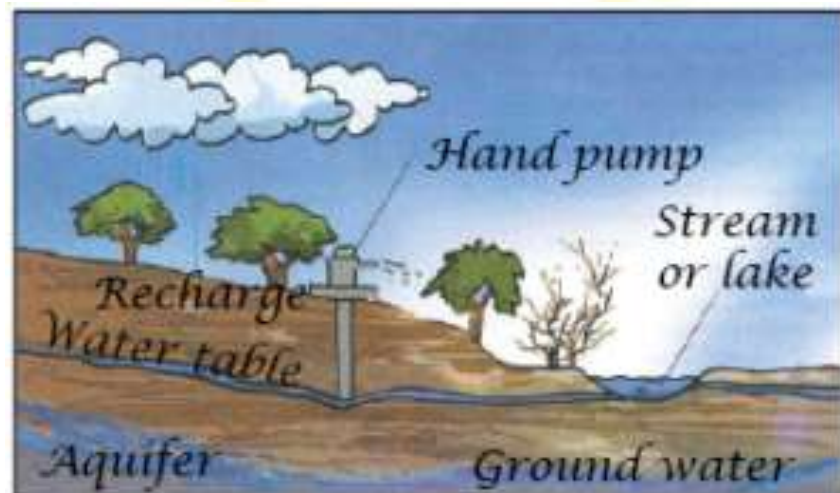


## Introduction

- We use water for our daily activities and make it dirty.
- Wastewater is the dirty water that goes down the drains from sinks, toilets, laundries which is rich in lather, mixed with oils.
- We can reuse this dirty water by removing pollutants from it.

## Water, our lifeline

- Demand of water is increasing day by day as population is increasing. Many of the people from some areas don not get enough water for their day-to-day activities.
- Increasing population is a great concern for the decline of the water table.
- In some places people have to walk several kilometers for fresh water.
- Industrial and agriculture activities and scanty rain cause the scarcity of fresh water.
- The general assembly of United Nations proclaimed the period 2005-2015 as the international decade for action on “water for life” on the occasion of world water day on 22 March 2005.
- The aim of this decade was to make effort in the direction of reducing the number of people who suffer for safe drinking water.
- The process of removing pollutant to make it safe for drinking is called cleaning of water.
- Sewage treatment is process of wastewater treatment.



## What is sewage?

- Our homes, industries, hospitals, offices release wastewater everyday this wastewater is known as sewage.
- Sewage also includes the rainwater that flows away washing the road and rooftops.
- Many dissolved and suspended impurities are present in the liquid waste, sewage.

### ➤ Activity 1

1. Near your home or your school locate an open drain on the roadside.
  2. Observe the color and the odor of the water flowing into it.
  3. You will notice that the sewage water that is running into the drain contains organic and inorganic impurities, nutrients, saprophytes, microbes and other disease-causing bacteria.
- human faeces, animal waste, oil, urea, pesticides, fruit and vegetable waste are organic impurities.
  - nitrates, phosphates, metals are inorganic impurities.
  - phosphorus and nitrogen are nutrient.
  - Vibrio cholera, salmonella paratyphi are bacteria.
  - Protozoans are the microbes.

## Water freshens up- an eventful journey

- Sewers are the network of big and small pipeline which in our home and public buildings that carry out wastewater.
- These sewers form the sewerage.
- Sewerage carries the sewage from the point of production to the point of disposal that is to the sewage treatment plant.
- In the sewerage at the junction of the 2 or more sewers manholes are located.

## Treatment of polluted water

### ➤ Activity 2

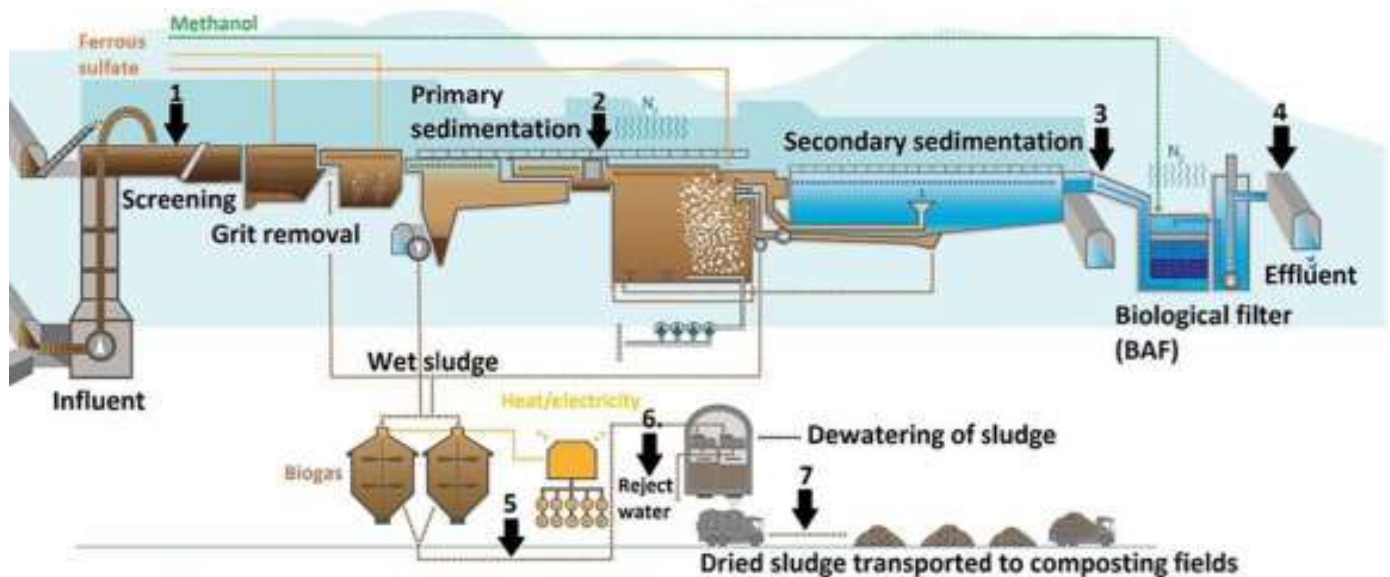
1. Take a jar full of water.
2. Add some impurities such as organic matter like grass, fruit peels, detergent, oil and a few drops of any color.
3. Now mix the mixture very well after capping the jar.
4. Keep this mixture in the sunlight for two days.
5. Pour the small amount of this mixture as a sample in a test tube after two days by shaking it very well.
6. Name this test tube as “before treatment; sample 1”
7. Observe the smell and color of the sample.

