Teacher's Guide

Water

Part 2

Based on Karnataka State Board Curriculum for Standard VI

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 | Teacher's Guide (2/3)
Part 2

Class VI
Board – Karnataka State Board
Subject – Science
Textbook – Science Textbook for Class VI (Karnataka State Board)
Chapter 14 – Water
Number of part – 03
Length – 70-80 minutes (estimated, for a class of 40-45 students)
Note: Teachers may divide the lesson plan into as many periods as they see fit

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

Learning objectives

Students will:

- Understand how the water cycle ensures circulation of water.
- Understand how floods and droughts are caused.

Learning Outcomes:
Students will:

- Appreciate how nature keeps a balanced supply of water everywhere and how imbalances are caused.

Key Terms:

Evaporation	Condensation	Transpiration	Precipitation	Ground Water
Liquid	Gaseous	Solid	Water Cycle	

Section II: How are we going to learn?

1. The Water Cycle

Time: 20-25 minutes

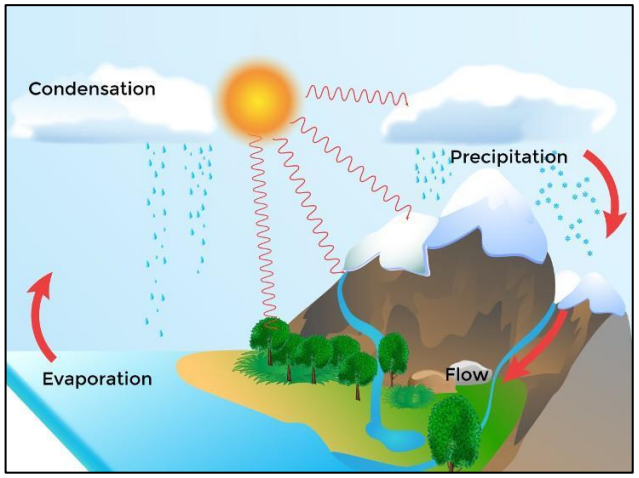
- We all understand that most of the water of this world is present in oceans. And we also know that this water is saline.
- What does saline mean, again? (a student raises their hand and answers)
- Saline water cannot be used. And therefore, we get all our fresh water from other places like ponds, lakes, rivers, the rain etc.
- But where does the water in rivers come from? What will happen when all the lakes dry up? How will they fill up again? If we have limited fresh water available on earth, why has water not been exhausted yet? (Take 3-4 responses)
- To understand this process, we will be now talking about a natural process known as the **water cycle.**

Facilitation Notes:

- Before we start discussing the water cycle, let's quickly revise a few concepts we studied in earlier chapters. (The teacher then asks the students each of these terms and refreshes memory if they are not able to answer.)

Evaporation	**Evaporation** is the process by which **water** changes from a **liquid** to a gas or vapour. **Evaporation** is the primary way through which **water** gets converted from liquid to gas or **vapour**. Source
Precipitation	**Precipitation** is **water** released from the clouds in form of rain, freezing rain, sleet, snow, or hail. It is the primary was in which water from the atmosphere comes back to Earth. Most **precipitation** falls as rain. Source
Condensation	**Condensation** is the process by which **water** vapour in the air is changed into liquid **water**. **Condensation** is crucial to the **water cycle** because it is responsible for the formation of clouds. **Condensation** is the opposite of evaporation. Source
Transpiration	**Transpiration** is the process by which excess moisture or water from plants is released into the atmosphere in the form of vapour. Source

- All these natural processes of evaporation, condensation, and precipitation come together to form the water cycle. How? Let's discuss.
- Water from oceans, lakes, rivers, and ponds evaporates when it absorbs heat from the sun and the atmosphere and becomes water vapour. Note that when water evaporates, all the salts dissolved in it stay back and only the water vapour rises up.

