# BIOGEOCHEMICAL CYCLE

**CARBON CYCLE, NITROGEN CYCLE, OXYGEN CYCLE, SULPHUR CYCLE**

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A **biochemical cycle, substance turnover** or **cycling of substances** is the transport and transformation of chemicals in ecosystems. These are strongly influenced by the unique hydrologic conditions in wetlands. These processes result in changes in the chemical forms of materials and also the movement of materials within wetlands. Energy flows through an ecosystem and is released as heat, but chemical elements are recycled. The ways in which an element or compound moves between its several biotic and a biotic forms and locations in the biosphere is called a **biogeochemical cycle**.

## Carbon Cycle

Any matter is called organic if it has carbon in it. Carbon is essential and is required to produce the molecules of nutrients such as carbohydrates, proteins, and fats. Plants use carbon dioxide and prepare food. Animals, in turn, consume plants. When plants and animals decompose, they release carbon dioxide.

4 steps of the carbon cycle

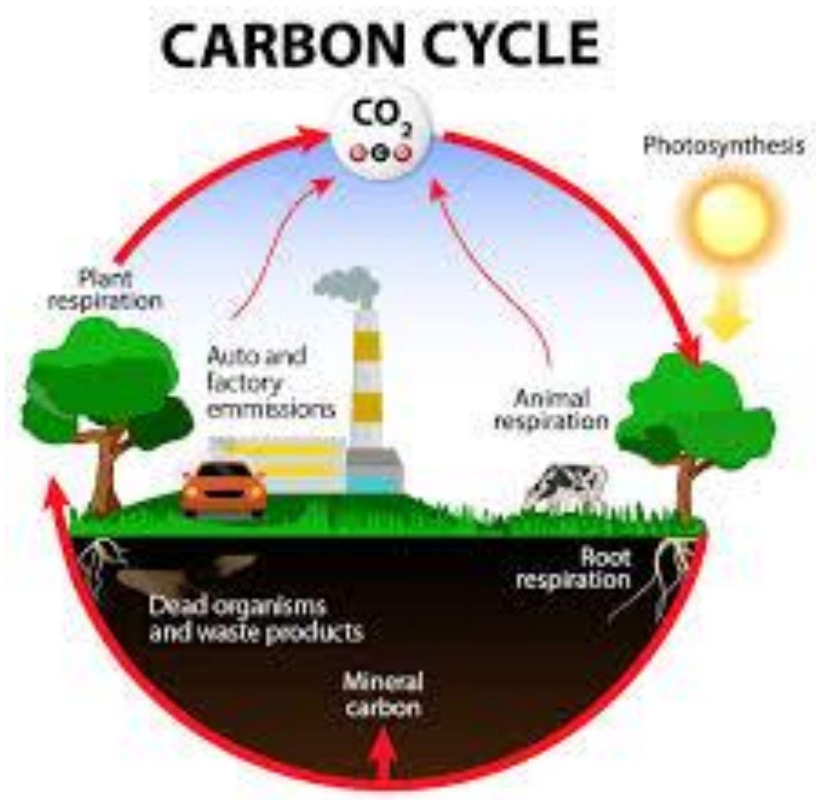
Photosynthesis

Decomposition

Respiration

Combustion.

Animals also release carbon dioxide during their respiration process. Carbon is also released when organic matter in burnt. In this way, carbon dioxide finds its way back to the atmosphere. This is again taken up by plants and the biogeochemical cycle continues

