

14. WATER

TOO LITTLE TO WASTE

In class VI, we had studied about the uses of water, about floods, droughts etc. So little is the quantity of water available for our use that we have to use it very carefully. We know that water is a precious resource. We cannot live without water. Not only we, plants and animals also depend on water for their survival. Recollect the water sources on the Earth. We can see huge amounts of water in seas and oceans. Is it useful for us? We do not use sea water for drinking. Why? Sea water is also not useful for crops. We use only fresh water.

Do you know what is fresh water? Where is it available? Fresh water is available in ponds, lakes, rivers and streams. Do you know how much fresh water is available on the Earth? If 10 liters of water is the total water on the surface of earth then out of this only 1ml is available as fresh water for our use as well as for several plants and animals.

If the total water on earth be 100%, let's see what percent would be available of fresh water.

Source of Water	Percentage
Ocean(sea water)	97%
Glaciers & Poles as ice (fresh water)	2%
Ground Water, Water in Ponds, Lakes and Rivers (available fresh water)	1%

Source of Water on Earth



- Could we now say, water is a precious resource? Justify your answer.
- How are we presently using this resource?
- What will happen if we continue to do so?

Do you know?



On World Water Day, that is 22 March 2005, the period 2005-2015

was declared as the International Decade for action on "Water for Life".

Did you notice that a very small amount of fresh water is available on earth? Most of the times we do not think of the importance of fresh water. We are not aware of the need to preserve fresh water.

Let us do-1:

List out the daily life situations where we waste water usually. Discuss in groups why we do so. Write reasons in your note book.

Neeraja collected a news letter for you. Try to analyse issues discussed in the newsletter.

SORROW OF EARTH:

My dear young minds, I am your living home I am called as Planet Earth I always try to make you happy by supplying various resources to meet your needs. But now I am in danger ,please listen to me.



Fresh water has been the constant and essential companion of human beings throughout history. Water is used in great quantities in agriculture and industries.

But your planet is poorly endowed with fresh water. Most water is rendered useless to humans by dissolved salts in the oceans. Only 2.5 Percent is available as fresh water of which 2/3 is locked up in Ice and snow. Nature is unkind in depositing almost eighty percent of rain over the sea. The rain that falls over the land has a great potential value.

Unsustainable extraction of fresh water causes water scarcity. Due to over extraction of fresh water underground reserves are falling rapidly. In India, the water table has fallen more than 300 meters. Human interventions which degrades the quality and quantity of natural supply of fresh water occur, in 3 principle ways .

Firstly dams alter the natural flow of rivers often leading to water scarcity. Secondly, soil moisture is lost by land degradation due to poor farming practices and deforestation. Thirdly, surface water is polluted by run off chemicals used in industries and house holds.

World population is projected to grow 9.3 Billion by 2050. In addition to safe drinking water and sanitation the rising pressure on fresh water will be felt most severely in the energy and food sectors. Two out of three people will be living with water shortage by 2025. The growth of demand the decline in fresh water availability ,the adverse health effects from poor water quality and scarcity will result in violence and water wars. The next cold war could be over water.

Neeraja said that it is a sad story and she was afraid of our future also. Why did she think so? What do you find in the newsletter? Write your opinion about this in your note book.

Day-by-day our needs are increasing rapidly. We use water for agriculture, industries, power generation etc. Water resources are not being increased along with population and their needs. We must be aware of the need to protect water resources.

Neeraja decided she would conserve water at home as an action towards the cause "Water for life".

What would you do for the cause "Water for life"?

Devi observed that a lot of water flows out of the kitchen as well as bathrooms at her house. She could not see water being wasted in this manner so she made a channel for water to flow from kitchen to the garden around. She could not waste water from the bathroom in a similar manner. Her mother told her that it could be used after purification. Seeing her interest in this, they decided to visit a water treatment unit during the weekend.

At the water treatment unit, they came to know about many things.

All the wastewater released by home, industries, hospitals, offices and other users are collectively called Sewage. Sewage is a liquid waste. Most of it is water, which has dissolved and suspended impurities, disease causing bacteria and other microbes. These impurities are called contaminants. These are :

Organic impurities - Human faeces, animal waste, oil, urea, pesticides, herbicides, fruit and vegetable waste etc.



Fig 1

Inorganic impurities- Nitrates, Phosphates, metals etc.

Bacteria & other microbes- Such as those which cause cholera, typhoid, dysentery etc.

