

# ENVIRONMENTAL SCIENCE (3110007)

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*Dedicated Faculty Committed Education*  
**Darshan**  
Institute of Engineering & Technology

Sr.	Topics	Teaching Hours	Module Weightage
1	<b>INTRODUCTION TO ENVIRONMENT</b> Definition, principles and scope of Environmental Science. Impacts of technology on Environment, Environmental Degradation, Importance for different engineering disciplines	2	8 %

2 <b><u>ENVIRONMENTAL POLLUTION</u></b>		
<p>a) <b>Water Pollution:</b> Introduction – Water Quality Standards, Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants</p> <p>b) <b>Air Pollution:</b> Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO<sub>2</sub>, NO<sub>x</sub>, Auto exhaust, Effects of common air pollutants</p> <p>c) <b>Noise Pollution:</b> Introduction, Sound and Noise, Noise measurements, Causes and Effects</p> <p>d) <b>Solid Waste:</b> Generation and management</p> <p>e) <b>Bio-medical Waste:</b> Generation and management</p> <p>f) <b>E-waste:</b> Generation and management</p>	14	44 %

3	<p><b>GLOBAL ENVIRONMENTAL ISSUES</b></p> <p>Sustainable Development, Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer, Carbon Footprint, Cleaner Development Mechanism (CDM), International Steps for Mitigating Global Change</p>	6	24 %
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4	<b>BASIC CONCEPT OF GREEN BUILDING AND SMART CITIES</b> Green Building: Introduction, Objectives, Fundamental Principles, Benefits of Green Building, Examples of Green Building Smart Cities: Concept	4	16 %
5	<b>CONCEPT OF 4R's</b> Principles, Application of 4R's	2	8%

# Chapter-1

## Introduction to Environment

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# Environment

- External **Surroundings** and condition which is directly or indirectly affects the living organisms.

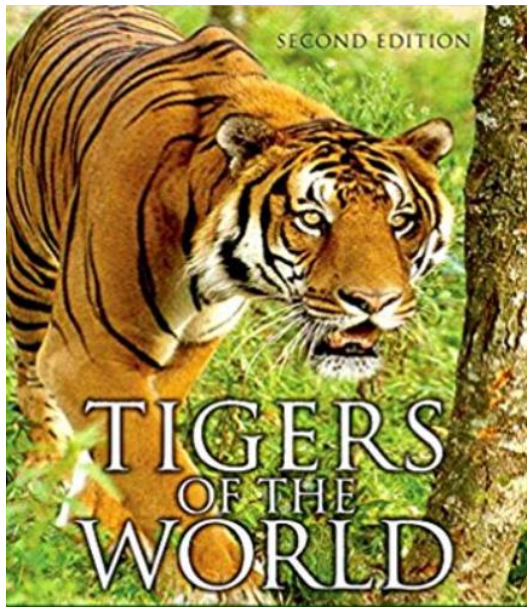
OR

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



# Ecology

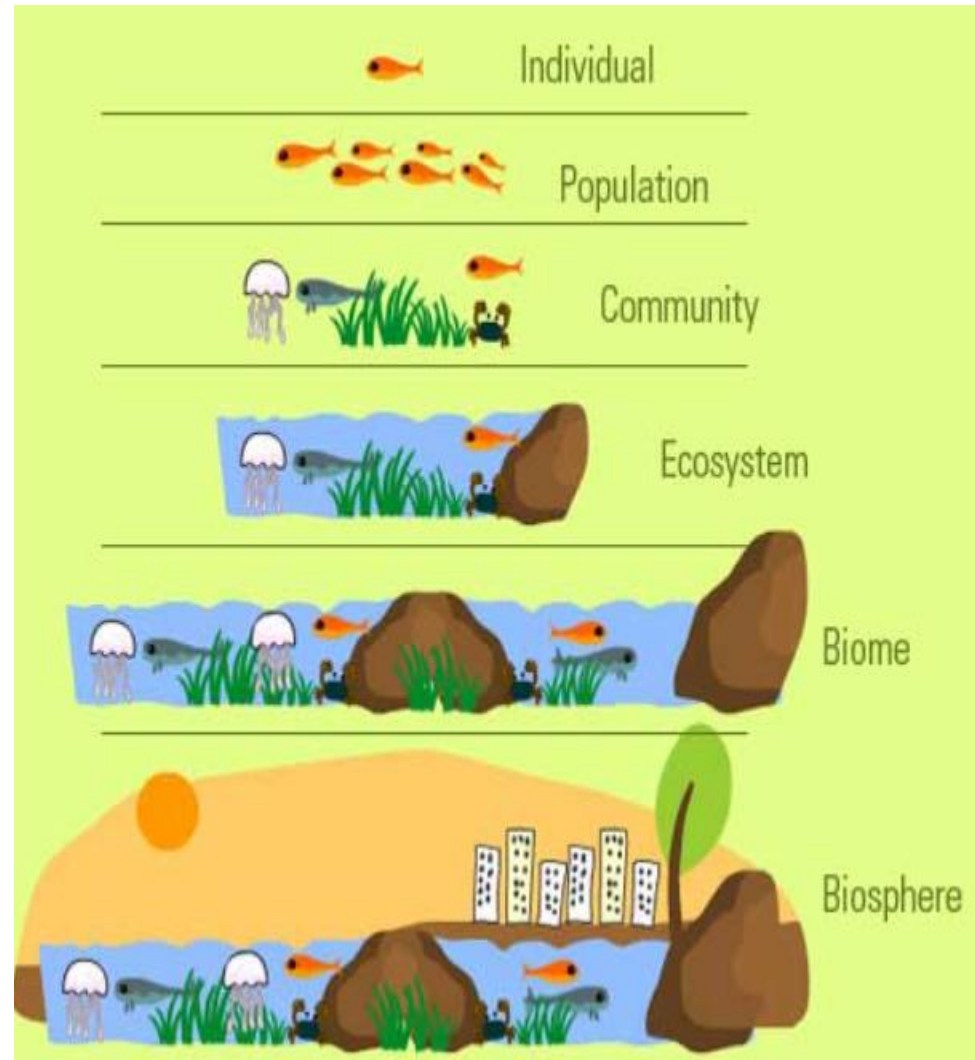
- The word Ecology is derived from two Greek words “oikos” meaning house, habitation or place of living and “logos” meaning study.
- Ecology is the study of the interrelationship between living organisms and their physical and biological ENVIRONMENT.





