and other electromagnetic radiation coming from the sun.
 - It balances heat of earth by absorption of IR and UV rays.
 - It plays important role in carrying water from the ocean to the land through hydrological cycle.
 - Oxygen supports living beings, CO_2 is essential for photosynthesis of plants.
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Structure of atmosphere

- Troposphere (0 – 18kms)
 - Stratosphere (18 – 50kms)
 - Mesosphere (50 – 85kms)
 - Thermosphere (or) ionosphere (85 – 500kms)
 - Exosphere (upto 1600kms)
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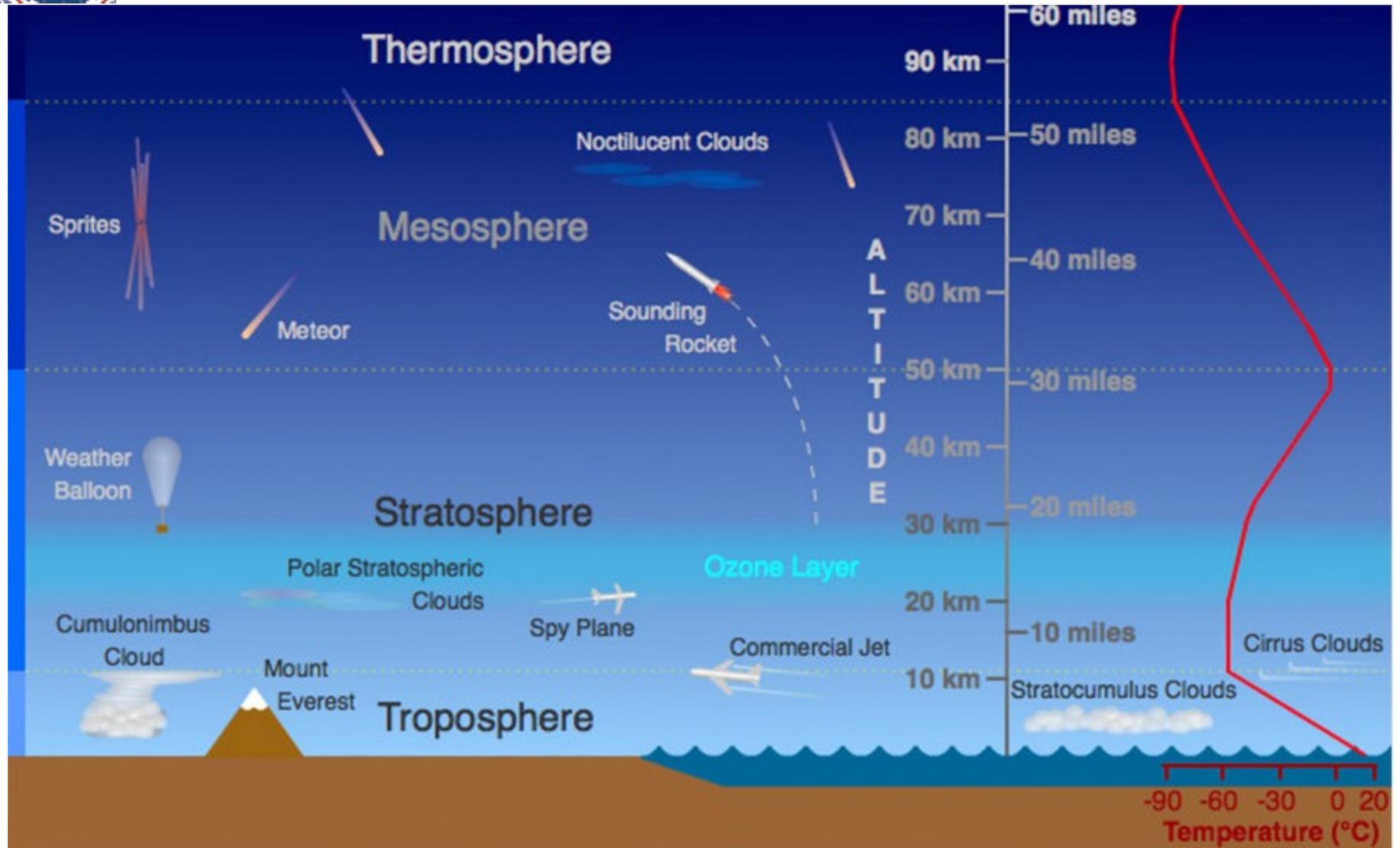


