Class- F.Y.B.Com **Subject- Environmental Studies (Semester-I)**

UNIT-I ENVIRONMENT AND ECOSYSTEM

❖ CONCEPT OF ENVIRONMENT

The term 'environment' is derived from the French word 'environ' which means 'surround'/to be around. Environmental studies deals with the sum of all social, economic, physical and chemical interrelations with our surroundings. Environment is the sum total of all living and non-living factors that compose the surroundings of man.

❖ DEFINITION OF ENVIRONMENT

According to C.C. Park "Environment **refers** to the sum total of all the conditions which surround man at a given space and time"

Douglas & Holland 'The term environment is used to describe, in aggregate, all the external forces, influences and conditions which effect the life, nature, behavior and the growth, development and maturity of living organisms'

❖ NATURE AND SCOPE OF ENVIRONMENT

Nature of Environment

1) Complex and Comprehensive: The nature of the environment is quite complex, because it is a mixture of all the living and non-living things that surround us. Thus the environment is composed of all the biotic and abiotic features. It includes plants, animals, soils as well as human beings. At the same time, it includes the large variety of rocks and minerals, landforms and water bodies, air and space along with building structures, roadways and railways, farms and factories and a large variety of artificial features. Thus, we say the environment is comprehensive in nature.

2) Dynamism: another important property of both natural and cultural environment is that their dynamism. It is always in a state of change. The natural courses of river are changing, the coastlines are broken and newly formed, the landforms are eroded and the natural vegetation shows seasonal changes. The human factor in the environment is becoming more significant. Especially with the fast changing technology the rate of change has been tremendously increased. Thus, all these indicate the dynamic nature of the environment.

3) System-oriented: The third significant property of environment lies in its systems. Both the natural and the cultural environment show certain processes that takes place according to some system or the other. The functioning of the certain natural cycles like the most popular 'water cycle' suggests the system-orientation of the natural environment. The system of water cycle is in existence even in the absence of human being on the earth. However, original systems get highly modified due to the intervention of man along with his changing technology.

Scope of environment

Scope means an extension of the views or the opportunity of environment understanding. As the environment is composed of 'whatever that lies around us', it is apparent that the environment gives us a broad scope. Its comprehensive nature itself suggests its vastness. However, the most common scope lies in understanding the environment in the following ways:

i) Firstly, the **nature** of environment

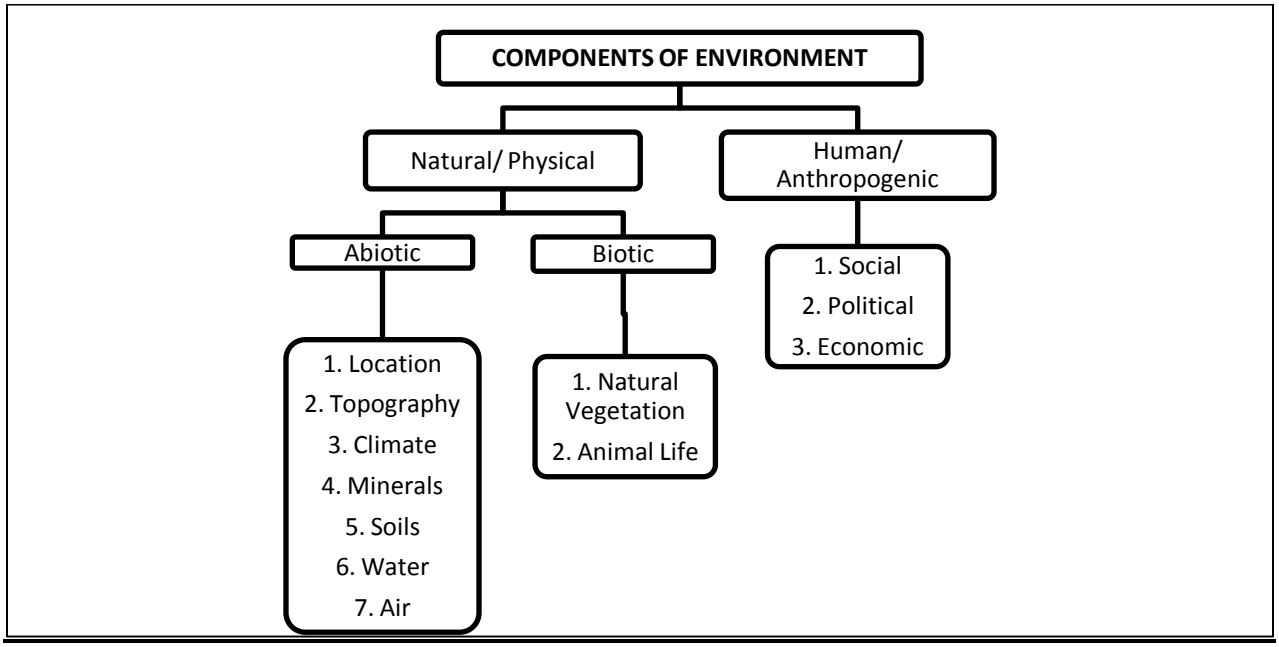
ii) Secondly, how it **functions**

iii) Thirdly, how it is being **intervened** and **exploited** by human actions

iv) Fourthly, how these interventions give rise to **environmental issues** like an environmental degradation on local and global scales and

v) Lastly, how to **mitigate the problems** related to the environmental loss, with the help of appropriate technology and wise action of man

