Teacher's Guide

Water: A Precious Resource

Period 2

Based on the NCERT curriculum for Standard VII

JANAAGRAHA CENTRE FOR CITIZENSHIP & DEMOCRACY

Janaagraha's initiative to improve citizen engagement in India's democracy through their civic learning program

Developed in collaboration with Young Leaders for Active Citizenship (YLAC)

Water: A Precious Resource | Teacher's Guide (2/3)
Period 2

Class VII
Board – CBSE
Subject – Science
Textbook – Science Textbook for Class VII (NCERT)
Chapter 16 – Water: A Precious Resource
Number of periods – 03
Length – 60 minutes

Section I: What are we going to learn and why is it important?

Learning objectives

Students will:

- Gain knowledge of the groundwater resource and understand its criticality.
- Learn about the factors that are causing ground water depletion and water pollution.
- Learn to use elementary data and statistics through an activity on analysis of the groundwater situation in different parts of India.
- Understand the role of a citizen in preserving ground water.
- Understand the role of the government, citizens and industry in preventing water pollution.

Learning outcomes

Students will:

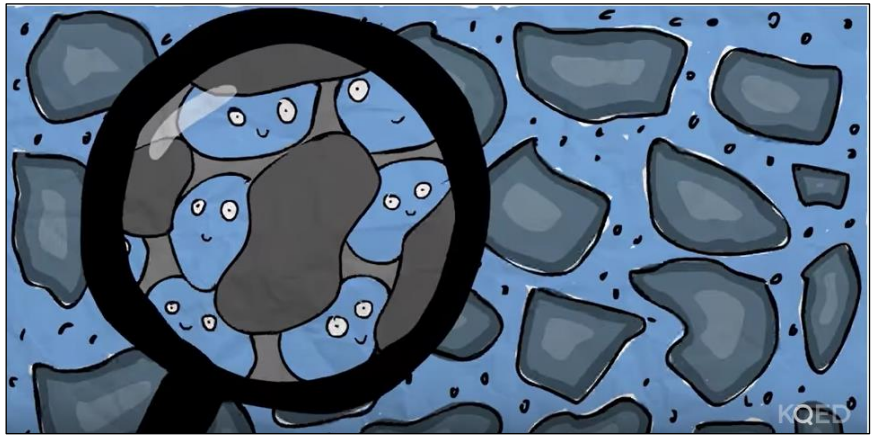
- Appreciate that groundwater is a scarce and important natural resource.
- Become conscious about their role as active citizens in conservation of water.

Key Terms:

Ground Water	Water Table	Aquifer	Brackish
Hand pumps	Infiltration	Saline	

Section II: How are we going to learn?

Ground water as an important source of water



Time: 15 minutes

Note to the teacher:

- Show the following video to the class:
  Video: What is ground water?
  The video explains where does ground water comes from and where it goes
  Link: Youtube
- Ask students to refer to Visual 16.7 in NCERT book on page 198

Facilitation notes:

- Moisture in the soil indicates presence of water underground.
- When we dig deep, we reach a level where all the space between the particles of soil and the gaps between the rocks are filled with water.
- The upper limit of this layer is called the '**Water Table**'.
- The table varies from place to place; the water found below the water table is called **ground water.**
- *Ask students, what the source of this groundwater is and take few responses, then add in the following points:*
  - Rain water falls on the ground and seeps through the soil.
  - Water from other sources (such as rivers and ponds) also seeps through the soil and fills the empty spaces and cracks deep below the ground. This process is called **infiltration.**
  - This is how ground water gets recharged.
- Places where the groundwater is stored between layers of hard rock below the water table is known as an **aquifer.**
- Water in the aquifers can be pumped out with the help of tube wells or **hand pumps.**

