

RESOURCE LIBRARY | ACTIVITY : 50 MINS

Weather, Meet Climate

Students gather and graph a second day of weather station data. They then clarify the distinctions and connections between weather and climate by viewing and discussing an interactive graph of billion-dollar weather events. Finally, they read to address hypotheses regarding the future frequency of extreme weather events in light of global warming.

GRADES

6, 7, 8

SUBJECTS

Earth Science, Climatology, Meteorology

CONTENTS

2 Resources, 3 Links, 2 PDFs

OVERVIEW

Students gather and graph a second day of weather station data. They then clarify the distinctions and connections between weather and climate by viewing and discussing an interactive graph of billion-dollar weather events. Finally, they read to address hypotheses regarding the future frequency of extreme weather events in light of global warming.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/weather-meet-climate/>

In collaboration with

DIRECTIONS

This activity is part of the [Climate Change Challenge](#) unit.

1. Prompt students to gather and graph weather station data.

- In the same weather data collection groups as in the previous activities in the *Extreme Weather* lesson, ask students to reflect on today's weather. Ask them to make predictions regarding how their variable will have changed when they examine today's data.
- Assign students to collect data for their variables. They can either physically use the class weather station, or digitally with the [National Weather Service 3-Day Weather Observation History](#), as during the [Meteorological Models](#) activity.
 - Students may need a reminder to enter their zip code in the upper left corner of the page, and then click on the '3 Day History' link at right-center, but should collect data today in small groups, rather than as a class, and with limited teacher assistance.
- Assign students to incorporate this data onto the second day of their point/line graph.

2. Clarify the distinctions and connections between weather and climate by viewing and discussing an interactive graph with students.

- Project the interactive [Billion-Dollar Weather and Climate Disasters: Time Series Graph](#). Ask for volunteers to point out the following elements:
 - Title
 - Key
 - x-axis label
 - y-axis labels (**Note:** There are two y-axes. The one on the left that corresponds to the number of billion-dollar disasters is most important here.)
- Help students familiarize themselves with the graph answering the following questions in a Think-Pair-Share:
 - *How many billion-dollar weather events occurred in 1980? (Three)*
 - *How many billion-dollar weather events occurred in 2018? (Fourteen)*
 - *What types of billion-dollar weather events are increasing over time? (Most types appear to be increasing. Increases in severe storms and flooding are particularly apparent.)*

- *What types of billion-dollar weather events are decreasing over time? (It's not clear that any are; perhaps winter storms.)*
- Prompt students to recall the distinctions between weather and climate (using their *Weather Interconnections Meaning Builder* from the *Weather Interconnections* activity if necessary), asking:
 - *Does this graph contain information about weather, climate, or both? (Both. Individual events on the graph are weather. However, long term patterns, such as the increase in severe, billion-dollar storms since 1980 that students likely identified above, represent information on climate.)*

3. Support students as they read to address hypotheses regarding the future frequency of extreme weather events.

- Reconvene students in their extreme weather groups from the *Weather Interconnections* activity.
- Challenge students to hypothesize how the frequency of their weather event will change in the future, given their understanding of carbon dioxide concentrations, global warming, and climate change.
 - Direct students to record their hypotheses in Part G of the *Extreme Weather Model Builder*, with supporting evidence to justify their claims. (Student hypotheses should articulate both their prediction and justification. For example, 'I think tornadoes will increase in the future as the planet warms because they form from warm air.' Hypotheses may incorporate prior information from the *Extreme Weather Model Builder* or more recent knowledge from the *Billion-Dollar Weather and Climate Disasters: Time Series Graph*.)
- Invite students to read and annotate an article to evaluate their hypothesis within their extreme weather groups, as follows:
 - Droughts: *Drought and Climate Change*
 - Hurricanes: 'Hurricanes and climate' section of *Hurricanes, Cyclones, and Typhoons Explained*
 - Tornadoes: *Tornadoes and Climate Change*

- As they read, students should determine whether the article agrees with their hypothesis. They should also note the evidence presented for any of the weather variables in Part H of the *Extreme Weather Model Builder* handout with their group.

4. Direct students to create a final extreme weather model incorporating the effects of global warming and climate change.

- With evidence from the article, direct students to revisit their revised extreme weather model (Part E) again, noting what information (text and/or visual) would be necessary to incorporate the role of global warming and climate change in this weather event (Part H).
- On a large piece of chart paper, ask each group to draw a final model incorporating:
 - Text and visuals to accurately depict the extreme weather event's formation (from Part E).
 - At least four of the six weather variables (from Part E).
 - A depiction of how global warming and climate change is predicted to affect the weather variables, which will, in turn, increase or decrease the frequency of this extreme weather event (using the information recorded in Part H).
- Next, distribute copies of the *Extreme Weather Model Rubric* and have students self-assess their final extreme weather models. Allow time for groups to make revisions to their model, if necessary.
- Collect the final extreme weather models for assessment.
- Revisit the class *Know and Need to Know* chart. Encourage students to articulate any recent insights or remaining questions regarding the connections between weather and broader patterns of global warming and climate change. Emphasize that the extreme weather events they have been exploring are related to climate change.