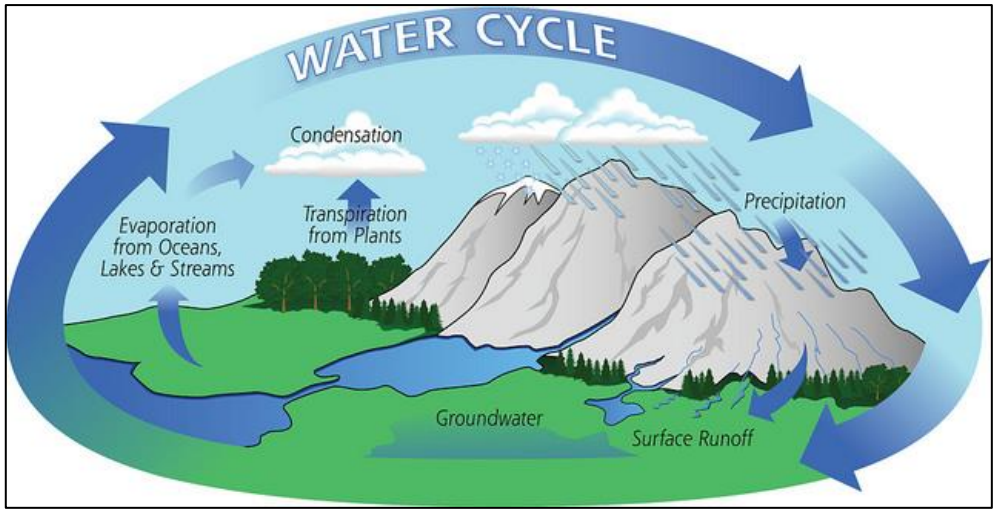


- During the day, water doesn't just evaporate by direct heat from the sun; it also absorbs heat from its surroundings and evaporates into the atmosphere. Refer to activity 2 in your textbooks to understand this in more detail.
- Water is also released into the atmosphere by plants and trees through the process of transpiration.
- As this water goes up in the atmosphere, the temperature of the atmosphere falls leading to cooling of this vapour. For example, you may have noticed every time you leave a very cold bottle out in the open, there are tiny water droplets on its surface. This happens because water vapour from the atmosphere condenses on the surface (Activity 3 in the textbook).
- Similarly, as water keeps rising in the atmosphere, temperature keeps falling. Water vapour then condenses to form tiny water droplets in the atmosphere. These water droplets appear to us as clouds.
- These clouds float around and get swayed by wind. They keep collecting water and when they become too heavy, they fall down as rain.
- Some clouds get blown to very cold regions such as the mountains where they turn into snow and cause snow fall and **hail**.
- The rain water (or melted water from the snow) then drains into rivers and streams. Thus, rain and snow bring water back to rivers, lakes, and ponds.
- The water that seeps into the ground also gets absorbed and collected under the ground as **ground water.** This ground water is then drawn out using wells and motor pumps.
- Sometimes when it is very cold, water vapour condenses very close to the surface of the Earth and forms water droplets in the atmosphere. These water droplets appear in the form of 'fog' and hamper visibility for humans, cars, trains etc.

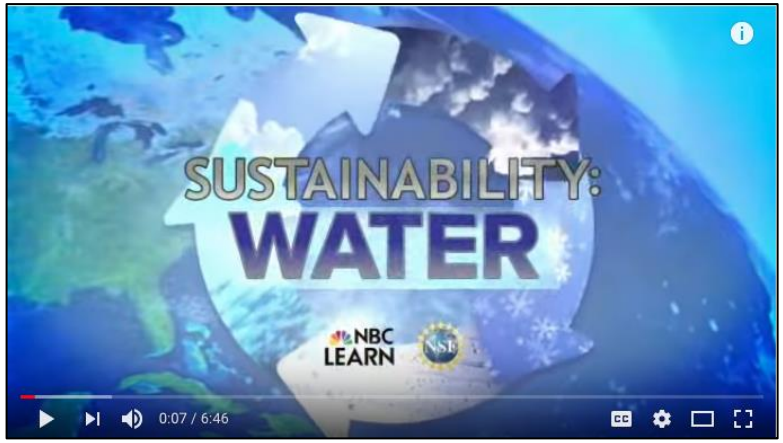
Mountain Fog

Source: Unsplash

- Here is the diagram of this entire process. (The teacher to draw the diagram on the board and give the students 5 minutes to copy it and answer questions.)



Source: Flickr



Video: The Water Cycle

Note to Teacher: This video is optional. Please show this to the students in case a setup is available.

The video illustrates and explains the water cycle and all the processes it is composed off.

Link: YouTube

- I will now quickly summarise the water cycle again:
  - The water cycle explains how the water **evaporates** from the surface of the earth, rises into the atmosphere, cools and **condenses** into water droplets or snow in the clouds and falls again on the earth's surface as **precipitation or rain.**
  - Everyone to now note the definition of water cycle: The process of circulation of Earth's water , in which water evaporates from the water bodies into the atmosphere, where it condenses and then falls as rain or snow, returning back to the water bodies by rivers.
  - When water circulates through the water cycle, it can be found in all the three forms, i.e., **solid, liquid and gas.**

Lab Activity

Time: 20 mins

Note to teacher: This is an optional activity to be conducted outside classrooms, at Science Labs

- Take students to the chemistry lab.
- Show how evaporation happens through boiling water.
- Show perspiration through collecting water droplets that have been formed on the lab tissues.
- Show water in condensed form as ice by freezing water and then reverse process by melting the ice.