Depletion of water table

Time: 5 minutes

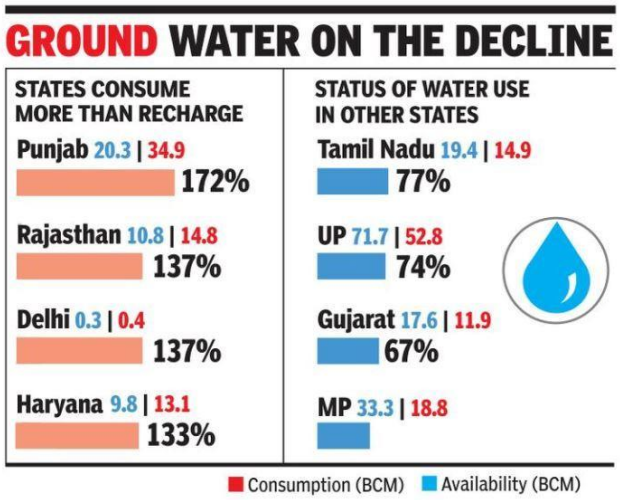
Facilitation notes:

- *Ask students*- What happens when we keep on drawing water from under the ground?
- *You will get following as possible response from the students, add them in case students have missed it.*
    - Ground water reduces and will eventually reach level zero.
    - There will be no water to consume for people.
    - There will be a drought.

- *Continue discussion with the following activity*

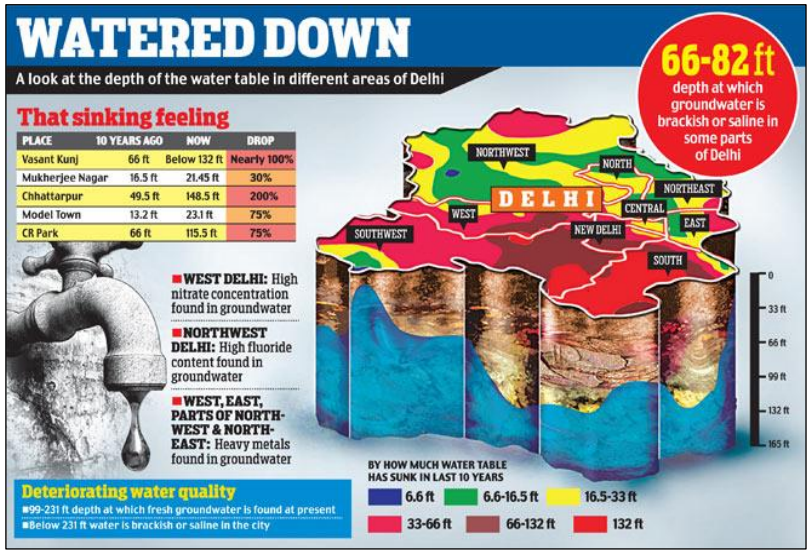
Activity: Learning through data
Time: 10 mins

Note to the teacher: Split the class into 4 groups, and hand them the following newspaper graphics or alternately project these graphics in the class one by one and discuss what each of these means. Original infographics can be access on links for projection.

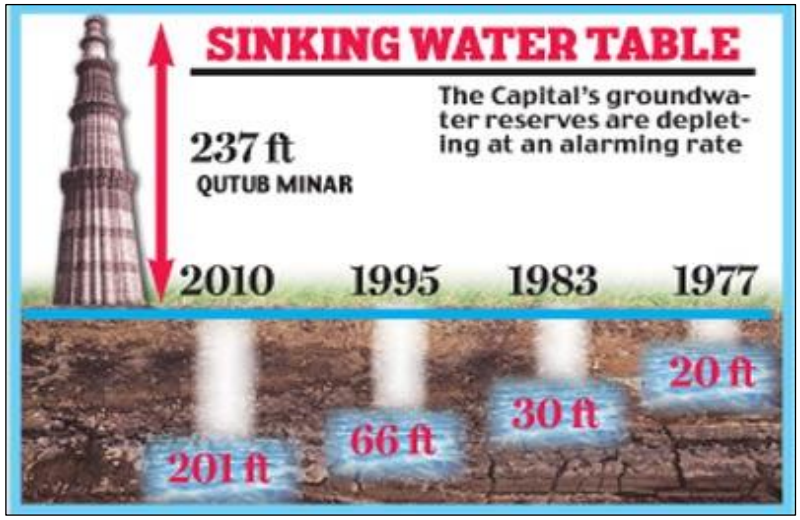


Explanation for Figure 1: This figure shows that in Punjab, Rajasthan, Delhi and Haryana the water consumption is far more than what is recharged. In states such as Tamil Nadu, Uttar Pradesh, Gujarat and Madhya Pradesh, consumption is still less than the available ground water. Volume of ground water is calculated in units of 'Billion cubic metres', here written as BCM.