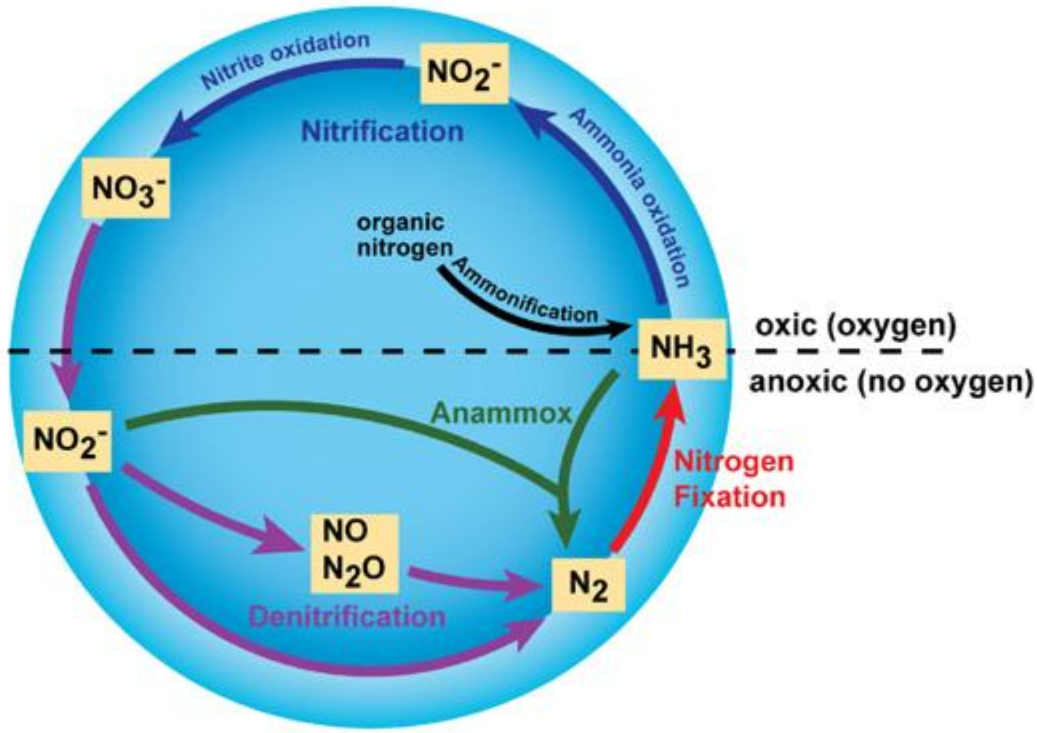


## Nitrogen Cycle

The **nitrogen cycle** is the biogeochemical **cycle** by which **nitrogen** is converted into multiple chemical forms as it circulates among atmosphere, terrestrial, and marine ecosystems. The conversion of **nitrogen** can be carried out through both biological and physical processes.

Nitrogen, or N, using its scientific abbreviation, is a colorless, odorless element. Nitrogen is in the soil under our feet, in the water we drink, and in the air we breathe. In fact, nitrogen is the most abundant element in Earth's atmosphere: approximately 78% of the atmosphere is nitrogen! Nitrogen is important to all living things, including us. It plays a key role in plant growth: too little nitrogen and plants cannot thrive, leading to low crop yields; but too much nitrogen can be toxic to plants.

Nitrogen is a very important element that is present in the genetic material – DNA and RNA. The nitrogen cycle is considered as the most complex of all biogeochemical cycles and it exists in nature in many forms. Nitrification, Denitrification, Nitrogen fixation etc. are all processes that are associated with the nitrogen cycle.




In conclusion, all these different biogeochemical cycles do not occur in isolation. The most important connecting link is the movement of water through the water cycle. The movement of water is very important for the discharge of phosphate and nitrogen into the various water bodies, including the oceans. The ocean is a major reservoir that holds carbon, another important element in the biogeochemical cycles.

## Oxygen Cycle

Oxygen cycle**,** circulation of oxygen in various forms through nature. Free in the air and dissolved in water, oxygen is second only to nitrogen in abundance among uncombined elements in the atmosphere. Plants and animals use oxygen to respire and return it to the air and water as carbon dioxide ($CO_2$). $CO_2$ is then taken up by algae and terrestrial green plants and converted into carbohydrates during the process of photosynthesis, oxygen being a by-product. The waters of the world are the main oxygen generators of the biosphere; their algae are estimated to replace about 90 percent of all oxygen used. Oxygen is involved to some degree in all the other biogeochemical cycles.

Oxygen cycle, along with the carbon cycle and nitrogen cycle plays an essential role in the existence of life on the earth. The oxygen cycle is a biological process which helps in maintaining the oxygen level by moving through three main spheres of the earth which are:

- Atmosphere
- Lithosphere
- Biosphere.

