



CLIMATE CHANGE UNIT

LESSON PLAN 3rd-5th grade

Topics

Climate versus Weather
Greenhouse Gasses
Acidification
Sea Level Rise
Alternative Energy

Objectives

Students will be able to:

- Compare and contrast weather and climate
- Identify how seasonal weather changes affect animals in Long Island Sound
- Explain how increasing levels of greenhouse gasses affects bodies of water like Long Island Sound
- Perform an experiment to see the effects of acidification on Long Island Sound animals
- Predict how sea level rise will affect the coastal habitats of Long Island Sound
- Identify sources of alternative energy that will reduce the effects of climate change

Instructional Materials

Topic Video
Vocabulary Flash Cards

Assessment Materials

Video Reflection Worksheet
Video Quiz
Weather vs Climate Worksheet (answer PDF available)
Greenhouse Gasses Worksheet (answer PDF available)
Acidification Worksheet – at home experiment (answer PDF available)
Sea Level Rise Worksheet – at home experiment (answer PDF available)
Alternative Energy Worksheet (answer PDF available)

Related Materials

Links to videos and reading material that provides additional information on topics.

Topic articles (Lexile levels adjustable)

*click on the article title for the link

[Climate change feedback loop](#)

[Climate change and butterfly migration](#)

[King tides show risk of climate change](#)

[Sea rise and storms on the Chesapeake Bay](#)

[Antarctica ice melt](#)

[What is ocean acidification?](#)

[Harnessing ocean winds](#)



NOAA Resources

The National Oceanic and Atmospheric Administration (NOAA) is a partner of SoundWaters. These are additional resources you may use in addition to the other materials included above.

Climate (general)

https://www.esrl.noaa.gov/gmd/education/info_activities/

<https://www.climate.gov/news-features/blogs/beyond-data/2010-2019-landmark-decade-us-billion-dollar-weather-and-climate>

Weather and climate

<https://www.ncei.noaa.gov/news/weather-vs-climate>

https://oceanservice.noaa.gov/facts/weather_climate.html

<https://climatekids.nasa.gov/weather-climate/>

<https://www.climate.gov/>

<https://www.climate.gov/teaching/resources/state-climate-2009>

Greenhouse effect & Greenhouse gasses

https://www.esrl.noaa.gov/gmd/education/carbon_toolkit/

https://www.esrl.noaa.gov/gmd/education/carbon_toolkit/basics.html

https://www.esrl.noaa.gov/gmd/education/behind_the_scenes/

https://www.esrl.noaa.gov/gmd/dv/spo_oz/OzonePoster.jpg

Sea level rise

<https://www.climate.gov/teaching/resources/sea-level-rise-0>

<https://www.climate.gov/teaching/resources/whats-causing-sea-level-rise-land-ice-vs-sea-ice>

<https://www.climate.gov/teaching/resources/global-ice-viewer>

Acidification

<https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification>

<https://dataintheclassroom.noaa.gov/content/ocean-acidification>

<https://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F>

<https://oceanservice.noaa.gov/facts/acidification.html>

<https://www.noaa.gov/education/resource-collections/special-topics/hands-on-science-activities/ocean-acidification-and-dry-ice>

Preventing climate change/ reducing carbon

<https://www.climate.gov/teaching/resources/how-world-can-tackle-climate-change>

<https://www.climate.gov/news-features/climate-qa/what-can-i-do-help-reduce-global-warming>

<https://www.climate.gov/teaching/resources/your-familys-carbon-footprint>

<https://www.climate.gov/teaching/resources/carbon-calculator-activity>

https://www.esrl.noaa.gov/gsd/education/poet/Act-14_POET_CCycle-Carbon-FootprintFinal_Feb2016.pdf

Alternative energy

<https://www.climate.gov/teaching/resources/search-education/intermediate-3-5-124/search-subjects/energy-use-8408>

NGSS Standards

Weather and Climate: 3-ESS2-1; 3-ESS3-1



Earth's Systems: 5-ESS2-1; 5-ESS3-1

CLIMATE VS WEATHER ANSWER KEY



Put the following terms or ideas into the correct column to indicate if it applies to climate, weather or both.