# Ecosystem:

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

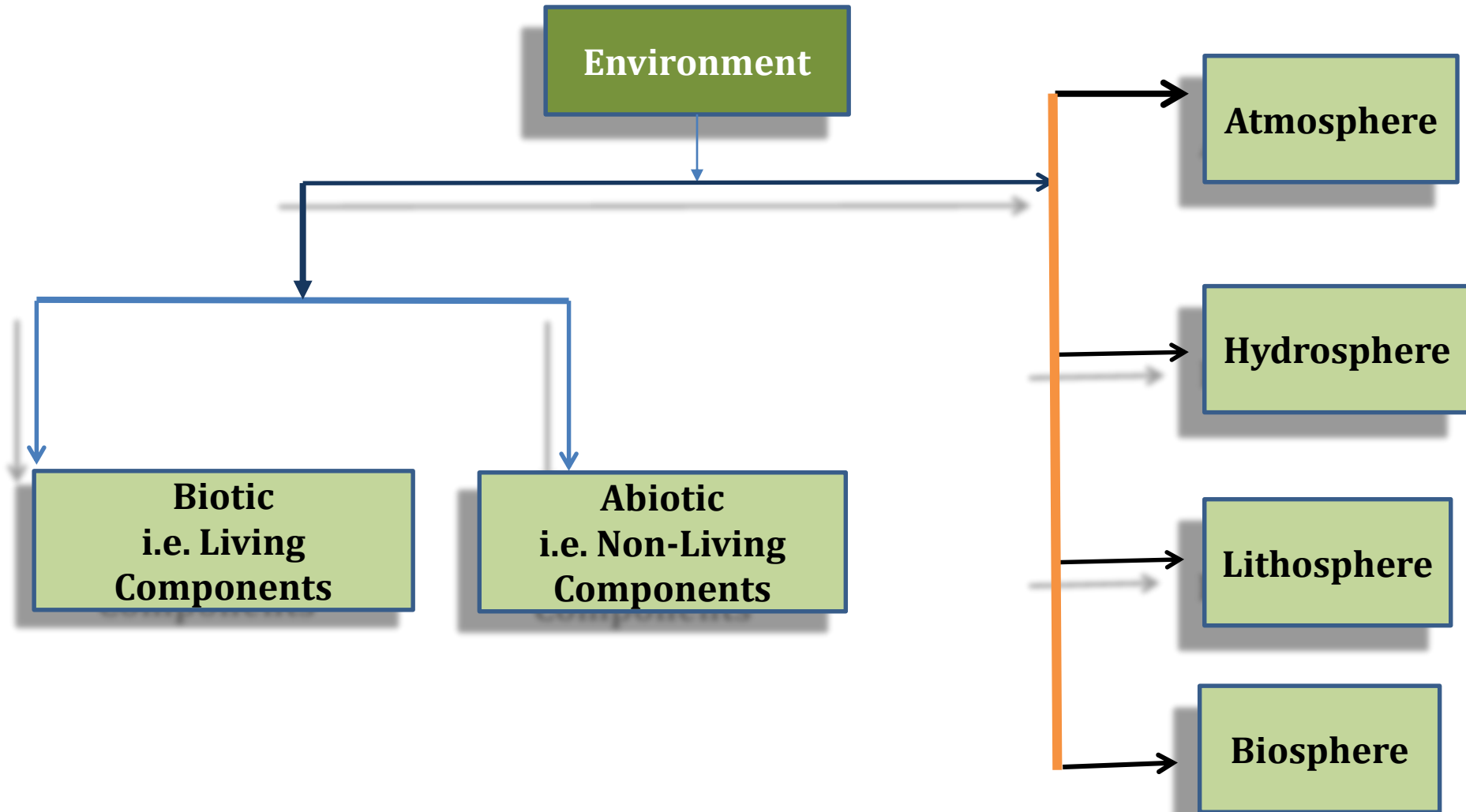


# Scope of Environment Science

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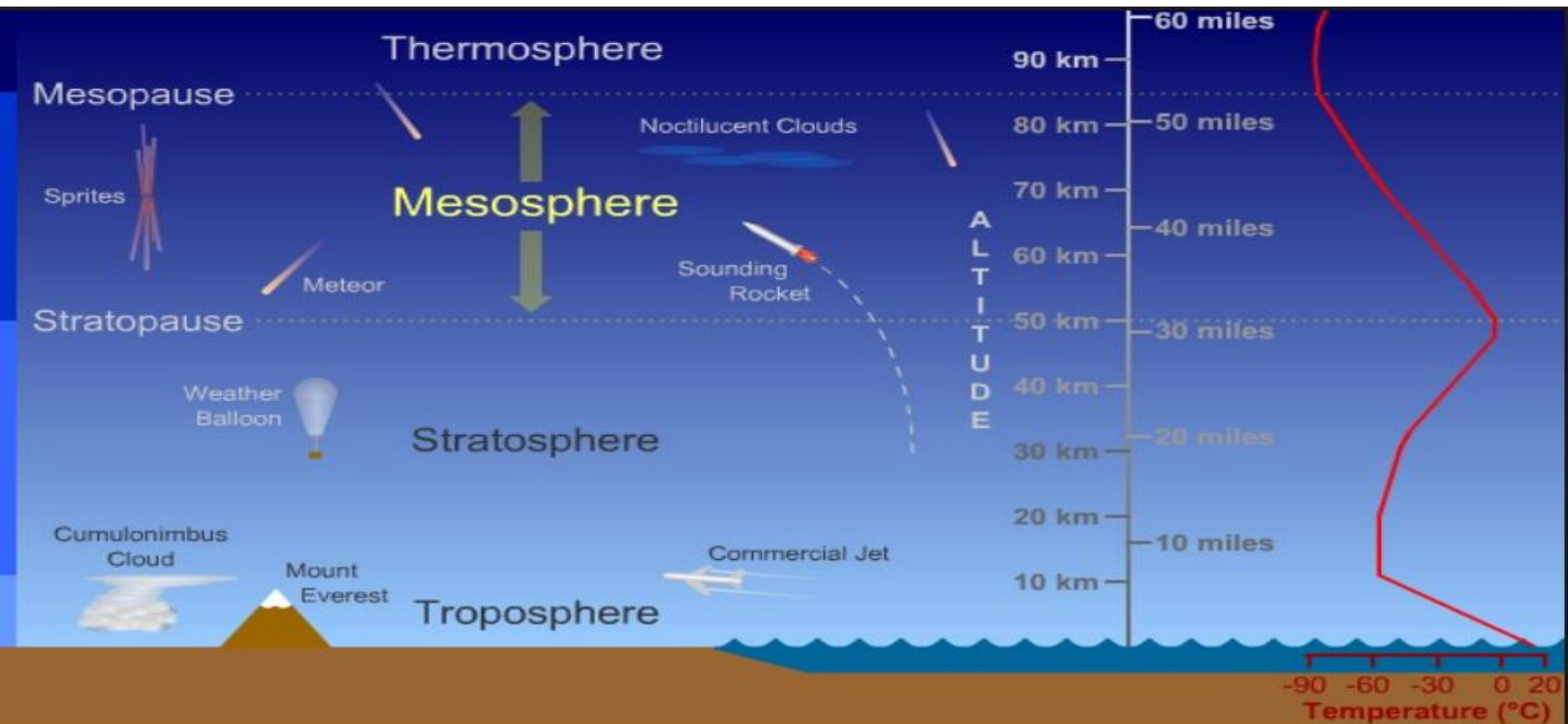
- It is **Scientific Study** of our environment and our place in it.
- Environment science is the study of earth, air, water living organisms and the man with its impact on environment.
- It is highly **multidisciplinary integrating disciplines** of physical, chemical and biological science, geology, mathematics, Sociology etc.
- Environment studies(science) is therefore a multi disciplinary subject where **different aspects** are dealt with a holistic approach.

# Components Of the Environment



# Components Of the Environment

- **Atmosphere:** The region surrounding the earth is known as atmosphere. Atmosphere is generally a mixture of gases surrounding the earth.



# Components of the Environment

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- On the basis of temperature profile and other related phenomena, atmosphere is divided into following major layers.