Processes of waste water treatment plant

Treatment of waste water involves physical, chemical and biological processes, which remove chemical and biological matter that contaminates water.

1. Wastewater is passed through bar screens. Large objects like rags, sticks, cans, plastic packets, etc are removed by this.



Fig.2

2. Water then goes to a grit and sand removal tank. The speed of the incoming wastewater is decreased to allow sand, grit and pebbles to settle down.



Fig.3

3. The water is then allowed to settle in a large tank which is sloped towards the middle. Solids like faeces settle at the bottom and are removed with a scraper. This is the sludge. A skimmer removes the floatable solids like oil and grease. Water so cleared is called clarified water.



Fig.4

The sludge is transferred to a separate tank where it is decomposed by anaerobic bacteria. The biogas produced in the process can be used as fuel or can be used to produce electricity.

4. Air is pumped into the clarified water to help aerobic bacteria to grow. Bacteria consume human waste, food waste, soaps and other unwanted matter still remaining in clarified water.

After several hours, the suspended microbes settle at the bottom of the tank as activated sludge. The water is then removed from the top.



Fig.5

The activated sludge is about 97% water. The water is removed by sand drying beds or machines. Dried sludge is used as manure, returning organic matter and nutrients to the soil.

The treated water has a very low level of organic material and suspended matter. It is discharged into the sea, a river or into the ground. Nature cleans it up further. Sometimes it may be necessary to disinfect water with chemicals like chlorine and ozone before releasing it into the distribution system i.e. river, groundwater etc..

Let us do: Study the sewage route in your home/school/any other place.

- Walk down the street or survey the campus to find the number of manholes.
- Follow an open drain and find out where it ends.
- Make a line diagram of the sewage route by following manholes and drains that appear to connect them.
- In case you do not find such a system in your locality, find out how sewage is being disposed off. Also find out whether it is sent to treatment plants or not.
- Is it being dumped into water bodies without being treated?
- Prepare a short report on your findings.

Let us do: Finding out what really happens to wastewater at treatment plants

You can do this individually or in groups at school or home. Record observations at each stage:



- Fill a large glass jar $\frac{3}{4}$ full of water. Add some dirty organic matter such as grass pieces or orange peels, a small amount of detergent, and a few drops of an ink or any colour.
- Cap the jar, shake it well and let the mixture stand in the sun for two days.
- After two days, shake the mixture and pour a small sample into test tube. Label this test tube "Before treatment; Sample 1". How does it smell?
- Use an aerator from an aquarium to bubble air through the sample in the glass jar. Allow several hours for aeration; leave the aerator attached overnight. If you do not have an aerator, use a mechanical stirrer or a mixer. You may have to stir it several times. This actually works like a

skimmer of waste water treatment plant.

- Aeration helps organisms to grow and break down waste material faster thus it leads to what is called as “**Biological Process**”.
- The next day when aeration is complete, pour another sample into a second test tube. Label it “After aeration; Sample 2”.
- Fold a piece of filter paper to form a cone. Wet the paper with tap water and then insert the cone in a funnel. Mount the funnel on a support (as you have learnt in Class VI).
- Place layers of sand, fine gravel and finally medium gravel in the funnel. (An actual filtration plant does not use filter paper, but the sand filter is several meters deep).
- Pour the remaining aerated liquid through the filter into the beakers. Do not allow the liquid to spill over the filter. If the filtered liquid is not clear, filter it a few times till you get clear water. This is “**physical process**”.
- Pour a sample of the filtered water into a third test tube labeled “Filtered; Sample 3”.
- Pour another sample of the filtered water into a fourth test tube. Add a small piece of a chlorine tablet. Mix well until the water is clear. Label the test tube “Chlorinated; Sample 4”.
- This is a “**Chemical Process**” of treatment.
- Observe carefully the samples in all the test tubes. Do not taste! Just smell them!
- What changes did you observe in the appearance of water after aeration?
- Did aeration change the odour?
- What was removed by the sand filter?
- By adding chlorine what changes do you observe in sample 3 and 4?
- Did chlorine has an odour? Was it worse than that of the wastewater?
- Write two points each of similarities and differences between the processes involved at the treatment plant and this experiment.
- What is the use of bar screen at sewage treatment plant? Was anything like that present in this experiment? Why?

Diseases caused by untreated water

If waste water is not treated and allowed to pass as such into our resources, it becomes a cause for a large number of diseases.

This is what happens at Ramu’s village.