Structure of Atmosphere

<i>Sr. No.</i>	<i>Name of Layer</i>	<i>Altitude from earth's surface in km</i>	<i>Temperature Range (°C)</i>	<i>Remarks</i>
1.	Troposphere	0–12	20 to –56	Presence of O ₂ , CO ₂ , N ₂ , NO _x , SO _x , and water vapours. Known for pollution.
2.	Stratosphere	12–50	–56 to –2	Presence of O ₂ and O ₃ . Aeroplane flying zone.
3.	Mesosphere	50–85	–2 to –90	Presence of N ₂ and O ₃ . Sound and radio waves reflected by this zone.
4.	Thermosphere	85–500	–90 to 1200	Presence of O ₂ and O ₃ , NO. Ionisation of elements.
5.	Exosphere	500–1600	> 1200	Air less and contains hydrogen gas in ionised state



Structure of Atmosphere





Composition of Atmosphere

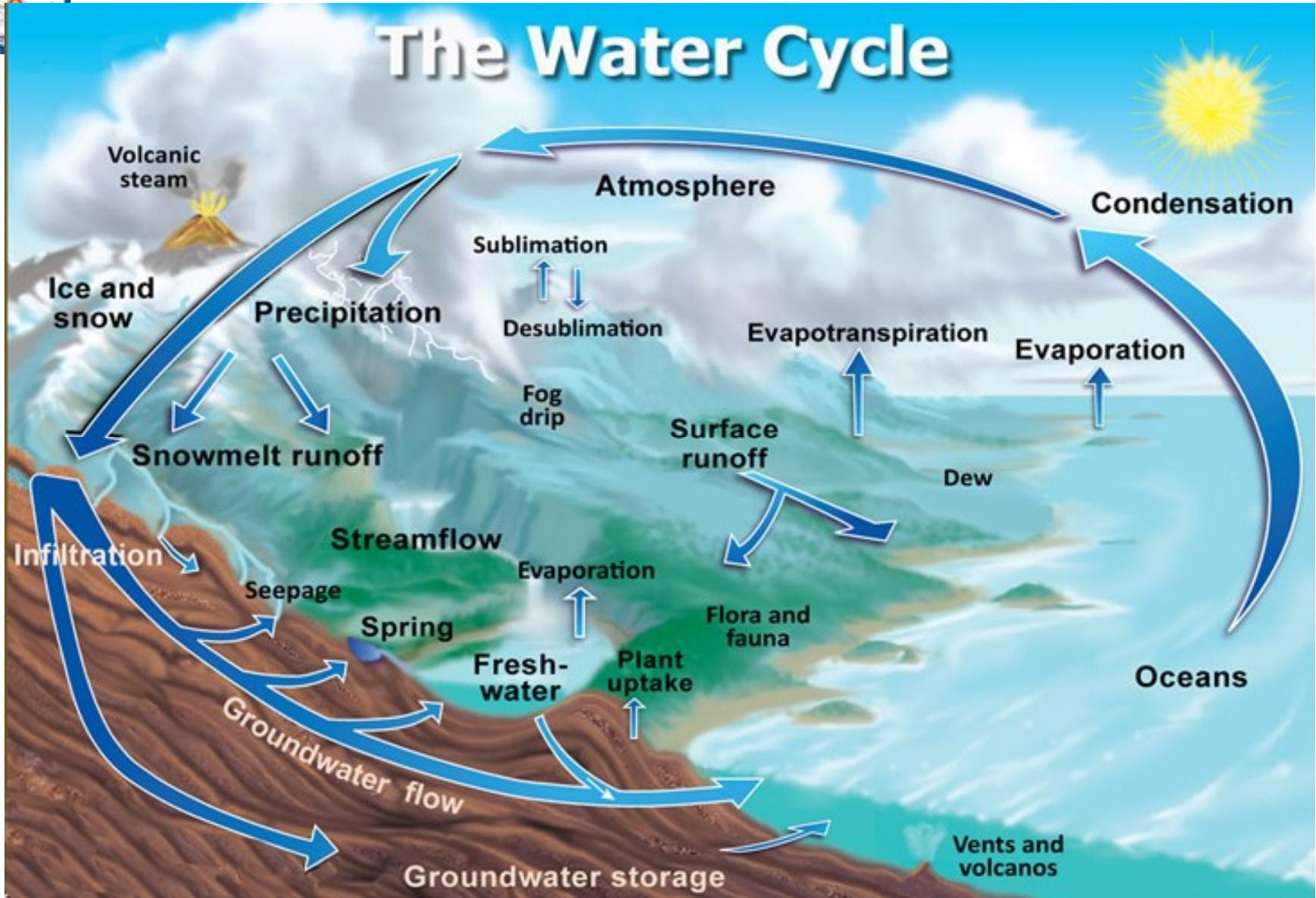
<i>Sr. No.</i>	<i>Names of gases</i>	<i>Concentration by % Volume</i>	<i>Category in atmospheric gases</i>
1.	Nitrogen (N ₂)	78.09	Major gases
2.	Oxygen (O ₂)	20.95	
3.	Argon (Ar)	0.93	
4.	Water vapours	0.1	Minor gases
5.	Carbon dioxide (CO ₂)	0.032	
6.	Neon (Ne)	0.0018	
7.	Methane (CH ₄)	0.0002	
8.	Helium (He)	0.0005	
9.	Ozone (O ₃), CO, H ₂ , NH ₃ , NO, NO ₂ , SO ₂ , and H ₂ S	Concentration by % Volume less than 0.000006	Trace gases



