



Natural Resources

Key points

"Environment is everything which surrounds an organism and influences its life. It includes physical and biological components."

NOTE

Biosphere is a closed system for minerals and is an open system in regards with the energy.

 The word resource is used for "means of supplying a material generally held in reserve".

Natural resources

-  Substances used by man in bulk for survival are called resources and since they are found in nature, they are called natural resources.
-  Life exists on earth because it has all the physical conditions necessary for sustaining it.
-  An ambient temperature, water and food are the basic needs of all life forms.
-  These basic needs of the life forms are to be met by the resources available on the earth and the energy from the sun.

🌍 The resources available on earth include land [Lithosphere], water [Hydrosphere] and Air [Atmosphere].

Lithosphere



🌍 The outer crust of the earth is called lithosphere.

Hydrosphere



🌍 The water present on the earth's surface and underground constitute hydrosphere.

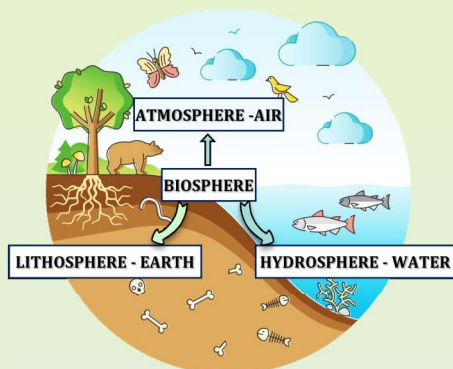
🌍 About 75% of the earth's surface is covered with water.