- Troposphere:- ( 0 To 12 Km) *Contains 75 % of the gases* in the atmosphere. This is where we live and weather occurs.
- Stratosphere:- (12 – 50 Km) *this layer contains ozone layer*. Ozone acts as a shield for the earth's surface. It absorbs ultraviolet radiations from the sun. This causes temperature increase in the upper part of the layer.
- Mesosphere:- ( 50 to 80 Km) *This is the coldest region of the atmosphere*. This layer protects the earth from meteoroid. They burn up in this area.

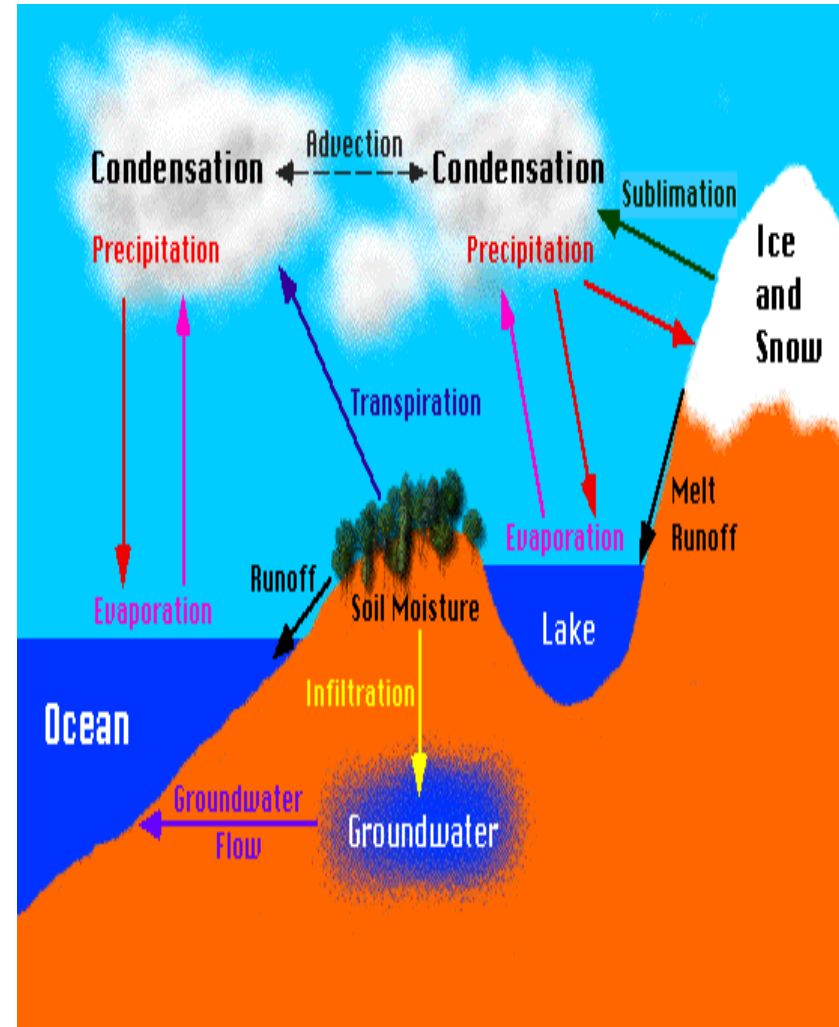
# Components of the Environment

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- Thermosphere:- ( 80 Km and above) *The air is very thin in this region.* Thermosphere means “Heat Sphere”. The temperature is very high in this region
- Ionosphere:-*This is the lower part of the thermosphere. It extends from 80 Km – 550 Km.* This layer generally helps in radio communication.
- Exosphere:- *The upper part of the thermosphere.* It extends from 550 km and above. Air is very thin here this is the area where satellite orbits the earth.

