Water Pollution

When the water present on earth in the oceans, seas, rivers, lakes, ponds and under the ground gets contaminated, it is termed as water pollution. The contamination of water results in a change in its physical, biological and chemical properties and hence makes it unsafe for drinking or usage of other purposes. The substances that cause water pollution are called **Water Pollutants**. The pollution of water can lead to serious effects such as diseases, an effect on the ecosystem of a region, and loss of aquatic life.

Major Water Pollutants

- **Sewage:** a massive amount of wastewater or sewage is dumped into water bodies such as rivers and seas which pollutes their freshwater and makes it inappropriate for any kind of consumption due to the rise of several bacteria and other microorganisms. It not only affects the aquatic life of the water body but also leads to severe diseases like cholera, diarrhoea and typhoid.
- **Industrial Chemical Wastes:** Harmful chemicals such as lead and mercury are often dumped by industries into the water bodies directly which contaminate their water.
- **Agricultural Effluents:** Fertilizers, pesticides, insecticides and farm wastes are often washed off by the rain to the water bodies and contaminate the water.
- **Oil Spills:** Oil spills often occur due to accidents and leakages of oil in the sea which leads to loss of aquatic life.
- **Thermal Wastes:** Thermal industries often spill warm water in the water bodies which decreases its oxygen content. It also leads to a rise in temperature of water which is not suitable for aquatic animals.
- **Suspended Solids:** They come from soil erosion, untreated sewage and mining. These suspended pollutants block the sunlight from reaching the aquatic plants and animals.

Organism	Diseases	Remarks
Ascaris sp.	Nematode worms	Danger to man from polluted water and dried sludge used as a fertilizer.
Bacillus anthracis	Anthrax	Found in waste water spores are resistant to treatment.
Brucella sp.	Brucellosis, Malta fever in man, contagious abortion in sheep, goat and cattle.	Transmitted by infected milk by contact, by waste water.
Entameoba histolytcca	Amoebic dysentery	Spread by contaminated water.
Leptospira sp.	Leptospirosis (Well's Diseases)	Caused by sewer rats.
Mycabact, tuberculi	Tuberclosis	Isolated from waste water
Salmonella paratyphi	Paratyphoid fever	Common in waste water
Salmonella typhi	Typhoid fever	Common in waste water
Salmonella sp.	Food poisoning	Common in waste water

Shigella sp.	Bacillary dysentery	Polluted water
Vibrio cholarae	Cholera	Polluted water
Virus	Poliomyelitus hepatitis	Waste water treatment plants
E. coil	Diarrhoea	Polluted water

What is wastewater?

The water that has been used and is not fit for usage again is called **Wastewater**. It is dirty water from the laundry, toilets, sinks and drains.

Water - Our Lifeline

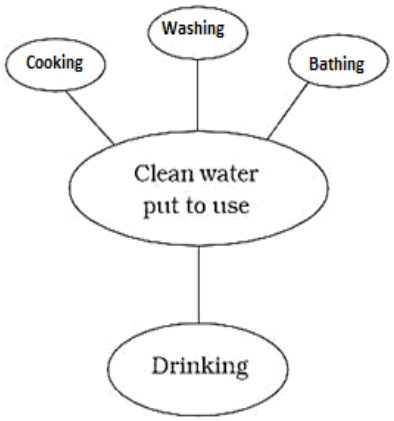

Figure 1: Usage of clean water

- We all need clean water however, not all can access the same.
- Hence, it is necessary not only to preserve water but clean the used water before dumping it into the seas or any other water body.
- This is why the United Nations proclaimed the period between 2005 and 2015 as the **International decade for action on 'water for life'.**

What do you mean by cleaning of water?

It is a process in which the pollutants from the water are removed before the water reaches a water body or before it is used again. This process is also called **Sewage Treatment**.

What is sewage?

- Wastewater from houses, offices, Industries, hospitals and other sources is called **Sewage**.
- Rainwater that flows into the drains during heavy rainfalls is also sewage because it contains pollutants that it washes off from the roads.
- Any liquid waste can be called sewage.
- Sewage water contains impurities mixed into it as well as some suspended pollutants.
- These impurities present in the sewage are called **Contaminants** as they contaminate the water.

Sewage is a mixture of impurities

- Organic impurities - Human faeces, animal waste, oil, urea (urine), pesticides, herbicides, fruit and vegetable waste. etc.
- Inorganic impurities - Nitrates, Phosphates, metals.
- Nutrients – Phosphorus and Nitrogen.
- Bacteria -Such as which cause cholera and typhoid.
- Other microbes - Such as which cause dysentery.