Atmosphere

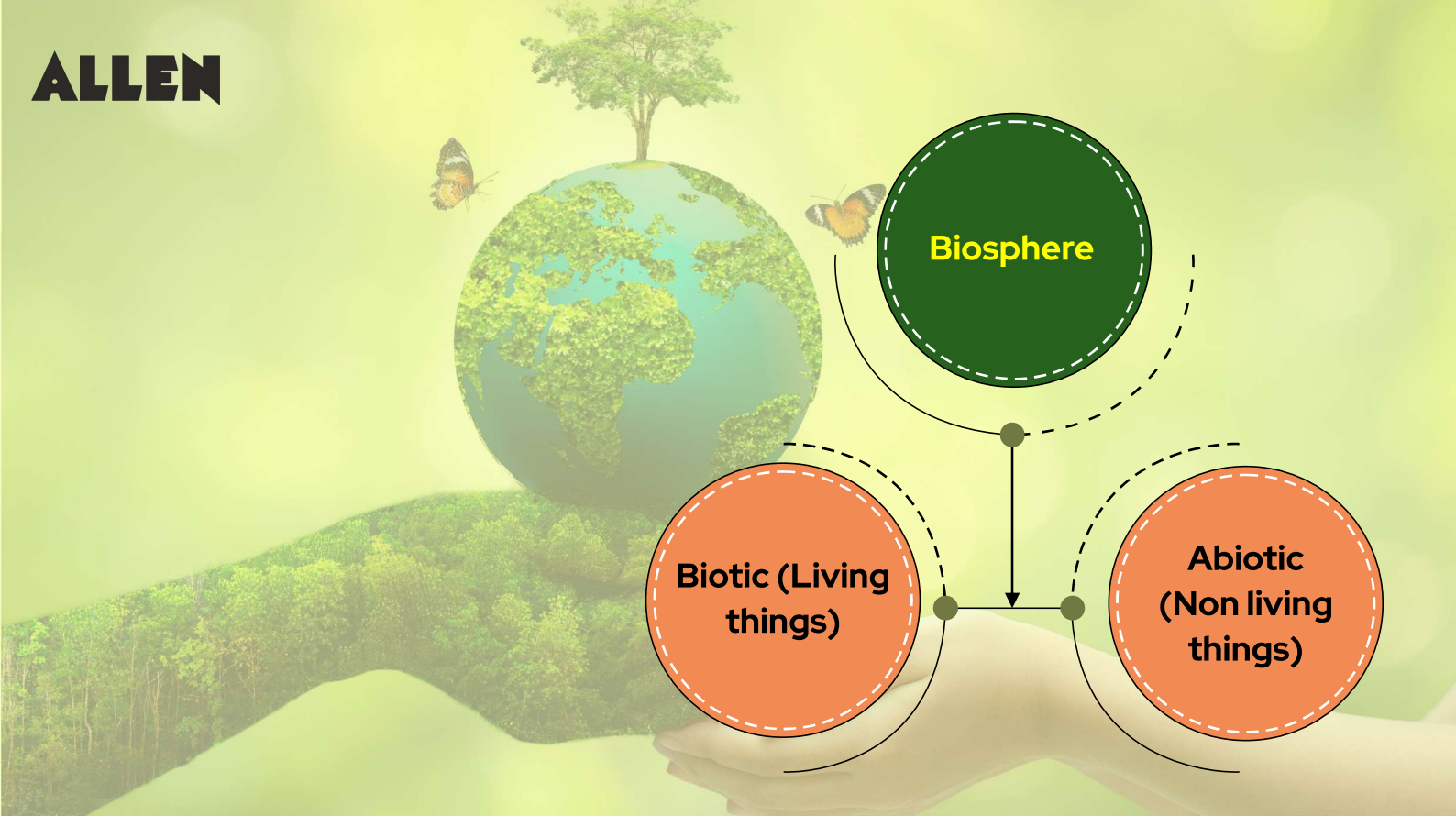


🌍 The air that covers the whole of the earth like a blanket is called atmosphere.

Biosphere



🌍 The life sustaining zone of the earth where the lithosphere, the hydrosphere and the atmosphere interact and make life possible is called the biosphere.

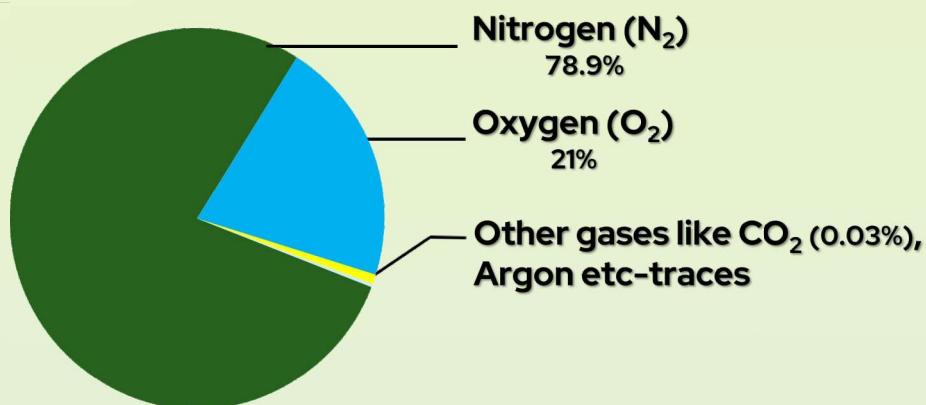


 Fossil fuels are considered as non-renewable resources because it takes millions of years to recycle.

The breath of life: Air

 Air is a mixture of many gases like nitrogen, oxygen, carbon dioxide, water vapour and some others present in the atmosphere.

 Air is an important inexhaustible natural resource.



(Composition of Air)

🌍 Earth's atmosphere has a series of layers. Moving upward from ground level, these layers are:

Troposphere

- 🌍 0-12 kms.
- 🌍 Weather changes occur in this layer.
- 🌍 Most clouds appear here.



Stratosphere



- 🌍 12-50 kms.
- 🌍 Contain ozone layer at 15-30 kms height
- 🌍 Commercial passenger jets fly in the lower stratosphere.

Mesosphere

- 🌍 50-80 kms.
- 🌍 Most meteors burn up in mesosphere.



Thermosphere



- 🌍 80-700 kms.
- 🌍 Satellites orbit around Earth within the thermosphere.

Exosphere

- 🌍 700 kms above the Earth's surface.



Importance of atmosphere

1 Role of atmosphere in climate control

- The atmosphere acts as a protective blanket for the Earth.
- Since atmosphere is a bad conductor of heat, it keeps the average temperature of the Earth fairly constant during the day and even during the whole year.
- Thus, the Earth receives just the right amount of heat, which helps in climate control and allows living organisms to exist.

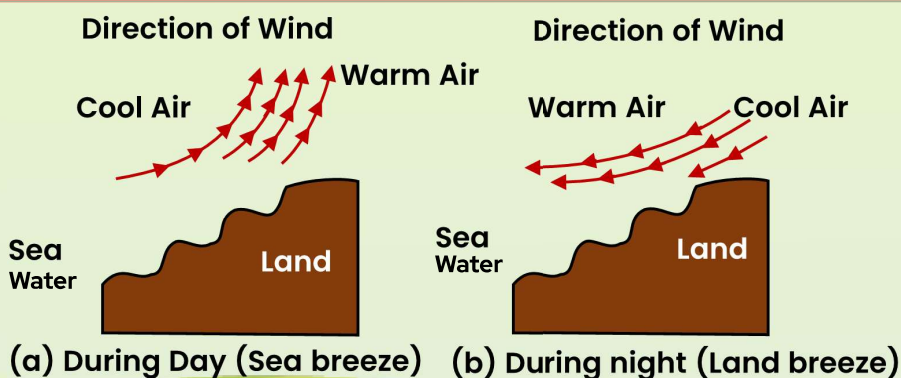
2 The movement of air-winds

- The atmosphere gets heated from the radiation that is re-radiated by the land or water bodies. As a result of heating, convection currents are set up in the air.