❖ COMPONENTS OF ENVIRONMENT

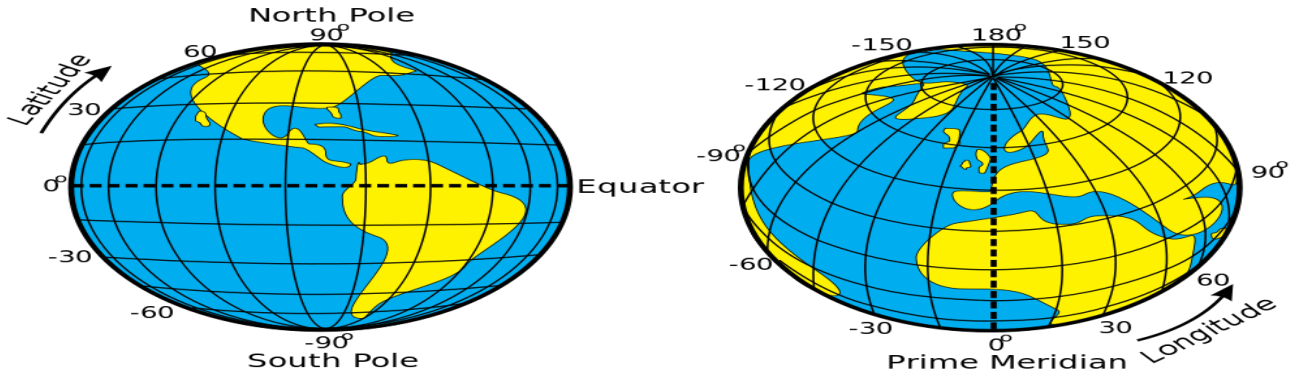


A) NATURAL/PHYSICAL ENVIRONMENT

I. Abiotic or Non-living factors

1) **Location:** The word location is derived from Latin word **"locus"** which means **"place".** It is a relative term. The location of country becomes important factor that influence human activities that will develop in that country. There are different types of locations like:

a) **Absolute location:** It is referred in terms of latitudes and longitudes. Eg India's location is 8^0 4' 28" and 37^0 17' 53" North latitudes and 68^0 7' 3" and 97^0 24' 37 East Longitudes.



b) **Relative Location:** It is mentioned with reference to some other reference like a country or a natural or manmade feature. It can be of following types:-

i) Continental Location: Countries which are located away from the sea in the interior parts of the continents have, continental location. Eg. Afghanistan, Mongolia, Poland, Nepal etc.

ii) Maritime/ Coastal Location: The word maritime is an adjective that simply means "of the sea", thus any land associated with the sea can be considered a maritime state. Eg- Mumbai, Chennai, Calcutta etc.

iii) Insular Location: A location of a country when surrounded by water on all sides. Eg- islands like Japan, U.K., Australia etc.

iv) Peninsular Location: A location of a country when surrounded three sides by water. Eg- India, Italy etc.

v) Portal Location: Countries which are located near the sea have portal location. Eg. India, New York etc.

2) **Topography:** Physical features of a region lime mountains, plateaus, plans, valleys, etc. These factors of environment influence the development of economic activities.

a) Mountains: Mountain regions have remained economically backward. Agriculture is not much developed rapid soil erosion. Due to lack of transport and communication facilities human settlement is limited and manufacturing industries are not developed. With the development in transport, communication technology and research mountainous regions have

become very useful for man. Today plantation of crops like rubber, tea, coffee etc is cultivated and tourism is also developed in mountainous area.

b) Plains: Plains occupy about 55% of land area and support nearly 90% of world's population. Concentration of population in plain areas is more because of fertile soil, presence of number of rivers and transport facilities. Due to transport and communication facilities manufacturing industries are also developed. Development of agriculture and industries has helped in development of trade.

3) **Climate:** Climate is sum total of all the atmospheric conditions experienced over any region during long period of time. Among all the factors of environment, climate is the most fundamental factor. Human settlement, capacity to undertake work, soil types, vegetation types etc all affected by climate.

   a) **Climate and activities:** Activities of man are greatly influenced by climate. Eg. Hunting, fishing, collection of wild fruits etc are important activities of equatorial region. Agriculture is most important activity of man in monsoon region.

   b) **Climate and Transport:** Climate also affect to development of transport. In the areas of heavy rain, road and railway tracks are often flooded. River transport is also disrupted due to floods. Air transport becomes very difficult due to story and cloudy or foggy weather conditions.

4) **Minerals:** A mineral is a naturally occurring resource**.** Minerals are the most unevenly distributed resources on the Earth's surface. Some countries possess large amount of certain resources whereas others are having less amount. Eg. 75% of the world's coal reserves are concentrated in the USA and W. Europe. About 90% of the world's oil reserves are found in the Middle-Eastern Countries and USA.

5) **Soils:** Different types of soils are found in different regions. Soil is important factor in raising a particular crop. Eg. Black cotton soils are suitable for cotton, tobacco etc. Alluvial soils for sugarcane, jute, rice etc. The fertility of soil controls the quality and quantity of a particular crop.

6) **Water:** Hydrosphere is derived from Greek word 'hydra' meaning water. It is relating to the water bodies of the earth covering about 71% of the surface area. This includes oceans, rivers,

lakes and even the moisture in the air. 97% of the earth's water is present in the oceans. The remaining 3% is fresh water; three-quarters of the fresh water is solid and exist in ice sheets.

7) **Air:** Atmosphere is derived from the Greek word 'atmos' meaning air. It is the gaseous cover around the earth. It is a mixture of gases. The air of our planet is 79% nitrogen and just 21% oxygen; the small amount remaining is composed of carbon dioxide and other gases. The change in the atmospheric conditions is termed by the words- weather and climate. The atmosphere controls the condition of wind, clouds, rain and snow. All living organism depend upon the atmosphere for their respiration.

