

1- Water Pollution

Addition or presence of unwanted substances in water is called water pollution.

2- Sources of water pollution

Water pollution is the major source of water born diseases and other health problems.

A. **Sediments** brought by runoff water from agricultural fields and discharge of untreated or partially treated sewage and industrial effluents, disposal of fly ash or solid waste into or close to a water body cause severe problems of water pollution.

water pollution leads to increase of water turbidity because of sediments reduces penetration of light in water that reduces photosynthesis by aquatic plants.

B. **Pollution due to pesticides and inorganic chemicals.**


Pesticides like DDT, metals like lead, zinc, arsenic, copper, mercury and cadmium, Oil. Pollution of water bodies by **mercury** causes Minamata disease in humans and killed fishes.

Minamata disease is a neurological disease caused by severe mercury poisoning. Signs and symptoms include ataxia, numbness in the hands and feet, general muscle weakness, loss of peripheral vision, and damage to hearing and speech. Minamata disease was first discovered in the city of Minamata, Kumamoto Prefecture, Japan, in 1956, hence its name. It was caused by the release of methylmercury in the industrial wastewater from a chemical factory.



Minamata disease

Cadmium poisoning causes Itai–Itai disease. Itai-itai disease is characterised by osteomalacia with severe bone pain and is associated with renal tubular dysfunction.



Did you know?

Itai-Itai disease was documented in case of mass Cadmium poisoning in Toyama Prefecture, Japan starting around 1912. Cadmium was released into rivers by mining companies. The Cd poisoning caused softening of bones and kidney failure [27]. The mining companies were successfully sued for the damage.

Itai–Itai disease

C. Thermal pollution

Power plants- thermal and nuclear, chemical and other industries use lot of water (about 30 % of water) for cooling purposes and the used hot water is discharged into rivers, streams or oceans.



Thermal pollution

Discharge of hot water in water body affects feeding in fishes, increases their metabolism and affects their growth. Their swimming efficiency declines. Running away from predators or chasing prey becomes difficult. Their resistance to diseases and parasites decreases. Due to thermal pollution biological diversity is reduced. One of the best methods of reducing thermal pollution is to store the hot water in cooling ponds, allow the water to cool before releasing into any receiving water body.

3- Ground water pollution

Human activities such as sewage disposal, dumping of farm yard manures and agricultural chemicals, industrial effluents are causing pollution of ground water.

4- Eutrophication

Eu' means well or healthy and 'trophy' means nutrition. The enrichment of water bodies with nutrients causes eutrophication of the water body.

Discharge of domestic waste, agricultural surface runoff, land drainage and industrial effluents in a water body leads to rapid nutrients enrichment in a water body. The excessive nutrient enrichment in a water body encourages the growth of algae duckweed, water hyacinth, phytoplankton and other aquatic plants.



Eutrophication is the process by which an entire body of water, or parts of it, becomes progressively enriched with minerals and nutrients, particularly nitrogen and phosphorus. It has also been defined as "nutrient-induced increase in phytoplankton productivity.

The biological demand for oxygen (BOD) increases with the increase in aquatic organisms. As more plants grow and die, the dead and decaying plants and organic matter acted upon by heterotrophic protozoans and bacteria, deplete the water of dissolved oxygen (DO).

5- Control of water pollution

The following measures can be adopted to control water pollution:

- (a) The water requirement and the quantity of waste water discharge should be minimized.
- (b) Water should be reused with or without treatment.
- (c) Recycling of water after treatment should be practiced to the maximum extent possible.

A- Treatment of waste water or sewage

Waste water from domestic or industrial sources or from garbage dumps is generally known as sewage. It may also contain rain water and surface runoff. The sewage water can be treated to make it safe for disposal into water bodies like rivers, lakes etc. This treatment of waste water or sewage is carried out in **effluent treatment plants** especially built for this purpose. The treatment involves three stages: **primary, secondary and tertiary**. This includes **1.sedimentation, 2. coagulation/flocculation, 3.filtration, 4.disinfection, 5.softening and 6.aeration**. **The first four steps** are of primary treatment. The first three steps are involved in **primary treatment** remove suspended particulate matter. **Secondary treatment** removes organic solids, left out after primary treatment, through their microbial decomposition. Effluents after secondary treatment may be clean but contain large amounts of nitrogen, in form of ammonia, nitrates and phosphorous which can cause problem of eutrophication upon their discharge into a receiving water body such as river, lake or pond. The **tertiary treatment** is meant to remove nutrients, disinfect for removing pathogenic bacteria, and aeration removes hydrogen sulphide and reduce the amount of carbon dioxide and make water healthy and fit for aquatic organisms. The residue obtained from primary treatment one known as sludge.

<https://www.youtube.com/watch?v=tpRsA7DJ-JI>

B- Water recycling

With increasing population the requirement for water is increasing rapidly. However, the availability of water is limited but an ever increasing water withdrawal from different sources such as rivers, lakes and ground water is depleting these sources and deteriorating their water quality. Therefore, it is essential to use the available water with maximum budget. This involves recycling of waste water for certain uses with or without treatment. Recycling refers to the use of waste-water by the original user prior to the discharge either to a treatment system or to a receiving water body. Thus the waste water is recovered and repetitively recycled with or without treatment by the same user.