CLIMATE	BOTH	WEATHER
Average rainfall	Precipitation	Hours, days, weeks
Three decades (30 years)	Temperature	Meteorology
Zones	Wind speed	What actually happens
What you expect	Air pressure	Forecast

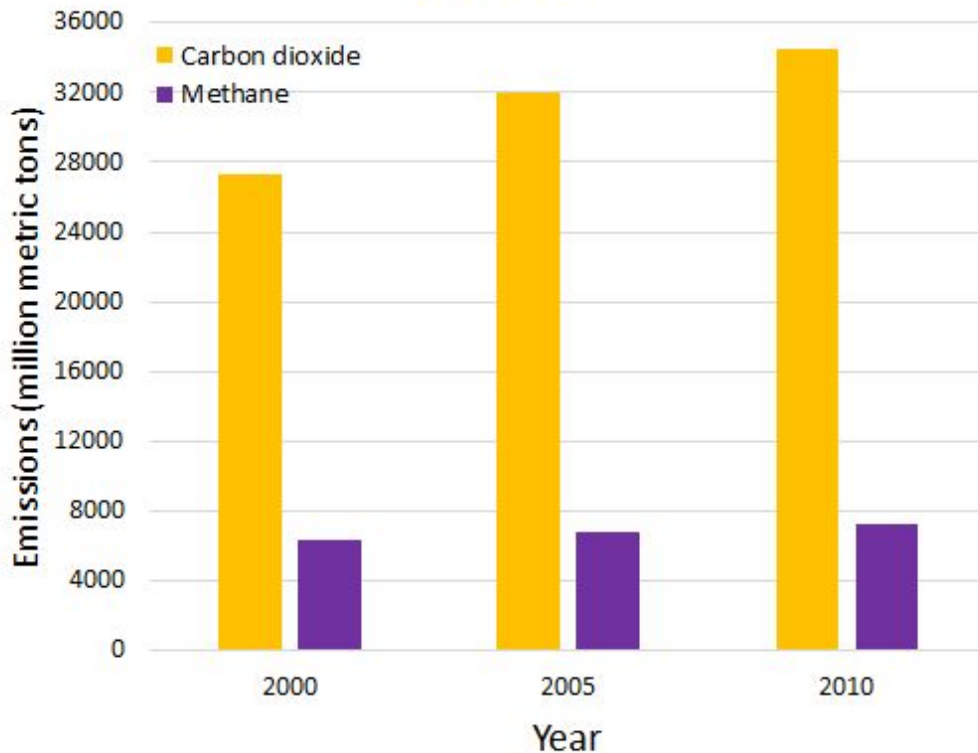
GREENHOUSE GASSES ANSWER KEY

Place a star on the pictures that show fossil fuels being used to make energy



When a greenhouse gas is produced, that is called an emission. Emissions are calculated yearly for individual countries as well as globally. Use the graph to answer the questions below

**Global Greenhouse Gas Emissions
1990-2010**



Which greenhouse gas gave off the most emissions overall?

Carbon dioxide

Did the emissions change the same amount from year to year for each gas? Use the graph to give an example.

Your estimations for each year do not have to be exact

CO₂ changed more overall, but also from year to year

27,000 → 32,000 → 34,000

Methane was much more consistent

6,000 → 6,500 → 7,000

Why would it be important to know if one type of gas is changing more than another?

If one gas is not changing too much from year to year, scientists could spend more time on the ones that are changing. By measuring each gas, scientists can make recommendations on which actions would be the best to reduce

SEA LEVEL RISE EXPERIMENT ANSWER KEY

Ice exists in many places on the earth both on land and in the water. Part of climate change involves rising air and water temperatures, which causes ice to melt. Melting ice is one of the ways that sea level can rise over time. We are going to conduct an experiment to see what happens to the sea level when ocean ice and land ice melt.



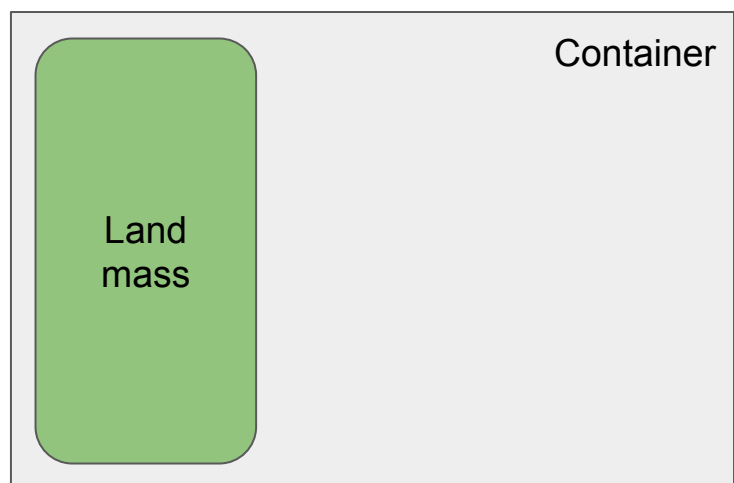
This experiment requires waiting for ice cubes to melt, so it may take several hours to a day depending on how fast the ice cubes melt.