NOTE

Differential heating of earth surface [water & land] causes the wind.

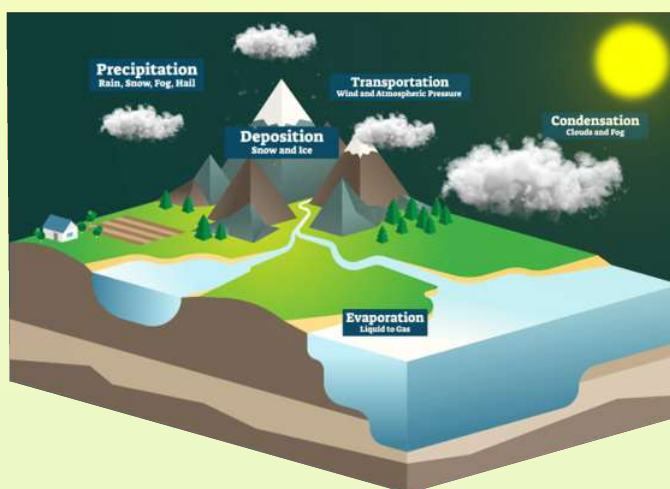
- In coastal regions, during the day, the air above the land gets heated faster and starts rising. So a region of low pressure is created and air over sea moves into this area of low pressure. The movement of air from one region to the other region causes winds.
- During the day, the direction of wind would be from the sea to the land and at night, both land and sea starts to cool. Since water cools down slower than the land, the air above water would be warmer than the air above land, thus the direction of wind would be from the land to the sea.



Movement of wind due to uneven heating of the air

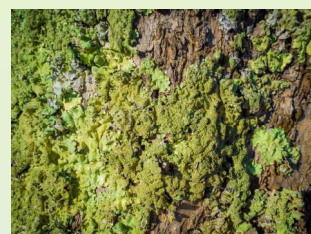
3 Rain

- When water bodies are heated during the day, a large amount of water evaporates and goes into the air. The wind carries the water vapour to various places. The air gets heated and rises up carrying the water vapour with it. As this air rises, it expands and cools causing the water vapour in the air to condense in the form of tiny droplets. Once the water droplets are formed, they grow bigger by the 'condensation' on these water droplets. When the drops grow big and heavy, they fall down in the form of rain. Rainfall pattern are decided by the wind patterns.



Air pollution

- An undesirable change in the physical, chemical or biological characteristics of air which caused due to an increase in the content of harmful substances (air pollutants) in air such as oxides of nitrogen and sulphur, etc.
- The major sources of air pollution are burning of fossil fuels like coal and petroleum, automobiles, thermal power plants and industries.
- Lichens show that atmosphere is free from the pollutants like CO_2 and SO_2 .



Harmful effects of air pollution

- It affects respiratory system causing breathing difficulties and diseases such as bronchitis, asthma, lung cancer, tuberculosis and pneumonia.



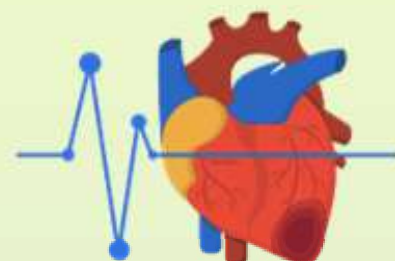
- Burning of fossil fuels like coal and petroleum releases oxides of nitrogen and sulphur inhalation of these gases is dangerous.
- These gases also dissolve in rain to give rise to acid rain.

- Combustion of fossil fuel increases the amount of suspended particles in air. These suspended particles could be unburnt carbon particles or substances called hydrocarbons.



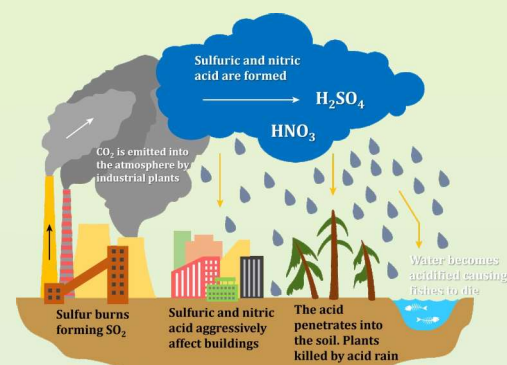
- The presence of high level of pollutants reduces visibility in cold weather and form smog.

- Regular breathing in the polluted air increases the incidence of allergies, cancer and heart diseases.



Acid Rain

- The rain which contains small amount of acid in it that is formed from the gases like sulphur dioxide and nitrogen oxides present in polluted air.
- It causes damage to the living and non-living things.

