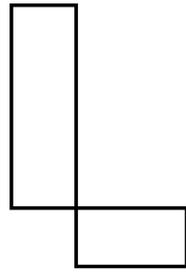


FAMILY TEACHING GUIDE

Tackle Climate Change

Standards-based instructional
resources for use at home

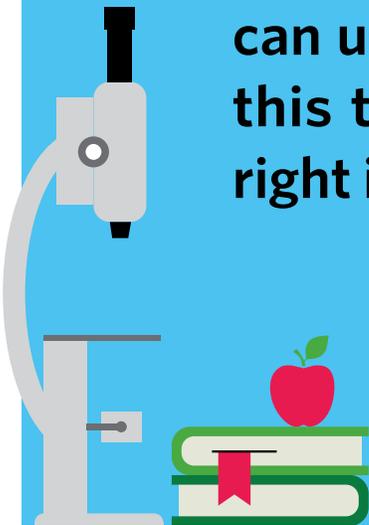


NATURE LAB

Educator Resources



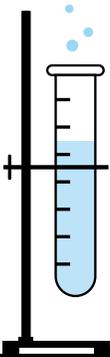
Nature Lab is intended to share the places, science and conservation stories of The Nature Conservancy with the next generation, with a focus on helping students connect what they see on the screen to actions they can take in their own backyard. Our teaching guides offer educators standards-based instructional resources for classroom use but now you can use our resources at home too! Use this thematic guide to explore nature right inside your home.





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DAY

1

Introduction

Climate change isn't a distant threat—it is happening now.

In order for students to fully grasp climate change they must first understand the difference between climate and weather. It is this basic understanding that helps to demystify statements we hear like “We had record snowfall this year! How can there be global warming?” Essentially, weather is short-term - it represents the conditions of the atmosphere over a short period of time. Weather is made up of sun, rain, clouds, wind, snow, flooding, blizzards, thunderstorms and so forth.

Climate is how the atmosphere behaves over a long period of time. When talking about climate scientists usually refer to the averages of precipitation, temperature, and other factors that occur over a long period of time in a particular place. Climate change refers to changes in these long-term daily averages of weather.

Climate change isn't a distant threat—it is happening now. The impacts of climate change include more extreme weather and natural disasters, chronic droughts & economic instability. The Nature Conservancy and its partners are focusing on innovative, science-based solutions that match the urgency of this crisis, such as restoring forests from Brazil to Indonesia and working to ensure a clean energy future. Solutions include planting trees, which have enormous potential to store carbon dioxide. Better forest management can be as effective as if we stopped burning oil. Showing how renewable energy can grow economies while reducing carbon emissions and helping the most vulnerable communities adapt to climate change by restoring habitats, such as mangroves that reduce the impact of severe storms, are also some of the key things we are doing to tackle this global issue. As individuals, we can all learn more about these various types of solutions and do our part to help improve our world. 



DAY

2

Giant Pandas and Climate

ESSENTIAL QUESTION

Why are all habitats important for both people and animals?

Today we'll join our expert scientist Yue Wang, a conservation planning officer for The Nature Conservancy, on a virtual field trip across the world to two stunning provinces in China—Sichuan and Yunnan—where we will explore majestic forests, towering mountains, and other iconic landscapes. While examining the role these vital natural areas play in the carbon cycle and climate change, as well as the benefits of reforestation, we will learn about the magnificent creatures who call these habitats home: giant pandas, golden snub-nosed monkeys, and the elusive and odd-looking takin. We will understand how important all habitats are for both people and animals—no matter where you are in the world.

ACTIVITY



WATCH:

[China's Great Forests: What the Giant Panda and Earth's Climate Share](#)

DISCUSSION

Q: Why are forests and trees important to humans?

A: Humans use forests for recreation and resources. We use wood from forests for building and for making paper products. Some people also use the wood as a heat source and for cooking. In the US, there are many protected forests that people visit to go hiking, fishing, and camping among other things. Forests also help filter water. Additionally, forests produce oxygen as a byproduct of photosynthesis and humans breathe oxygen.