II) <u>Biotic or Living factors:</u>

1) **Natural Vegetation:** Natural vegetation is plants that are not grown by humans. Vegetation means the green cover which is present on the surface of Earth. The vegetation cover is directly dependent on climate. Forest is a habitat (home) for animals. They provide oxygen which is essential for survival of animal world as well as humans. Natural vegetation provides us timber, wood, fruits, leaves herbs etc. Lumbering is an important activity for humans. Industries like paper and pulp industry, construction industry, match box, ship building, sports goods etc. depends on forests for raw materials.

2) **Animal Life:** Animal plays a very important role in the ecology of nature and activities of man. Animal life is an asset to man, providing him products like milk, meat, egg, fat, wool, bones, horns, skin etc. Hunting and fishing are amongst the oldest occupation of man Animals had also been used for transport purposes like horses, cattles, camels, etc. Animal husbandry becomes an important economic activity where animals are raised for meat, milk, eggs or other products Animal rearing has also grown all over the world on commercial scale like cattle farming, sheep farming, poultry farming, pig farming etc. From wherever man has lived by sea, lakes and rivers, fishing is developed. Both occupations require direct adjustment to the environmental conditions. All these are highly specialized and profit oriented industry. Thus, there is a close relationship between animal products and man.

<u>B) HUMAN/ANTHROPOGENIC ENVIRONMENT</u>

1) **Social Environment:** The population is unevenly distributed on the earth's surface. The size of population affects the flow of world commerce. Densely populated countries of Asia demand large quantity of food grains as their domestic production is inadequate to feed their

population. On the other hand, countries like Canada and USA have moderate population so they have surplus food grains.

2) **Political Environment:** The political conditions prevailing in a country directly affects the flow of commerce of that country. The countries of the world follow different political systems such as Democratic, Communists, Dictatorial etc. The countries following the same political system form a trading block to regulate their trade and get more benefits by reducing unhealthy competition.

3) **Economic Environment:** Economic environment consists of all the components which make the development possible in a country. It consists of economic policies, trade policy, economic planning models, economic systems etc.

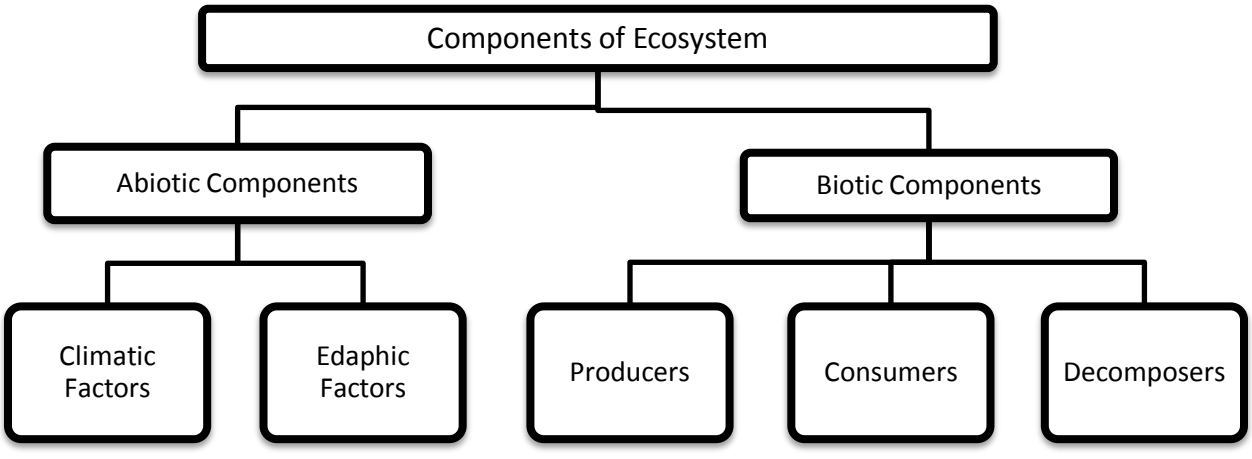
❖ ECOSYSTEM

The term Ecosystem was first used by A.G.Tansley in 1935 but it was coined by Roy Clapham in the year 1930.

According to A.G. Tansley ecosystem refers to "the system resulting from the integration of all the living and non-living factors of the environment". In simple words, it is a fundamental functional unit on the surface of the Earth.

According to George Usher "The complete ecological system of an area including plants, animals and the environmental factors is known as ecosystem"

❖ COMPONENTS OF ECOSYSTEM



An ecosystem comprises of two basic component i.e. abiotic components and biotic components.

1) Abiotic components: The abiotic components include the non-living or the components of physical environment. Abiotic component are **mainly** of two types,

i) Climatic factors- It includes rainfall, temperature, light, wind, humidity, etc.

ii) Edaphic factors: It includes soil, pH, topography, minerals, oxygen, carbon dioxide etc.

2) Biotic Components: The living organisms include, plants, animals, and micro-organisms in an ecosystem forms biotic components. Biotic Components are further classified into 3 main groups

i) Producers or Autotrophs: Autotrophs are self-feeders, i.e., they prepare their own food. They are also known as producers. This process starts when the sunlight is absorbed by chlorophyll (the pigment in the plant which gives the plants their green colour). The plants use this energy to combine carbon dioxide with water to make carbohydrates i.e. sugar (glucose), starches and celluloses. Oxygen is given out as a by-product of photosynthesis. The process of photosynthesis can be summarized as

CARON DIOXIDE + WATER + SOLAR ENERGY ⟶ GLUCOSE+ OXYGEN

Only producers or plants can make their own food. They provide food directly or indirectly for animals and decomposers. Human beings and other animals get nutrients either by eating plants or by eating animals that feed on plants.

ii) Consumers or Heterotrophs: Heterotrophs are organisms that feed on autotrophs. Heterotrophs are called consumers which generally feed on other organisms. Consumers are grouped into different categories depending on the food they consume.

a) Herbivores (plant eaters): Herbivores are referred to as first order consumers and they directly feed on plants. Example: Cattle, deer, rabbit, etc.