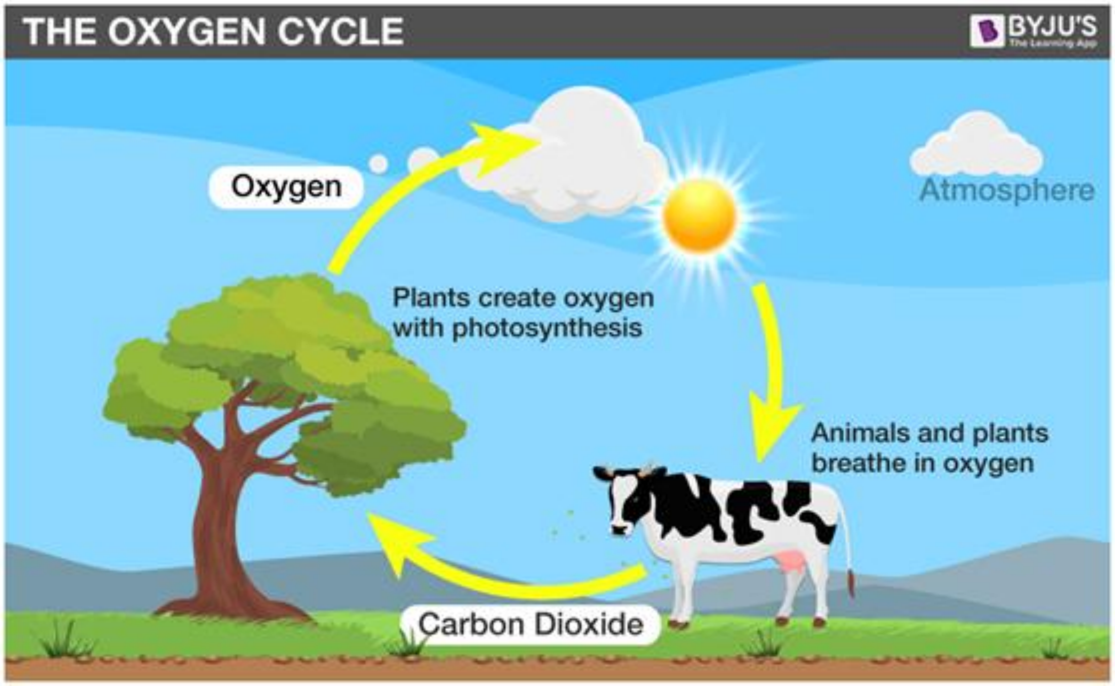
**Stages of the Oxygen Cycle**

The steps involved in the oxygen cycle are:

**Stage-1:** All green plants during the process of photosynthesis, release oxygen back into the atmosphere as a by-product.