Materials

- 2 shoebox sided containers with sides that are kind of tall (do not use a baking tray as the sides are too low)
- A ruler
- Food coloring (optional)
- Clay, rocks or some material to make “land” on one side of the container.
- Ice cubes that are the same size (*how many you use will depend on the size of your land mass and container.*)

- 1) Create your two experimental setups. On one side of each of your containers, create a “land mass” using clay or another material. *Make sure the land masses look as similar as possible*

Here is an example of how it should look



SEA LEVEL RISE EXPERIMENT ANSWER KEY



- 2) Mark one container as the land ice container and the other one the ocean ice container. In the land ice container, add ice cubes on your “land structure”. In the ocean ice container, add the same number of ice cubes to the bottom of the container.
- 3) Add water to each container so the water level is the same for both and does not go up onto the land. If you add food coloring to the water, it may make it easier to see. Measure the height of the water in each container and add it to the table in the “before row”. Mark the water level with marker or tape. Take a picture of your setup and add it to page 3.

	<u>Land Ice</u>	<u>Ocean Ice</u>
Before Experiment	<i>varies</i>	<i>varies</i>
After Experiment	<i>Higher water level</i>	<i>Same water level</i>

Make a hypothesis (educated guess): Which type of ice (land or ocean) will cause the sea level to change more? Explain your answer.

Answers vary

- 5) After the ice cubes melt, measure the water level again and add them to the table from step 2. Include a picture on page 3 of the worksheet.

- 6) **Did your experiment results match your hypothesis? Explain why or why not**

The land ice results should have been larger b/c it was not in the water to start so all water from it is additional.
The ocean ice should shouldn't change b/c the floating ice cubes took up “space” before the water was added and so it takes up the same space when it melts.

- 7) **Why would it be important for people who study sea level rise to know the total amount of land ice and ocean ice on earth?**

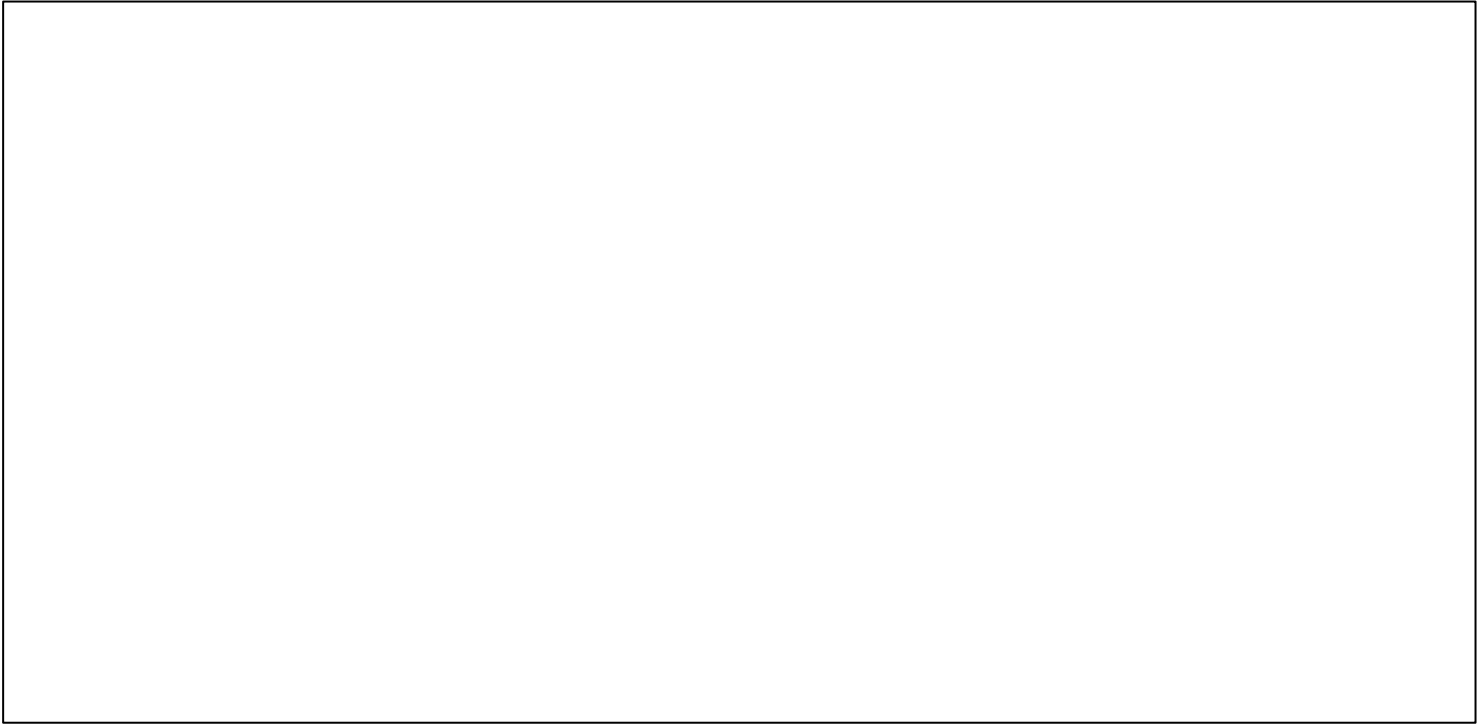
Since land ice is a large contributor to sea level rise, by knowing the total amount of ice on land, scientists can make predictions about how much the water level could rise if it all melts at a specific rate