Source: Times of India

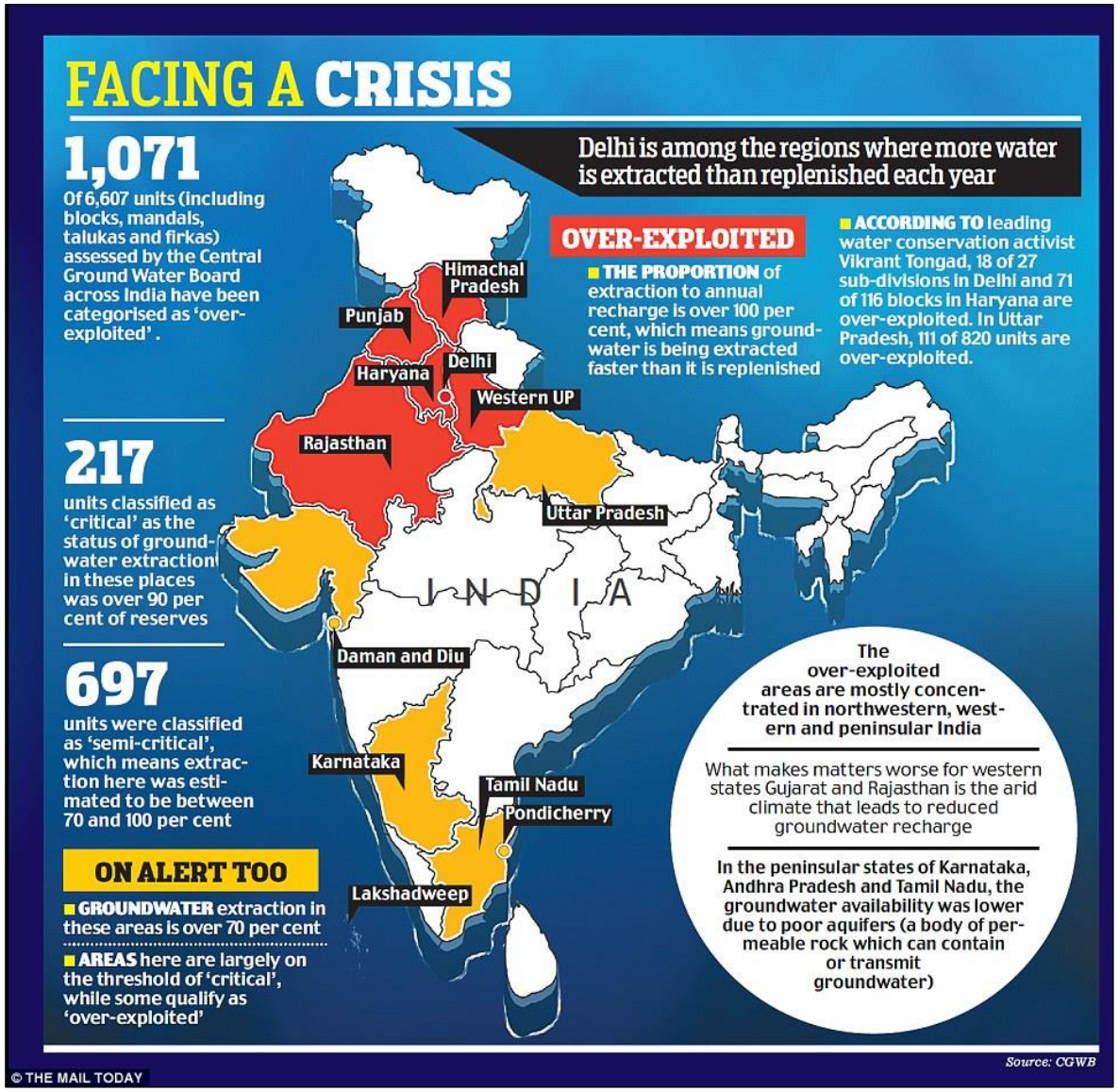


Explanation of Figure 2: This chart shows how Delhi's water table has gone down in a 10-year period. Water table has dropped to as much as 148 ft. from 49.5 ft in Chattarpur. In addition, the groundwater is unfit for consumption in some areas, where there is high concentration of metals and minerals. These pollutants must have trickled down with the rain water. New terms here are: 'Saline' which means salty, 'brackish' which means 'slightly/somewhat salty'. This also shows us that everything in environment is inter-connected if we pollute our environment; the water that seeps into the ground carries those pollutants with it making it unfit for consumption.
Source: India Today



Explanation for Figure 3: This figure shows how progressively water table has gone down in Delhi from 1977 to 2010. In fact, you must dig as deep as the height of Qutub Minar to reach water now in Delhi! This has been caused by increasing population and resulting concretisation of the city.

Source: India Today



Explanation for Figure 4: This figure shows that there is over exploitation of ground water in states that are coloured red i.e. more groundwater is used than recharged. The states in yellow are also on alert because they use 70% of the available groundwater each year. This means that if they have one bad year in terms of rainfall, their water table will also fall drastically as less water will seep into the ground. Therefore, they are at risk too.

Source: Daily Mail

Facilitation notes:

- Why do you think, we are witnessing this situation around the country?
- The water table does not get affected as long as we draw as much water as is replenished by natural resources.
- However, water table may go down if the water is not sufficiently replenished. This happens due to the following reasons:
    - **Increasing population-** With increasing population, there is more demand for construction of buildings like houses, offices, schools, etc. This leads to construction of *pukka* floors which prevents water from seeping down into the ground. A huge amount of water is also required for construction work. Eventually we start consuming more water than what is replenished as we saw in the infographics before.
    - **Increasing industries-** More population also leads to demand for more products. Every industry requires a huge amount of water. Did you know, it takes around 10,000 litres of water to manufacture 1 pair of jeans!
    - **Increasing agriculture-** There is also a demand for more food with increasing population. However, farmers in India depend on rainfall mainly for irrigation which can be erratic. Therefore, they must depend on ground water to irrigate their fields. If you have ever visited a farm, you may have seen borewells there that draw water from the ground.
- To add to this problem, we are also polluting our already existing lakes and rivers.

Pollution of Water bodies

Time: 20 minutes

Note to the teacher: Show the following video

Video: India's water bodies dying a slow death

Video talks about different rivers of India which are drying up leading to water crisis in the nation.