In case of terrestrial ecosystem some birds eat seeds, rabbits eat twigs and leaves, Grasshoppers eat all parts of plants. In case of aquatic ecosystems, zooplankton feed on phytoplankton.

b) Carnivores (Flesh eaters) : Carnivores are animals that feed upon other animals. They are classified as:

- **Primary carnivores:** This feed on the herbivores. Example: Frog, predatory birds, snakes, etc.
- **Secondary carnivores:** This includes animals that feed on the primary carnivores. Example: Wolf, peacock, owl, etc.

c) Omnivores (plant & animal eaters) : These are animals which can eat both plants and animals. Eg. Rat, Fox, pigs, cockroaches and man.

Consumers can also be categorized as- **Primary Consumer, Secondary Consumer, Tertiary Consumer and Quaternary Consumer.**

iii) Decomposers /Detritivores/ Reducers: These are organisms that live on the refuse and dead organic matter in the ecosystem. Detritivores include scavengers such as crabs and vultures that eat the remains of dead animals and decomposers such as fungi and bacteria that break down plant debris, animal droppings and other dead organic matter. They perform the important function of releasing the organic matter in their natural form back to the environment.

❖ CLASSIFICATION/TYPES OF ECOSYSTEMS

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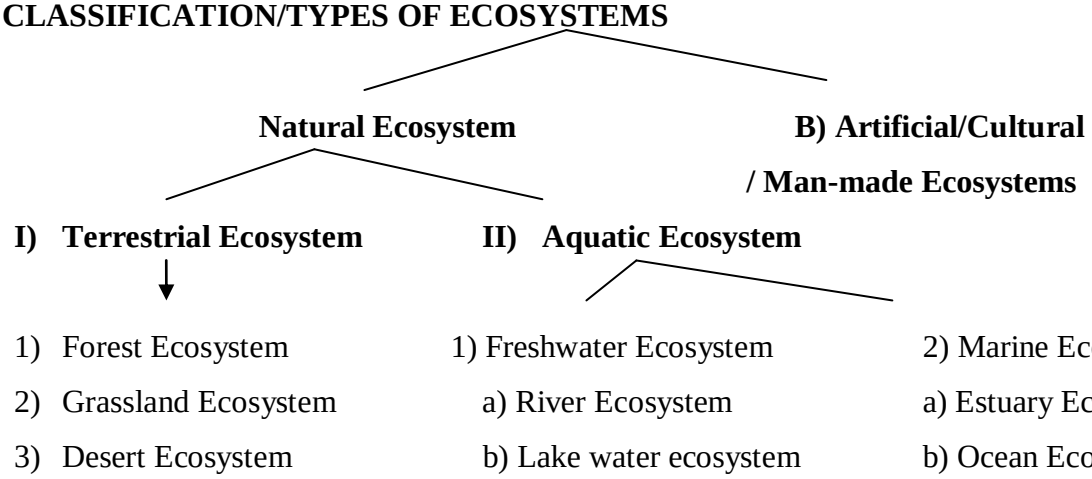


A. Natural Ecosystems: Natural ecosystems occur in nature and are self-regulatory. They can survive even without human interventions. They are rich in bio-diversity and have complex food webs.

I. Terrestrial Ecosystem: includes ecosystem on the land.

1. Forest Ecosystem: Forests are composed of various plants such as trees, shrubs, climbers, etc. It also includes animals such as mammals, birds, amphibians, reptiles,etc. Plants and animals are dependent on each other; together they form different type of food chain. **Eg: Trees→Deer→Fox→Tiger**

2. Grassland Ecosystem: Area which have 25 to 50 cms of rainfall have grassland ecosystem. Low rainfall helps in growth of trees, shrubs, grass, herbs and also animals like deer, jackal,

rabbit, fox, lion, reptiles, etc. In summer, grassland dries and dies, so animals depend upon stored food in the form of fats to survive.

Eg: Grass → Grasshopper →Frog →Snake→ Hawk

3. Desert Ecosystem: Areas which have trees less than 25 to 50cms of rainfall have a desert ecosystem. It helps for the growth of trees like Babul, Acacia, thorny shrubs like cactus and animals like specialized insects, reptiles, desert fox, desert cat, birds, etc.
Eg: Thorny shrubs → Kangaroo Rat → Desert Snake → Hawk

II. Aquatic Ecosystem: An ecosystem of water bodies is called as aquatic ecosystem.
1. Freshwater Ecosystem: is classified into two: River Ecosystem and Lake Water Ecosystem.

a.River Ecosystem: It is also called 'Lotic' means 'running water' or stream, or River. In river ecosystem, Phytoplankton, Zooplanktons, green algae, fish, birds like kingfisher, eagle and other animals like hippopotamus, water buffalo, snake buds, owl etc.

b. Lake water ecosystem: It is also called as 'lentic' means 'still' water' or lakes, ponds, pools, swaps etc. Depending upon size of lake different plants, insects, fish, birds and other aquatic animals form a part of the lake ecosystem.
2.Marine Ecosystem: It refers to deep bodies as an ocean or shallow ones. It is classified into two: Estuary Ecosystem and Ocean Ecosystem

a.Estuary Ecosystem: It is a mixture of freshwater and saline water of ocean currents. Freshwater and Seawater provides environment for large variety of plant and other aquatic animals

b.Ocean Ecosystem: This ecosystem provides luxurious ground for a variety of plants. There are herbivores and omnivores and other species mainly mammals, Pisces, invertebrates, reptiles, amphibians, etc. The shallow water in the continental shelf area supports rich ecosystems. Little life exists in central part of ocean because sunrays do not reach sea bottom.

