

SULPHUR CYCLE

- * Sulfate (SO_4) is principle biologically available form, it is reduced by autotrophe and incorporated into protein as it is an essential constituent of certain amino acid.

Note: Sulfur containing amino acids:-

Methionine

Cysteine

homocysteine

taurine.

- * Neither it is limiting factor to a plant ^{& animals} nor it is required in quantities like ~~so~~ nitrogen and phosphorus. But, it is the key one in of the general ~~production~~ pattern of production and decomposition.

e.g. when iron-sulfides are formed in sediment phosphorus is converted from an insoluble to a soluble form, and thus enters the pool available living organisms.

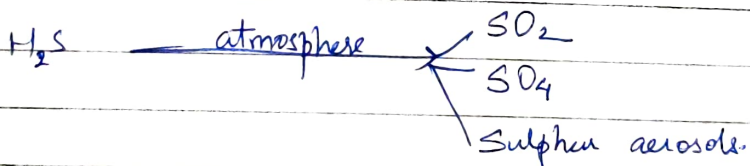
This is an illustration that how one cycle regulates the another.

- * Recovery of phosphorus as part of sulfur cycle is most pronounced in the anaerobic sediments of wetlands which are also important sites for the recycling of

carbon and nitrogen.

Lithosphere }
 Atmosphere } These three involved in
 Ocean } cycling of sulfur.

- * The microbially driven process in deep anaerobic zones in soils and sediments results from the upward movement of gaseous hydrogen sulfide (H_2S) in land and wetland ecosystems.
- * The decomposition of proteins also lead to production of hydrogen sulfide (H_2S).
- * Once in the atmosphere, this gaseous phase (H_2S) is converted to other forms, principally sulfur dioxide (SO_2), sulfate (SO_4) and sulfur aerosols (very fine floating particles of SO_4).



- * The sulfur aerosols, reflect sunlight back to the sky (unlike CO_2), thereby contributing to global cooling.
- * These aerosols also contribute to the acid rain.

Effect of air - pollution :-

Both the nitrogen and sulfur cycles are increasingly being affected by industrial air - pollution.

- * The gaseous oxides of sulfur are toxic to varying degrees. Normally they are transitory step in the cycle and in most of the environment, they are present in very low concentrations.

↓

So harm is managed.

Now a days, the combustion of fossil fuels, however, has greatly increased, the concentration of these volatile oxides in the air, specially in urban areas and in the vicinity of power plants, to the point where they adversely affects important biotic components and processes of ecosystems.

- * When plants, fish, birds or microbes are poisoned, human eventually are also adversely affected.
- * These oxides constitute about $\frac{1}{3}$ rd of industrial pollutants on an average.

* Sources: -

Coal-burning emissions and automobile exhaust are major sources of SO_2 and SO_x , emission production and, along with other industrial combustion a major source of poisonous forms of nitrogen.

- * SO_2 (sulfur dioxide) is damaging to photosynthesis also. The destruction of vegetation around copper smelters is largely caused by SO_2 .
- * Both sulfur and nitric oxides interact with water vapour to produce droplets (aerosols) of dilute sulfuric

and nitric acid (H_2SO_4 and HNO_3) that fall in earth as acid rain.

* Acid rain has great impact on soft-water lakes or streams and already acidic soil that lack pH buffers.

Note: pH buffers. Carbonates, calcium salts and other bases.

* The increase in acidity in lakes lead to be made the incapable of supporting fish.

* Building of tall ~~stack~~ smokestacks for coal burning power has increased the problem because longer the ox remain in cloud layers, the more acid is formed. This is typical example of "quick fix" that produce more severe long term problem (local fallout extended to regional fallout).

The long term solution is to gasify or liquefy coal, thereby eliminating the emissions entirely.