8. Now bubble air through the mixture in the jar with the help of an aerator. If aerator is not available then you can use the mechanical stirrer from that you have to stir the mixture several times.
  9. Keep the mixture aside for one day till the aeration is done.
  10. Now again take small amount of mixture from the jar and pour it into another test tube and label it as "after aeration; sample 2"
  11. Now insert a cone of wet filter paper in a funnel.
  12. Now place a layer of sand in the bottom of the funnel and then the fine gravel and finally the medium gravel in the funnel for filtration.
  13. Now pour the aerated mixture through the filter into a beaker. Pour the water several times till you get clear water.
  14. Now take third test tube and pour a small amount of sample from this clear water and label this test tube as "filtered; sample 3".
  15. Now take the fourth test tube and pour a small amount of filtered water in it as a sample this time add a chlorine tablet in the test tube and put a label on the test tube as "chlorinated; sample4".
  16. Now smell all the samples you will observe that the odour of the sample of mixture after aeration.
  17. Many dust particles have been removed by the sand filter.
  18. Chlorine removes the color from the water.
  19. In the fourth test tube you will observe that the water is quite pure and clear but you will also find that the water is now have smell of chlorine which is not as worse as that of the wastewater.
- This is how wastewater is treated in the big water treatment plants.

## Wastewater treatment plant (WWTP)

- Removal of physical, chemical and biological contaminants from water through physical chemical and biological process is called the treatment of wastewater.
  - 1) Through the bar screen large objects are removed from the wastewater.
  - 2) After passing through the bar screens water enters to the grit and sand removal tank. In this stage the speed of the water is decreased so that the sand and pebbles can settle down.
  - 3) Water then settles in a large tank. This tank has a slope in the middle. Solids like faeces settle down and then removed by scraper from the bottom of the tank this is called the sludge.
  - 4) Floatable dirt like oil and grease are then removed by the skimmer.
  - 5) Now the obtained water is clarified.
  - 6) For the decomposition of the sludge by anaerobic bacteria it is transferred to another tank.
  - 7) This process produce biogas which can be used as fuel or to produce electricity.

- 8) Aerobic bacteria grow in the clarified water when air is pumped into the clarified water. The remaining waste in the clarified water such as human waste, food waste, soap waste and other unwanted waste are consumed by the aerobic bacteria.
- 9) The suspended microbes settle at the bottom after several hours this is the activated sludge
- 10) From the top of the tank clear water is removed and is then discharged into a sea or a river or into the ground. Disinfection of water through chemicals like chlorine and ozone is sometimes needed before discharging the treated water into any water body.
- 11) 97% of the activated sludge is water which is removed by sand drying beds or machines and the dried sludge is used as manure.



## Become an active citizen

- We often notice overflowing open drains that get worse during rainy days.
- Offensive smells, disgusting sights from such places that repel us.
- Flies, mosquitoes and other insects prevailed by these unhygienic conditions.
- As a responsible citizen we can approach to a civic body to inspect such places and do the needful.

## Better housekeeping practices

- We should throw oil and fats in the dustbins as it can block the pipes and clog the soil pores which reduces the filtering power of soil.
- Many chemicals kill microbes which help in purification of water so we should not throw chemical into the drain.
- Some waste chokes the drains those waste should be kept in a dustbin.
- A new mission Swachh Bharat has initiated by the government of India in 2006. This mission is directed for the proper sewage disposal and toilet for everyone.
- Vermi-Processing toilet is a design of toilets which converts the human excreta into the vermi cake by treating the human excreta by the earthworm.

## Sanitation and disease

- A large number of diseases is caused by the poor sanitation and contaminated drinking water.
- Soil and water pollution is caused by the untreated human excreta which lying in open areas.
- Underground water is source of water for tube wells, wells which is also get polluted by these human wastes which can cause diseases like cholera, typhoid, polio and dysentery.

## Alternative arrangement for sewage disposal

- Onsite sewage disposal systems are being encouraged to improve sanitation. It is very low-cost disposal system.
- Places where there is no sewerage system like in some hospitals, isolated buildings this onsite sewage disposal system are used. For example: septic tanks, composting pits.

## Sanitation at public places

- Large number of wastes is generated in railway stations, bus depots, airports, hospitals. Epidemics could break out if these wastes are not properly disposed.
- Litter should not be thrown in any open area it should be kept with us until we find any litterbin.

## Conclusion

- We must keep the water sources in a healthy state.
- As an individual we should take the initiative to practice a hygienic lifestyle.
- Collectively we can bring a great change in the direction of healthy and pollution free lifestyle.