Hydrosphere

Watery part of the earth

- 97% in vast oceans & seas
- 2% in polar icecaps & glaciers
- 1% fresh water
- Moderating the temperature of the earth
- Ancient civilization is associated with rivers





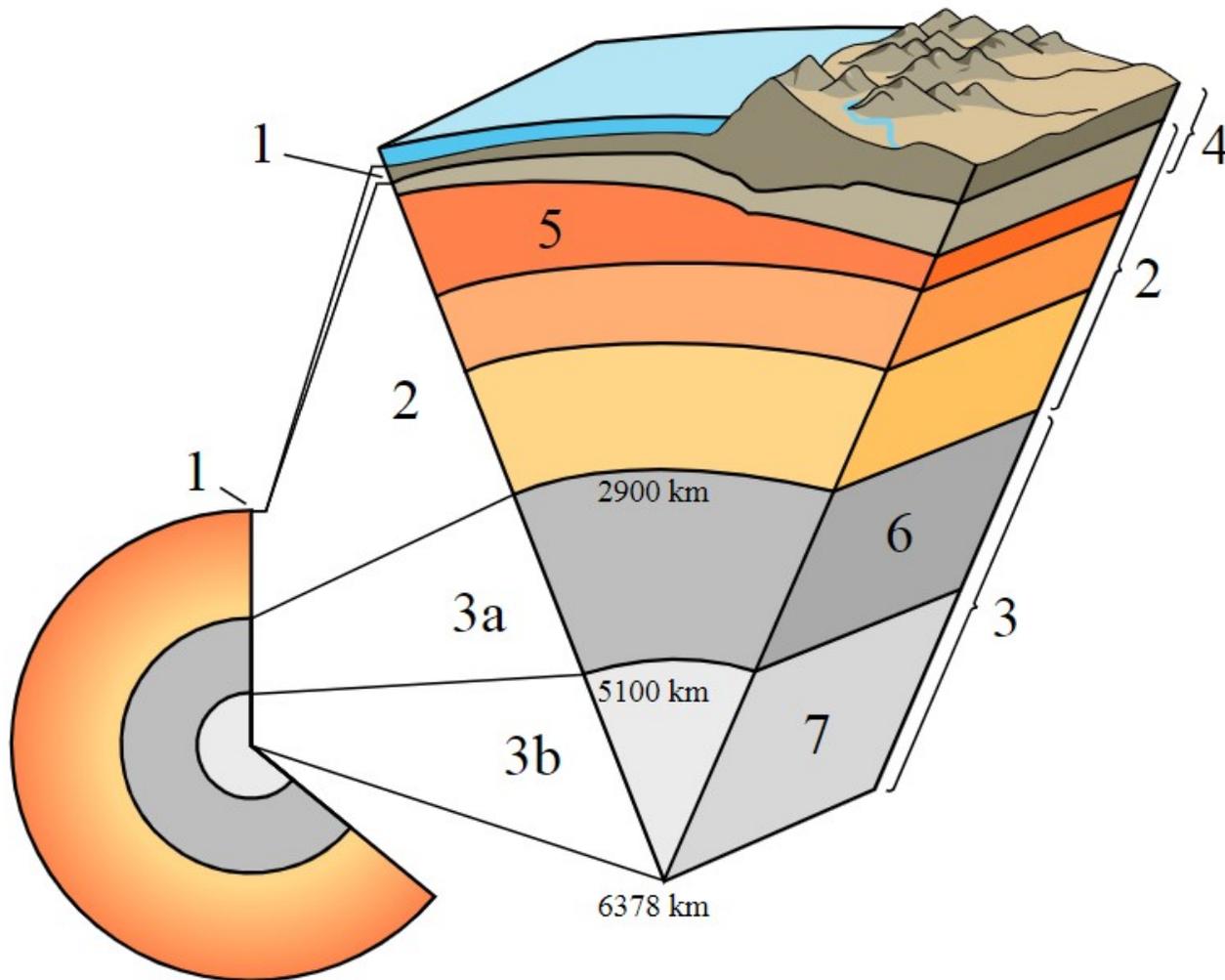
Lithosphere

Rigid outer layer of earth's crust

- Consists of the rocks & soil which contain minerals and ores
- Soil- mixture of organic and inorganic matter
- Role of soil- man depends soil for growing crops for his food
- Soil fertility depends on microbes-200 to 500 billions/gram