B. Artificial or Cultural or Man - Engineered Ecosystems: are made by man and are artificial. They rely (depend) on human efforts to sustain, thus are not self-regulatory/ they cannot survive without human interventions. They are not rich in bio-diversity and have simple food webs. They are created for specific purposes by copying the conditions of natural ecosystem.

Examples

- Orchard and farms for agricultural benefits
- Parks and gardens for recreation
- Zoos and aquarium for study, tourism, hobby, conservation and education
- Beach resorts for recreation and relaxation
- Agricultural land for production of crops
- Pastoral land for feeding domestic animals
- Man-made lakes, ponds ,wells, dams for storing water

❖ FUNCTIONS OF ECOSYSTEM

The basic function of the ecosystem is to keep the environment functioning and constantly in a state of maintaining balance and stability of the environment. The following are the functions of ecosystem:

1) Primary functions: Green plants have chlorophyll with the help of which they absorb solar energy and combine it with water and carbon dioxide to make sugar (glucose), starches and celluloses. Oxygen is given out as a by-product. This process is called as photosynthesis.

2) Distributing Energy: The consumers consume plants and energy in the plants gets distributed in the form of food to all consumers (Herbivores ⟶ Carnivores ⟶ Omnivores).

3) Material Cycling: Once energy is distributed, they are used by various other consumers for their respiration and survival. After the death of consumer they get decomposed by the micro-organisms like bacterial and fungus

➢ **General Functions:**

- Ecosystem if formed of living and non-living components.
- In an Ecosystem, there is an interaction between living and non-living components.
- Solar energy is the main source of energy.
- It is well organized system.
- Living organisms in an Ecosystem are inseparable from their habitat.
- Living component of plant includes trees, shrubs and climbers. Algae which live in fresh and salt water, etc.
- Living component animal would range from microscopic animals to small insects and the larger animals such as fish, amphibians, reptiles, birds and mammals.

- Non - Living components includes water, climatic condition and geographical condition.

STRUCTURE OF ECOSYSTEM

(I) Energy Transfer/ Energy flow

1) **Food chain:** All ecosystems are made up of food chains that begin with energy i.e. sunlight extracted from the physical environment and converted into organic matter by plants. Herbivores synthesize a portion of the plant material into their bodies. The flesh of herbivore provides nutrition and energy to the carnivores. Thus energy is passed on from one organism to another step by step, thus establishing a link this links together form a food chain. Food chains are also found in the water where zooplanktons survive on phytoplankton. The small aquatic organisms consume zooplanktons; the small fish, which is consumed by the large fish.

   Food Chain in Grassland

   Grass →Grasshopper →Frog →Snake →Hawk

   Food chain in Forest

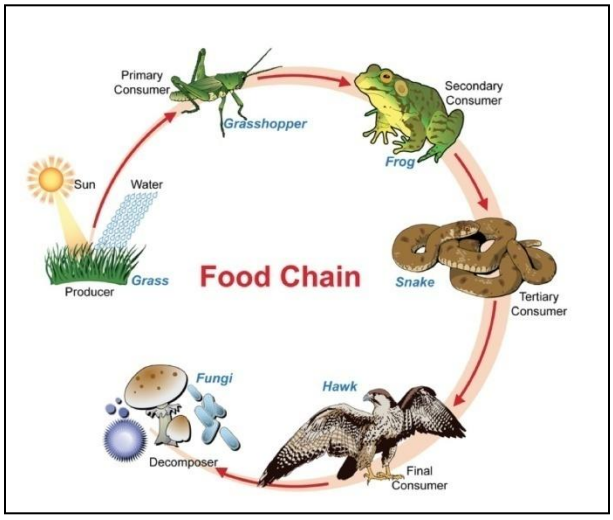
   Trees→ Deer→ Fox→ Tiger

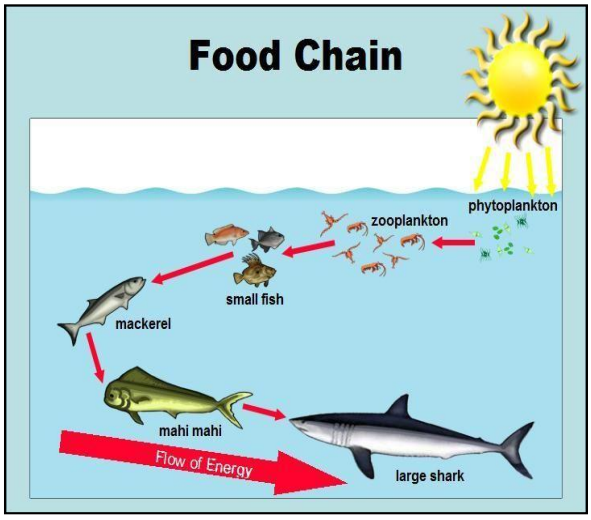
   Food Chain in Pond

   Phytoplankton→ Water Fleas→ Small fish→ Big Fish →Man

Food chain in Ocean Area

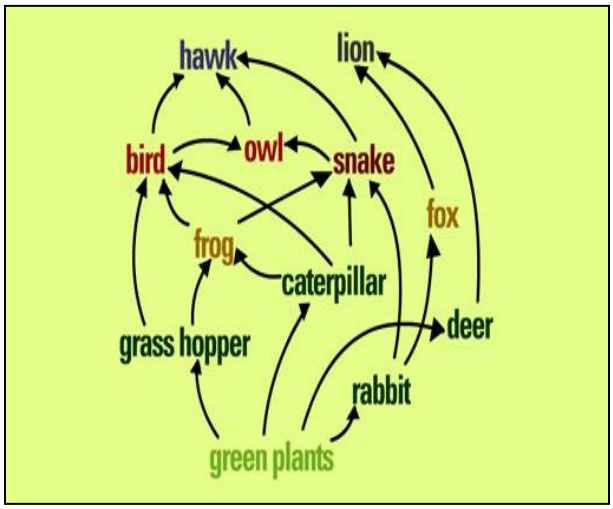
Marine algae→ Small fish →Large fish →Shark

