

# Today I Learned About Climate Impacts

## Description:

We hear about climate impacts all over the world, often in global terms. But what is happening where? And what will happen in our own communities? Students play a game to understand changes to precipitation. Then, using the US Climate Resilience Toolkit, they investigate local climate concerns and solutions.

## Skills & Objectives

### SWBAT

- Explain how carbon dioxide in the atmosphere causes higher temperatures.
- Explain some relationships between higher temperatures and changes to precipitation.
- Understand key climate challenges for their area.
- Understand a few adaptation solutions for their area.

### Skills

- Understanding graphs
- Communicating scientific understanding

### Students Should Already Know That

- The water cycle moves water through evaporation, condensation, precipitation, infiltration, and surface runoff, and that all these stages can be affected by temperature.

#### Standards Alignment:

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

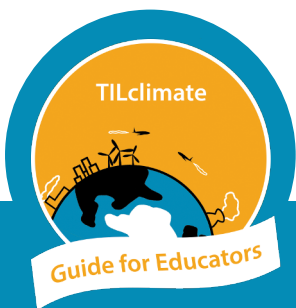
HS-ESS3-5 Analyze the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change.

#### Disciplinary Core Ideas:

ESS2.D Weather and Climate

ESS3.C Human Impacts on Earth Systems

ESS3.D Global Climate Change



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## How To Use These Activities:



Pages with the circular “TILclimate Guide for Educators” logo and dark band across the top are intended for educators. Simpler pages without the dark band across the top are meant for students.

Each of the included activities is designed to be used as a standalone, in sequence, or integrated within other curriculum needs. A detailed table of contents, on the next page, explains what students will do in each activity.

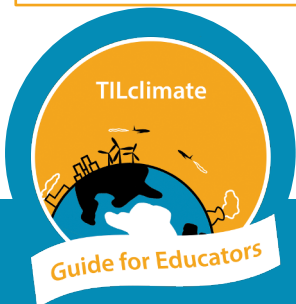
## A Note About Printing

All student pages are designed to be printable in grayscale, except for the maps on pages 1 and 3. Larger versions of these maps are provided. A few copies of this page could be printed color for students to share, or the image projected in the classroom.

The worksheets do not leave space for students to answer questions. Students may answer these questions in whatever form is the norm for your classroom – a notebook, online form, or something else. This allows you, the teacher, to define what you consider a complete answer.

**Podcasts in the Classroom:** Throughout these Guides for Educators, we invite students to think about how they would share their learning with family and friends. One way to do this is to encourage your students to create their own podcasts - they're shareable, creative, and have multiple options for embedded assessment. We would love to hear any podcasts or see any other projects you or your students create! Email us at [tilclimate@mit.edu](mailto:tilclimate@mit.edu), Tweet us @tilclimate, or tag us on Facebook @climateMIT.

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## Detailed Table of Contents

Page	Title	Description	Time (min)
	Podcast Episode	Students listen to TILclimate: TIL about climate impacts, either as pre-class work at home or in the classroom. <a href="https://climate.mit.edu/podcasts/e6-til-about-climate-impacts">https://climate.mit.edu/podcasts/e6-til-about-climate-impacts</a>	10-15
1-2	The Water Cycle Game	In a hands-on game, students model observed changes to precipitation patterns due to a warming world.	15-20
3	Water Cycle Game Science	Students look at maps related to the precipitation changes modeled in the Water Cycle Game.	10-20
4-5	Think Globally, Act Locally (requires single shared internet computer)	Using the US Climate Resilience Toolkit, students investigate local climate impacts.	15-25
6-8	Resilience Investigation (each team or individual requires internet)	In teams, students investigate local climate impacts and possible adaptations to those impacts. Then, they develop a communication plan to share their learning with their community.	30-45+

## The Water Cycle Game

### Materials:

- At least 20 small objects per participant/cloud, such as beads, beans, poker chips, etc. to represent water droplets.
- A small cup to hold the objects for each participant/cloud (all but two students.)

### Setup:

- This game can be played in any room that has enough space for all participants to move around, such as a large classroom, gym, multipurpose room, or outdoors (if the objects are findable in the space).
- Distribute small objects (water droplets) around the space. You can create lakes and oceans (i.e., with clumps of objects), forests (with smaller clumps), deserts (with no droplets) or whatever you'd like. You may label these features, if you like.



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## Local Climate Impacts and the Water Cycle

This Educator Guide includes a game and an online investigation project. Educators may pick and choose among the pieces of the Guide, as suits their class needs.

Parts of this Guide may align with the following topics:

- Physical science: Evaporation and heat trapping gases.
- Life/environmental science: The water cycle, changes to evaporation.
- History/social science: Effects of precipitation changes on policy, migration, etc.
- ELA/nonfiction: Communicating scientific understanding to the general public.

## MIT Resources

We recommend the following as resources for your own better understanding of climate change or as depth for student investigations. Specific sections are listed below:

- Climate Science, Risk & Solutions, an interactive introduction to the basics of climate change. <https://climateprimer.mit.edu/>
  - Chapter 02 The greenhouse effect and us
  - Chapter 03 Measuring past temperatures
  - Chapter 04 Predicting climate
  - Chapter 07 What are the risks?
  - Chapter 10 What can we do?
- MIT Climate Portal Explainers are one-page articles describing a variety of climate topics. <https://climate.mit.edu/explainers>
  - Climate-Resilient Infrastructure
  - Sea Level Rise
  - Urban Heat Islands
  - Cities and Climate Change
  - Climate Models
  - Greenhouse Gases



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## Wrap-Up Discussion Questions

- How accurately did the game model these two precipitation changes?
- What other precipitation changes might you expect with a warmer Earth?
- How would the climate concern you studied affect people in your community?
- How could a solution you chose work in your community?
- According to data compiled by the Yale Program on Climate Change Communication, 61% of Americans believe that climate change will harm Americans, while only 43% believe that they will be personally harmed. Why do you think so many people in the U.S. believe that they will not personally be affected much by climate change? How could you help those people understand the potential climate impacts in their communities?

## Climate Solutions

Climate solutions can be thought of as falling into four categories outlined below. Across all categories, solutions at the community, state or federal level are generally more impactful than individual actions. For example, policies that increase the nuclear, solar and wind mix in the electric grid are generally more effective at reducing climate pollution than asking homeowners to install solar panels. For more on talking about climate change in the classroom, see “How to Use This Guide”.

### • Energy Shift

How do decision-makers make the switch from carbon-producing energy to carbon-neutral and carbon-negative energy?

### • Energy Efficiency

What products and technologies exist to increase energy efficiency, especially in heating and cooling buildings?

### • Adaptation

How can cities and towns adapt to the impacts of climate change?

### • Talk About It

Talking about climate change with friends and family can feel overwhelming. What is one thing you have learned that you could share to start a conversation?

What solutions are the most exciting in your classes? We would love to hear from you or your students! Images, video, or audio of student projects or questions are always welcome. Email us at [tilclimate@mit.edu](mailto:tilclimate@mit.edu), Tweet us @tilclimate, or tag us on Facebook @climateMIT.