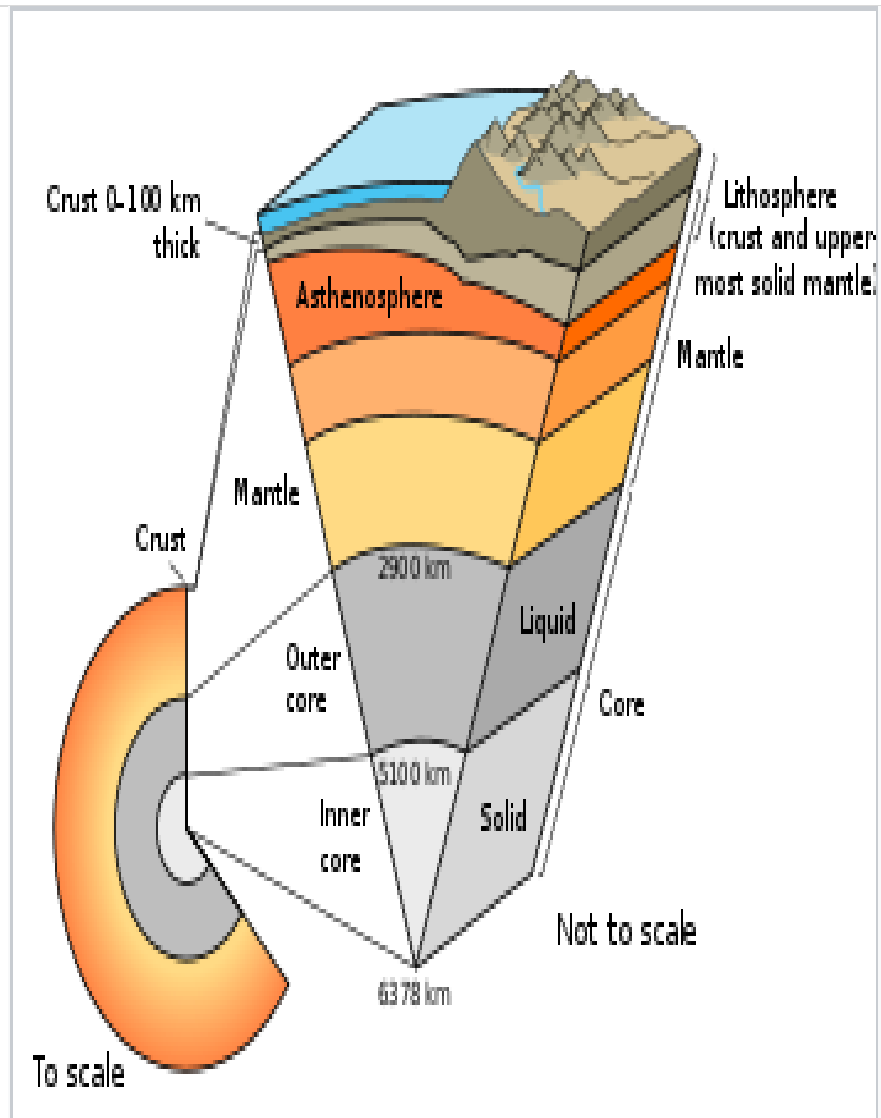
# Components of the Environment

- **Hydrosphere:** Hydrosphere is in fact water environment, *about 70 % of earth is covered by water.*
- Water is available in seas, oceans, lake, river, glaciers etc.. It is estimated that the *hydrosphere contains about 1360 million cubic km of water* out of which 97 % is in oceans and sea, 2 % is in glaciers and ice caps while remaining 1 % of fresh water is available for human consumption.



