NATIONAL GEOGRAPHIC

RESOURCE LIBRARY I ACTIVITY : 1 HR 40 MINS

How We Use Water

Students explore how people in the Western United States use water by analyzing the *Freshwater Use in the West* map. Students then connect this to Mount Everest by exploring interactives, historical data, and maps regarding the water supply and demand around Everest. Students examine trends in data regarding water usage over time and make a connection between population and water usage by visiting *MapMaker Interactive*. They compare the population density where they live to the population density of the Everest watershed.

GRADES

6, 7, 8

SUBJECTS

Biology, Ecology, Conservation, Earth Science, Climatology, Geography, Physical Geography

CONTENTS

1 Image, 1 Resource, 6 Links, 1 PDF

OVERVIEW

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For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/how-we-use-water/

In collaboration with

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learning that connects

DIRECTIONS

This activity is part of the Peak Water: Mount Everest and Global Water Supply unit.

1. Assist students as they analyze graphs, maps, and images to learn how people in the Western United States use water.

- Have students work in pairs to make claims about how people in the Western United States use water by analyzing the *Freshwater User in the West* map.
    - Have students look at the map. Ask students to identify:
        - *Which area(s) of the map use the most water?* (Southern California, potato farms in Idaho)
        - *How much water is being used in those areas?* (2,500 million gallons (9,463,529.46 cubic meters) of water a day)
        - *Where does the West get most of its water?* (Reservoirs like Lake Powell, Lake Mead, and Shasta Lake)
    - Have students look at the graphs of water use. Ask students to identify:
        - *How does the public and domestic water use of the western states compare to the rest of the United States?* (The western states use more public and domestic water per person than the rest of the United States, between 50-100 gallons (.189-.379 cubic meters) per person more per year.)
        - *How does the agriculture water use of the western states compare to the rest of the United States?* (The western states use significantly more water per day for agriculture—on average 50 billion gallons (189,270,589 cubic meters) of water per day more.)
        - *How does the industry water use of the western states compare to the rest of the United States? (*The western states use significantly less water for industrial use—close to 20 billion gallons (75,708,235 cubic meters) of water less than the rest of the United States.)

    - Lead a whole-class discussion to have students share what they think these findings mean for water security and water resources for the Western United States. Elicit students' ideas about how to ensure water security and equitable water access for people living in these dry regions.

- Connect this issue to international water security by navigating the *Stunning Inequality in World Water Use* article's slideshow and reading the accompanying captions. Ask students to respond to the following questions in small groups:

    1. *What was the least amount of water used, in liters?* (60 liters in Niger)
    2. *What was the most amount of water used?* (1,000 liters in New York City)
    3. *Besides those two extremes, what was the average amount of water used per family?* (about 160 liters)
    4. *Why do you think there are such differences in the amount of water each family uses?*

- Ask students to consider what this might mean for water security and water resources around the world. Distribute the *Project Journal: How We Use Water* and have students record their ideas and responses using Question 1.

2. Facilitate students' exploration of interactives, historical data, and maps to understand the water supply and demand around Mount Everest.

- In pairs, have students view the EarthPulse *Everest Human Water Demand* data.
- Prompt them to consider the specific ways that humans use water from Everest by asking:

    - *What are the three water uses represented by the chart?* (Domestic, irrigation, industrial)
    - *Of those three human water demands, which used the most water?* (Domestic)

        - Brainstorm with students the kinds of tasks that count as domestic.

- Then have students consider water use by other organisms (such as pine trees, yaks, pikas, and snow leopards) in the Everest watershed by analyzing the EarthPulse *Everest Total Water Demand* data and asking: *How does the natural demand for water in the ecosystem compare to the human demand?* (30km^3 less/year)
- Next, either in partners or as a class, direct students to explore the EarthPulse *Interactive Everest Map*. Under the "Demand" category, select "Settlements & Agriculture." Ask students what they notice. Then have them select "Rivers" in addition to "Settlements &

Agriculture." Ask students what they notice with this addition, encouraging them to zoom in and out using the plus and minus on the map.
- Ask: *What does this mean for water use in the Ganges (Ganga)-Brahmaputra River region if snowpack is reduced or if glaciers are shrinking?* (This may result in less water availability for people. Water resources may be become less reliable as glaciers retreat.)
- Have students record their responses to these findings using Question 2 in their Project Journal.

3. Help students explore data regarding water usage in the United States over time.

- Visit the *Trends in Water Use* article presented by the United States Geological Survey (USGS) and have pairs of students analyze graphs about water usage over time.