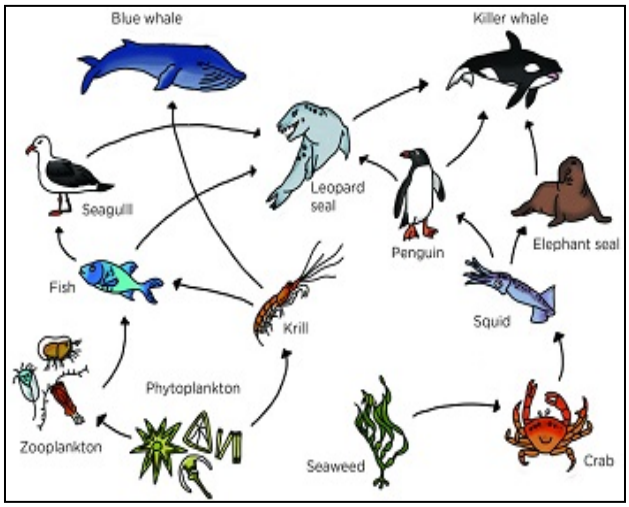




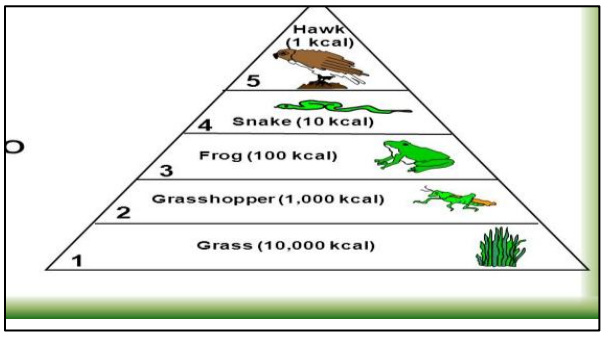
2) Food web: Food chain represents relationship between producers and consumers. In reality or in the environment all elements are inter-related and inter-dependent and such a set of integrated food chains or the combination of different food chains are called as food web. The organism in most ecosystems form a complex network of interconnected food chains called as food web. Food

web is more complicated than our ideal food chain, because most of the consumers consume more than one type of organism and most organisms are consumed by more than one type of consumer.

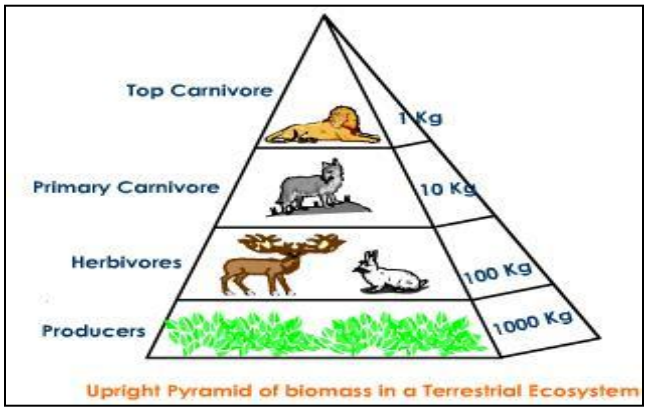




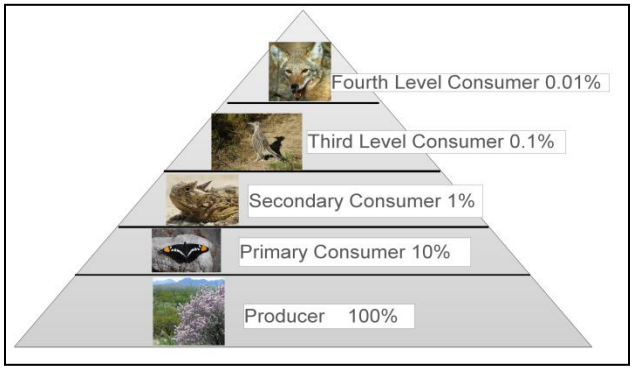
3) Ecological pyramid: Each food chain consists of different levels. The point of energy transfer from the environment to an organism and from one organism to another defines each level. All food chains have generally three to four level of energy transfer, which is called as Trophic level. When we see the energy transfer through various trophic levels we find that there is a relationship between the number of species, biomass and energy availability which is called as Food Pyramid or Ecological Pyramid. Food pyramid can be expressed in three types:



i) Pyramid of Number: It includes only the number of species. Animals at the base are more in number and as we go up in the pyramid the number goes on decreasing with successive trophic levels.