Rubric

Use the *Extreme Weather Model Rubric* to formally assess students' progress towards NGSS PE *MS-ESS2-5*: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

Extending the Learning

Step 2: You may wish to download data from the interactive [Billion-Dollar Weather and Climate Disasters: Time Series Graph](#) to practice additional analyses with students. Or you may choose to assign additional research into specific extreme weather events, such as Hurricane Katrina of 2005, the El Reno tornado of 2013, or the Camp Fire of 2018. You may also wish to add discussion of the human and economic dimensions of such events, possibly in conjunction with students' social studies educators.

OBJECTIVES

Subjects & Disciplines

Earth Science

- Climatology
- [Meteorology](#)

Learning Objectives

Students will:

- Collect and graph current, local data on key weather variables.
- Revise a model of an extreme weather event to incorporate the role of global warming and climate change.
- Relate global warming and climate change to extreme weather.

Teaching Approach

- Project-based learning

Teaching Methods

- Cooperative learning
- Multimedia instruction
- Reading

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
 - Information, Media, and Technology Skills
 - Information Literacy
 - Media Literacy
 - Learning and Innovation Skills
 - Communication and Collaboration
 - Critical Thinking and Problem Solving
 - Life and Career Skills
 - Productivity and Accountability
 - Social and Cross-Cultural Skills
- 21st Century Themes
 - Environmental Literacy
 - Global Awareness
- Critical Thinking Skills
 - Analyzing
 - Applying
 - Understanding
- Science and Engineering Practices
 - Constructing explanations (for science) and designing solutions (for engineering)
 - Developing and using models

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- CCSS.ELA-LITERACY.RST.6-8.7:

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

NEXT GENERATION SCIENCE STANDARDS

- Crosscutting Concept 2: Cause and Effect:

Cause and effect relationships may be used to predict phenomena in natural or designed systems.

- **MS-ESS2-5:**

Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

- **Science and Engineering Practice 2:**

Developing and using models

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Chart paper
- Anemometer (optional)
- Barometer (optional)
- Clear-walled, straight-sided vessel, such as a glass beaker
- Hygrometer (optional)
- Rulers
- Thermometers

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Monitor/screen, Projector

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction
- Large-group learning
- Small-group learning
- Small-group work

ACCESSIBILITY NOTES

Step 3: Each of the articles in this step has been leveled to accommodate readers at multiple levels.

RESOURCES PROVIDED: WEBSITES

- National Weather Service: 3-Day Weather Observation History
- NOAA: Billion-Dollar Weather and Climate Disasters: Time Series

RESOURCES PROVIDED: HANDOUTS & WORKSHEETS

- [Extreme Weather Model Builder](#)
- [Extreme Weather Model Rubric](#)

RESOURCES PROVIDED: IMAGES

- Hurricanes, Cyclones, and Typhoons Explained

RESOURCES PROVIDED: ARTICLES & PROFILES

- Center for Climate and Energy Solutions: Drought and Climate Change
- Tornadoes and Climate Change

BACKGROUND & VOCABULARY

Background Information

Extreme weather events include hurricanes, tornadoes, and droughts. Each of these extreme weather events has the capacity to powerfully influence the lives of humans, and can sometimes even be deadly. The frequency and intensity of many extreme weather events have been on the rise in recent years.

Depending on the type of extreme weather event, shifts in frequency and intensity may or may not be related to global warming and climate change. For example, the destructive potential of hurricanes is increasing as sea levels rise, leading to greater storm surges. Warmer

temperatures can increase the severity of drought by evaporating more water from soils. Finally, the relationship between tornadoes and climate change is currently not clear, but the subject of ongoing scientific research.

Prior Knowledge

[]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
atmospheric pressure	<i>noun</i>	force per unit area exerted by the mass of the atmosphere as gravity pulls it to Earth.
climate	<i>noun</i>	all weather conditions for a given location over a period of time.
climate change	<i>noun</i>	gradual changes in all the interconnected weather elements on our planet.
drought	<i>noun</i>	period of greatly reduced precipitation.
global warming	<i>noun</i>	increase in the average temperature of the Earth's air and oceans.
humidity	<i>noun</i>	amount of water vapor in the air.
hurricane	<i>noun</i>	tropical storm with wind speeds of at least 119 kilometers (74 miles) per hour. Hurricanes are the same thing as typhoons, but usually located in the Atlantic Ocean region.
precipitation	<i>noun</i>	all forms in which water falls to Earth from the atmosphere.
temperature	<i>noun</i>	degree of hotness or coldness measured by a thermometer with a numerical scale.
tornado	<i>noun</i>	a violently rotating column of air that forms at the bottom of a cloud and touches the ground.
weather	<i>noun</i>	state of the atmosphere, including temperature, atmospheric pressure, wind, humidity, precipitation, and cloudiness.
wildfire	<i>noun</i>	uncontrolled fire that happens in a rural or sparsely populated area.
wind	<i>noun</i>	movement of air (from a high pressure zone to a low pressure zone) caused by the uneven heating of the Earth by the sun.

For Further Exploration

Instructional Content

- [National Geographic: Resource Library: Collection: Weather](#)
- [National Geographic: Resource Library: Collection: Catastrophic Weather Events](#)
- [National Geographic: Resource Library: Collection: Climate](#)
- [National Geographic: Resource Library: Collection: Climate Change](#)



© 1996-2020 National Geographic Society. All rights reserved.