- Debrief on how water takes all shapes and forms (**solid liquid, gaseous**).

- Extend the learning to how water exists on Earth in these forms.
- Re-emphasise that the continuous recycling of water among its three forms keeps the total amount of water on the earth constant even when the whole world is using it.

2. Imbalances in the water cycle

Time: 10-15 minutes

Note to teacher: In case a projector is not available, the teacher can talk about floods/ droughts without showing the photos.

- Continuing from the last part, I want one student to recap the water cycle for me. (Select a student who recaps the process).
- How many of you have heard from your parents or read in the papers that a certain state did not get rainfall or there is shortage of water there or a **drought**? (a few students share responses)
- And when was the last time you heard of a **flood** situation in some place in India. How many of you heard of the Kerala floods?
- Why do you think floods or droughts happen?
- A flood and a drought happen in opposite situations. A flood occurs when there is an excess of rainfall in an area, the water levels rise in the rivers and lakes and spreads in the surrounding areas, causing widespread damages to humans, animals, and property.
- For those of you who do not know of the recent floods, in the monsoon of 2018, Kerala received more than usual rainfall. As a result large areas of the state were submerged under water and hundreds of people died. Can you imagine any human activities that may worsen a flood? (expected responses- human waste clogging drains, cutting of trees leading to no break in the flow of water)
- A drought is the opposite of a flood. A drought is a situation in which an area receives very little or no rainfall leading to a prolonged shortage of water hampering the day to day activities of life. Plants and animals suffer; the crops are destroyed leading to acute food shortage.
- Here are a few pictures to explain what I am talking about (the pictures are optional, in case a projector is available)

Drought	Flood
 Source: Flickr	 Source: Wikimedia
 Source: Unsplash	 Source: Wikipedia

Source: The Hindu

Source: Wikimedia

- So basically, an imbalance in the water cycle leading to no rain or too much rain is both harmful for the environment.
- In conclusion, the water cycle is a natural way to ensure that water keeps circulating all over the planet. However, it is not perfect.

Section III: Assessment

Pop Quiz
Time: 5 minutes
Facilitation Notes:
Ask the following questions to the students:

- Fill in the blanks:
  - Excessive rainfall can cause _____.
  - No rainfall can cause _____.
  - The process of changing of water into vapour is called_____.
  - The process of changing of vapour into water is called _____.
- How are droughts and floods caused?
- True or false:

- The water cycle is a fool proof natural process.
- We don't need to worry about water getting over because rainwater will recharge all fresh water sources.
- The problem of water is huge, that individual efforts do not make a difference.
- A blackboard dries up after wiping it due to condensation.
- Evaporation takes place only in sunlight.
- Water vapour is present in the air only in monsoons.
- Water only evaporates from lakes and rivers and not from the soil. (False. It evaporates even from land)

Homework:

1. When I keep a cold bottle of water in the open, why do I notice droplets of water on its surface?
2. Suppose you want to dry your school uniform quickly. Would spreading it near an *anghiti* or heater help? If yes, how?
3. How are clouds formed?

Section IV: 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.

Recap by the teacher

Time: 3 minutes

- Water available on Earth exists in three forms- Solid, Liquid and Gas.
- Water Cycle is a process through which water is sustained on Earth, the key steps to this process are- Evaporation, Condensation, Transpiration and Precipitation. The water vapor in the air condenses to form tiny droplets of water, which appear as clouds. Many tiny water droplets come together and fall down as rain, snow or hail.
- This water cycle ensures a natural balance of water and also recharges ground water. However, due to increased buildings and concrete, water is not able to seep into the soil and, therefore, ground water levels are falling.

- Imbalances in the water cycle result in droughts and floods.
- Either situation is harmful for humans and other living beings.

Section VI: Additional Resources

Resources for students:

1. Video: What is ground water?
   The video explains where ground water comes from, how it is collected and what are its benefits/ uses.
   Link: YouTube

2. Video: Water Dammit: The face of drought in India
   The short video shows photographic coverage of various drought hit regions in India.
   Link: YouTube

3. Video: Earth's Water Cycle
   The video very innovatively explains how Earth recycles all its water to ensure that fresh water is available.
   Link: YouTube

Resources for teachers:

1. Reading: Experiments to make students learn more about water pollution and how to undo it
   These experiments demonstrate the impact of pollution of water bodies and the risks associated with it.
   Link: Gironline

2. Reading: Teacher's toolkit and additional information on ground water
   The website is a very informative resource to understand ground water and how it plays a role in our lives, its depletion etc.
   Link: Groundwater.org

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