Link: Youtube

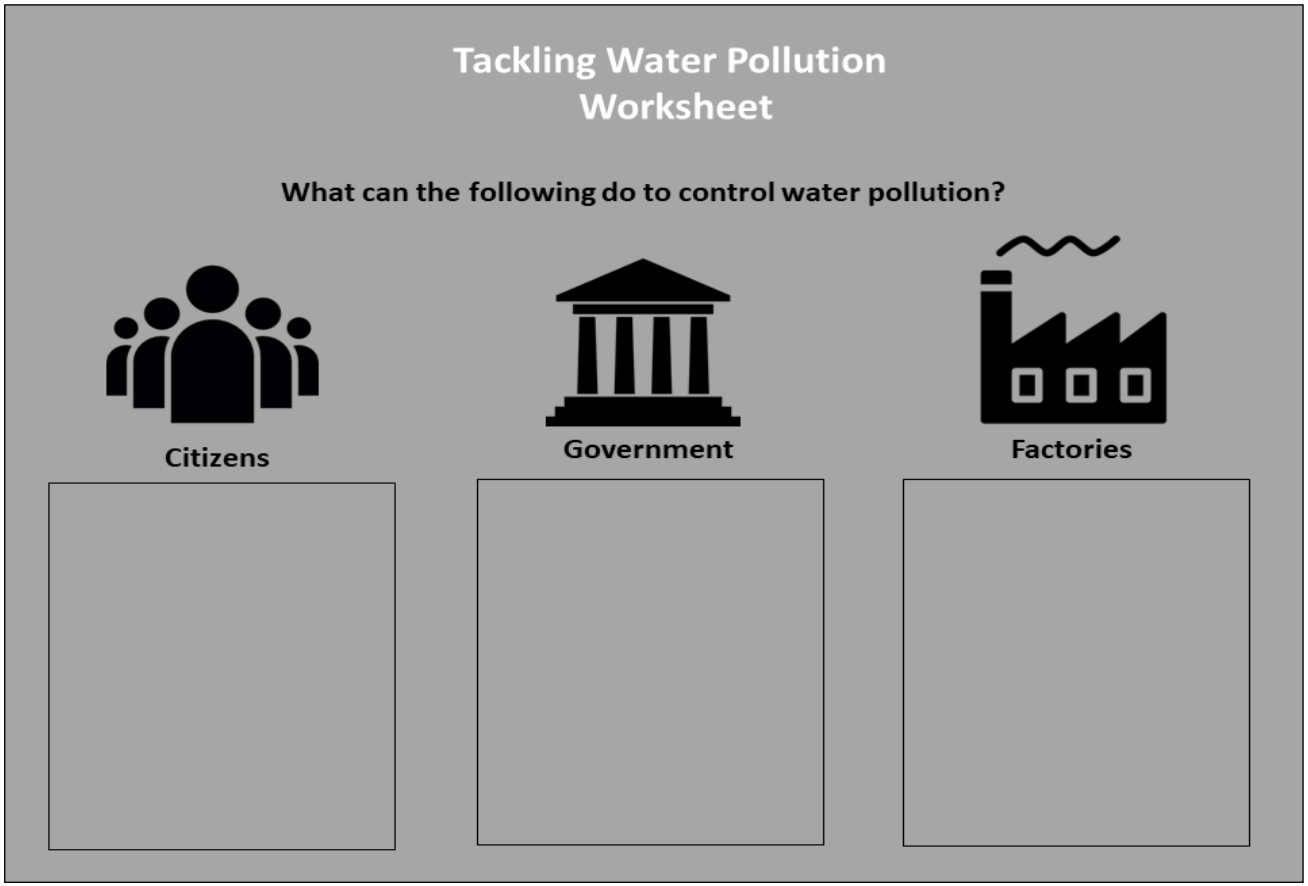
Facilitation Notes

- So, as you can see, that most of the water bodies in India have been polluted due to disposal of industrial waste and plastics into them.
- Tell me who can solve the problem?
- Government, industry, citizens
- How can the problem be solved?

Note to the teacher: Split the class into 3 groups. One group is the government, the other group is citizens and the last group is industry. Each group has to come up with a 5-minute role play on what decisions they would have to take as a group to solve the problem of the water pollution.

OR

Give the following worksheet to the students and ask them to write down as many ideas as possible in 5 minutes.



Note: Students may not be able to think of all these solutions, but you can nudge them to think about how citizens, government and industry relate to each other and what pressure can they exert on each other

Solution guide for the Teachers:

Steps to be taken by citizens:

- Do not litter/ do not dirty the water bodies.
- Use fewer plastic items.
- Put pressure on the government to take action against factories who pollute the water bodies.
- Spread awareness about conservation of environment among friends and families.
- Organise citizen led clean ups of local water bodies, parks and public spaces.

Steps to be taken by Government:

- Fine factories and people who pollute the environment. For example, Chadha Sugar Mill was fined Rs. 5 cr for spill of untreated waste into the river Beas that killed hundreds of fish and contaminated water for several kilometres. (Link: https://goo.gl/R2z3zR)
- Treat the water that has been polluted.
- Launch initiatives to clean up the rivers and lakes. For example, the government of India has launched National Mission for Clean Ganga to rejuvenate the river.

Steps to be taken by Factories

- Do not release waste in water bodies.
- Treat waste before it is released in water (if at all).
- Invest in technology that is environmentally friendly.
- Pay money for cleaning up water bodies that have been polluted by their actions.