# Components of the Environment

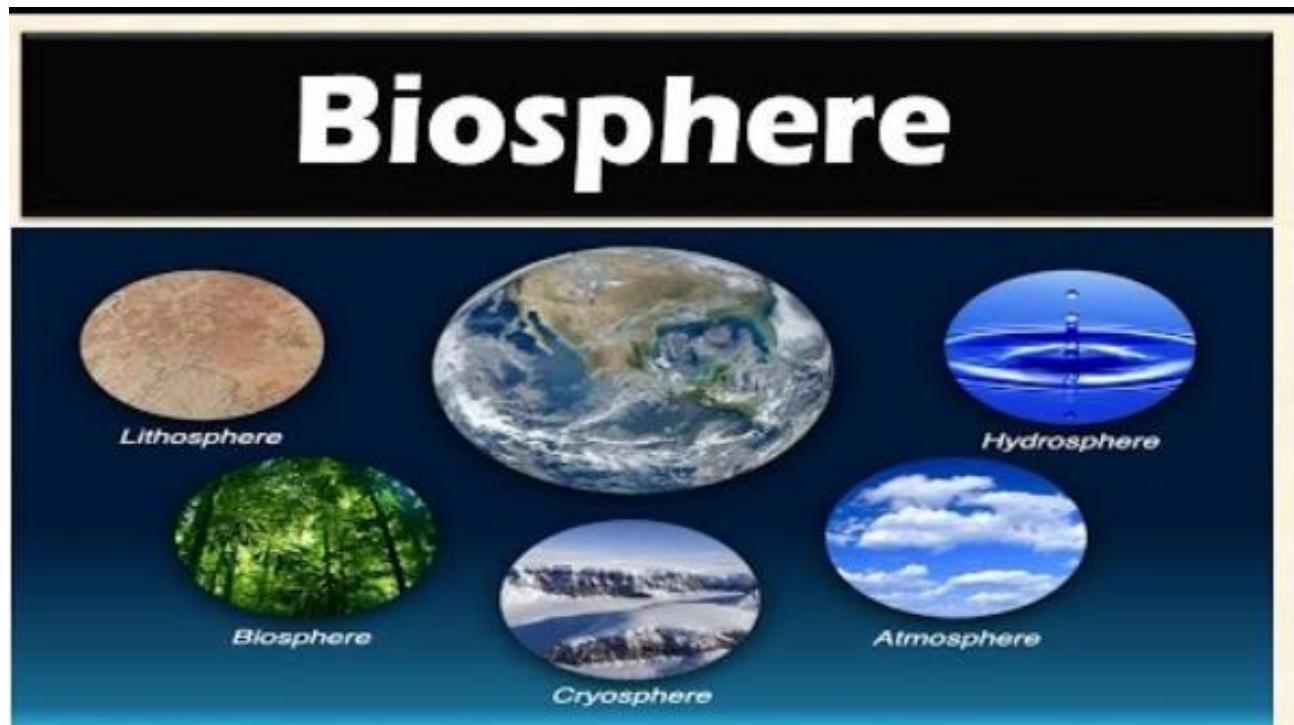
- **Lithosphere:** The uppermost part of the *earth crust* is known as Lithosphere.
- Lithosphere includes, *soil and its particles, rocks, metal* etc. , Lithosphere plays an important role as it not only produces food for human beings and animals, but also the decomposition of organic waste is carried out by a host of microorganisms in the soil.





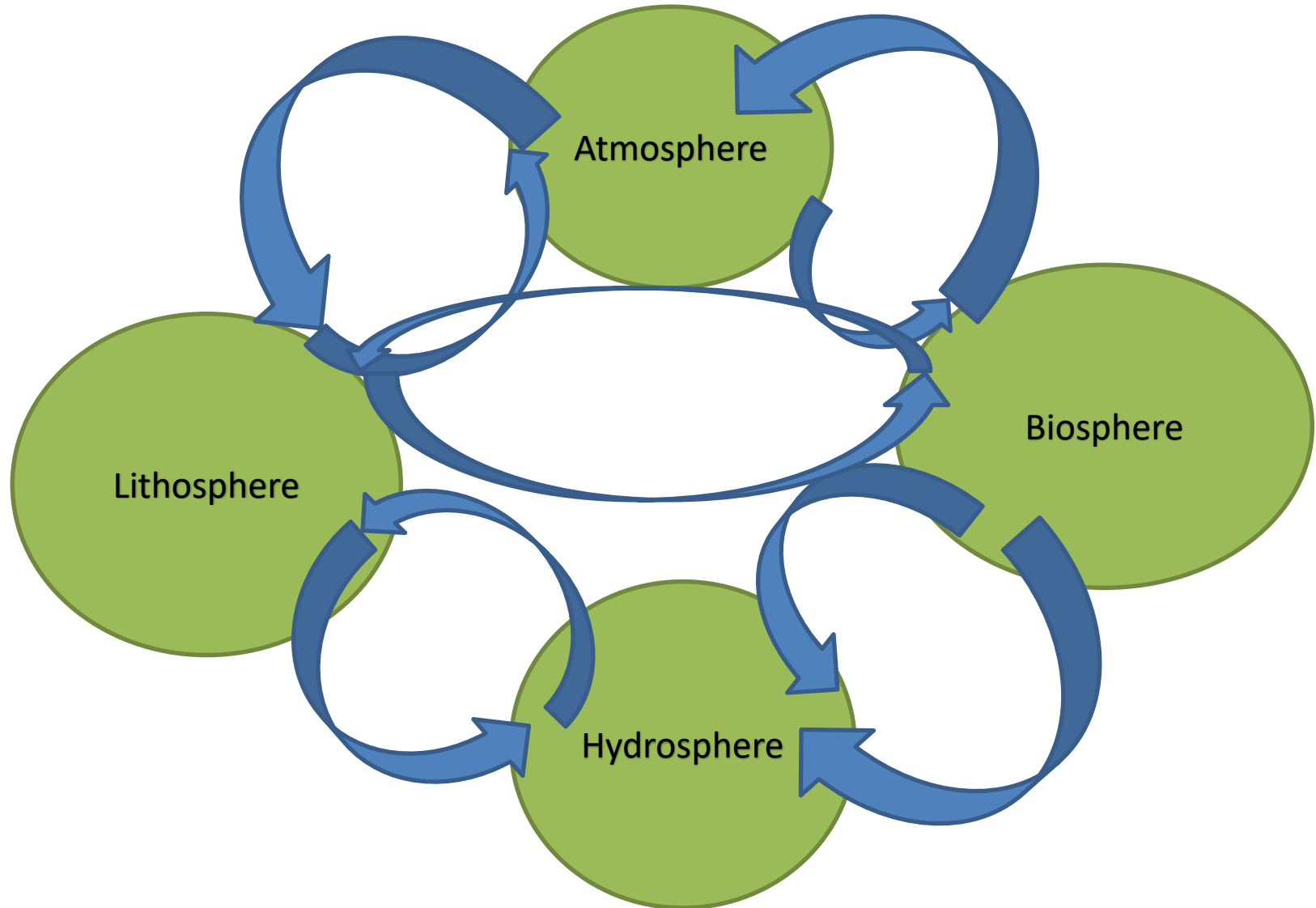
# Components of the Environment

- **Biosphere**: The life supporting mantle of the earth extending from few kilometer into the atmosphere to the deep ocean is known as *Biosphere*. The region of the earth where life exist is known as Biosphere.