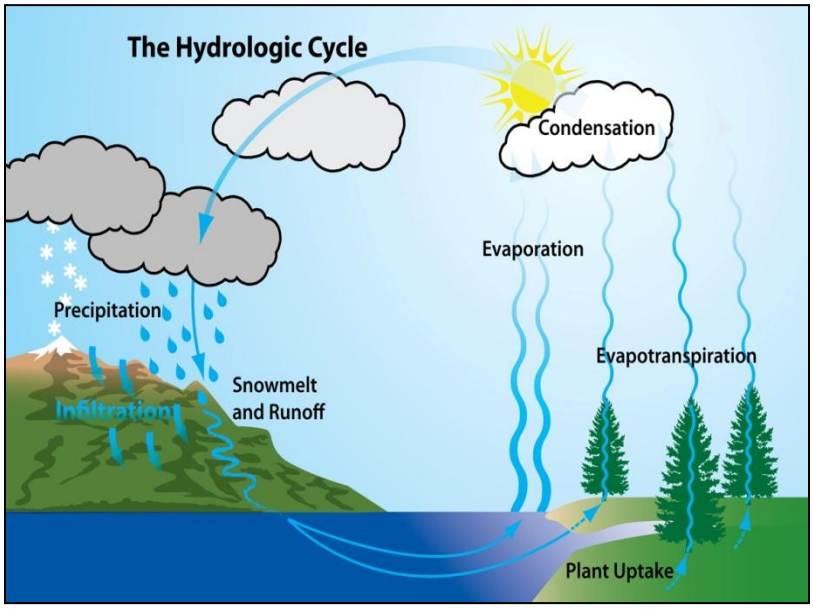
ii) Pyramid of Biomass: It includes total weight of the organic matter of each trophic level. The total biomass tend to decrease as we move up from trophic level I to IV.



iii) Pyramid of Energy: The energy pyramid is constructed on the basis of amount of energy used at trophic levels. The energy availability at each successive trophic level goes on declining.

II) Bio-geo chemical cycles

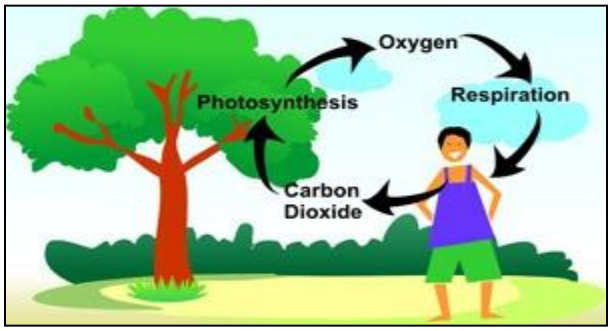
1) Hydrological Cycle/ Water Cycle



It is the cycle of water through sea, land and atmosphere. Heat energy from the sun causes water in streams, rivers, seas or lakes to change from a liquid to a water vapor. This is called **evaporation.** The vapor rises into the air and collects in clouds. Water vapor collects in clouds. As the clouds cool the water vapor condenses into water drops. This is called **condensation.** These drops fall to the earth as rain and snow. Water falls to the earth from clouds, mainly as rain, but sometimes as snow, hail etc.

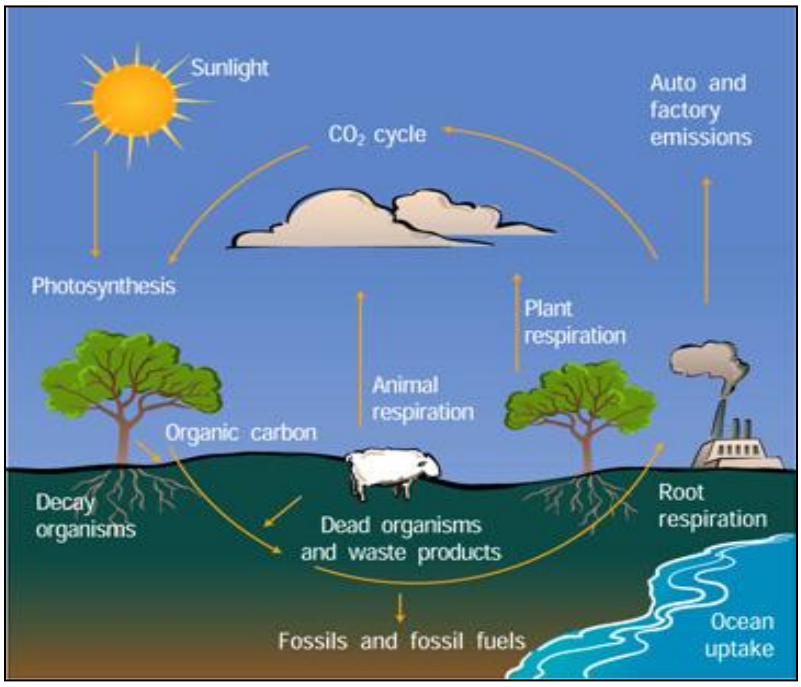
This is called **precipitation.** A part of water penetrates down into the soil as ground water. This is called **Percolation.** The remaining water flows over the land joins lakes, rivers, seas and oceans from where again it evaporates. This is called **Run-off**

