

The Composition of the Earth

Composition of the Earth

The earth occupies a unique place among the planets in the solar system as it is the only planet which sustains life. The reasons for the existence of life are the availability of air, water and solar energy.

The area of the surface of the Earth is about 510 million square km and it is considered a very large system.

The earth system is composed of four sub systems.

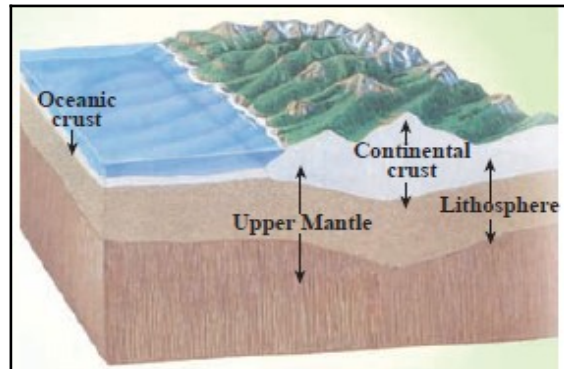


There is an interaction among these four sub-systems.



Lithosphere

Lithosphere is the layer that includes the Earth's crust and the upper mantle. Continents and oceans are located in the lithosphere.



The lithosphere consists of two parts according to its structure.

The lithosphere is the home for living beings. Most of the human activities occur here. The living and non living resources which are found in the lithosphere are utilized to fulfill human needs.

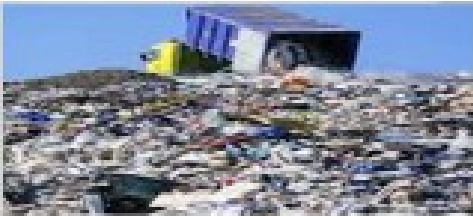
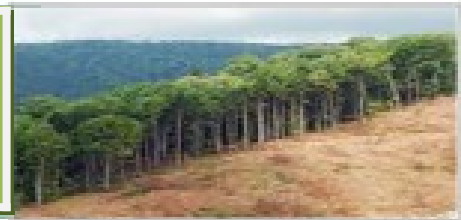


When the resources found in the lithosphere are utilized by man, the lithosphere is affected in various ways.



The occurrence of land degradation due to excavation of land to obtain mineral resources

Intensification of soil erosion as a result of exposure of land due to clearing of forests



Damage to certain layers of the lithosphere as a result of disposal of domestic and industrial waste