# Interaction between Different Components of the Environment

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# Interaction between Different Components of the Environment

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- There are four major environmental components:-Atmosphere, Hydrosphere, Lithosphere, Biosphere
- A Schematic representation of four environmental components and their interrelationship is shown in the Figure.
- The circle represents the sphere and the curved arrows indicate the flow path of matter,
- There is a closed, dynamic ,inseparable, organic coupling or interrelationship among the environmental components.
- If one of the components or linkages changes, all other components responds.

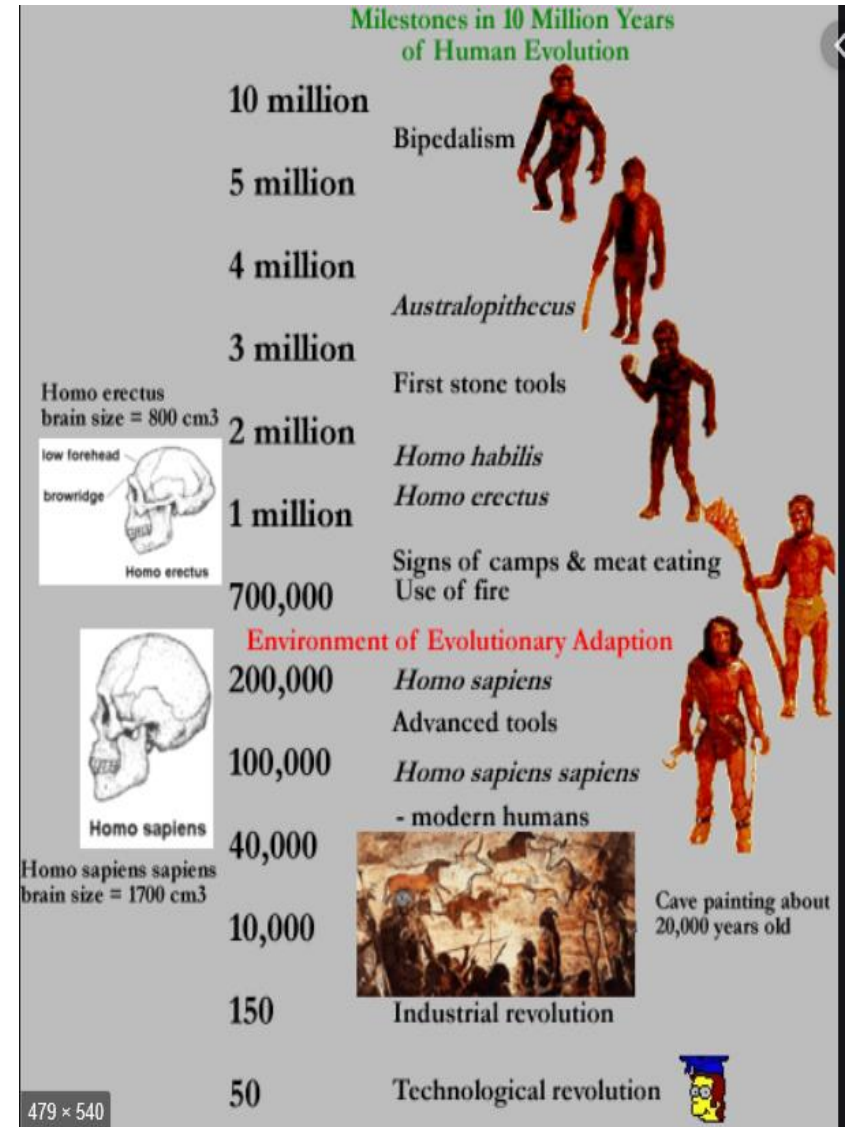
# Interaction between Different Components of the Environment

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- Atmosphere may be considered as a **transport components** that moves the substances from atmospheric sources to the receptor.
- Hydrosphere divided in **two systems** one is freshwater and another is the marine .
- The lithosphere is the **solid shell** of inorganics materials on the surface of the earth.
- The biosphere is the thin shell of **organic matter** on the earth surface comprising of all the living organisms.

# Man and Environment Relationship:

- The two words Man and environment are not new to the human history and the interrelation between them is well established. Thinking about the environment is as old as our first human ancestors.
- Their survival depended on knowledge of it. Concern for the environment is also not new. Since ancient times, people have known the importance of preserving it.



# Man and Environment Relationship:

- Worshipping of trees and rivers, animals and the birds was not based on the superstition; but there was a hidden message preserving and protecting of the environment.
- The religious rituals served an important purpose- they made people aware of the environment and its important and so indirectly helped preserve and nourishes it.





# Man and Environment Relationship:

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- community participation in all those practices that would lead to the maintenance of ecological balance.
- Man is the only living organism capable of modifying its surrounding environment according to the need. Other animals change according to the environment.



# Man and Environment Relationship:

- First man starting hunting the animals and cutting trees for his basics need gradually with the time he started cultivating food grains for that he started hunting animals and cutting trees for his basics needs, gradually with time he started cutting forests and converting them in to grass lands/agricultural fields. To increase his comforts he started disturbing each and every component of the environment.

