

Sea Level Rise Experiment

Does melting ice lead to sea level rise? This experiment will lead students to make observations, collect data, and interpret their findings.

Materials:

- two identical small clear boxes
- clay or playdough
- tray of ice cubes
- ruler
- water
- data sheet

Vocabulary:

Density: the amount of a material per the area, calculated as mass divided by volume

Volume: the amount of space a material takes up

Displacement: the amount of fluid moved out of the way by an object submersed in the fluid

Climate Change: the human caused, long-term changes in weather and temperatures

Hypothesis: a prediction that can be tested via experimentation

Pre-Experiment Questions

Write your answers to the questions below.

1. Where in the world is there ice?

2. Is that ice on land or water?

3. Would either or both types of ice melting cause the sea level to rise? Make a hypothesis, or prediction, about what you think will happen. Record your prediction here.

Experiment Directions

1. Place equal amounts of your “land” (clay or playdough) in half of each container. Make it as smooth and flat as possible.

2. Place half of your ice cubes off the land in one container. Add water until the ice floats but does not go onto the land, record the amount of water used: _____. This container represents sea ice.

If necessary, add more clay or playdough until the water level can be high enough for the ice to float. Make sure to add the same amount of clay or playdough to both containers.

3. Place half of your ice cubes on the land in one container. This represents the land ice. Pour the same amount of water from the previous step, be careful not to spill it on the land.

4. Record the initial water depth.

5. Check and record the water depth every 15 minutes until all the ice is melted. Use additional paper if necessary.



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Record your data in the tables below.

Land Ice		Sea Ice	
Time	Water Level (mm)	Time	Water Level (mm)

Post-Experiment Questions

Write your answers to the questions below.

In which container did the water rise more?

Was your hypothesis correct or incorrect? Why?

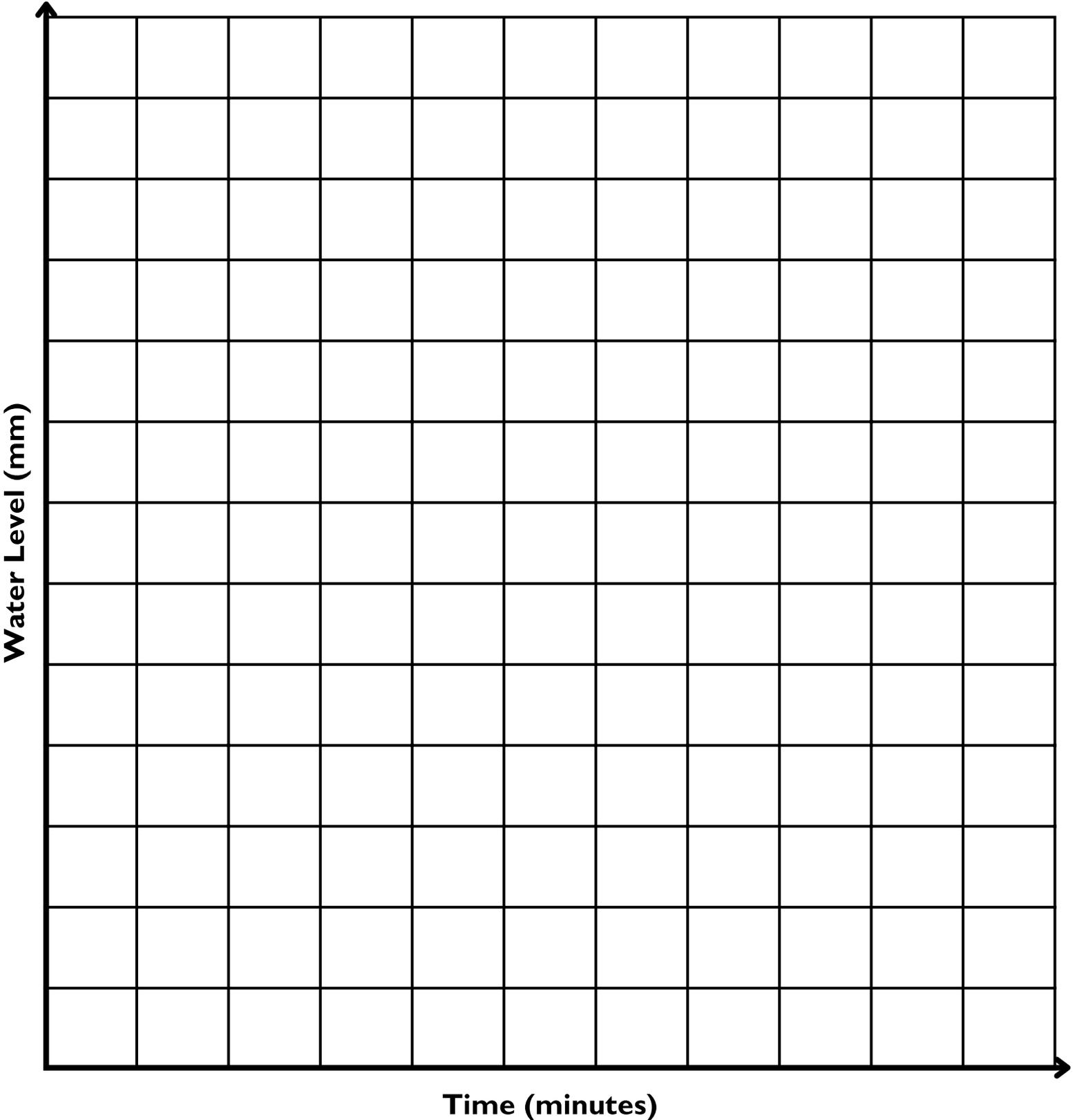
Do either or both types of ice cause sea level rise? Explain in your own words.