Lithosphere



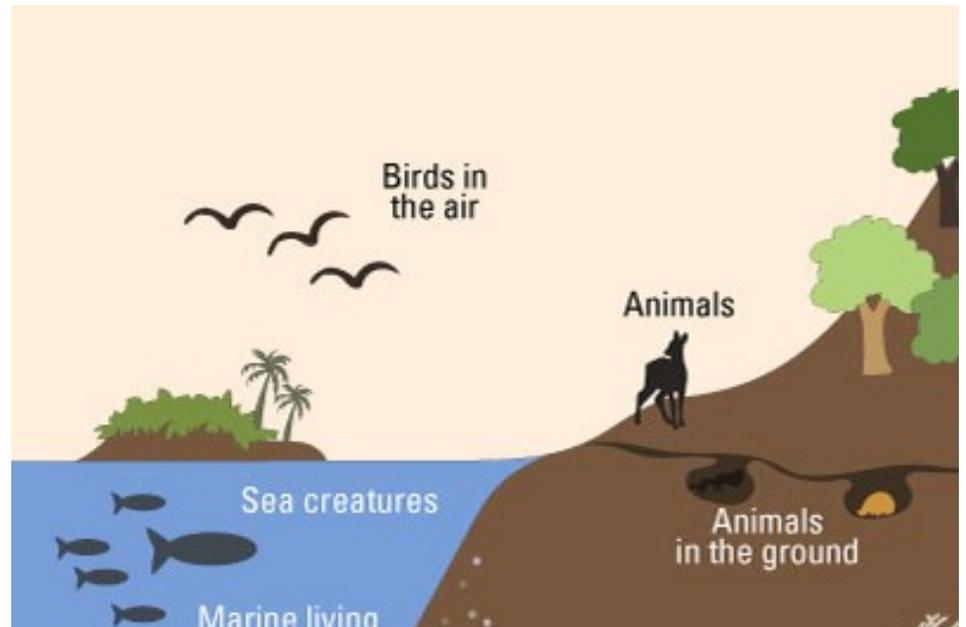
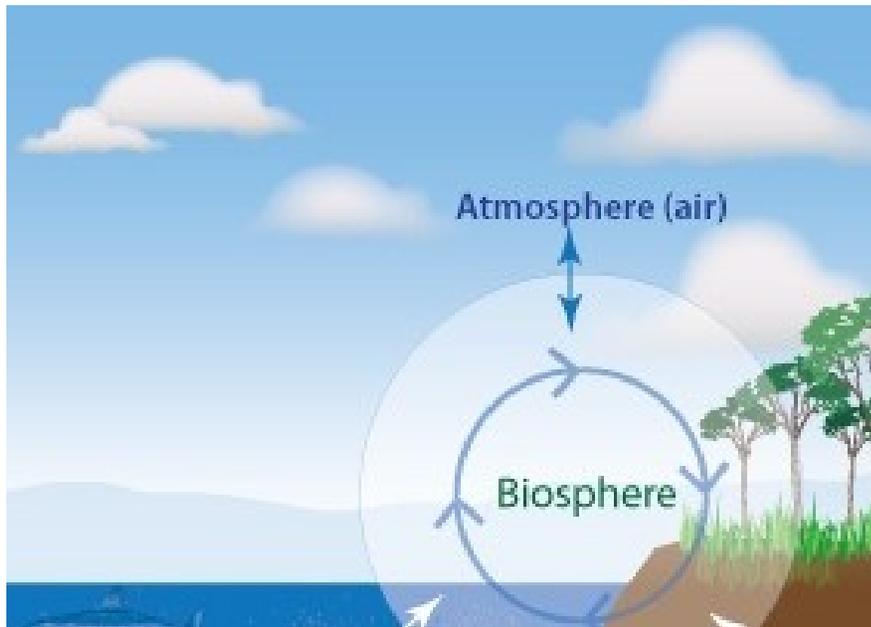


Biosphere

- The realm of living things found in atmosphere, hydrosphere & lithosphere
 - It is large & complex
 - Divided into smaller units- Ecosystems
 - Ecosystem- Communities- Populations-Organisms
 - Biosphere is dependent on the environment & environment is affected by biosphere
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Biosphere