Changes seen in the surface landscape

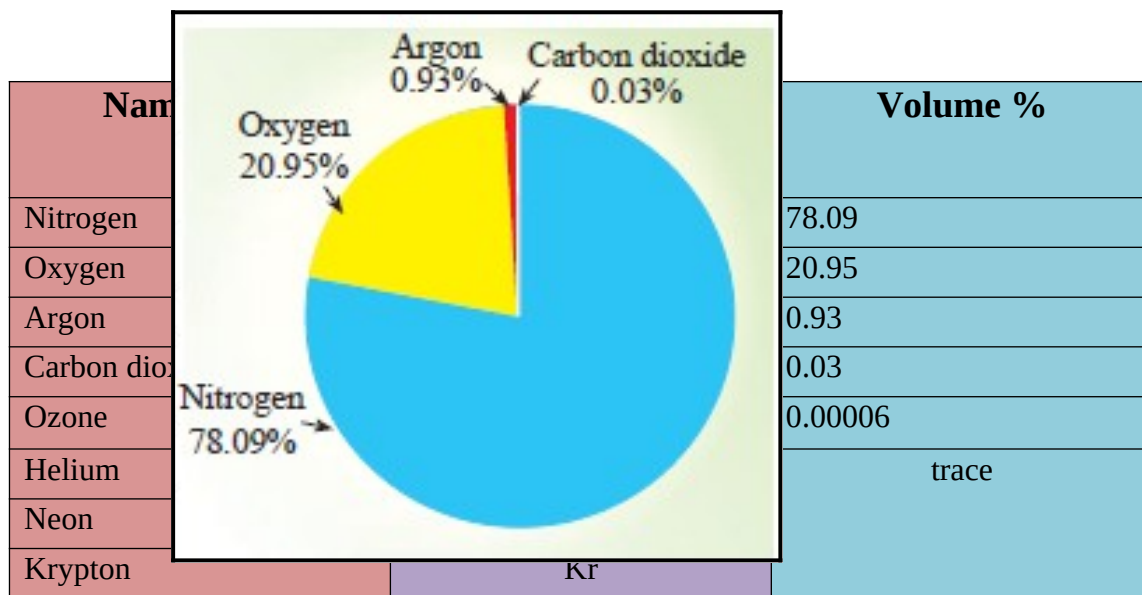
Changes in the ground water level



Atmosphere

- The atmosphere is the thin blanket of air around the earth that consists of various gases.
- The atmosphere is held by the earth due to its gravitational pull.
- The most important layer of the atmosphere is the area that extends up to 120km from the surface of the earth.
- 50% of the total air content of the atmosphere is present in the region that extends up to 5-6km from the earth’s surface.
- The atmosphere is immensely important for the existence of living beings and plant life as it provides oxygen for respiration of living beings and the necessary carbon dioxide for the process of photosynthesis.
- The atmosphere mainly consists of various gases and it also contains water vapour, dust and salt particles.

Composition of the atmosphere



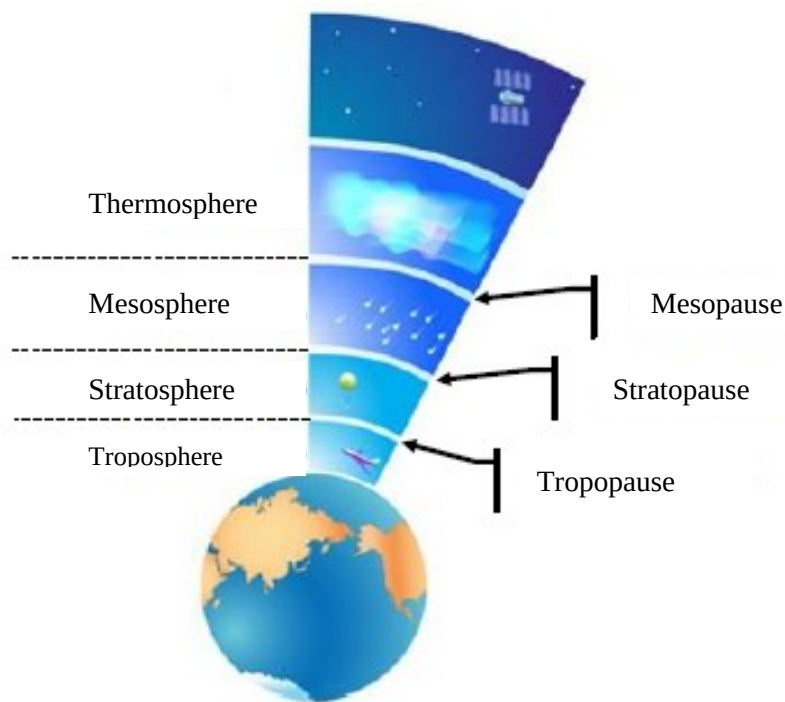
- **Reasons for the changes in the composition of the atmosphere**
 - Various human activities
 - Burning of fossil fuel. (in transportation and generation of energy)
 - Harmful smoke from factories.
 - Set fire to forests.
 - From agricultural fields.
 - Natural reasons
 - Volcanic eruptions.
 - Release of methane from marshes.
 - Wildfire.

- ❖ The gasses that added to the atmosphere causing the changes in the composition of the atmosphere.
 - Carbon dioxide
 - Methane
 - Carbon monoxide
 - Sulphur dioxide

Structure of the atmosphere

The atmosphere is divided into four main layers on the basis of change of the temperature with the altitude.

1. Troposphere
2. Stratosphere
3. Mesosphere
4. Thermosphere



Special characteristics of each layer of the atmosphere

Layer	Upper limit	Temperature	Characteristics
T R O P O S P H E R E	12km in equatorial regions	About 19°C	The temperature decreases with altitude. It is known as environmental lapse rate. The temperature decreases by 6.4°C for every 1000m.
	8km in polar regions		96% of the gases of the entire atmosphere is concentrated in this zone.
			All the atmospheric phenomena including precipitation, temperature, pressure, humidity, winds and formation of clouds occur within this layer.
			The processes that occur in the troposphere are very important for the existence of the biosphere.