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Graph your data below and give the graph a title.

Title



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Teacher Guide

Background Information

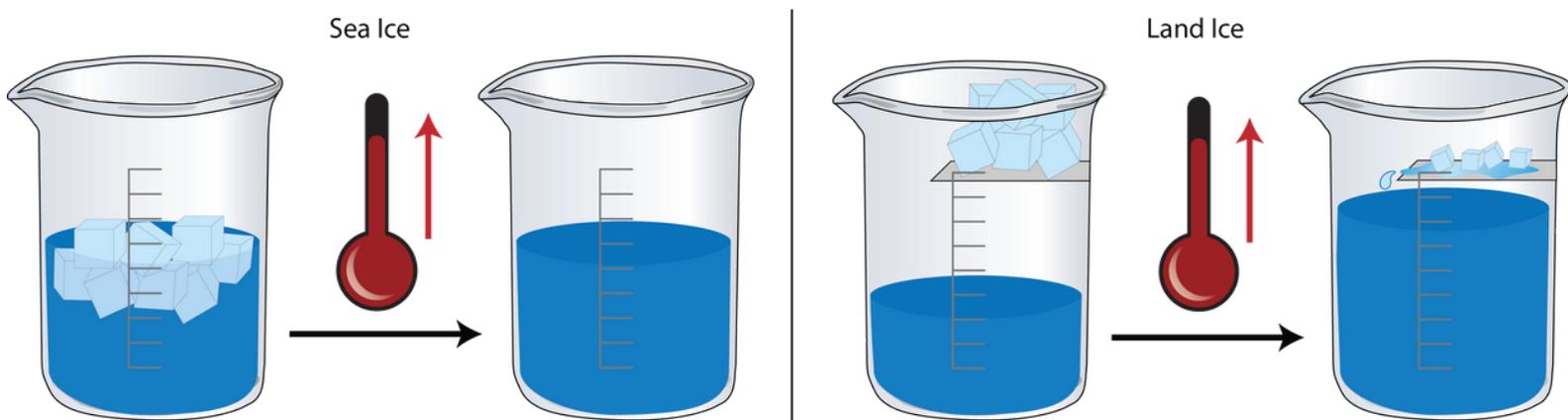
Climate change is warming our planet's temperature. One consequence of that warming is sea level rise. This experiment is designed to show how only some of the world's ice will impact the sea level.

The sea level rise has two main causes. The first is not discussed within the confines of this experiment. It is known as **thermal expansion**. As a substance warms, the particles making it up move faster and spread further apart. Like when a substance melts from solid to liquid, it will spread out to fill the space. As the ocean warms, it expands. Thermal expansion is responsible for approximately 40% of the amount the sea has already risen.

The second cause is the focus of this experiment: the melting of land ice. When ice melts on land, the water that ends up in the ocean will add to the volume of the ocean, contributing to sea level rise. When objects float in water they displace an amount of water equal to their mass. This means that sea ice melting will not contribute to sea level rise. The ice is already displacing an amount of water that is equal to the mass of the liquid that will come from the melting of the ice.

Sea level rise is just one part of the danger to our coastlines. With sea level rise comes higher tides (including higher king tides), greater chance of coastal flooding during storms, and farther reaching storm surges. As the sea level rises, many communities, businesses, and habitats will be destroyed.

As little as 1 meter of sea level rise would submerge parts of every coastal city in Marin including Corte Madera, Mill Valley, San Rafael, Sausalito, Novato, and even as far inland as Petaluma. In every predicted sea level rise scenario, the San Francisco airport will be inundated with water. Check out ourcoastourfuture.org to see how sea level rise will impact your community.



Conceptual diagram illustrating polar ice types in relation to climate change:

There are two kinds of polar ice - ice that floats on the sea (sea ice) or ice that sits on land (land ice). Because sea ice already floats on the water, it does not impact sea-level rise when it melts into the ocean. Because land ice sits on the land, it does add to sea-level rise when it melts into the ocean.

Both types of polar ice increase and decrease naturally during the year. In the summer, sea and land ice melt, and in the winter the ice builds, or reforms. That pattern is shifting with climate change, however, since both summers and winters are becoming warmer. This means that there is more melting in the summer, and less freezing in the winter, so the amount of total ice will decrease.

Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: More Info - Melting Ice. Learn. Barrier islands and sea level rise. Teach Ocean Science. <http://ian.umces.edu/link/assateague>



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