

Teacher's Guide

Water: A Precious Resource

Period 3

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 (3/3) Period 3

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:

- Understand the importance of water management.
- Learn different techniques that can be used by individuals as well as communities to conserve water.
- Understand government policies on water management.

Learning outcomes

Students will:

- Become aware about the idea of water management and how is that applicable to their daily lives.
- Become active citizens by gaining knowledge of water conservation policies of the government and learning about community driven initiatives to conserve water.

Key Terms

Water Management	Rain Water Harvesting	<i>Bawris</i>	Drip-Irrigation
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Section II – How are we going to learn?

Water Distribution

Time: 10 minutes

Note to the teacher: Refer to **Visual 16.8 in NCERT book** on page number 200

Facilitation notes:

- Did you know that water is distributed unevenly across the globe?
- Some places are water rich while some have scanty rainfall.
- *Take responses from the class and continue*
- Do you know of areas where there is too much rain and where there is too little of it?
- Within India, the rainfall varies from place to place; some regions have excessive rains while others have very little rainfall.
- Excessive rainfall leads to floods while whereas lack of rainfall results in draughts.
- *For further discussion, ask the below mentioned questions:*
 - How much annual rainfall your city gets? How does it compare to the rainfall in other regions of India?
 - Is there sufficient water available in your area throughout the year?
 - Do you face water shortage in day to day lives? In which months do you face water shortage?
 - Do you think enough rainfall will guarantee ample water supply and no water shortage?

Water Management

Time: 15 minutes

Facilitation Notes:

- As we saw that rainfall varies greatly from region to region. Therefore it is important to manage the existing water resources and conserve rain water.
- [United States Department of Agriculture](#) defines ‘water management’ as the control and movement of water resources to minimize damage to life and property and to maximize efficient beneficial use. In simpler language, it means minimising wastage of water and making it available to people for consumption.
- *Ask students what are some of the examples of water mismanagement that we witness generally in our daily lives both by individuals and communities. Take a few responses and add if missing:*

- Leakage in water pipes/ water tankers.
- Wasting water while brushing teeth or taking a shower.
- Lack of water supply pipelines resulting in people digging bore wells.
- Leaking taps.
- Addition of industrial waste to the lakes and other supplies of freshwater.

- Now let's see an example of good water management now at an individual level

Rain Water Harvesting

Video: Bengaluru Man Hasn't Paid Water Bill In 22 Years. Why That's A Good Thing

Link: [Youtube](#)



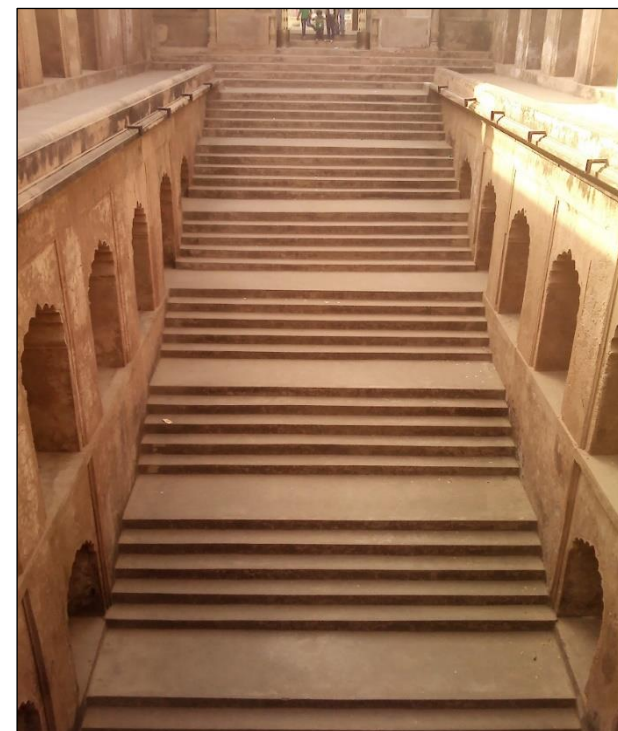
Video description: The family of a senior scientist in Bengaluru has not paid their water bill for 22 years. The reason is that Mr. AR Shivakumar is doing fine without a water connection by using treated rainwater not just for bathing and washing, but also for drinking. He designed his green home more than two decades ago - building in a water harvesting system that yields more than 400 litres of water daily. [Source](#)