			Normal aeroplanes fly in the area close to the upper boundary of the troposphere
Tropopause			The upper limit of the troposphere.
STRATOSPHERE	48-50km	About 25°C in the upper limit	The increase of temperature with the increase in altitude is a special characteristic in this layer.
			The ozone layer which is very important for the existence of the biosphere is located between 20-30 km of this layer
			The specific feature of the ozone layer is the absorption of the ultra-violet rays of the sun that are harmful to living beings.
			The location of the ozone layer influences the increase of temperature in this part.
			Most of the meteorites that fall towards the earth from space burn up and get destroyed within the stratosphere.
			Supersonic jets fly within the central region of this layer.
Stratopause			The upper boundary of the Stratosphere
MESOSPHERE	80km	About -90°C	The temperature decreases with the altitude.
			There is no water vapour, clouds and dust particles in this region.
			The lowest temperature of the atmosphere prevails in this region.
			Electric phenomena occur in abundance in this layer.
Mesopause			The upper boundary of the Mesosphere
THERMOSPHERE	120km	The temperature at noon is about 1100°C.	The temperature increases rapidly with the altitude.
			There is a high temperature in this layer.
			The difference between the temperature of day and night is at a higher level.
			The volume of gases is very low
			The upper boundary of the thermosphere is the upper boundary of the earth's atmosphere

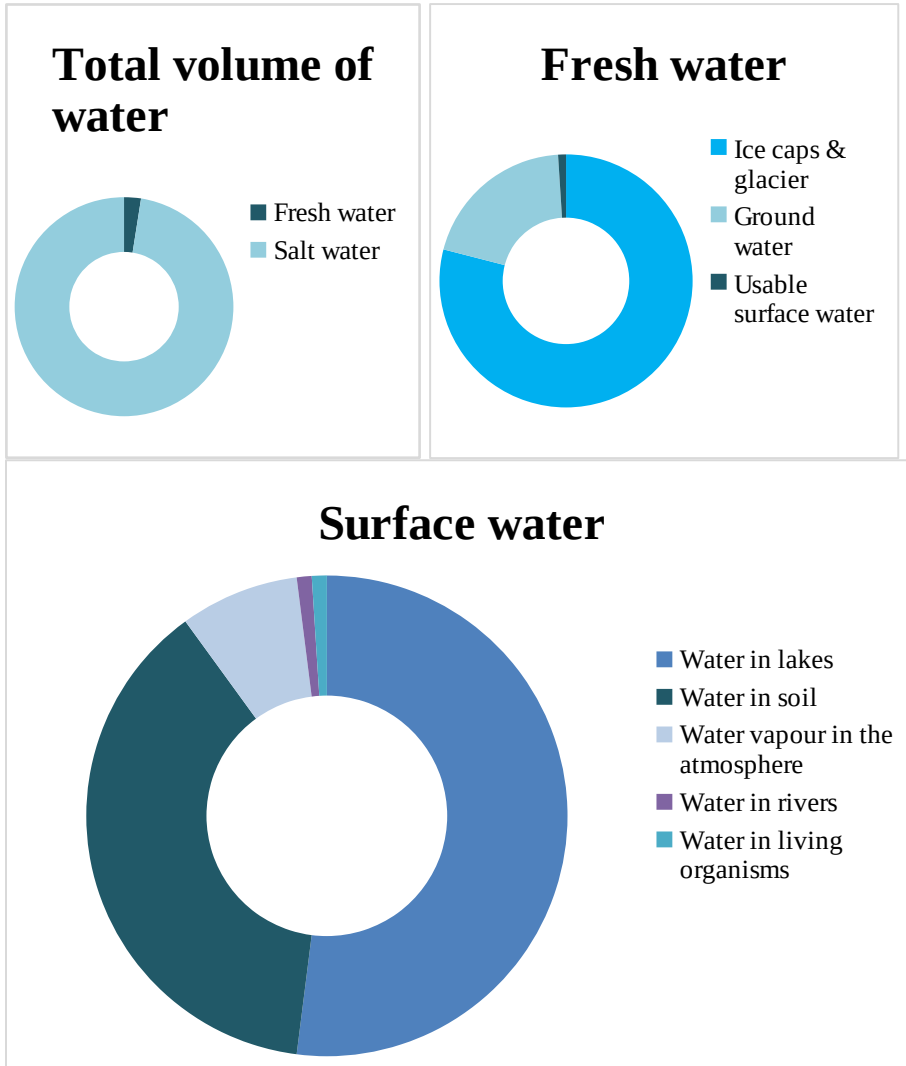
Hydrosphere

The entire body of water on the surface of the earth in various forms is termed the hydrosphere. The total volume of water on earth is calculated as 1386 million cubic kilometers (Environmental Geography 1996).

