

WATER POLLUTION

Water pollution is defined as addition of organic, inorganic biological or radioactive substances to water thus making it unsuitable for its designated use.

Sources of Water Pollution

There are two types of sources of water pollution:

- **Point sources:** Point sources are those sources which discharge pollutants through pipes, sewers (sewerage system). For example, the factories situated close to river bank after some treatment discharge their pollutants in the rivers, because the source and type of pollutant is known, these pollutants can be easily treated.
- **Non Point Sources:** All pollutants scattered on the ground which makes its way into the water pollution. For example surface run off containing fertilizers and pesticides fall in this category of pollutants.

Causes of water Pollutants:

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- **Disease Causing (Pathogens) Waste:** Bacteria, Virus, Protozoans and other parasitic organisms which enter the water through domestic sewage are capable of causing diseases and spread large number of diseases like typhoid, jaundice, cholera, diarrhoea.
- **Organic Wastes:** Various domestic and industrial units contribute to a variety of organic wastes. Petroleum refineries, food processing units, dairy farms, slaughter houses detergents, oil, plastics are some of the organic wastes which have a threat on aquatic life.
- **Inorganic Wastes from Industries:** Number of acids, salts, dyes, compounds of toxic substances like cadmium, lead, zinc, mercury, arsenic are released from industrial units.
- **Agricultural Wastes:** Agrochemicals like fertilizer containing nitrates and phosphates, pesticides, insecticides enter the water body along with surface run off.
- **Radioactive Wastes:** Any fool proof method of disposal of radioactive wastes has not been found out. These are just dumped in the seas in sealed containers. Any leakage would have a large scale negative impact on life. These wastes can accumulate in high concentration as these pass through various food chains.
- **Suspended Particles Waste:** Along with rain surface runoff and rain large number of suspended particles containing silt, soil, sand are brought into water where they start settling.
- **Heat:** water bodies are used as coolants for various industrial units, thus causing an increase in temperature of the water body. Increased temperature lowers the dissolved oxygen thus posing a problem for aquatic animals sensitive to change on temperature and oxygen level.

Effects of Water Pollution

Certain effects of water pollution are:

- **Pathogens:** All the pathogenic organisms which enter the water body are capable of causing a variety of diseases like cholera, typhoid, dysentery, diarrhoea etc.
- **Agrochemicals :** Fertilizers detergents containing nitrate and phosphate are the major pollutants of a water body. When these nutrients enter the water, accelerate the growth of algae called as 'algal blooming'. This excess algal growth consumes oxygen and since these algae have a short

life cycle, their death and decomposition further deplete the oxygen levels a process called as Eutrophication. This results in creation of anaerobic conditions and release of foul gases resulting in killing of other aquatic animals.

- **Nitrates:** when present in excess in drinking water cause blue baby syndrome or methaemoglobinemia where haemoglobin converts into non functional oxidized form.
- **Toxic Compounds from Industries:** Industrial waste generated, contain many toxic materials like arsenic mercury, cadmium, lead, zinc, copper, etc. These toxic materials can cause a variety of diseases

These toxic materials concentration increases at each trophic level called as biomagnification or bioaccumulation. For example river water may have very little concentration of DDT but fishes and birds feeding on lower organisms have high concentration of DDT that it becomes unfit for human consumption.

- **Oxygen Consuming Wastes:** Organic waste which when enters the water body, gets decomposed by micro organisms present in water and their decomposition lowers the dissolved oxygen present in water. This lowered dissolved oxygen (DO) is harmful for the sensitive aquatic organisms. Fishes like trout and salmon require a DO of 5-8 mg/L DO for their survival and reduction in DO may replace these fishes by less desirable varieties like carps which require 3.0 mg/L DO for their survival.
- **Sediments:** All the suspended particles which make their way in water cause a increase of turbidity. Turbidity lessens the amount of sunlight coming the water thus reducing the efficiency of photosynthesis leading to disturbance in food chains and food webs.
- **Oil:** Oil from oil spills find its way into a water body and oil being immiscible with water, forms a layer on the water surface. Oil uses oxygen for its decomposition thus reducing the growth of phytoplankton and effecting the entire food chain.

Control of Water Pollution

Water pollution can be controlled by:

- Taking bath and washing clothes directly in ponds, tanks and streams should be avoided.
- Use of legumes or other nitrogen fixing plants should be promoted to reduce the amount of inorganic fertilizers added to soil.
- Bio pesticides should be used to reduce reliance on pesticides.
- Rational and limited use of agrochemicals (fertilizers, pesticides) to prevent or reduce their amounts entering in a water body.
- Recycling and reuse of waste water where possible.
- Thermal Pollution or addition of excess heat in water can be reduced by employing cooling ponds. Hot waste water should not be directly put in water body.
- Polluted water should be first treated by sewage treatment plants and should be reused.
- For controlling point source pollution, its treatment should be done before discharge into water body.
- Removal of toxic compounds like mercury, phonetic compounds should be done by employing methods like adsorption, ion exchange methods, reverse osmosis, etc.

- Enforcing strict laws on industries to treat their waste before discharging in water.
- Water hyacinth can purify water polluted by biological and chemical waste as it absorbs the toxic material from water.

CASE STUDY

1. **Mercury Poisoning in Minamata-Japan:** In 1953, in Minamata town in Japan people started suffering from vision, hearing problems and numbness in body parts. When its cause was searched, it came into light people were suffering from Minamata disease. It was caused when certain effluents containing mercury were discharged from a local chemical industry and the mercury dumped into water transformed into water soluble methyl mercury which accumulated in fishes and by the process of bio magnification showed increase in concentration in humans thus causing the disease.
2. **Central Ganga Action Plan:** River Ganga plays very crucial role in the economic, social and cultural aspect in the lives of many people.

Ganga is a perennial river formed by confluence of smaller rivers of Devprayag. One of them is Bhagirathi which originates from Gomukh in Gangotri glacier and the other is Alakhnanda.

After going to a distance of 220 km in Himalayas, Ganga enters the plains at Hardwar. Ganga drainage basin covers one of the most thickly populated regions of the world. There are 100 towns in Ganga basin of which 27 major towns are located on the banks of Ganga itself.

Indian population have been so inconsiderate, that in the quest of development they have dumped filth of sewerage pipes, untreated industrial effluents and run off containing fertilizers and pesticides into the river to such an extent that Ganga has been labelled as the most polluted river of the world.

Central Ganga Authority (GGA) was set up in 1985 to oversee implementation of action plan drawn up for cleaning polluted stretches of Ganga.

The action plan proposed to:

- Divert sewage flowing into river for treatment.
- Construct pumping stations and sewage treatment plants.
- Construct Community toilets.
- Construct electric crematoria.
- Development of river Ghats.

Despite the best efforts and even spending a huge sum of Rs. 327/20 crore, Ganga could not be cleaned.

Public participation is essential for successful cleaning programme of the river.