2) Oxygen cycle



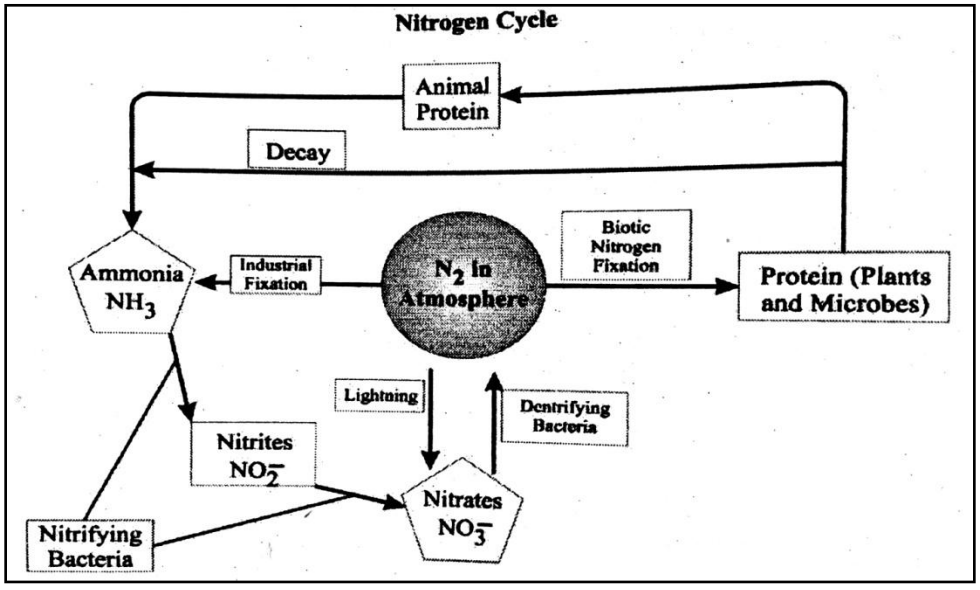
The oxygen cycle involves circulation of oxygen. Oxygen is found as a gas in the atmosphere. Plants release oxygen during photosynthesis. Animals including man breathe oxygen during respiration and release carbon dioxide which is again taken by green plants. Thus, oxygen and carbon cycles together form a complete system

3) Carbon cycle



The circulation of carbon in atmosphere is called carbon cycle. The atmospheric carbon dioxide is taken by the green plants. They are consumed by primary, secondary consumers. It gets converted into carbohydrates. When they respire carbon dioxide is given out. When they die, the carbohydrates are broken into simple substances and carbon dioxide is given out. The carbon gets gets stored in the trunks of the plants. Due to the earth's tectonic movements, these plans get buried in the soil. Carbon gets converted into coal. With the burning of fossil fuels, carbon-dioxide

4) Nitrogen Cycle: Nitrogen is an element available abundantly in the atmosphere but the living beings cannot use it directly. Nitrogen cycle begins with nitrogen fixation. The natural process of fixation is lightning. By this process nitrate formation takes places in the soil which is used by plants in making their food. The other method of nitrogen fixation is nitrifying bacteria which are present in the leguminous plants which trap nitrogen from atmosphere and enrich soil. The artificial method of nitrogen fixation is application of chemical fertilizers.



Soil, plants take up nitrogenous compounds and through food chain, it goes into the bodies of animals. The protein disintegrates into the bodies of organisms and released as a waste product. On the death of plants and animals, nitrogenous compounds enter into the soil. The denitrifying bacteria present in the soil simplify this complex

❖ MAN AND ENVIRONMENT RELATIONSHIP

Man and Environment have a reciprocal relationship. The relationship between the two is of the feedback type. It is a two way process wherein both influence each other. Every action by man has a consequent reaction from the environment that is characterized or experienced after a time gap and will be suffered by other neighboring areas too. Feedback can be positive or negative. Positive feedback leads to development and negative feedback leads to destruction.

- **Environment influence on man**
  1. Basic need of man i.e. food, clothing and shelter are determined by climatic conditions.
  2. Occupation
  3. Availability of all the resources –air , water, soil, climate
- **Man Influence on environment**
  1. Rapid exploitation of renewable resources (resources like forests, fisheries, land, etc) beyond their natural capacity to regenerate.
  2. Reduction of biodiversity on the earth due to expansion of agricultural land, human settlements & industrialization.
  3. Extinction of some species of both plants and animals life.
  4. Excess use of energy resources.
  5. High level of greenhouse gases emission and increase in global warming.
  6. Use of chemical for increasing the food production on the earth causing major health risks and environmental contamination.
  7. Increased industrialization causing a major problem of water, soil & air pollution.
  8. Degradation of soil and deforestation.

❖ IMPORTANCE OR SCOPE OF ENVIRONMENTAL STUDIES

1) Understand relation between man and environment: Study of environmental studies play an important role in understanding relation between man and environment. It helps to know various environment issues like global warming and ozone depletion, acid rain, marine pollution and biodiversity which are result of human interference in environment. These are not merely national issues but are global issues and hence require international efforts and cooperation to solve them.

2) Inform, aware and educate people about environmental problems: It helps to inform, aware and educate people about environmental problems like climatic change, conservation, biodiversity,

water pollution, air pollution, sound pollution, waste management, wasteful and overuse of resources need for sustainable life style, etc.

3) Reduce pressure on natural resources: There is a heavy pressure on the natural resources like land, water, minerals etc. Eg. Overuse of water resources is creating shortage of drinking water and underground water quantity is depleting. So the environmental studies will enable to reduce pressure on these valuable natural resources.

4) Protection and Conservation of mother earth: It helps in creating awareness/importance of protection and conservation of our mother earth. This in turn will help to reduce the destruction of environment due to the release of pollution into the environment.

5) Save humanity from extinction: It is utmost important for us to save the humanity from extinction. Man is undertaking development activities which results into degrading quality of the environment and depleting the biosphere. This indirectly results into extinction of biodiversity and also threatening to humanity.

6) Career Opportunities: Many businesses are going 'green' (environmental friendly). The environment education will open up many career opportunities in the corporate world, in private industries, NGOs and as freelance consultants. Green businesses are hiring people to assess, analyze and help to alleviate (lessen/improve) several problems related to environment degradation, poverty, hunger, public health and sanitation, famine and drought and so on.

7) Importance for students of Commerce faculty: An environmental study has an important place for the students of commerce faculty. It will help them to understand to keep their business 'green', healthy environment, proper and wise use of resources.

8) To know sustainable way of life: Environmental studies will help to know the more sustainable way of life. Eg. Save water, stop use of plastic, plant trees etc.

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