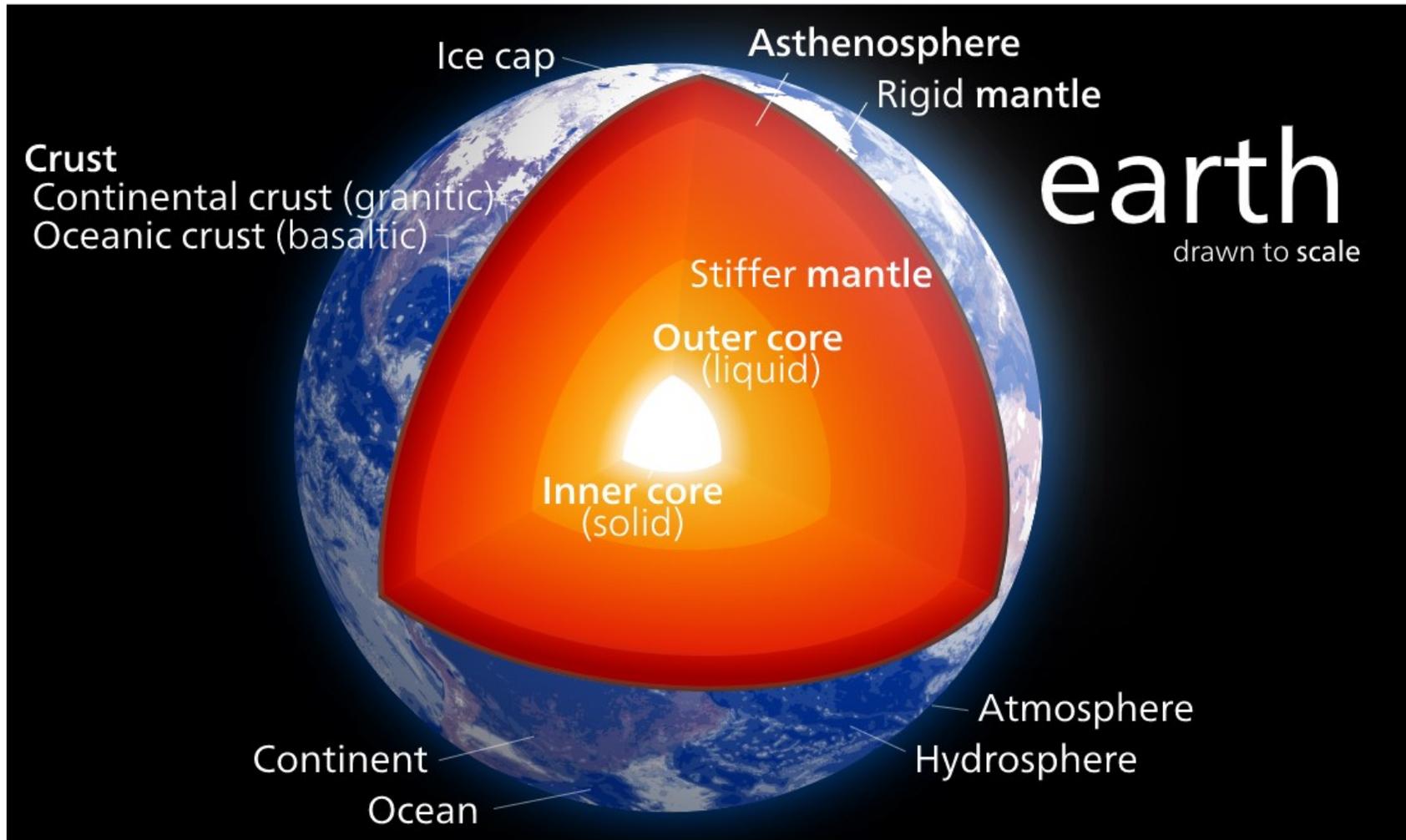
Elements in Biosphere

- Approximate percentage of elements in living organisms (from bacteria to humans) compared to the non-living world. Trace represents less than 1%.

	Biosphere	Atmosphere	Lithosphere
Oxygen (O)	65%	21%	46%
Carbon (C)	18%	Trace	Trace
Hydrogen (H)	10%	Trace	Trace
Nitrogen (N)	3%	78%	Trace
Phosphorus (P)	Trace	Trace	>0.1%



Structure of Earth





Types of Environment

Natural Environment

Those part of the planet, which remains untouched & has not been invaded by man

It operates through self-regulating mechanisms

Any change in natural ecosystem by natural processes is counter balanced by other components- air, water, soil etc..



Types of Environment

Man made environment

He is the transformer of his environment

Altered the natural environment by overpopulation, Urbanization, agricultural revolution, industrial Revolution etc.



Man & Environment

- Human Civilization leads to irremediable environmental crisis
 - Man interferes carbon- greenhouse effect
Global warming, Sulphur- acid rain
 - Crisis is due to
Man as a biological animal, rational & social & transformer of his environment
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Environment Education

Definition

The process of sensitizing students & public about environmental crisis recognizing environmental values & clarifying concepts. It develops skills & attitudes to understand & appreciate the inter relatedness of man