Q: Why are forests and trees important to other animals?

A: Trees and forests provide habitat and food for animals. Forests must be large enough.

Q: Describe carbon sequestration.

A: Carbon sequestration is the long-term storage of carbon. A lot of carbon is stored underground in the soil and in the fossil pool. However, when fossil fuels are burned, carbon that was once stored is released back into the atmosphere. Carbon is sequestered in trees and plants too, which is why reforestation can help mitigate climate change by reducing the accumulation of greenhouse gases like carbon dioxide.

Q: What human activities cause carbon dioxide to be released in the atmosphere?

A: The burning of fossil fuels like coal and gas release carbon dioxide into the atmosphere.

Q: What are some "natural" activities that cause carbon dioxide to be released in the atmosphere?

A: Decomposition and respiration by land and sea plants are two processes that produce carbon dioxide. Humans also exhale carbon dioxide.

Q: What can we do to decrease the release and overall amount of carbon dioxide into the atmosphere?

A: We can drive less, use public transportation, reduce energy use, and use renewable resources like solar and wind energy. We can prevent deforestation and plant more trees.



Share your findings and reflections with us on social media and help us spread the word!

! TAKE ACTION

- Use the free, online interactive map at Global Forest Watch to examine worldwide forest change over time. Access the tool here: <http://www.globalforestwatch.org/>
- Think about where in the world the nearest forest to YOU is and search for it using this tool. **Write your local representative** to tell the why you want to help protect this forest.



DAY

3

Coastal Resilience and Climate

ESSENTIAL QUESTION

What is the role of nature in increasing climate resilience?

Explain to students that climate resilience is the ability of a system to absorb stresses imposed by climate change and still maintain function while adapting and evolving and becoming better prepared to handle future climate impacts. Climate resilience can come in many forms and efforts to increase resiliency include social, technologic, political, and economic strategies at every level of society. Using nature-based solutions to help us create resiliency is one of many efforts.

We will examine how our state will be impacted by climate change by examining various online resources including the [States at Risk](#) report card. We will be able to see how our state stacks up against other states in terms of preparedness and examine in more detail the areas where the state is ill-prepared. We will also find climate resilience stories for areas with similar threats and then share the inspirational stories they have found.

ACTIVITY



WATCH:

[Nature's Role in Creating Resilience](#)

DISCUSSION

Visit <https://www.un.org/sustainabledevelopment/wp-content/uploads/2017/07/13.pdf>

Together, search for answers to the following questions and have a discussion about what you find:

- What is the evidence that proves the climate is changing?
- Are human activities or natural variations in climate responsible for the climate change being observed today?
- Is climate change influenced more by human activities and excess greenhouse gases or changes in the sun's energy?
- Do emissions of carbon dioxide from human activities have a big impact on Earth's climate?
- Will a small rise in sea level affect people (even in the United States)?
- Is it too late to do anything about climate change?

TAKE ACTION

Go to <http://www.climatecentral.org/states-of-change#/nation> and click on your state. Discuss the few "quick facts" about your state. This screen also shows a pie chart with electricity sources for your state. It may be interesting to note from where the majority of your state's power comes.

Next go to <http://statesatrisk.org/> and look up your state's report card by clicking on it. Make a list of the areas where your state excels and a list of those areas in which your state received

a low grade. Explore each area by clicking on the letter grade. Note how many people are vulnerable or at risk where appropriate.

Choose a focus area from the areas that were graded (extreme heat, drought, wildfires, inland flooding, and coastal flooding) and then search using the [U.S. Climate Resilience Toolkit](#) for examples of how other communities have developed resilience plans to mitigate these problems. Students can filter by region on this site, but it may be more useful to filter by climate threat/stressor first so that they can focus on the particular threat identified in States at Risk. If they can't find enough information for their chosen threat, suggest that they browse the stories for something that they find inspirational.