Water freshens up - An Eventful Journey

- **Sewers** - Large and small pipes that are installed in buildings to carry sewage water are sewers.
- **Sewerage** - A network or transport system consisting of sewers is called **Sewerage**.
- It carries sewage water from the point where it is produced to the point where it is disposed (treatment plant).
- It consists of manholes that are located at every 50 to 60 metres.
- The manholes are installed at a point where two or more sewers intersect or change their directions.
- Every locality has as a system that allows removal of waste from the houses and industries.

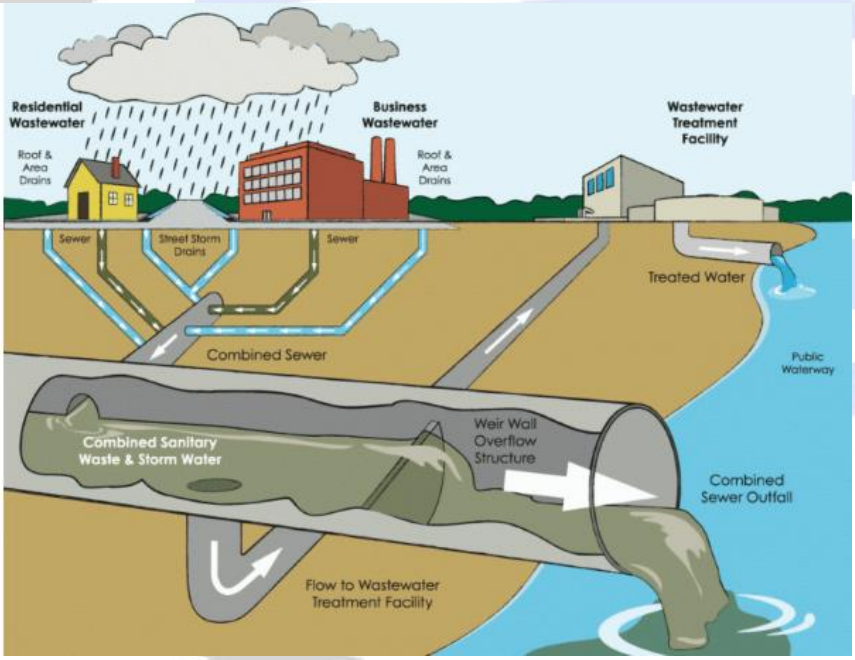

Figure 3: Sewerage

Wastewater Treatment Plant (WWTP)

Wastewater includes biological, physical and chemical matter and hence involves biological, physical and chemical processes of removal of the contaminants.

The physical and biological process of treatment of water:

1. Separation of Large Objects from Sewage Water

The wastewater is first passed through **bar screens** which remove big objects from the water like plastic bottles, napkins, rags, cans and sticks.

Figure 4: Bar Screens

2. Separation of Sand and Dirt

The wastewater is then sent to a **grit and sand removal tank**. The speed of the water is decreased at this step. This allows the sand, dirt and pebbles to settle down.

3. Removal of Solids

- Now the water cycles in a tank called **Clarifier** which is sloped in the centre. This lets the solids like faeces to settle at the bottom. This is called **Sludge**.
- The sludge is then separated from the water with the help of a **Scrapper**.
- Substances like oil and grease are removed with the help of a **Skimmer** as they float above the water. In this step clarified water is obtained.
- The sludge so obtained is passed into a tank where **anaerobic bacteria** can decompose it and produce biogas. The **biogas** is then used as a fuel.

Figure 5: Sand and Girt Removal Tank

4. Suspended Sludge Removal

- The clarified water also needs to be cleaned further. Hence, it is moved to an **aerator** that pumps air into it.
- This allows aerobic bacteria to grow in this water.

- The **aerobic bacteria** consume organic waste, soaps, food waste and other elements that remain in the clarified water.
- This water is allowed to settle for several hours and then these waste materials settle down in the tank. This is called **Activated Sludge**.
- The water is removed from the top of this sludge with the help of machines or sand drying beds. The sludge is then dried and can be used as manure.

Figure 6: Aerator

This treated water contains fewer amounts of impurities and suspended matter. This water is safe to dump into a water body or under the ground. Hence, it is then discharged into a sea, river or underground. Nature further cleans it up.

Chemical Treatment of Wastewater:

- Sometimes harmful chemicals can be present in the water even after treating them physically and biologically.
- These chemicals are therefore removed by using disinfectants such as **chlorine** and **Ozone**.
- Often chlorine gas or ozone gas is introduced in this water which purifies it chemically.

