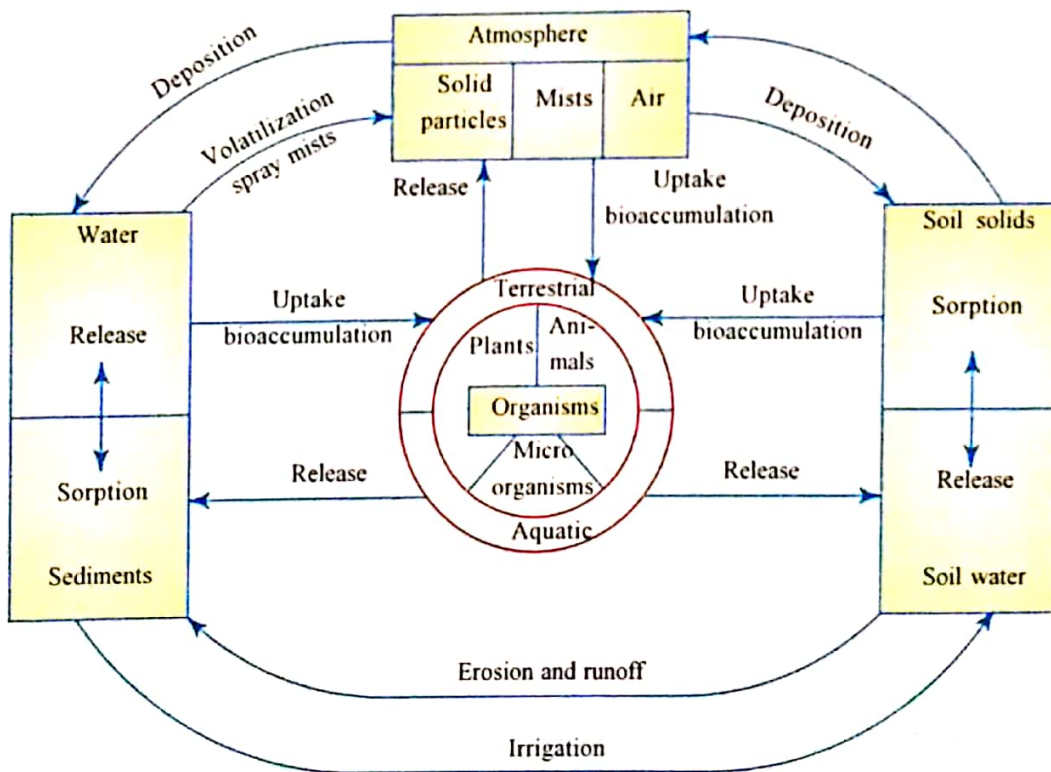


WATER POLLUTION

The quality of water is of vital concern for mankind since it is directly linked with human welfare. It is a matter of history that faecal pollution of drinking water caused water-borne diseases which wiped out entire populations of cities. At present, the menace of water-borne diseases and epidemics still looms large on the horizons of developing countries. Polluted water is the culprit in all such cases. The major sources of water pollution are domestic waste from urban and rural areas, and industrial wastes which are discharged into natural waterbodies.

Generally speaking, water pollution is a state of deviation from the pure condition, whereby its normal function and properties are affected. It has been mentioned before (Ch. 3) that a knowledge of aquatic environmental chemistry is the key to the understanding of water pollution and its control. Water pollution can be best considered in the perspective of possible pollutant cycles throughout the environment. Figure 12.1 illustrates the major routes of pollutant interchange among the biotic, terrestrial, atmospheric and aquatic environments.



The signs of water pollution are obvious to all:

- Bad taste of drinking water
- Offensive odours from lakes, rivers and ocean beaches
- Unchecked growth of aquatic weeds in waterbodies
- Decrease in number of fish in freshwater, river water, sea water
- Oil and grease floating on water surfaces

These disturb the normal uses of water for public water supply:

- Recreation and aesthetics
- Fish, other aquatic life and wildlife
- Agriculture
- Industry

WATER POLLUTANTS

The impurities that occur in natural water can be classified into three groups, according to their physico-chemical properties.

(a) These are substances which completely dissolve in water. They are present in water as separate molecule or ions. This water can not be distinguished from absolutely pure water. The presence of impurities can only be detected by chemical analysis or organoleptically (by taste). Natural water may contain solution of many gases such as O_2 , N_2 , CO_2 , H_2S and others, soluble salts of Na, K, Ca, NH_4 , Mg, Al, Fe, and Mn etc. Industrial sewage pollutes water with salts of heavy metals such as Cu, Pb, Mg, Cd, Hg etc and with various organic substances, such as phenols, formaldehyde, etc. Dissolved impurities are not retained by sand, paper or any other common filter.

(b) Impurities belonging to this group form colloidal systems with water. The particles of these impurities consist of aggregated molecules. For example, soap particles in water consist of about 50 molecules. Colloidal systems are formed from substances almost insoluble in a given liquid. The colloidal particles are so small that these fine particles are not retained by sand in settling tanks or by filter papers. They are held by membranes of collodion. Substances of mineral origin, such as SiO_2 , $Al(OH)_3$, $Fe(OH)_3$ and organic substances such as humins or fulvic acid, can be contained in water in the colloidal state. The presence of these substances may colour water from yellow to brown.

(c) This group of pollutants form suspensions in water. These are particles of sand, clay and organic matter, which are washed off from the soil by rain water, thawing snow and ice, and other runoff.

It should be noted that :

- (a) *The term pollution is also derived from the Latin word pollutus (pol means before and lutus means wash). Before washing, water contains impurities and hence the term water pollution is used to indicate an act of contamination or making foul the natural water bodies such as rivers, wells, lakes, seas, streams etc.*
- (b) *There is a difference between pollution of water and contamination of water. Pollution is the general term, which also includes contamination. Contamination is the specific term used to indicate pollution. Contamination makes water totally unfit for the best use, e.g. drinking. Contamination makes water unsafe and unreliable for use.*
- (c) *The polluted water is objectionable to the human senses of sight, odour, feel and taste, but contaminated water is not expected to be apparently objectionable.*
- (d) *Coloured water, saline water, offensive smelling water, oily and greasy water, water containing floating bodies etc. are the examples of water pollution. Water containing harmful pathogenic bacteria is an example of water contamination.*
- (e) *Pollution causes undesirable changes and also threatens the land, water, air and outer space environment.*
- (f) *The sum total of all the available water on the surface of Earth is called hydrosphere.*
- (g) *The arrangement for properly organising the hydrosphere in order to avoid water crises in future is called water management.*
- (h) *The most important industries which are responsible for water pollution in India are chemicals and pharmaceuticals, pulp and paper, sugar, distilleries, textiles, tanneries,*

steel mills, oil refineries etc.

- (i) *The catchment area, distribution system, oily and radioactive wastes, water supply sources, storage reservoir etc. are other sources of water pollution.*