- o Water can be seen in different forms on earth.
 - As solid (ice) and liquid (water) in the lithosphere
 - As gaseous (water vapour) in the atmosphere
 - In the bodies of plants and animals
- Uses of water
 - o For the existence of bio systems.

- o For drinking purposes
- o For domestic activities
- o For agriculture
- o For various industries
- o As a mode of transportation

Distribution of water on the earth



The Water Cycle

The continuous process by which water is circulated throughout the earth and the atmosphere through evaporation, condensation, precipitation, and the transpiration of plants is known as the water cycle.

Formation of clouds

Condensation

Precipitation

Evaporation

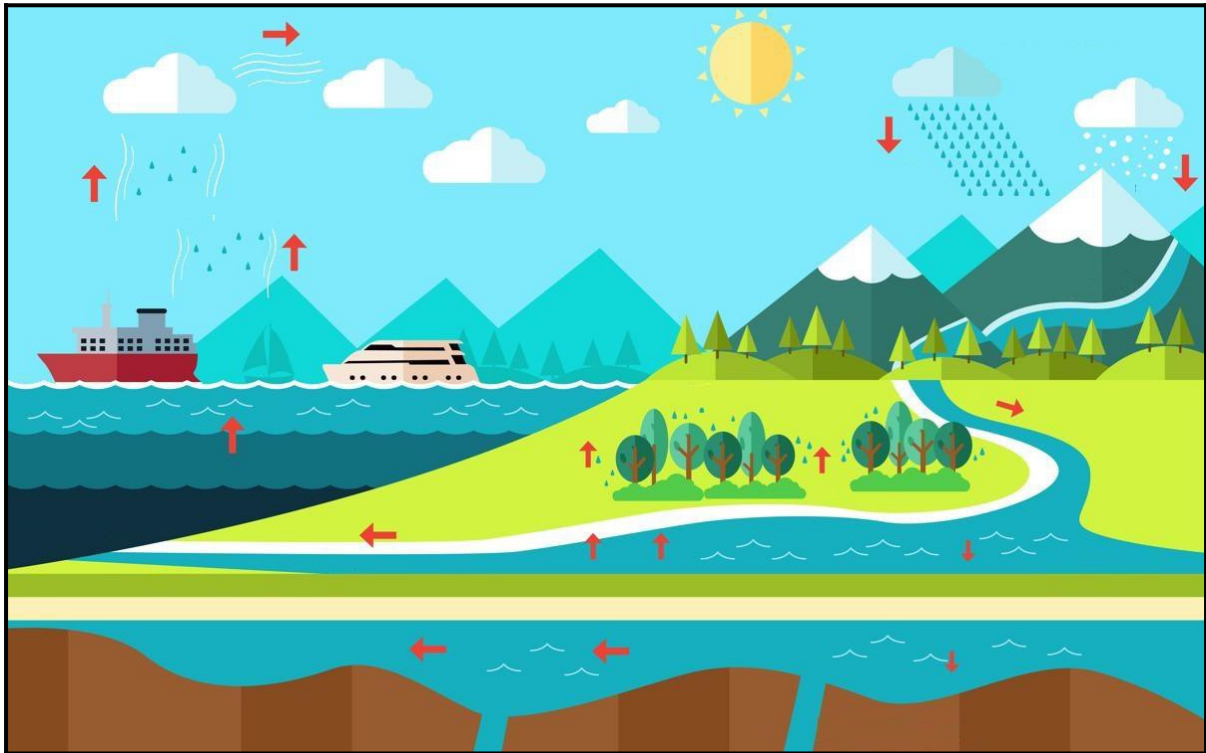
Transpiration

Ocean

Evaporation Ground water

Evaporation

Infiltration Surface runoff



- Evaporation-The atmosphere gets the water that is evaporated from the surface of the land and other water bodies due to the heat of the sunlight
- Transpiration- The release of water from plant leaves. Plants put down roots into the soil to draw water and nutrients up into the stems and leaves. Some of this water is returned to the air by this
- Condensation- The change of the state of water vapour from the gas phase into the liquid phase. Water vapour faces this situation due to the lapse rate in the troposphere.
- Precipitation-It is water released from clouds in the form of rain, freezing rain, sleet, snow or hail.
- Infiltration- The movement of water into the ground from the surface. Percolation is the movement of water past the soil going deep into the ground water.
- Surface runoff- A part of the precipitation flows over the landscape. Impervious areas cause excessive runoff

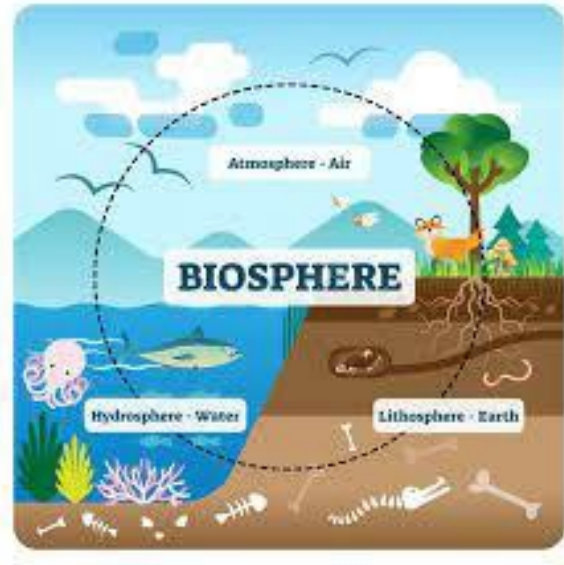
Water pollution

- Changes in the quality of water like transparency, odorless etc. is called pollution of water.

- At present, the quality of water is deteriorating due to the impact of various human activities and several natural reasons.
 - o Natural phenomena
 - * Occurrence of landslides.
 - * Due to floods
 - * Due to tsunami
 - * Due to droughts
 - o Human activities
 - * The mixing of fertilizers and chemicals added to soil in agricultural activities with the water.
 - * Irregular release of domestic waste
 - * Chemicals released by the industries
 - * Irregular disposal of sewage.