SEA LEVEL RISE EXPERIMENT



EXPERIMENT PICTURES

Take a picture of your setup with the ice cubes BEFORE you let them melt



Take a picture of your experiment RESULTS showing the change in the water levels



ACIDIFICATION EXPERIMENT

In the video, you learned that acidic water can affect the shells of animals. In the video we conducted an experiment with seltzer, which is an acid.

You are going to conduct your own experiment with a liquid that is also an acid, but a MUCH stronger one than the seltzer, Vinegar. This experiment should take 1-2 days depending on the size of the shells. Larger shells may even take 2-3 days.

Materials:

- Vinegar
- Seashells (at least 2 different kinds)
- Plastic or glass containers large enough to fit the shells. You will need 1 per shell type

- 1) For each shell, you need a container with enough vinegar to cover over the shell
- 2) Include a picture of the different shells you are using for the experiment

Insert shell pictures

- 3) Make a hypothesis (an educated guess) about what will happen to the shells based on the following questions:

Will all the shells be affected the same by the vinegar? Explain your answer

Answers vary

If the shells they chose are thin and small, they will probably break down faster than larger, thicker shells, but it all depends on what type of shell they use.

Should the shells break down faster or slower than the alka seltzer experiment from the video? Explain your answer.

The shells should break down faster than the alka seltzer experiment because vinegar is a stronger acid and it should weaken the shell materials faster.

- 4) Place the shells in the vinegar for 1-2 days. When the experiment is done, look at the shells. Some things to consider: are they the same size and color? Do the shells feel the same? Answer the following questions to conclude your experiment.

What happened to each shell?

Answers vary

Why would it be important to know if one type of animal shell is affected more than another when it comes to acidification and the food chain?

There are many different shelled animals in Long Island Sound and they are all part of the food chain. If one animal does not have a strong enough shell, it may not survive and eventually the whole population goes away. The predator of that animal may not have enough to eat as a result.

ALTERNATIVE ENERGY ANSWER KEY

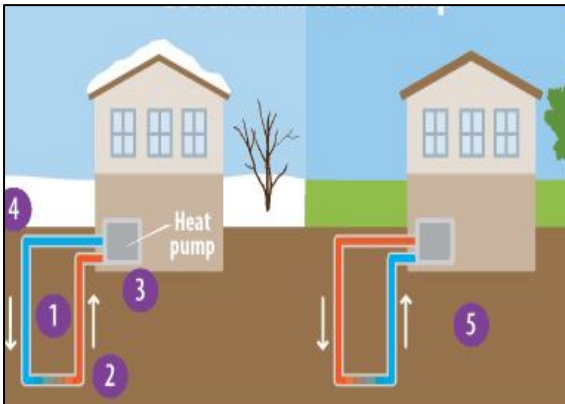
In the video, you learned about five sources of alternative energy.
Label these pictures with the correct type of alternative energy
they are using



WIND



SOLAR



GEOHERMAL



HYDROELECTRIC

Why it is important to use renewable energy instead of non-renewable energy

Answers may vary

Non-renewable resources can only be used once and add to pollution in the air and water.

Since they can only be used once, they may eventually run out.

Renewable energy will help prevent climate change over time.