All residences there release waste water from kitchen, bathrooms and toilets outside their houses, which gets stagnated and causes diseases like diarrhoea, malaria, typhoid and cholera.

- Suggest what Ramu could do to stop the stagnation of water.

Other ways of Disposing Sewage:

We dispose waste water in our daily life in different ways and means. We often see water stagnated near bore wells or beside houses. Sometimes human and animal excretions also mix with this water. We get a foul smell when we walk near those areas. To prevent this we need a proper drainage system. In some villages and towns we can see drainage canals on both sides of the streets to maintain flow of waste water.

- Is there any drainage system in your village?

Types of Drainage Systems:

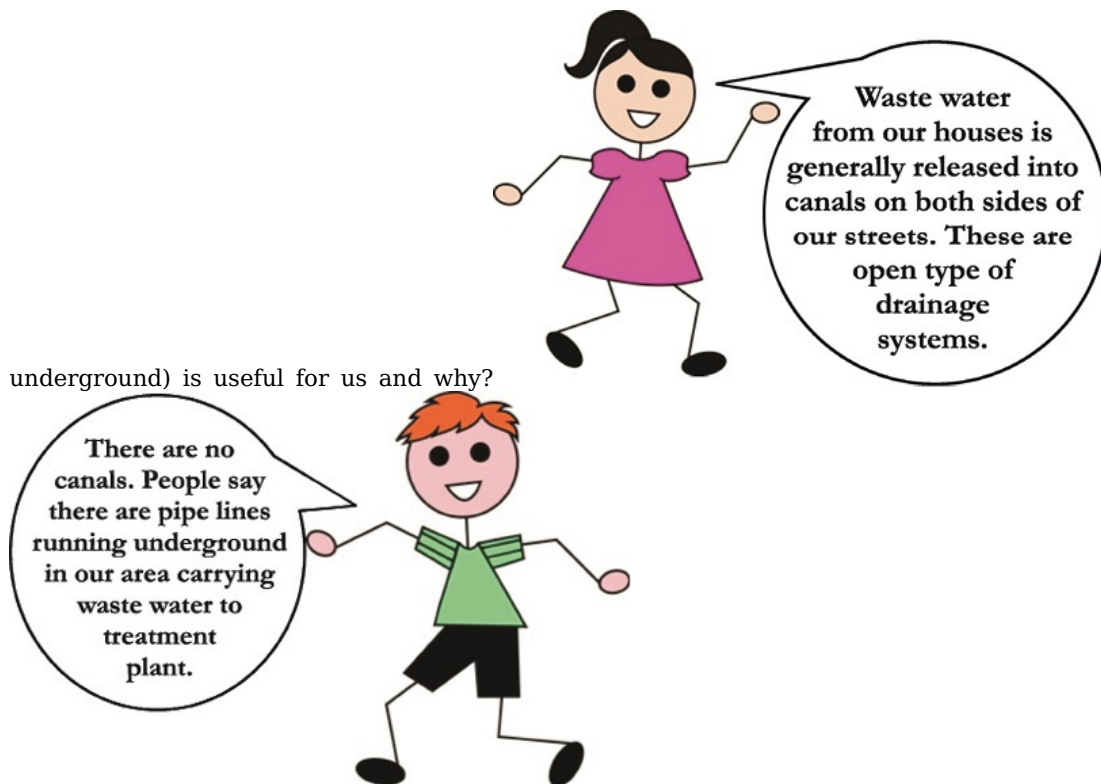
Generally we make some arrangements in our areas to carry waste water and other materials released by domestic activities. In some places people construct a ditch to settle drainage water. In some places they make the waste water flow in canals to their fields or to the waste lands around.

- Is it right to leave untreated waste water in this manner?

Let us do: To find out types of drainage system in a locality

Make a list of drainage systems that you may have heard about (You may also ask your teacher):

- Which among the above is the most common type of drainage system that you see?
- How is the flow of water blocked sometimes in drainage canals?
- What can be done to reduce such blocks?
- How can a closed drainage system be useful for us?
- Discuss with your friends/teacher and write which type of drainage system (either open, closed or



Some homes do not have drains running to a common treatment plant. They usually have a septic tank instead. These are units of waste disposal used at homes usually in villages/towns and in some individual houses in cities.



Fig 7

Do you know? Our state government provides septic tank facility for each home in the village.

- Collect information about how many families have septic tanks and toilets in their houses in your village/town/nearby village. Ask the families who do not have one to construct the same.
- How are the wastes from toilets disposed of in your school? Write a few lines about the process.