Objectives

- Awareness
 - Knowledge
 - Attitude
 - Skill
 - Evaluation ability
 - Participation
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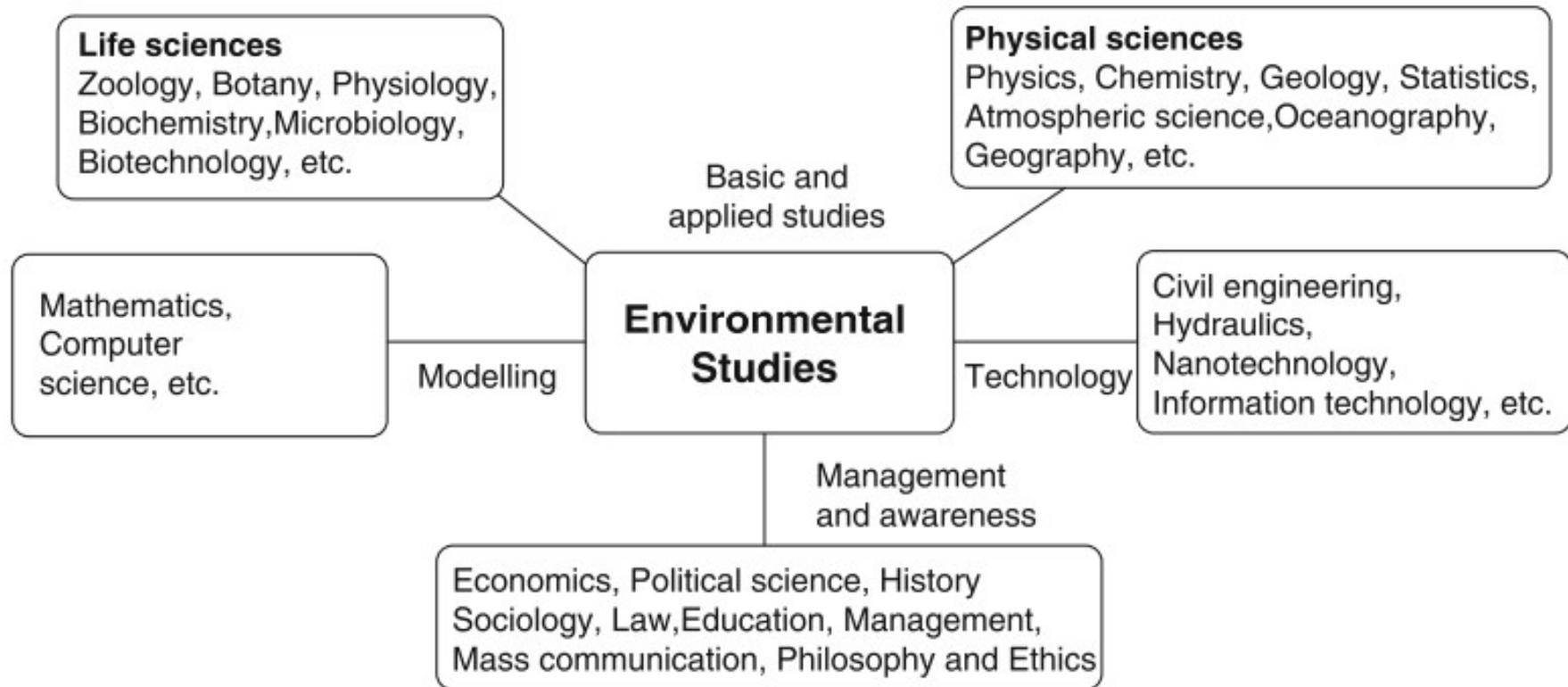
Multidisciplinary Nature of Environmental Studies

Environmental studies is a multidisciplinary subject that covers various fields sciences viz. biology, chemistry, physics, soil science, geology and geography, microbiology, physiology etc.

Besides law, social science, and engineering, mathematical modelling etc. are also required for the study of the environment, and the solution of environmental problems.



Multidisciplinary Nature of Environmental Studies...



Ref: Edwards G.I. (2019) Multidisciplinary Approach to Environmental Problems and Sustainability. In: Leal Filho W. (eds) Encyclopedia of Sustainability in Higher Education. Springer, Cham



Multidisciplinary Nature of Environmental Studies...