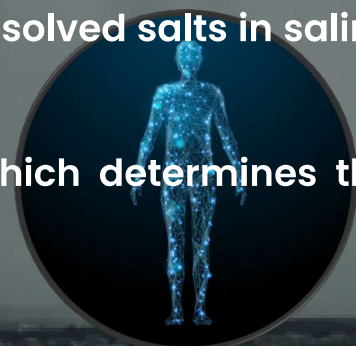
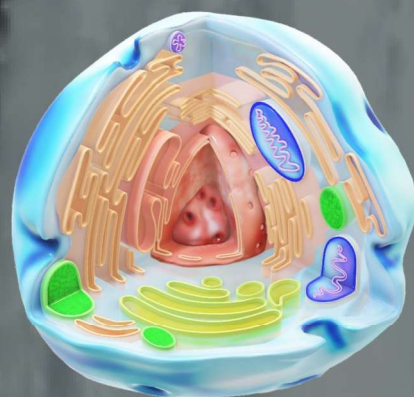


Water – a wonder liquid

- The oceans, rivers, streams, lakes, ponds, pools, polar ice caps, water vapour, etc. collectively form the hydrosphere, the main component of which is water.
- Major part of water is found in seas and oceans.
- Fresh water is found in ice-caps and on snow covered mountains.
- The underground water and the water in rivers, lakes and ponds is also fresh.

Necessity of water

- All cellular processes take place in water medium.
- All reactions that take place within our body and within the cells occur between substances that are dissolved in water.
- Substances are also transported from one part of the body to the other in a dissolved form.
- Organisms need to maintain the level of water within their bodies in order to survive.
- Water regulates the Earth's temperature. It also regulates the temperature of the human body, carries nutrients and oxygen to cells, cushions joints, protects organs and tissues, and removes waste.
- Terrestrial life forms require fresh water because their bodies cannot tolerate or can not get rid of the high amount of dissolved salts in saline water.
- The availability of water is the major resource which determines the diversity of life on land.
- Water is essential for sustenance of life.



NOTE

Water dissolves more substances than any other liquid. Wherever it travels, water carries chemicals, minerals, and nutrients with it.

NOTE

The availability of water decides not only the number of individuals of each species that are able to survive in a particular area, but it also decides the biodiversity of life there.

Water Pollution

- It is contamination of water of rivers and lakes with unwanted and harmful substances.
- Water is said to be polluted when there is any physical, biological or chemical change in its quality that adversely affects living organisms and makes it unfit for use.



Ways by which water is polluted

- Agricultural substances such as fertilizers and pesticides are used to increase crop yield, and some percentage of these is washed into the water bodies that pollutes the water.
- Sewage from homes and wastes from factories are dumped into rivers or lakes.
- Hot and cold water discharged from industries make a change in temperature, which is harmful for aquatic organisms.
- All these affects the balance among various organisms that are found in water bodies.

NOTE

Eutrophication- When nitrates and phosphates from farmland and sewage escape into water they cause excessive growth of microscopic green plants. This may result in a serious oxygen shortage in the water.



Water pollution refers to

Addition of undesirable substances to water bodies

Removal of desirable substances from water bodies

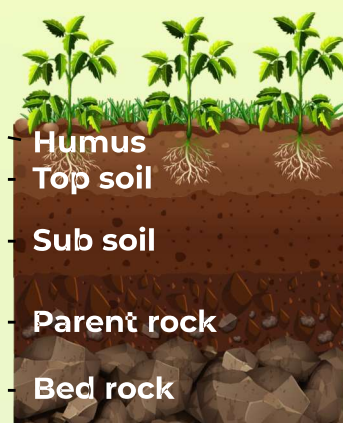
A change in temperature

NOTE

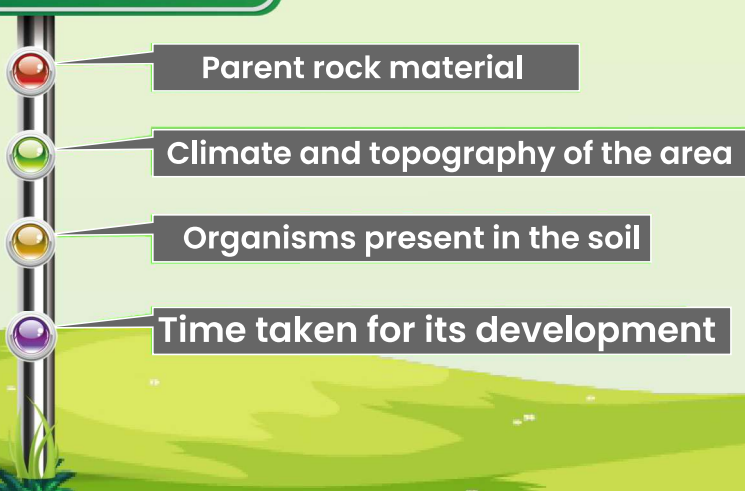
High concentration of DDT disturb calcium metabolism in birds, it causes thinning of egg shell and their premature breaking, it causes decline in bird populations.

