Department of biology

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((Ecology))

Stage (-3-)

LEC- ((7))

Ecosystem function– Biogeochemical cycles (cycling of nutrients in ecosystem)

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Ecosystem function– Biogeochemical cycles (cycling of nutrients in ecosystem)

In ecosystems flow of energy is linear but that of nutrients is cyclical. This is because energy flows downhill i.e. it is utilized or lost as heat as it flows forward .The nutrients on the other hand cycle from dead remains of organisms released back into the soil by detrivores which are absorbed again i.e. nutrient absorbed from soil by the root of green plants are passed on to herbivores and then carnivores. The nutrients locked in the dead remains of organisms and released back into the soil by detrivores and decomposers. This recycling of the nutrients is called **biogeochemical or nutrient cycle** (Bio = living, geo = rock chemical = element). There are more than 40 elements required for the various life processes by plants and animals. **The entire earth or biosphere is a closed system** i.e. nutrients are neither imported nor exported from the biosphere.

There are two important components of a biogeochemical cycle

1. Reservoir pool – atmosphere or rock, which stores large amounts of nutrients.

2. **Cycling pool or compartments of cycle-** There are three kinds of these cycles:

1- Hydrological cycle: deal with the cycling of water in ecosystem.

2- Gaseous cycle: deals with gases cycling in ecosystem, the living organisms have a main role in it with it environment such as carbon and nitrogen.

3- Sedimentary cycle: deals with chemical elements cycling in ecosystem, also living organisms are with a main role in it with its environment such as sulfur and Phosphorus.

You shall now learn about the bio-geo chemical cycles carbon , nitrogen and phosphor

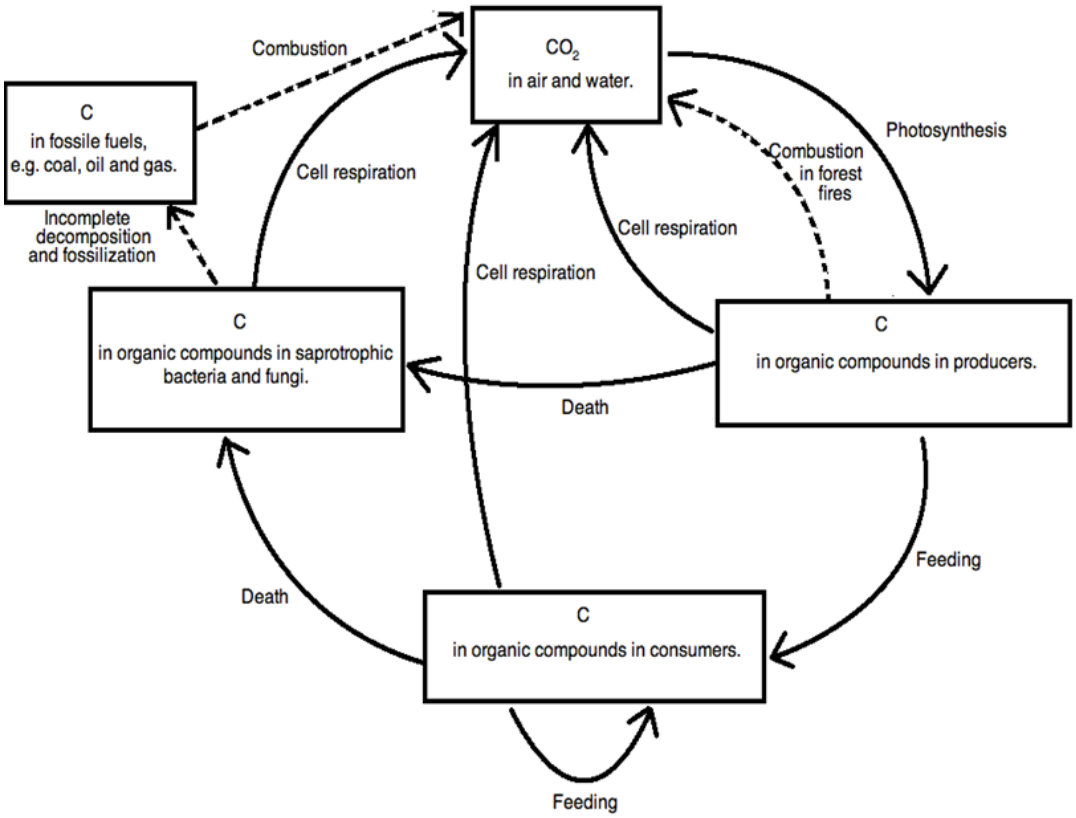
Gaseous cycles

Frist \\ Carbon cycle

The **carbon cycle** is the biogeochemical cycle by which carbon is exchanged among the biosphere, pedosphere, geosphere, hydrosphere, and atmosphere of the Earth. The source of all carbon is carbon dioxide present in the atmosphere. It is highly soluble in water; therefore, oceans also contain large quantities of dissolved carbon dioxide. The global carbon cycle consists of following steps-

• Photosynthesis

Green plants in the presence of sunlight utilize CO2 in the process of photosynthesis and convert the inorganic carbon into organic matter (food) and release oxygen. A part of the food made through photosynthesis is used by plants for their own metabolism and the rest is stored as their biomass which is available to various herbivores, heterotrophs, including human beings and microorganisms as food. Annually 4-9 $x10^{13}$ kg of CO2 is fixed by green plants of the entire biosphere. Forests acts as reservoirs of CO2 as carbon fixed by the trees remain stored in them for long due to their long life cycles. A very large amount of CO2 is released through forest fires.



• Respiration

Respiration is carried out by all living organisms. It is a metabolic process where food is oxidized to liberate energy, CO2 and water. The energy released from respiration is used for carrying out life processes by living organism (plants, animals, decomposers etc.).

Thus CO2 is released into of the atmosphere through this process.

• Decomposition

All the food assimilated by animals or synthesized by plant is not metabolized by them completely. A major part is retained by them as their own biomass which becomes available to decomposers on their death. The dead organic matter is decomposed by microorganisms and CO2 is released into the atmosphere by decomposers.

• Combustion

Burning of biomass releases carbon dioxide into the atmosphere.

Impact of human activities

The global carbon cycle has been increasingly disturbed by human activities particularly since the beginning of industrial revolution . Large scale deforestation and ever growing consumption of fossil fuels by growing numbers of industries, power plants and automobiles are primarily responsible for increasing emission of carbon dioxide.

Carbon dioxide has been continuously increasing in the atmosphere due to human activities such as industrialization, urbanization and increasing use and number of automobiles. This is leading to increase concentration of CO2 in the atmosphere, which is a major cause of global warming.