Facilitator notes:

- As you saw in the video, **Rainwater Harvesting** is the process of collection of rainwater from surfaces on which rain falls, filtering it and storing it for multiple uses.
- In this video, this man was harvesting water for his own house and has enough water for all his needs; what will happen when you harvest water at the level of a city?
- The groundwater will get replenished leading to an increase in the water table. It is the best way to make sure that water table does not get depleted and it is a very cheap process. Simply put, all the buildings just need to be made in a way that the rainwater on the rooftops slides into a storage tank.
- Since rainwater harvesting is a cheap and effective way of addressing the water crisis, many state governments and municipal bodies have made policies to make rainwater harvesting compulsory in large buildings.
- Let's look at an example of a traditional rainwater harvesting system.

Bawris

- *Show the adjoining picture to students*
- Did you know that rainwater harvesting is an age-old practice in India?
- *Bawris* or stepwells are not only architecturally beautiful, they also played the important role of rainwater harvesting in areas with scanty rainfall like Gujarat and Rajasthan.
- *Ask students if they can guess how these stepwells harvested water?*
- The evaporation in Bawris is less due to their depth.
- The rain that the region received would be diverted to bawris through canals built on the hilly outskirts of cities. The water would then percolate into the ground, raising the water table. To minimise water loss through evaporation, a series of layered steps were built around the reservoirs to narrow and deepen the wells.
- With time, however the Bawris fell into disuse and garbage started piling into these reservoirs.
- Now, government is trying to revive these structures realising the important role they played in water conservation.



Source: [Wikipedia Commons](#)

Drip Irrigation

- As we had discussed in our last session, agriculture uses the most of groundwater for irrigation of crops.
- However, with methods such as drip irrigation, much less water is required to irrigate the fields. Drip irrigation is a technique of watering plants by making use of narrow tubings which deliver water directly at the base of the plant
- *Show the adjoining picture:*
- Looking at this picture, can anyone guess how this saves water?
- With the drip irrigation, precise amounts of water are delivered directly to the plant's root. It gives farmers much more control over where the water is distributed, allowing them to use only the exact amount of water needed for each plant. It also saves water because it is subject to much less evaporation as the water is distributed. Windy conditions also do not alter the drip process and as water is delivered slowly and directly to the roots, water or soil runoff is significantly reduced.



Source: [Agrilinks](#)

Role of citizens in conserving water

Time: 15 mins

Notes for the teacher: For group activity, divide the class in 4 groups (Ideal group size is of about eight to ten students).

- Group one and two will work on CASE 1 and group three and four will work on CASE 2. Teacher reads out both the cases or shares print outs in the class and share questions to be discussed.
- All the groups discuss responses for 5 minutes for the shared questions among their group members and make a note in notebooks.
- Group 1 will share their response for Case 1 followed by feedback from Group 2 on what extra points did they have (Time- 5 mins).
- Next, ask Group 3 to share their response for Case 2 and Group 4 will share their feedback on what additional points could have been made (Time - 5 mins).
- **Questions to be read out by the teacher-**
 - What led to water crisis in the first place, if applicable?

- What measures to overcome water shortage have been discussed and how do they affect the water cycle?
- What role did the citizens play?
- How has it benefited them?

Case 1: Jar Rain Water Harvesting system, Thailand: Thailand falls in the tropical belt of the world. It has abundant rainfall; the wet seasons are from May-October, when the country experiences southwest monsoon. The annual rainfall ranges from 102 cm in the northeast to over 380 cm in the peninsula. Traditionally people collect rainwater to use it exclusively for drinking and cooking. People prefer rainwater to other water due to its taste. Most rural Thai people use at least two water sources. Rain water from jars and tanks and shallow ground water from tube wells. The construction of over 10 million 1-2 cubic meter for cement jars for rainwater storage in Thailand has demonstrated the potential and appropriateness of this conservation system as a primary rural water supply technology. The rainwater harvesting jars are almost used by all the individual houses and thus they have access to year round to clean water. The jars come in various capacities from 100 to 3,000 litres and are equipped with lid, faucet, and drain. The most popular size is 2,000 liters, which costs 750 Baht, and holds sufficient rainwater for a six-person household during the dry season, lasting up to six months. Source: www.rainwaterharvesting.org

