

# Connecting Climate Change to the Water Cycle

---

## Description:

This lesson will provide students with an understanding of the water cycle and the ways in which it will be altered by climate change. By encouraging a deeper understanding of the connections between the water cycle and climate change, we can encourage a systems thinking approach to interpreting human interactions with Earth systems, including how they have affect the natural world and the global water system.

## Objectives:

- Recognize and understand the feedback loop between climate change and the water cycle
- Understand how the changes to the water cycle will affect us, on a global, regional, and local scale
- Make connections to current and past environmental events related to the water cycle

## Vocabulary:

Drought, evaporation, flood, precipitation

## Materials:

- Computers, laptops, or tablets with internet access
- Paper and markers
- Post-Its

## Background Information:

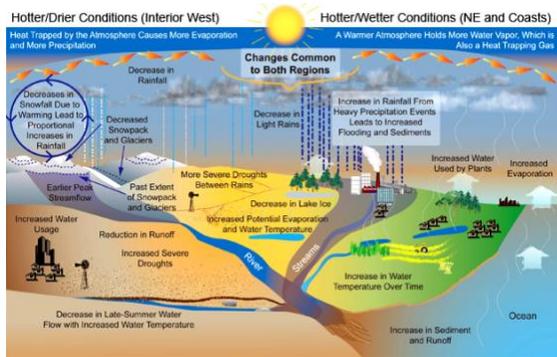
The global average increase in temperature caused by climate change is affecting the water cycle in various ways.

As discussed in DEP’s [Placing Climate Change in New York City](#) lesson, sea level rise is a significant aspect of climate change that is drastically shifting Earth systems. This is one way the water cycle is being affected by climate change. In addition to sea level rise, climate change is causing more floods and droughts to occur globally. As the temperature on the surface level of the Earth increases, so does the rate of evaporation. This causes the soil to dry out faster, creating harder and less permeable soil. Instead of water soaking into the soil, it runs off into streams and rivers. This degrades soil quality which can make agricultural land unusable and creates turbid water filled with soil, clay and other particles.

Additionally, an increase in water evaporation affects another part of the water cycle, precipitation. Warmer air can hold more water vapor which can lead to stronger, more intense storms. These storms can cause massive floods in various climates, which greatly shifts the natural systems of the affected areas. Again, this shift in the water cycle is particularly relevant when considering agriculture. When climates shift to increased (or decreased) precipitation, farmers in these areas are required to shift their practices to match these new conditions. This can cause decreased agricultural productivity.

It is important to realize that shifts like this in the Earth’s natural systems effects all living

organisms, not only humans, and as climate change intensifies, so will these shifts.



Visit the U.S. Global Change Research Program's website to view the [Projected Changes in the Water Cycle](#) diagram above in greater detail.

## Method:

- Split the class into groups of four and assign each group a location to research. The locations assigned can vary, you might choose to assign each group a different continent for a global perspective, different cities within the U.S., different neighborhoods within New York City, or let the groups choose locations that interest them. We recommend assigning New York City to one group, no matter the scale you choose, to maintain a local focus.
- Instruct students to research evaporation and precipitation online for their assigned location. Within each group, half of the students should focus on evaporation and the other half should focus on precipitation. Consider using NOAA's maps on [precipitation](#) and [evaporation](#) in the U.S. over various time intervals. Encourage students to look at current events and news articles as well.
- On poster paper, or digitally using excel or Google sheets, have students create a graph that displays their research, with change

over time. They may choose to create two different posters for evaporation and precipitation.

- Ask students to predict how these rates will change in the future, based on the background information and their research. Consider assigning a specific time period for this component.
- Tape each group's final product for a science gallery walk. Students can spend time viewing all of the posters and leave comments or further questions they may have using Post-Its.

## Discussion:

- How did the locations vary?
- How do the precipitation and evaporation rates relate to each other?
- How have these changes impacted us and the environment? How will they impact us in the future?
- What actions can we take to slow down these effects on the water cycle?
- As climate change intensifies, how will changes in the water cycle affect the human population in the future? List some mitigation and adaptation strategies to address these intensified effects.

## Extension:

- Encourage students to learn about where our water comes from by getting to know people who live in the watersheds! Participate in [the Watershed Agricultural Council's Green Connections program](#), where "students from upstate NYC watershed and downstate NYC classrooms become pen-pal buddies for a school year. Buddies exchange letters, learn from a common watershed curriculum, do a local

stewardship activity, and share hands-on watershed experiences on two joint field trips—one to NYC, and one to the upstate NYC watershed." Consider how students experience impacts of climate change in these two different ecosystems.

**NYC Department of Environmental Protection**

[educationoffice@dep.nyc.gov](mailto:educationoffice@dep.nyc.gov)

For more information visit [www.nyc.gov/dep](http://www.nyc.gov/dep)