Soil

- It forms the upper surface of the land and supports plant growth.
- The layer of unconsolidated particles derived from weathered rock, organic matter (humus), water and air.
- Soil is an important resource that decides the diversity of life in an area.
- The outermost layer of our Earth is called the crust and the minerals found in this layer supply a variety of nutrients to life forms.



FORMATION OF SOIL



Factors or processes for soil formation

The Sun-

-  The Sun heats up rocks during the day so that they expand.
-  At night, the rocks cool down and contract.
-  The unequal expansion and contraction in different parts of the rock results in the formation of cracks and ultimately rocks break up into smaller pieces.

NOTE

Loamy soil is the best soil for growing crops. It has high water holding capacity, high aeration and high root penetration.

Water-

-  Water helps in the formation of soil in two ways-
-  Firstly, water could get into the cracks in the rocks formed due to uneven heating by the Sun. If this water freezes, it will widen the cracks.
-  Secondly, fast flowing water carries big and small particles of rock downstream, causing breakdown of rock particles into smaller, finer particles through their abrasive effects.

Wind-

-  Strong winds also erode rocks down. They also carry sand from one place to the other like the water does.

Living organisms-

-  Also influence the formation of soil. While lichens grow on surface of rocks, they release certain substances that cause the rock surface to powder down and form a thin layer of soil. Likewise, small plants like moss and roots of big trees also break the rocks.

Components of soil: soil is a mixture

- It contains small particles of rocks that vary in size (sand > silt > clay)
- It contains bits of decayed living organisms which is called humus.
- Soil also contains various forms of microscopic life.
- It contains nutrients and availability of which depends on the rocks from which it was formed.
- It contains air and water.



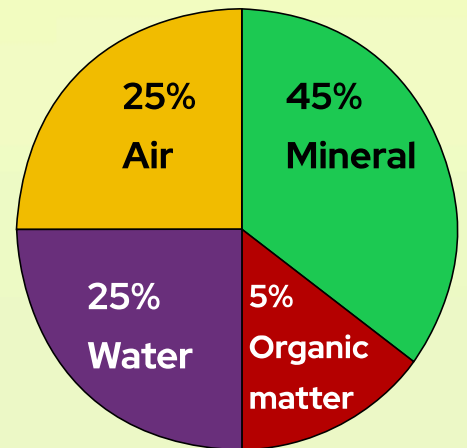
Sand



Silt



Clay



Top soil

- It is the topmost layer of the soil that contains humus and living organisms in addition to the soil particles.
- Humus is a major factor in deciding the soil structure because it causes the soil to become more porous and allows water and air to penetrate deep under the ground.
- The quality of the topsoil is an important factor that decides biodiversity in that area.

Soil pollution

- The removal of useful components from the soil and addition of other substances, which adversely affect the fertility of the soil and kill the diversity of organisms that live in it.



-  Use of large amounts of fertilizers and pesticides destroy the soil structure by killing soil microorganisms that recycle nutrients in the soil.
-  It kills the earthworms which are instrumental in making the rich humus thus affect the fertility of soil.

Soil erosion

-  The removal and thinning of the fertile top soil due to climatic and physical processes, such as high rainfall and wind etc.
-  Soil erosion occurs easily where the soil is not covered by vegetation.