Case 2: Madanthyar village, Mangaluru, Karnataka: Despite having an average annual rainfall of 4,000-4,500 mm, the village had begun to suffer from acute water scarcity with rivulets and springs drying up in the recent years. Many reasons contributed to this shortage—rampant conversion of paddy fields to arecanut plantations, extensive fragmentation of landholdings, lesser community participation and individual borewells. Where people could once draw water at a depth of about 65-135 feet in borewells, the situation turned dire when this depth dipped down to a staggering 400 feet and more. Plus, there were more than 50 borewells within a one square kilometre radius of Madanthyar, which played a central role in draining its springs, streams and rivulets.

Fortunately, one professor and his group of students from the Sacred Heart College in Madanthyar came forward to resolve this crisis. Using traditional water conservation methods like check dams, water percolation pits, and rain water harvesting, Joseph NM, who is an Economics professor at the college, along with over 100 students together from Sacred Heart College and another college in neighbouring village of Belthangady, have been able to address the water problems of this village. They resuscitated six check dams across the Artilahalla rivulet. In fact, the students from the college have even given themselves the moniker of Jala Kranti (water revolution) team, which quite befittingly highlights their crusade. Using local amenities like sandbags and mud, they constructed check dams that have a water-holding capacity up to 1-1.5 km. According to Melwyn D'Souza, one of the farmers who has directly benefitted from the check dams, these structures have helped revive the water table across open wells and ponds in his locality, which had almost run dry last year.

**Check dams are small dams or barriers constructed in a small water body to decrease the streamflow velocity and divert water.*

Role of Government in Water Management

Time: 5 minutes

Facilitation notes:

- India has around 18% of the world's population but only 4% of world's renewable water resources.
- These water resources are also unevenly distributed across the country, often resulting in conflict among different user groups.
- Therefore, a need was felt to institute a National Water Policy that was first drafted in 1987 to take an overall perspective on water management in the country.
- Since then, it has been updated as and when required. The policy is formulated by Ministry of Water Resources, under the Government of India. The policy touches upon efficient resource planning (i.e. of water sources like rivers), recycling and regulating the exploitation of ground water.

In addition to the central government, the state and city governments also make policies and laws relating to water conservation depending on their local requirements. Here a few examples of the water harvesting policies at the state and the city level.

Himachal Pradesh: In this hilly state, all the commercial and institutional buildings, tourist and industrial complexes, hotels etc., existing or coming up and having an area of more than 1000 square metres are required to have rain water storage facility according to the size of their roof area. For instance, the bigger locations will have to ensure there is a bigger storage facility. Clearances from the government are not issued to the owners of the buildings unless they produce satisfactory proof of compliance with this requirement. As per the law, the toilet flush systems have to be connected with the rainwater storage tank.

Source: rainwaterharvesting.org

Haryana: Haryana Urban Development Authority (HUDA) has made rainwater harvesting mandatory in all new buildings irrespective of roof area. As per this rule, in the notified areas in Gurgaon and the adjoining industrial areas, all the institutions and residential colonies have been asked to adopt water harvesting by the Central Ground Water Authority (CGWA). The idea is to have storage facility built in the buildings at the time of construction. The CGWA has also banned drilling of tubewells in notified areas.

Source: rainwaterharvesting.org

Bengaluru: In 2009, the government made it mandatory for a building constructed of a certain size (30 x 40 square feet) and above to install rainwater harvesting systems. They identified about 1.5 lakh properties in the city, which meet the criteria. Users with domestic consumption lines flouting norms have to face a penalty of 25% on their monthly water bill for the first three months, which is increased to 50%, should they fail to install RWHs. In case of commercial buildings, the penalty is higher at 50% for the first three months, following which they will have to pay a penalty equivalent of their bill.

Source: The Hindu, Feb 07, 2018, Rainwater Harvesting: Record fine in January, Shruti H.M.