- Life sciences e.g. zoology, botany, biochemistry, genetics etc. are required for the study of living organisms and their inter relationships.
- Basic concepts of physics, chemistry, geography, atmospheric science and oceanography are required for understanding the basic physical and chemical structure of the environment, and to study the transfer of energy in the environment.



Multidisciplinary Nature of Environmental Studies...

- Mathematics, statistics, computer science etc. are required for collection and analysis of various types of environmental data, and for environmental modelling.
- For studying socio-economic aspects of various environmental problems sociology, management and economics is required.



Multidisciplinary Nature of Environmental Studies...

- Civil engineering, chemical engineering, mechanical engineering, and nanotechnology are required for providing the solutions to many environmental problems especially related to pollution control, waste disposal and wastewater-treatment etc.
- Environmental education and mass communication are required to spread the awareness about environmental problems.



Multidisciplinary Nature of Environmental Studies...

- History is required for studying the devastation caused by humans through the use of modern science.
- Environmental laws are required for the protection of environment through legal measures.
- To sum up, environmental studies is a multidisciplinary subject where we deal with different aspects, which requires a holistic approach.



Scope of Environmental Studies

The scope of environmental studies include:

- Developing an awareness and sensitivity to the total environment and its related problems
- Motivating people for active participation in environmental protection and improvement
- Developing skills for active identification and development of solutions to environmental problems
- Imbibe and inculcate the necessity for conservation of natural resources
- Evaluation of environmental programmes in terms of social, economic, ecological and aesthetic factors.



Importance of Environmental Studies

- In the industrialized era that we live today, every component that we intake - be it, air, water or food are contaminated by industrial activities. There is no zero pollution. To minimize this problem, knowledge of environmental studies is essential. An in-dept study of environmental studies will help us in the following ways:
- We will begin to appreciate and adopt the idea of "development without destruction of the environment"
- Knowledge about "various types of environments & different environmental hazards"
- Playing an effective role in protecting the environment by "demanding changes in law and enforcement systems".
- Having a "positive impact" on "quality of life".
- Creating a "concern and respect for the environment".



Need For Public Awareness

- Increasing population, Urbanization and poverty have generated pressure on the natural resources and lead to a degradation of the environment. To prevent the environment from further degradation, the supreme court has ordered and initiated environmental protection awareness through government and non-government agencies to take part in protecting our environment.
- Environmental pollution cannot prevented by laws alone. Public participation is equally important with regard to environmental protection.



Need For Public Awareness

- Environmental Education (EE) is a process of learning by giving an overall perspective of knowledge and awareness of the environment. It sensitizes the society about environmental issues and challenges interested individuals to develop skills and expertise thereby providing appropriate solutions.



Need For Public Awareness...

- Climate change, loss of biodiversity, declining fisheries, ozone layer depletion, illegal trade of endangered species, destruction of habitats, land degradation, depleting ground water supplies, introduction of alien species, environmental pollution, solid waste disposal, storm water and sewage disposal pose a serious threat to ecosystems in forest, rural, urban and marine ecosystems.
- Both formal and informal education on the environment will give the interested individual the knowledge, values, skills and tools needed to face the environmental challenges on a local and global level.



Environmental Calendar

World Wetland Day	February 2
World Forest Day	March 21
World Day for Water	March 22
World Meteorological Day	March 23
Earth Day	April 22
International Biodiversity Day	May 22
Anti-tobacco Day	May 31
World Environment Day	June 5
World Ocean Day	June 8
World Population Day	July 11



Environmental Calendar

Ozone Week	Sept. 16–23
World Car-free Day	Sept. 22
Green Consumer Day	Sept. 28
World farm Animal's Day	Oct. 2
World Habitat Day	Oct. 3
World Animal Welfare Day	Oct. 4
Wildlife Week	Oct. 1–7
World Conservation Day	Oct. 24
International Day for Natural Disaster Reduction	Oct. 13
International Day for Biological Diversity	Dec. 29