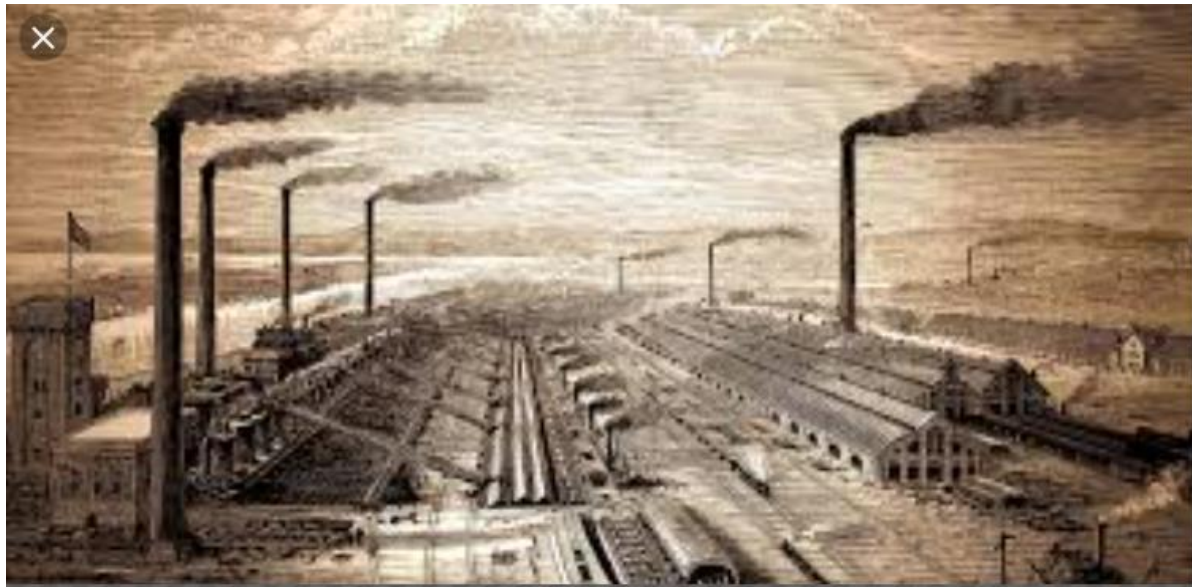




# Man and Environment Relationship:

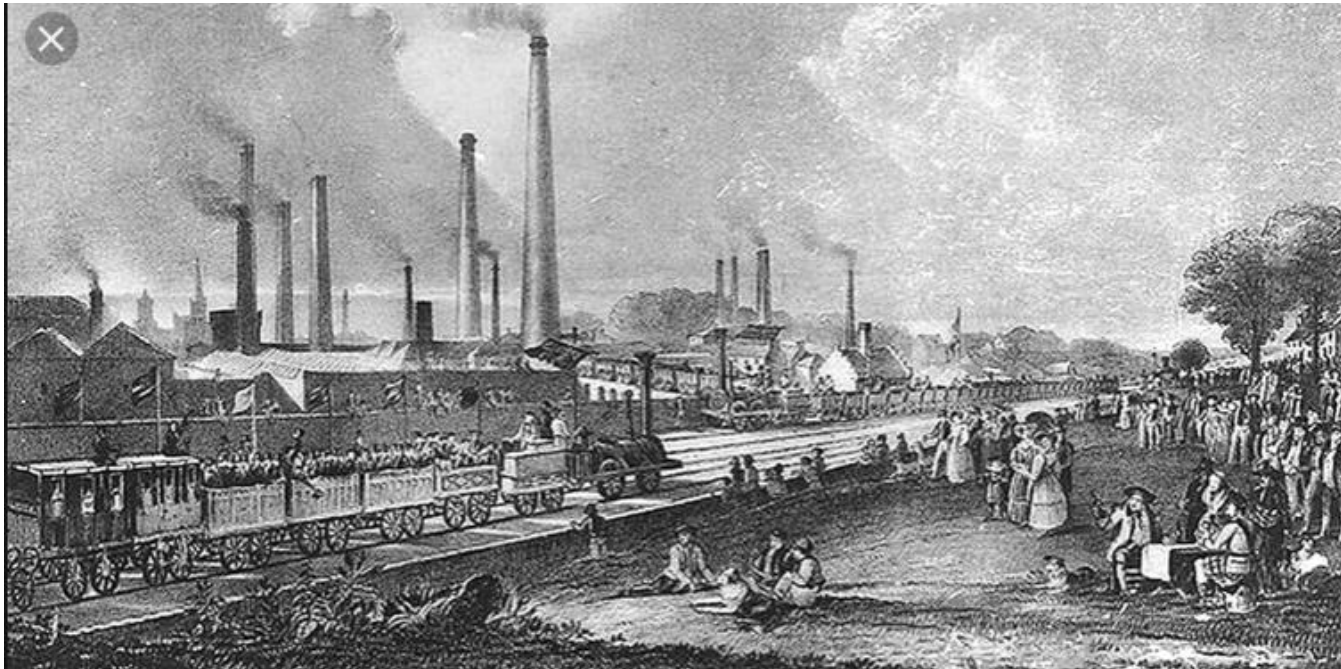
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- With the start of the industrial revolution the total scenario changed. Quantity of carbon dioxide emission increased tremendously which has started showing effect in the form of discharge of industrial waste and sewage. Major environmental issues arising due to human activities are global warming, acid rain, ozone depletion and population explosion.



# Man and Environment Relationship:

- Emission of  $\text{CO}_2$  and the other gases in atmosphere from fossil fuel burning and other human activities may raise the temperature of the earth's lower atmosphere several degrees by 2050. This would disrupt food production and flooding of low-lying coastal cities and croplands.



# Man and Environment Relationship:

- An estimated 36500 species of plants and animals become extinct each year, mostly because of human activities.
- The main factors which affect the distribution of population and human settlement are: Relief of land, climate, soils, mineral deposits, water supply...





# 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:



# Environmental Degradation

- Soils are eroding.
- Forests retreat.
- Water quality is unsatisfactory.





# Environmental Degradation

- Urban air quality is worse.
- Watersheds are losing storage capacity.
- Reservoirs are filled up with sediments.



# Environmental Degradation

- Wildlife and their habitats are being eliminated.
- Solids wastes pile up and smolder.
- Coastal spawning grounds disappear





# Environmental Degradation

- Some of these components have changed to such an extent that cannot be set right by self-regulatory mechanism of the environment. Consequently, the changed environmental conditions adversely affect the living organisms of the biosphere.