End the session with this inspiring video of Versova Beach Clean Up in Mumbai, a great example of active citizenship

Video: Olive Ridley turtles back on Versova beach after 20 years.
The video talks about how citizens joined hands to clean up the Versova beach, Mumbai, restoring the eco-system and getting the Olive Ridley turtles back to the beach.
Link: Youtube

Section III: Closure

Time: 5 minutes

Summary by students

Note to the teacher: Select a student at random to summarize the key points and learnings of the session.
Time: 2 minutes

Recap by the teacher

Time: 3 minutes

- Groundwater is the water available beneath the surface of Earth and is a major source of water for us.
- The upper limit of this layer where the water is available on Earth is called the Water Table.
- The groundwater gets recharged through rain water and water from the other sources such as rivers and ponds.
- When water table doesn't get replenished as rapidly as it is used, it results in scarcity of groundwater.
- The water depletion is due to three key factors:
    - Increase in the industrial activity
    - Increase in the agricultural activity
    - Increase in the population
- In addition, pollution of water is another major cause of worry.
- Citizens have an important role to play in conservation of environment and water bodies.
- In the next session/ class we will learn how to manage water as a resource at individual and city level.

Section IV: Assessment

Pop Quiz
Time: 5 minutes

Facilitation Notes:
Ask the following questions to the students:

- What is the process of 'seepage of water from surface to empty spaces and cracks deep below the ground' called?
- True or false: Construction of pukka floors is good for recharge of water table.
- True or false: Plastics decompose if you let them be in water for a long time.
- What is an aquifer?
- True or False: Water table is the same in all parts of a state.
- What can citizens do to ensure that ground water doesn't get depleted at a fast pace?

Homework: Find out the following about your neighbourhood:

1. How many houses in your colony have submersible/groundwater pumps that draw ground water for daily usage? Why do they need these pumps?
2. What do they use ground water for?
3. Is it allowed to have these pumps in your colony?

Section V: Field Visit

Note: To plan a field visit in your city, look for any water body that has been polluted due to neglect by the citizens, industry and the government. The objective of the field trip is to make students realise the gravity of this problem in the country.

Ideal visit Time: 1- 2 hours

Bangalore: Make a trip to Bellandur Lake and discuss-

- Is the water in the lake clean and consumable?
- How is the situation of lake affecting us?
- What are the sources of pollution for the lake?
- Extended Learning Assignment

- What measures can be taken by the authorities, people, industries (different stakeholders) to clean the lake and prevent future deterioration?
- Present this in the form of a well-researched plan with key challenges and recommendations

Delhi: Make a trip to Yamuna bank and discuss-

- Is the water in the river clean and consumable?
- Note down the pollutants that you can see in the water.
- What are the sources of pollution for the river?
- Extended Learning Assignment
  - Find out from newspaper reports, what measures have been already taken to clean Yamuna the government?
  - Present analysis of their effectiveness.

Mumbai: Make a trip to Mithi River bank and discuss-

- Is the water in the river clean and consumable?
- Note down the pollutants that you can see in the water.
- What are the sources of pollution for the river?
- Extended Learning Assignment
  - Find out from newspaper reports, what measures have been already taken to clean this river?
  - Present analysis of their effectiveness.

Section VI: Additional Resources

Resources for students:

1. Reading: Living through a water crisis, the story of Cape Town
   Link: Time.com

2. Reading: Farmer Suicide
   This article talks about how draught is leading to suicides among Indian farmers
   Link: The National

3. Video: India's water crisis: A warning to the world
   The video highlights the water crisis India is facing, how villagers and farmers are suffering in the situation
   Link: Youtube

Resources for teachers:

1. Reading: Experiments to make students learn more about water pollution and how to undo it
   Link: Gironline

2. Reading: Teacher's toolkit and additional information on ground water
   Link: Groundwater.org

3. Video: India's water crisis: A warning to the world
   The video highlights the water crisis India is facing, how villagers and farmers are suffering in the situation
   Link: Youtube

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