Effect of scarcity of water on plants and inter-connectedness of nature

Time: 5 minutes

Facilitation notes:

Humans, animals, plants; essentially all living forms existing on earth need water for survival. While we learnt about water scarcity and its effect on human life, here is a glimpse of how water scarcity can affect plants as well:

- What happens to plants if they are not watered regularly?
- They dry up and sometimes they die as plants need water to get nutrients from the soil.
- So, what will happen, if there is acute shortage of water on earth?
- Without water, therefore there will be no plants, without plants, there will be no oxygen and without Oxygen there will be no us!
- The end of water means end of all life on this planet.
- **Everything in nature is inter-connected and there it is important to conserve all natural resources.**
- As we had learnt earlier, the extent of human desires is endless, but as mindful citizens we need to adopt practices that help us maintain the natural balance.

Section III –Assessment

Pop Quiz

Time: 5 minutes

Note for the teacher: Ask students to answer if the following statements are True or False

Facilitation notes:

- True or false: Drip irrigation is an effective method for water management.
- True or false: Bawris are a modern method for conservation of water.
- What is rain water harvesting? Explain the process.
- True or False: Solar energy is a non-renewable source of energy.
- What can citizens do to ensure a moderate consumption of electricity at a household level?
- True or False: Life on earth cannot exist without water.

Section IV – Closure (5 mins)

Summary by students

Time: 2 minutes

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

Recap by the teacher

Time: 3 minutes

Facilitation notes

- Water is distributed unevenly across the globe, while some countries are water rich others have very limited availability of ground water. This depends on the level of rainfall in each region.
- Water management is an effective allocation and use of water as it is a limited resource.
- Rain water harvesting is an effective technique of water management.
- There exists several traditional and modern means of water conservation like drip irrigation, step wells, check dams, rain water harvesting.
- All natural resources are interconnected and therefore we need to maintain balance of nature.
- Citizens have an important role to play in conservation of environment.

Homework

1. Refer to the activity 3 in the **Extended Learning - Activities & Projects, NCERT, Class VII, Page 204**
 - Split the class in the groups of five students.
 - Ask them to prepare a detailed report on traditional + modern ways of water harvesting.
 - Ask them to include case studies and examples from across the globe, choose at least one rural and one urban.

- Refer to www.rainwaterharvesting.org for information.
- Make students present in the following week.

2. Community Activities:

- Initiate in a team a community campaign where you are spreading door to door awareness to other residents about importance of water and electricity conservation and make them sign the pledge, submit signed pledges and posters at school
- Find out rules regarding rainwater harvesting in your city.
- Conduct a survey of 5 households in your neighbourhood and find out how many houses/apartments have rainwater harvesting facility?
- Conduct a survey of 10 families in your neighbourhood and find out how they are conserving water and electricity.

Section V: Field Visit(s) to study water conservation

Note: To plan a field visit in your city, look for any water conservation site, step wells or a building/ campus which has installed rain water harvesting system.

Ideal visit Time: 1- 2 hours

Some of the suggested locations for Bangalore, Delhi and Mumbai are shared below:

Bangalore: Field visit to water conservation park, Jayanagar:

- Identify the various models of rainwater harvesting and how are they resulting in water conservation.
- What role can government play in the water conservation?

Delhi: Field visit to step wells in the [city](#):

- Explain the process of the traditional techniques used in the step wells.
- How can these wells be revived?
- What role can government play in reviving these step wells?

Mumbai: Field visit to one of the complexes as listed [here](#) which have installed rain water harvesting:

- Determine what was the need of rain water harvesting in their complex?
- How did they make it happen? What were the key challenges faced?
- How are the residents benefitting from this?
- How can this be adapted in other parts of the city?

Section VI – Additional resources

Resources for students:

1. Reading: Rain Water Harvesting in Mumbai
[Link: Firstpost](#)
2. Reading: Urban water management in India
[Link: Waterworld.com](#)
3. Reading: Interventions that brought clean water to Odisha villages
[Link: The Better India](#)
4. Reading: Water Atlas to help farmers get the water they need
[Link: The Better India](#)

Resources for teachers:

1. Reading: Success stories from parts of India
[Link: The Better India](#)
2. Reading: Teachers Toolkit for rainwater harvesting at school
Link: [Teachers of India](#)

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