

# Warmer Water and Rising Sea Levels Experiment

*A lesson in the NJAITC Climate Change Series*

**OVERVIEW:** This simple experiment shows students how an increase in the temperature of the ocean can cause the level of the ocean to rise.

**GRADES:** K-5

**OBJECTIVE:** Students will be able to:

- Explain why warmer temperatures cause sea levels to rise.
- Describe problems sea-level rise could cause for people.

**MATERIALS:**

Small plastic water bottle (about 16 fluid ounces works well)  
Heating pad or heat lamp (If you don't have either of these, setting the bottle in bright sunlight will work.)

One clear plastic straw

Water resistant modeling clay or plumber's putty

Marker

Ruler

*Optional:* Blue food coloring for the water

Thermometer

the book *Understanding Climate Change, Facing a Warming World*,  
by Melissa McDaniel



*Note: The experiment can be done as a whole class demonstration or by small groups of students. If working in small groups, students will need one set of materials per group.*

## **BACKGROUND**

Rising sea levels are one of the consequences of global climate change. Sea-level rise has two causes:

- Warmer temperatures melt the glaciers and ice sheets on mountains and in the Arctic and Antarctica. The resulting liquid water eventually runs into the ocean.
- Higher temperatures mean warmer ocean temperatures. As the water warms, its volume increases. This is known as *thermal expansion*.

About half of sea level rise is due to ice melt and half to thermal expansion. *This experiment demonstrates to students how warming water temperatures cause the level of the ocean to rise.*

Scientists estimate that at the current rate of global warming, the level of the ocean on the coast of New Jersey could rise up to two feet by the year 2050.

## PROCEDURE:

*Optional:* Read Chapter 1, The Dangers of Climate Change in *Understanding Climate Change, Facing a Warming World*, by Melissa McDaniel.

Start a discussion with students asking them if they know some of the consequences of a warming planet. Tell students that one of the consequences is that the level of the ocean will rise, causing it to flood low-lying islands or coastal areas. Explain the two reasons for sea-level rise when temperatures increase: thermal expansion and glacier and ice melt. Explain that today you are going to do an experiment to see how one cause, warming water temperatures, can cause the level of the ocean to rise.

Ask students what the three states of water are: solid, liquid, and gas. Ask what conditions are necessary for solid water - ice - to turn into liquid water. Explain that an increase in temperature causes the water molecules to gain energy and move faster. As they move faster, the water molecules move farther apart, causing the water to take up more room. This is an increase in the water's volume, called thermal expansion.

To start the experiment, fill the plastic water bottle to the very top of the rim with water. If you are using food coloring, put it in the water before filling the bottle.

Press the clay or putty around the straw. Make sure you don't pinch the straw closed and make sure there are no gaps between the clay and straw for water to leak out. If you want to use a thermometer to measure the temperature of the water, you can also push a thermometer into the clay beside the straw. This is not necessary for students to observe the results of the experiment.

Insert the straw into the top of the bottle, being careful not to spill water out. Wrap the clay around the opening of the bottle so it stays in place. You should see some water in the straw near the top of the clay.

Place the bottle on the heating pad, under the heating lamp, or in the sun. Use a marker to mark the top of the water in the straw. Don't move the bottle once you've made the mark, as moving the bottle can change your measurement.

Over the course of 45 minutes to an hour, have students observe the level of the water in the straw, measuring the changes from the beginning mark. The longer you observe the experiment, the more dramatic the results will be.

Discussion: Ask students to describe some of the problems that a rising sea level could cause for people who live on islands or in low-lying coastal areas.

### EVALUATION:

Ask students to write a sentence, paragraph or essay about their observations of the experiment. Ask them to list the dangers sea-level rise might pose for people in different areas on Earth.

### EXTENSION:

Read Chapter 3 Climate Change and You in *Understanding Climate Change, Facing a Warming World* by Melissa McDaniel. Discuss steps children and families can do to combat climate change.

Conduct the *Ice Melt and Rising Sea Levels Experiment* in the NJAITC Climate Change Series.

### New Jersey Learning Standards

*Climate Change Education, Science: K-PS3-1, K-ESS3-3, 3-LS4-4, 3-ESS3-1, 4-ESS3-2*