    - Direct students to locate and analyze the *Trends in Population and Freshwater Withdrawals by Source* graph and ask students to identify:

        1. *When was water use at its highest?* (1980)
        2. *When was water use at its lowest?* (1950)
        3. Then have students read the description below the graph and have them identify: *What caused the drop in water use after 2005?* (Decrease in withdrawals for thermoelectric power and a decrease in public supply withdrawals)

    - Have students analyze the *Trends in Total Water Withdrawals by Water Use Category, 1950-2015* graph and ask them to identify:

        1. *What two categories of water use accounted for most of the water withdrawals?* (Irrigation and thermoelectric power)
        2. *What questions do you have for what we can do to ensure we use less water across all categories of water use?* (Answers may vary)

- Help make a connection between population density and water usage by having students visit *MapMaker Interactive* and compare the population densities between where they live and the Everest watershed.

    - On the right-hand side, click "Add Layer," then the "Human Populations" category, then the "Population Density" layer. If needed, define population density.
    - Find Mount Everest on the map by zooming in. Adjust the transparency as needed to find it, then readjust it so the students can see the darker red color. Click "Legend" on the right-hand side.

    - Ask: *What is the population density of the Everest watershed?* (Students should say that it is around 500 persons per square mile.)
    - Students should repeat this process by finding the population density for their local watershed.
    - Ask: *What similarities and differences do you see between population density in your area and in the Everest watershed?* (Answers will vary based on location)

- Have students record their responses to these findings using Questions 3 and 4 in their Project Journal.

4. Prompt students to reflect on their learning in their Project Journal for this activity.

- Students revisit the *Sustainable Development Goal 6: Clean Water and Sanitation* encyclopedic article and record their response to the quote presented in Question 5 of their Project Journal.

Tip

Step 3: This *Groundwater and Surface Water* activity is on the higher end for the middle school level, but could be a good extension or additional resource to include as time allows.

Modification

Step 3: You may decide to do some of these activities as a whole class, like navigating *MapMaker Interactive*.

Informal Assessment

Students show their learning through partner discussions, class discussions, and in their *Project Journal: How We Use Water*. Journals will be collected after each activity.

Extending the Learning

Have students conduct research (e.g., online, surveys, interviews) to find out how their local community or state uses water. Is it on irrigation, industry, domestic use, or something else? Use the *Total Water Use* data-based interactive map from the United States Geological Survey (USGS) to find out how each state uses water.

Step 1: As time allows, read the *Water Inequality* article to delve deeper into why certain countries have access to or use more water than other countries.

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology
- Conservation

Earth Science

- Climatology

Geography

- Physical Geography

Learning Objectives

Students will:

- Use tables, graphs, charts, articles, and maps to obtain information about how humans use water.
- Collect evidence that humans impact resources in ecosystems, particularly freshwater.
- Understand that there is inequity in water access across the world.

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Reflection
- Visual instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information Literacy
    - Media Literacy
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
- 21st Century Themes
  - Environmental Literacy
  - Global Awareness
- Critical Thinking Skills
  - Analyzing
  - Evaluating
- Geographic Skills
  - Analyzing Geographic Information
  - Answering Geographic Questions
- Science and Engineering Practices
  - Analyzing and interpreting data
  - Obtaining, evaluating, and communicating information
  - Using mathematics and computational thinking

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.WHST.6-8.9:**
Draw evidence from informational texts to support analysis, reflection, and research.

NEXT GENERATION SCIENCE STANDARDS

• **Crosscutting Concept 2:**
Cause and Effect
• **MS. Earth and Human Activity:**

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

- **MS-ESS3-4:**

Construct an argument supported by evidence for how increases in human and natural resources impact Earth's systems.

- **Science and Engineering Practice 1:**

Asking questions and defining problems

- **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information

Preparation

What You'll Need

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per pair, Monitor/screen, Projector, Speakers

PHYSICAL SPACE

- Classroom

GROUPING

- Heterogeneous grouping
- Large-group instruction
- Large-group learning

BACKGROUND & VOCABULARY

Background Information

Students should begin to understand the connection between freshwater stored in mountain glaciers and snowpack and water security. Students should see that with an increased human population, there is increased water usage.

Prior Knowledge

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Recommended Prior Activities

- A Day Without Water
- Precious Freshwater
- Watersheds
- Water Towers and Shrinking Glaciers

Vocabulary

Term	Part of Speech	Definition
agriculture	*noun*	the art and science of cultivating land for growing crops (farming) or raising livestock (ranching).
domestic	*adjective*	having to do with the day to day activities and upkeep of a personal residence such as a house, apartment, farm, or other estate.
industry	*noun*	activity that produces goods and services.
inequality	*noun*	difference in size, amount, or quality between two or more things.
irrigation	*noun*	watering land, usually for agriculture, by artificial means.
Mount Everest	*noun*	highest spot on Earth, approximately 8,850 meters (29,035 feet). Mount Everest is part of the Himalaya and straddles the border of Nepal and China.
population density	*noun*	the number of people living in a set area, such as a square mile.
thermoelectric power plant	*adjective*	power plant that uses a temperature difference between two materials to generate electricity.