Share your findings and reflections with us on social media and help us spread the word!

Once you have identified a story of resilience, write a summary of how the location is developing climate resilience. Share these stories with us on social media [@TNCNatureLab](#) on [Twitter](#) and [Facebook](#) and [@nature_org](#) on [Instagram](#)!



DAY

4

Powering the Planet: Renewable Energy (Part 1)

ESSENTIAL QUESTION

How can we get the energy we need without harming nature?

We use energy to power our lives every day—to boot up our computers, fuel our cars, charge our cell phones, flick on a light switch, and in a myriad of other ways. Join scientist Alex Wegmann as we embark on a Virtual Field Trip to explore a compelling question: How can we get the energy we need without harming nature?

By harnessing renewable sources of energy, such as sunlight and wind, scientists are finding ways to do just that. On this journey, we'll visit the Palmyra Atoll, a wildly remote cluster of islands atop coral reefs and teeming with animal life. Scientists there have developed ways to power the entire island almost exclusively through renewable energy sources. We'll also journey to the scorching Mojave Desert, home to rattlesnakes, tortoises, bats, and coyotes, to check out massive solar panel installations that are working to power large cities. We'll learn about innovative methods for capturing energy that are safe, sustainable, and can change the destiny of life on our planet.

ACTIVITY



WATCH:

[Powering the Planet: Renewable Energy Part I: \(00:00-21:20\)](#)

DISCUSSION

Q: List at least two ways we get energy to power our lives.

A: Burning coal, gas, burning wood, biodiesel, algae/biofuel, wind, sun, water, geothermal, etc.

Q: In the virtual field trip, Dr. Alex Wegmann talked about the importance of the bird guano to the ecosystem. Describe the role that guano plays on Palmyra Atoll.

A: The birds eat fish and other organisms from the marine environment and when they defecate, the nutrients from the marine environment are essentially transferred to the terrestrial environment. The guano (feces) acts as a fertilizer for the plants. The plants in turn support life on the islands (geckos, insects, etc.). The island's heavy rainfall pushes nutrients from decomposing plants or dead organisms back out to the ocean where they came from originally. Everything is connected.

Q: Why is Palmyra a perfect place to study how a marine ecosystem responds to climate change?

A: Palmyra is a perfect place to study how a marine ecosystem responds to climate change because it has little human influence from things like pollution or overfishing. It is as close to a pristine environment that you can get and therefore, the changes observed are less likely to be caused by other variables related to human influence.

Q: What is the difference between renewable and nonrenewable resources? Provide examples of each.

A: Renewable resources include the sun and wind and are things that can be "replenished" or are not used up. Nonrenewable resources include fossil fuels like coal and oil that took a long time to form and are not as easily replenished. For example, coal and oil are more likely to be used up before more can form because the process takes so long.

Q: What is the reason for the special design of Palmyra's wind turbine (shown below)?

A: The wind turbine has a much different design than regular turbines because of the importance of the atoll as a nesting ground for thousands of birds. Regular wind turbines can harm birds and it was important to prevent this happening on the islands to limit human impact while harnessing wind power.

Q: Why was it necessary to install solar panels and a wind turbine on the atoll?

A: The wind turbine is intended for use as a back-up energy source in the event of bad weather, heavy cloud cover, or nightfall that could limit solar power production. Using renewable energy on Palmyra also helps keep costs down while protecting the environment.



Share your artworks and reflections with us on social media and help us spread the word!

! TAKE ACTION

Pause to discuss the following question:

What are some ways we can help to make a difference when it comes to energy use?

A: You can turn off lights when you leave a room. While reducing energy use is a good start, it's not always practical. Switching out old incandescent light bulbs for newer, more energy.

Make a commitment to reduce your energy use as a family by making a creative poster, sign, or drawing. You will start your poster today and complete it tomorrow!