# Environmental Degradation

- Environmental degradation thus can be **defined as** the lowering of environmental qualities due to the damaged caused by both **natural events** and **human activities** in the basic structure of the environment **at local, regional and global levels adversely affecting all living organism including man.**



# Environmental Degradation

- The total environmental degradation and pollution arises mainly due to **consumption of natural resources** by **over population** of the developing countries and **wasteful over consumption of resources** by **developed countries**.
- IPAT equation popularly known as the impact equation as presented .
- $I = PAT$  {P=population, A= affluence T= Technology}



# Environmental Degradation

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- Environmental degradation has led to the **destruction of the environmental stability and ecological balance**. Some of the natural events that cause **environmental degradation** are **volcanic eruption, forests fires, earthquakes, floods**.



# Environmental Degradation

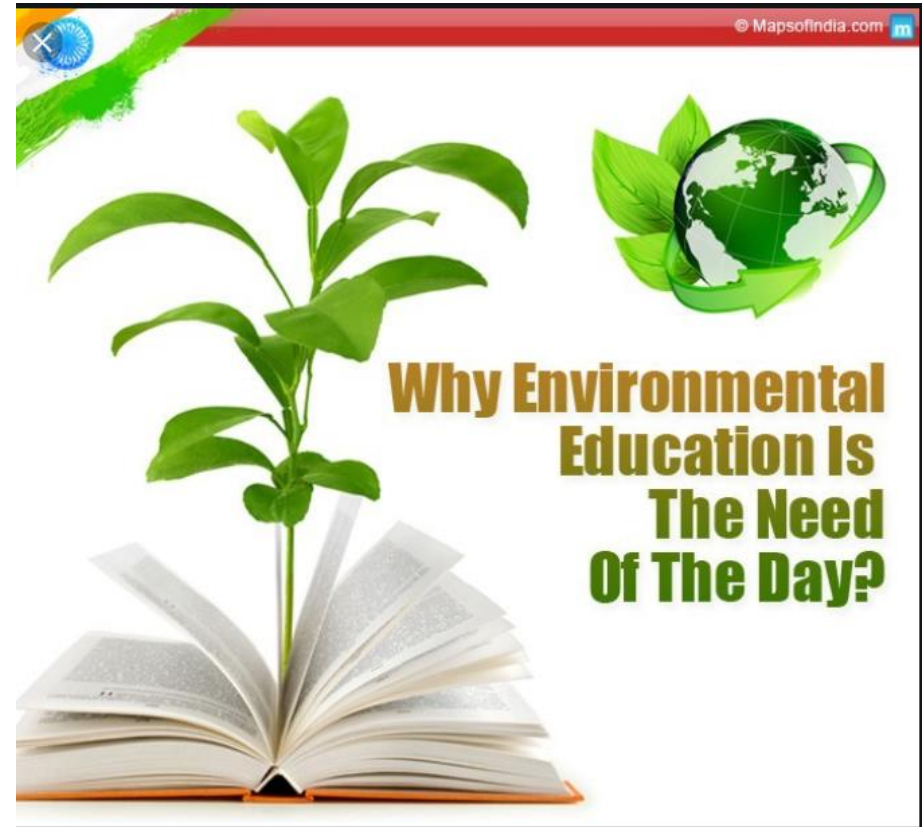
- Examples of human activities causing pollution and degradation of environment are nuclear explosion, release of toxic gases from automobiles, power plants and various industries etc.





# Environmental Education:

- Environmental Education is an integral process, which deals with **man's interrelationship with his natural and manmade surroundings**, including the relation of population growth, pollution, resource allocation and depletion, conservation technology, **urban and rural planning to the total human environment.**



# Environmental Education: Importance

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- The objective of environmental education is to make **public aware** about environmental problem, and importance of environment protection.
- It gives us the basic understanding about **various aspects of environment** and its associated problem.
- It teaches us the concept of **sustainable development**.
- It gives an idea about beneficial **use of natural resources** without damaging it much.
- It teaches us **how to conserve energy** and save our planet.
- It develops skills to identify environmental problems and their solution

# Environmental Education: Objectives

- Increase awareness of total environment.
- Increase the knowledge of environment.
- Improve attitude towards environment.
- Provide motivation for environmental protection.



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# Environmental Education: Principles

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- Environmental education **considers environment in totality**.
- It is not a one short learning process but it requires a holistic **approach as it multidisciplinary in nature**.
- Environmental hazards are controllable and every citizen has a **moral obligation** and **responsibility towards** this. Education must be given to all section of the society.
- Help learner to **discover the systems and causes** of environmental problems.



# Importance of Different Engineering Disciplines:

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## 1. Mechanical Engineering:

- it deals with design and operation of **many combustion processes**.
- He/she try to increase the efficiency of combustion process, as incomplete combustion leads to **production of carbon dioxide and other air pollutants**.
- Use of refrigeration which have **higher global warming potential** , which may eliminate the use of these environmentally.

## 2. Civil Engineering:-

- **Demolition and construction waste** are produce in large quantity in various works related to civil engineering.
- If a civil engineering is aware of the problems cause in **handling and disposing of waste**.

# Importance of Different Engineering Disciplines:

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## 3) Electrical Engineering :-

- Producing energy by **conventional energy sources** causes depletion of **natural resources and large amount** of pollution.
- Power sector is one of the largest contributor.
- Basic knowledge of different types of **pollutant produce in power generation and their impacts on environment**.

## 4) Computer/IT Engineering:-

- It includes of e-waste, its source and impacts on the environment.
- Computer engineers with a **sound knowledge of environmental science** would try to develop technologies which can be used to upgrade existing computer and IT gadgets easily thereby reducing the need of **replacing the existing one**.