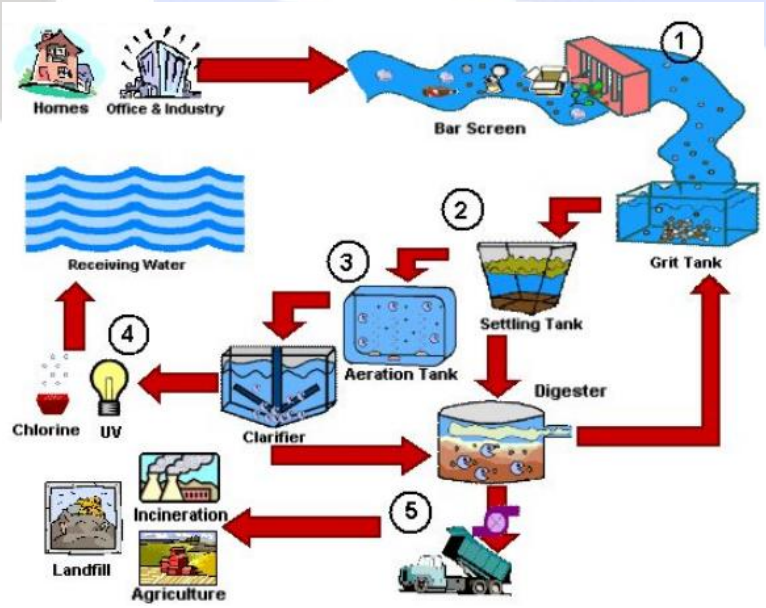

Figure 7: WWTP

Eucalyptus Plant and Cleaning of Water

Eucalyptus plants can absorb the water at a faster rate and then they release pure water vapour. In this way, they act as a natural water purifier. Hence, it is advised to plant Eucalyptus trees along the sewage ponds.

Figure 8: Eucalyptus Plant

Why should we adopt better housekeeping practices and become an active citizen?

- We should try to reduce the waste that produced in our households so that there is not much pressure on WWTP. It is often difficult to clean tons of wastewater.
- The sewage water can cause several problems such as harmful diseases, unhygienic and unsanitary conditions in the locality.
- Hence, we can be more considerate about producing a limited amount of waste and we can accomplish this by adopting better housekeeping practices.
- Also, we can become an active citizen by making sure that there are no open drains or sewers in our locality. If we find any we should immediately report the same to the municipality.

What better housekeeping practices we can adopt?

A good way to minimise the sewage water is to check what is going in our drains. If we dispose of our waste properly we may be able to reduce the sewage. Here are some housekeeping practices that we should adopt:

- We should through all the oil and fats in dustbin rather than throwing them of the dream. Oil and fats harden and block the drains. Moreover, it is difficult to separate them from the water.
- We should not throw chemicals in the drains like insecticides, pesticides or medicines. They can kill the microbes in the water that help in its purification.
- We should not throw things in the drain that can block them like tea leaves, food remains, cotton, soft toys etc. We should always through them in the dustbin.

Figure 9: Treating Water at home

Sanitation and Disease

- Sanitation refers to the health conditions of people related to the disposal of sewage, human excreta and provision of clean drinking water.
- Poor sanitation and polluted drinking water can lead to many diseases.
- Hence, a sanitation system aims to provide a clean environment for us so that we can stay away from diseases.
- Improper sanitation can give rise to different diseases that arise from contaminated water such as typhoid, dysentery, hepatitis, polio, cholera and meningitis.
- The human excreta is a health hazard and can lead to soil and water pollution. It can pollute the surface water and groundwater. Hence, people should never defecate in open areas.

Alternative Arrangement for Sewage Disposal

- As an alternative for sewage disposal **on-site sewage** is being used nowadays, for example, septic tanks, compost pit toilets and chemical toilets.
- The onsite sewage treatments use natural procedures to treat and dispose of the wastewater or sewage.
- This system is suitable in places where there is no central wastewater collection system.
    - **Septic Tanks** – A septic tank is often installed under the ground in houses or buildings such as hospitals. It allows decomposition of sewage from home through the action of anaerobic bacteria.
    - **Chemical Toilets** – A chemical toilet has a separate compartment that treats human waste with chemicals and decreases their odour.
    - **Composting Toilets** – A composting toilet treats human waste with biological processes. The aerobic bacteria are present in a storage tank that act upon the waste and turn it into compost.

  Many organizations have also installed on-site hygienic waste disposal technology in which the human excreta directly flows into a biogas plant and is then used as an energy resource.

Sanitation at Public Places

- There are numerous places in our country which are very busy such as airports, railway stations and bus depots.
- Many times large gatherings such as fairs and festivals are also organized where a large number of people visits.
- This results in the generation of large amounts of waste and if the waste is not treated properly it can lead to several diseases and even an epidemic.
- Hence we should all become aware and contribute to maintaining sanitation not only in our homes but also at public places.
- If we adopt certain practices at public places we can help in maintaining their sanitation, for instance:
    - We should not throw garbage in public places and always use the dustbins.
    - We should not spit around in a public place.