Share these stories with us on social media @TNCNatureLab on [Twitter](#) and [Facebook](#) and @nature_org on [Instagram](#)!



DAY

5

Powering the Planet: Renewable Energy (Part 2)

ESSENTIAL QUESTION

How can we get the energy we need without harming nature?

ACTIVITY



WATCH:

[Powering the Planet: Renewable Energy Part II: \(21:20-End\)](#)

DISCUSSION

Q: What is the relationship between fossil fuels and carbon dioxide?

A: When fossil fuels are burned or combusted, they release carbon dioxide into the atmosphere.

Q: Describe what happens when a photon (a packet of light energy from the sun) hits a solar cell.

A: When photons hit a semiconductor on a solar panel, their energy frees some electrons in the semiconductor material. The electrons create an electric current, which is harnessed by wires connected to the positive and negative sides of the cell. The amount of electricity that can be produced depends on the number of cells in each solar panel and the number of panels in a whole facility.

Q: How do fossil fuels contribute to climate change?

A: When fossil fuels are burned, they release greenhouse gases like carbon dioxide into the atmosphere. Greenhouse gases contribute to climate change because they create a layer of gas in the atmosphere that can trap heat. Normally some of the sun's energy gets reflected back out into space, but when there is a layer of greenhouse gases, heat can be trapped, causing warming.

Q: How do engineers and scientists decide where to locate solar facilities?

A: The first consideration when locating a solar facility is the amount of solar radiation a site receives. This makes the desert Southwest a prime location for siting solar facilities. Other considerations include how much the land will be disturbed. For example, solar facilities can destroy animal habitat, so it's important to choose locations that will have less impact on animals and plants and/or choose sites that have already been disturbed like abandoned fields. Additionally, it's important to note where major migration routes exist so as not to block the movement of animals.

Q: In the United States (in 2015) how much electric power was generated from renewable resources?

A: Only 13%

TAKE ACTION

Make a commitment to reduce your energy use as a family by completing the creative poster, sign, or drawing that you started yesterday. Share these stories with us on social media [@TNCNatureLab](#) on [Twitter](#) and [Facebook](#) and [@nature_org](#) on [Instagram](#) and help us spread the word!



Share your artworks and reflections with us on social media & help us spread the word!



DAY

6

Reforestation and Climate

? ESSENTIAL QUESTION

What can people all over the world do to preserve and restore forests?

Together, we will learn about the importance of forests and the impacts of deforestation and reforestation with a focus on global climate change. We will explore the ways in which forests decrease carbon dioxide and greenhouse gases in the atmosphere, thereby minimizing climate change, and improving air quality. We will also think about the ways in which deforestation and forest restoration affect wildlife.

→ ACTIVITY



WATCH:
[Reforestation: Impact on Climate](#)

“ DISCUSSION

Distribute roles to different family members for students to participate in a discussion. In this discussion, students should be given the opportunity to develop a deeper understanding of the focal point of the discussion through sharing of perspectives, questions, and interpretations. In this discussion students will be exploring different perspectives on the pros and cons of deforestation. Explain to students that to prepare for this discussion, you will research more information about these roles together. Use Google to find more information about the roles below and take some notes!

Possible roles include:

- A** Conservationists: Forests are home to many species of plants and animals.
- B** Logger: My job is to cut down trees and without this job I cannot provide for my family.
- C** Pharmacist: Many medicines come from our forests and many are yet to be discovered.
- D** Farmer: I clear away land by burning a few acres of trees to grow crops for my family to eat.
- E** Environmentalist: Forests help moderate climate change by taking in carbon dioxide during the day. Too much carbon dioxide leads to an increase in greenhouse gases, which causes changes in our climate.
- F** Restaurant owner: I need paper and meat products to meet my customers' demands.

! TAKE ACTION

Use these discussion questions to write a reflection paragraph about the connection between reforestation and climate. Share these stories with us on social media [@TNCNatureLab](#) on [Twitter](#) and [Facebook](#) and [@nature_org](#) on [Instagram](#) and help us spread the word!