 - * Due to marine transportation and fishing industry
 - * Disposal of waste into water bodies

Biosphere

Biosphere is the constantly active sub-system of the geo-system. The environment within which all plants and animals live belongs to the biosphere.



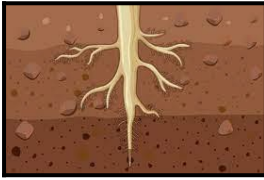
The existence of the biosphere depends on the interaction of the atmosphere, lithosphere, and hydrosphere with each other.

There are two factors that affect the processes in the biosphere.

There is a direct influence of non living factors towards the biosphere. Sun is the prime source of energy for all the processes in the biosphere. Non living components are essential for the existence of living components; however non living components are not depend on living components.

The boundaries of the biosphere

In the lithosphere
- The layer in which the root system of plants spreads and where soil organisms live (2.5 m within the soil approximately).



In the hydrosphere

- The ocean bed in which sufficient amount of sunlight penetrates for the process of photosynthesis.



In the atmosphere

- The limits where birds fly (Approximately about 5000 m in the upper sky).

"Every part of this earth is sacred to my people. Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing, and every humming insect is holy in the memory and experience of my people. The sap which courses through the trees carries the memories of the red man. So, when the Great Chief in Washington sends word that he wishes to buy our land, he asks much of us..."

"This we know: All things are connected. Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself. But we will consider your offer to go to the reservation you have for my people. We will live apart, and in peace...."

"If we agree, it will be to secure the reservation you have promised. There, perhaps, we may live out our brief days as we wish. When the last red man has vanished from the earth, and his memory is only the shadow of a cloud moving across the prairie, these shores and forests will still hold the spirits of my people. For they love this earth as the newborn loves its mother's heartbeat. So, if we sell our land, love it as we've loved it. Care for it as we have cared for it. Hold in your mind the memory of the land as it is when you take it. And preserve it for your children..."

- Chief Seattle