Conservation of Water:

We perform many activities in our daily life using water. We can conserve water by adopting certain good practices. Let us read about the practices performed at Mary's house.

I am Mary. There are six persons in my family. My grandfather says water is precious so don't waste it. My mother collects water in a bucket after cleaning rice, dal and vegetables in the kitchen which contains peels of vegetables and we use this water for our cattle. We do not throw solid food remains, tea leaves and oily wastes down the drain. My father made a channel so that the kitchen and bathroom water flows to the coconut and banana plants in our garden. We always use mild soaps and detergents so that this water may not harm our plants. One day my grandmother asked me to measure drops of water which leaked from a tap in the bathroom. I noticed that three mugs full of water leaked from that tap in a day. Then she asked me to calculate how many mugs of water was wasted in a year. We immediately got our tap repaired.

- What are the ways in which Mary's' family conserves water at home?
- How can you conserve water in your home?
- Do people in your area conserve water? How?
- If they don't, think and write some suggestions that you would like to give them.

Another step towards conservation:

Nallavally is the oldest Vana Samrakshana Samithi (VSS) of Medak district, which was formed in 1993 with 600 members. An area of 310.40 Hectares has been allotted from Nallavally forest block to the VSS members.



Prior to formation of Vana Samrakshana Samithi, the Socio-Economic condition of the villagers was bad. Many of them used to migrate to other places as their lands were not suitable for cultivation due to lack of enough ground water. They could only raise rain fed crops like Jowar, Red gram, Horse gram, Maize etc., Availability of water even for drinking purpose was also difficult as all open wells and bore wells used to dry up in summer season.



The VSS members have constructed several Percolation Tanks, Contour Trenches to harvest the rainwater. Check Dams and Rock Fill Dams have also been constructed to conserve water to revive the forest area.

Key words

Sewage, Wastewater, Contaminants, Septic tank, Drainage system, Percolation tank, Contour trenches, Bar screen, Grit, Check dam, Rock fill dam, Activated sludge.

What we have learnt

- Only one percent of all water resources is available as freshwater.
- The available resource of fresh water is getting depleted at a very fast pace due to different human activities.
- Wastewater is generated at homes, industries, etc. by different human activities.
- All the wastewater released by home, industries, hospitals, offices and other users are collectively called Sewage.
- Sewage is a liquid waste. Most of it is water, which has dissolved and suspended impurities, disease causing bacteria and other microbes.
- Sewage water contains inorganic, organic and bacterial as well as other microbial contaminants.
- Wastewater is treated in treatment plants
- Physical, chemical and biological processes are involved in treatment of wastewater at the treatment plants.
- Chlorine kills harmful disease causing organisms present in wastewater.
- Aeration allows growth of microbes that break down wastes.

- Different types of drainage systems are open, closed and underground ones.
- Septic tanks also help in wastewater disposal.
- Water should be treated before being released to water bodies.
- Water must be conserved by individual efforts as well as through efforts made by the community.

Improve your learning

1. Fill in the blanks and give reasons.
 - (a) Cleaning of water is a process of removing _____.
 - (b) Wastewater released by houses is called _____.
 - (c) Dried _____ is used as manure.
 - (d) Drains get blocked by _____ and _____.
2. What is sewage? Explain why it is harmful to discharge untreated sewage into rivers or seas?
3. Why should oils and fats not be released in the drain? Explain.
4. Describe the steps involved in getting clarified water from wastewater.
5. What is sludge? Explain how it is treated.
6. Untreated human excreta is a health hazard. Explain.
7. Name two chemicals used to disinfect the water.
8. Explain the function of bar screens in a wastewater treatment plant.
9. Explain the relationship between sanitation and disease.
10. Outline your role as an active citizen in relation to sanitation.
11. What would you do to motivate people in your street to utilise toilets ?
12. What would happen if there were no microbes that break down wastes in sewage?
13. What point would you like to address in the letter for your panchayat officer about drainage system in your village / town?
14. Go to a nearby railway station / bus station / hospital / industry. What type of sewage is released? List out where and how.
15. Fresh water is scarce. What is your contribution to make your family members aware of the need to save water?
16. Prepare atleast 5 slogans on "Don't waste water".
17. Make a writeup for your project on preservation of rain water.
18. Is there a check dam or any other water conservation unit in your village? Write a note on it.
19. Have you got any doubt about diseases caused by un treated water? List them out.
20. If you see water running off from a public tap what would you do about it?