Causes of soil erosion

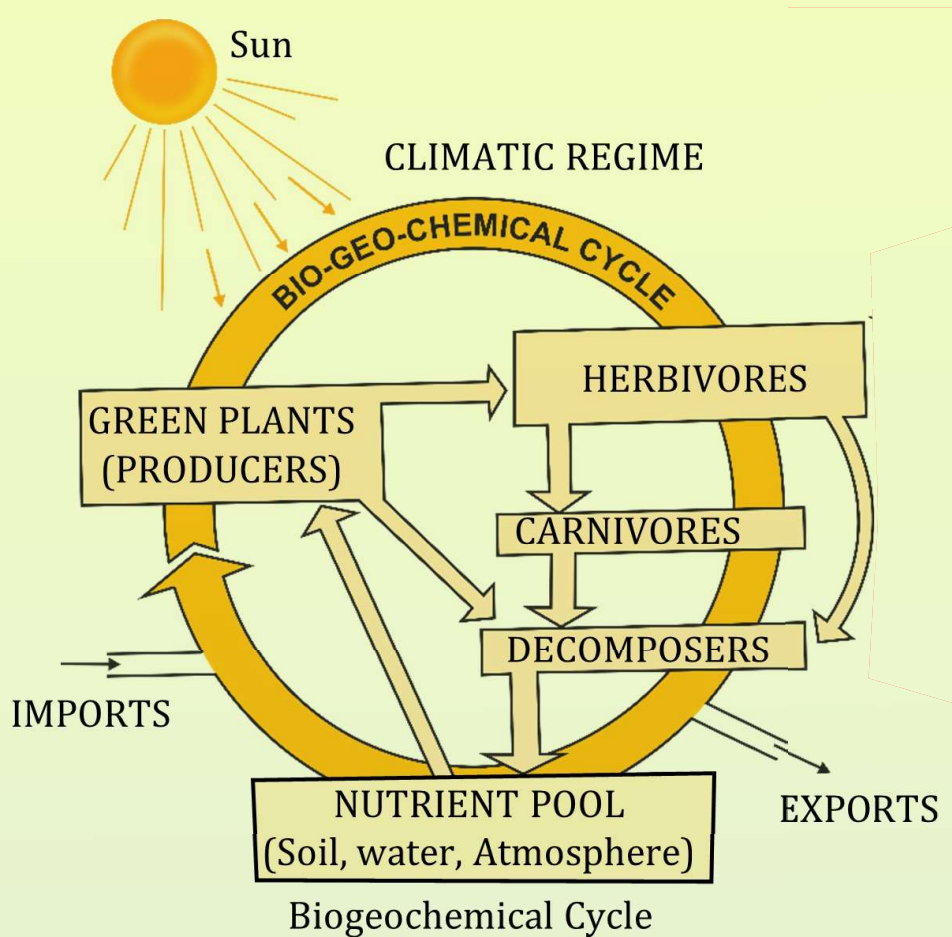
-  Wind
-  Rain
-  Improper farming or tilling and leaving the field fallow for long time
-  Frequent flooding of rivers which removes the top soil of the fields near the river banks.
-  Deforestation

Prevention of soil erosion by

-  Intensive cropping.
-  By providing proper drainage canals around the fields.
-  Soil erosion in hilly areas can be prevented by practicing terrace farming.
-  By planting trees and sowing grasses.
-  By constructing strong embankments along the river banks.

Biogeochemical cycles

- The cyclic flow of nutrients between non-living environment and living organisms is known as biogeochemical cycles.
- It is the process of transfer and circulation of the essential chemical nutrients such as Carbon, Hydrogen, Oxygen and Nitrogen in a biosphere.