**Stage-2:** All aerobic organisms use free oxygen for respiration.

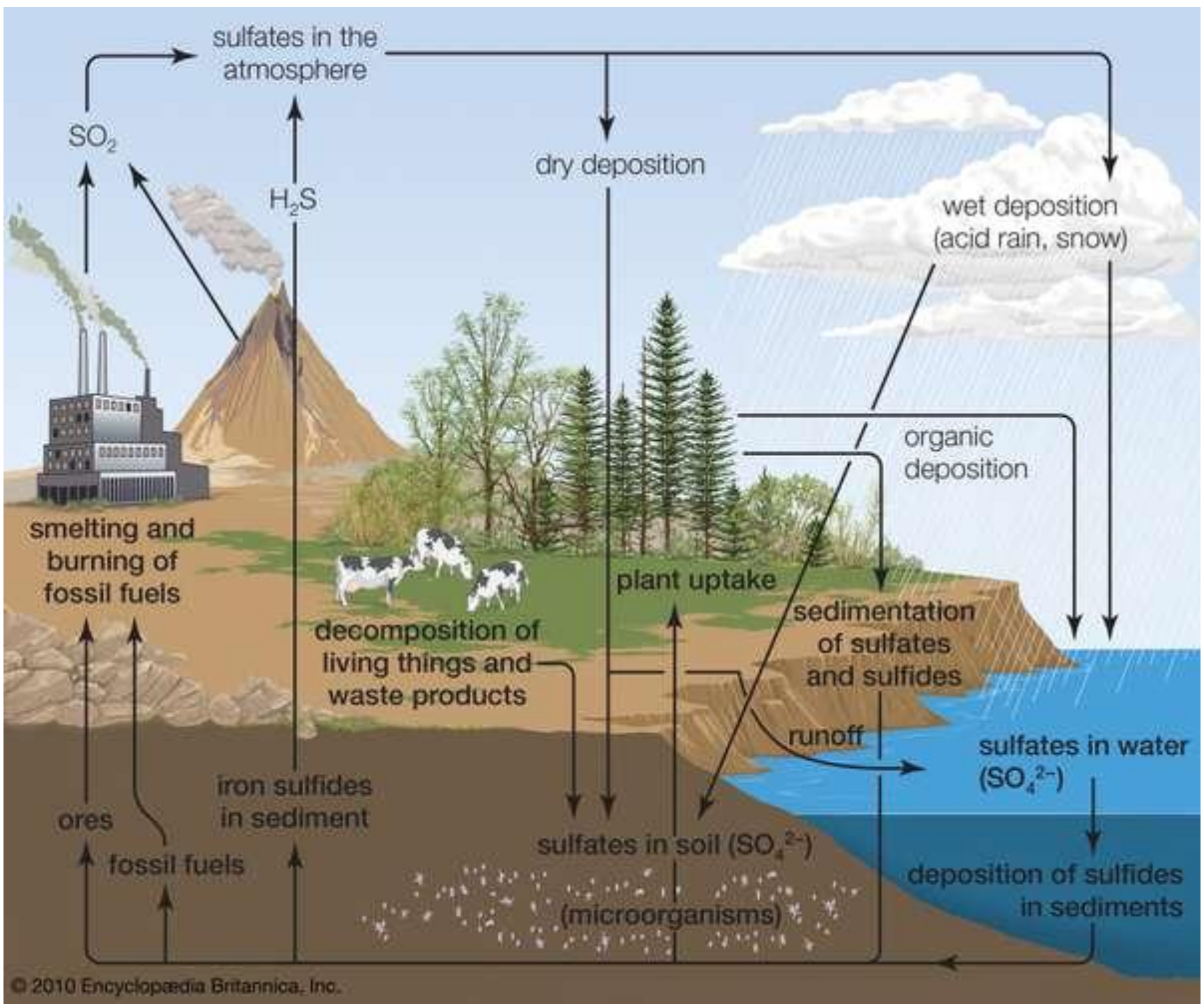
**Stage-3:** Animals exhale Carbon dioxide back into the atmosphere which is again used by the plants during photosynthesis. Now oxygen is balanced within the atmosphere




Oxygen is released by the plants during photosynthesis. Humans and other animals inhale the oxygen exhale carbon dioxide which is again taken in by the plants. They utilise this carbon dioxide in photosynthesis to produce oxygen, and the cycle continues.

**SULPHUR CYCLE**

Sulfur (S), the tenth most abundant element in the universe, is a brittle, yellow, tasteless, and odorless non-metallic element. It comprises many vitamins, proteins, and hormones that play critical roles in both climate and in the health of various ecosystems. The majority of the Earth's sulfur is stored underground in rocks and minerals, including as sulfate salts buried deep within ocean sediments. The sulfur cycle contains both atmospheric and terrestrial processes. Within the terrestrial portion, the cycle begins with the weathering of rocks, releasing the stored sulfur. The sulfur then comes into contact with air where it is converted into sulfate (SO4). The sulfate is taken up by plants and microorganisms and is converted into organic forms; animals then consume these organic forms through foods they eat, thereby moving the sulfur through the food chain. As organisms die and decompose, some of the sulfur is again released as a sulfate and some enters the tissues of microorganisms. There are also a variety of natural sources that emit sulfur directly into the atmosphere, including volcanic eruptions, the breakdown of organic matter in swamps and tidal flats, and the evaporation of water.



Major sulfur-producing sources include sedimentary rocks, which release hydrogen sulfide gas, and human sources, such as smelters and fossil-fuel combustion, both of which release sulfur dioxide into the atmosphere

Sulfur-containing proteins are degraded into their constituent amino acids by the action of a variety of soil organisms. The sulfur of the amino acids is converted to hydrogen sulfide ($H_2S$) by another series of soil microbes. In the presence of oxygen, $H_2S$ is converted to sulfur and then to sulfate by sulfur bacteria. Eventually the sulfate becomes $H_2S$. Hydrogen sulfide rapidly oxidizes to gases that dissolve in water to form sulfurous and sulfuric acids. These compounds contribute in large part to the “acid rain” that can kill sensitive aquatic organisms and damage marble monuments and stone buildings.