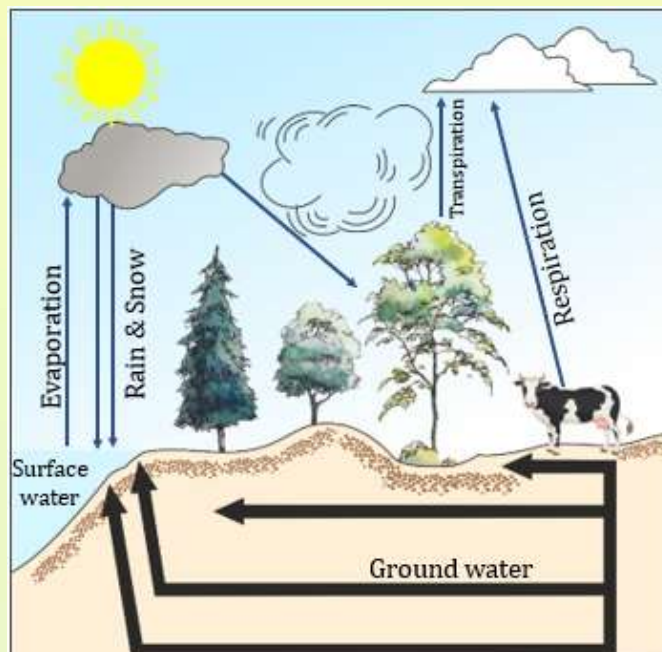


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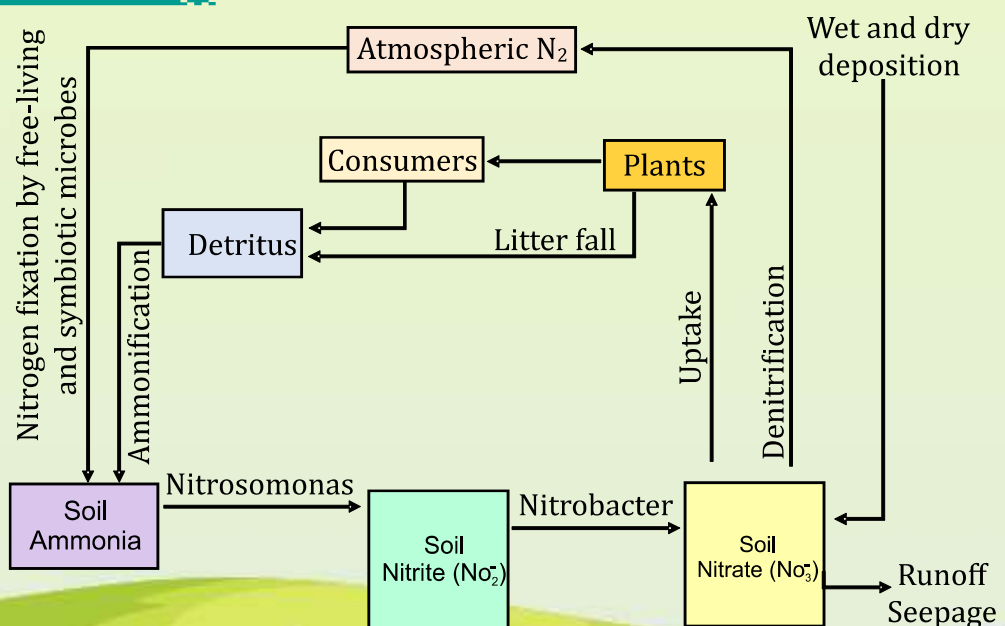
The term "Cycle" is used for the movement of matter and the term "Flow" is used for the movement of energy.

The water cycle

- Cells contain 70 to 90 percent water.
- More than 90 percent of the moisture passes through plants by transpiration and only 10 percent evaporates directly from surfaces.
- Three important processes in water cycle are evaporation, condensation and precipitation.



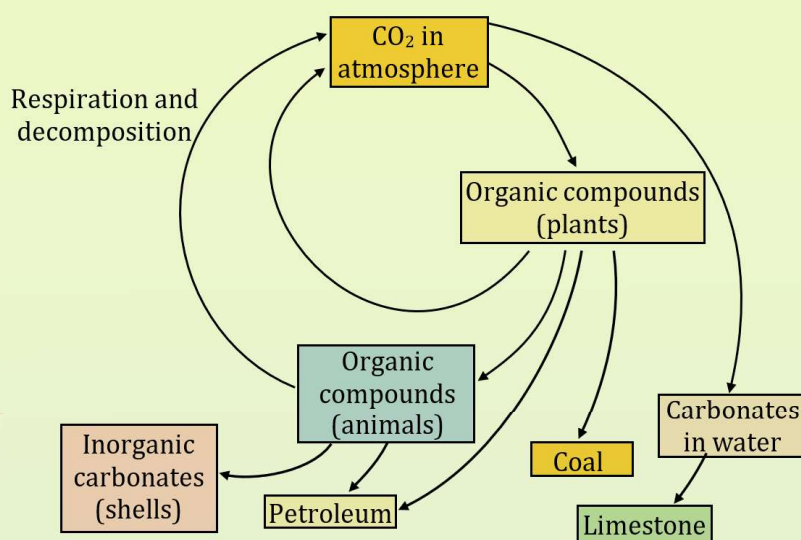
The Nitrogen cycle



-  **Nitrogen fixation** : To convert atmospheric nitrogen into usable form (nitrates, ammonium ions) which are soluble in water which is done by various N_2 fixing bacteria e.g. Rhizobium, blue green algae and bacterium Azotobacter.
-  **Ammonification** : Decomposing of complex & dead organic matter into ammonia which is done by micro-organisms living in the soil e.g. bacteria and fungi.
-  **Nitrification** : Conversion of ammonia into nitrites and then into nitrates which done by nitrifying bacteria e.g. Nitrosomonas and Nitrobacter.
-  **Denitrification** : Reducing nitrates present in the soil to release nitrogen gas back into atmosphere e.g. Pseudomonas.

The carbon cycle

-  Carbon is found in various forms on the Earth.
-  It occurs in the elemental form as diamond and graphite.



-  As carbon dioxide in the atmosphere.
-  As carbonate and hydrogen-carbonate salts in various minerals.
-  As dissolved carbonic acid and bicarbonates in water.
-  As fossil fuels like coal, petroleum and natural gas.

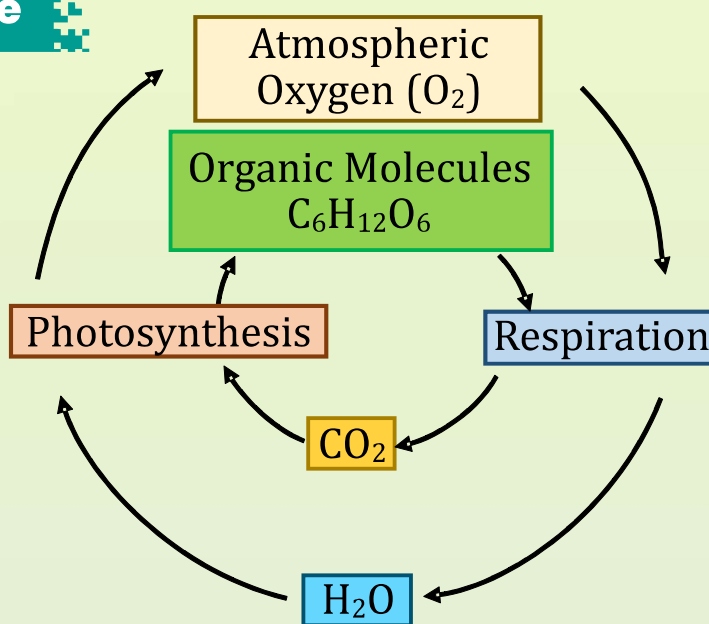
Carbon dioxide returns to the biosphere in the following ways:

-  Both plants and animals release carbon dioxide to the atmosphere as a product of respiration.
-  By decomposition of organic wastes and dead bodies by decomposers.
-  By burning of fossil fuels, like coal, and petroleum.
-  By forest fires.

The Green house effect

-  It is an effect occurring in the atmosphere because of the presence of certain gases (greenhouse gases) e.g. CO_2 , CH_4 , etc., that absorb infrared radiation and prevent the escape of heat from earth thereby increasing the temperature worldwide.
-  Thus, increase in carbon dioxide content in the atmosphere would cause more heat to be retained by the atmosphere leading to global warming.

The oxygen cycle



Oxygen cycle in nature

-  Oxygen constitutes about 21 percent of the atmospheric gases.
-  Oxygen is also present in combined forms such as carbon dioxide (CO_2) and water (H_2O).
-  In the earth's crust oxygen is found as the oxides of most metals and silicon and also as carbonate, sulphate, nitrate and other minerals.
-  Oxygen cycle maintains the level of oxygen in the atmosphere.
-  Oxygen from the atmosphere is used up in three processes, namely combustion, respiration and in the formation of oxides of nitrogen.
-  Oxygen is returned to the atmosphere in only one major process, i.e., photosynthesis. Green plants are a major source of oxygen in the atmosphere.

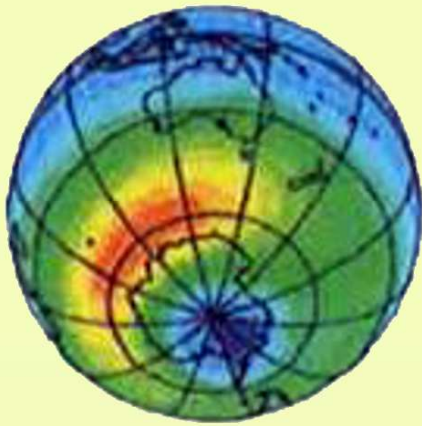
NOTE

Oxygen gas normally is the divalent molecule O_2 . Ozone, O_3 , is another form of pure oxygen.

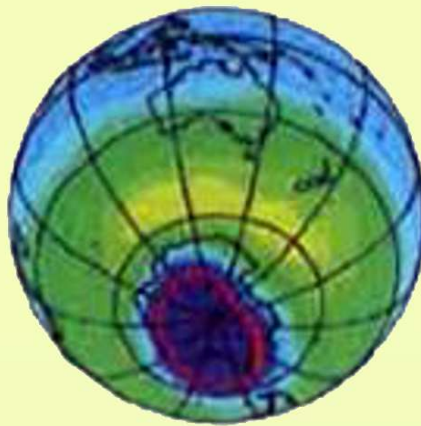
Ozone layer

This is a layer of ozone (O_3) present in the stratosphere of atmosphere surrounding the Earth. It protects the earth from harmful radiations like high energy ultraviolet radiations.

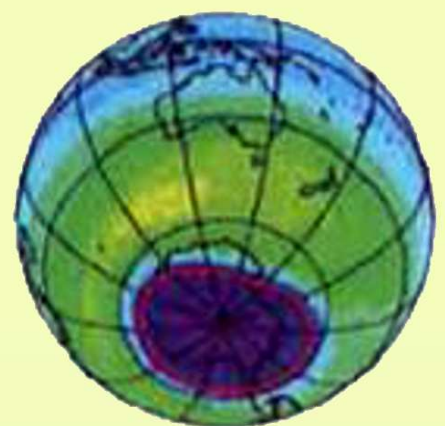
-  When the harmful chemicals like chlorofluorocarbons (CFC) (Carbon compounds having both fluorine and chlorine which are very stable and not degraded by any biological process) are released into the air, it accumulates in the upper atmosphere and reacts with ozone, resulting in reduction of the ozone layer by forming a hole.
-  Thus, the ozone layer in the atmosphere becomes thinner and gets depleted allowing more ultraviolet rays to pass through the earth.



October
1980



October
1985



October
1990

Satellite picture showing the hole (magenta colour) in the ozone layer over Antarctica.