- 1 Describe the role of trees in the carbon cycle.
- 2 Explain the relationship between carbon dioxide, deforestation/reforestation, and global climate change.
- 3 Discuss two effects that human activity has on the carbon cycle.



Share your reflections with us on social media and help us spread the word!



DAY

7

Climb-It Change

? ESSENTIAL QUESTION

How are alpine regions impacted by climate change?

→ ACTIVITY



WATCH:
[Climb-It Change](#)

“ DISCUSSION

Q: Trevor Bloom talks about spending a lot of time outside and in nature as a child. What are some of your favorite memories of the outdoors? What are your favorite places to spend time in nature?

Answers will vary.

Q: What are some of the indirect effects of climate change that Trevor Bloom worries about?

A: Pathogen outbreaks, wildfires, flooding.

Q: What is the team's hypothesis? Discuss the meaning of this term if students have not yet learned this concept.

A: Increased frequency of wildfires at high elevation will lead to faster destruction of alpine ecosystems.

Q: *Saxifraga austromontana* is the plant that Trevor Bloom and his team are searching for. Draw your own image of this plant. Write some of its characteristics around your drawing.

Q: The scientists have about 1500 historical records of the *Saxifraga Austromontana*. How will they use these records in their experiment?

A: They will use them locate where historical populations of the plant have grown and map out those locations.

Q: The team ran analyses to see what the likelihood of finding the population in a burned site as compared to an unburned site. What did they find? What do their findings show?

A: A burned site had 3x greater likelihood of extinction of the plant's population than an unburned site. This shows that wildfires are leading to local extinction of species.

Q: What did Trevor Bloom and his team find in the end?

A: Trevor Bloom and his team found that alpine species are going lose 40-80% of their habitat by middle to end of century due to temperature and precipitation. When adding wildfires to this equation, this plant will lose 40% of its range by 2050.



Share your reflections with us on social media and help us spread the word!

! TAKE ACTION

Trevor and his friends remind us that we must get out into nature (when it's safe to do so) and see the places that are changing so rapidly. The more we know about a place, the more we want to protect it!

To conclude your week of learning all about climate change, [sign the pledge](#) to stand in favor of climate action! Take it one step further and share this pledge with your friends and family members. Ask them to sign the pledge too!



Share your learnings!

**You've
earned it!**



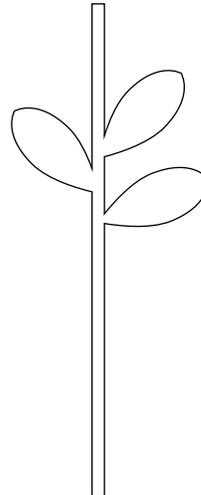
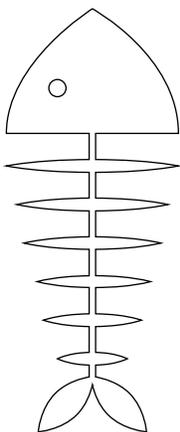
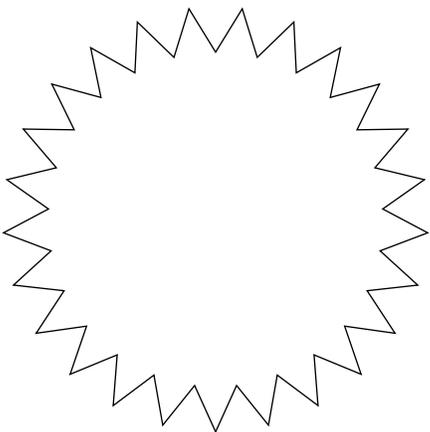
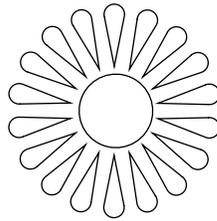
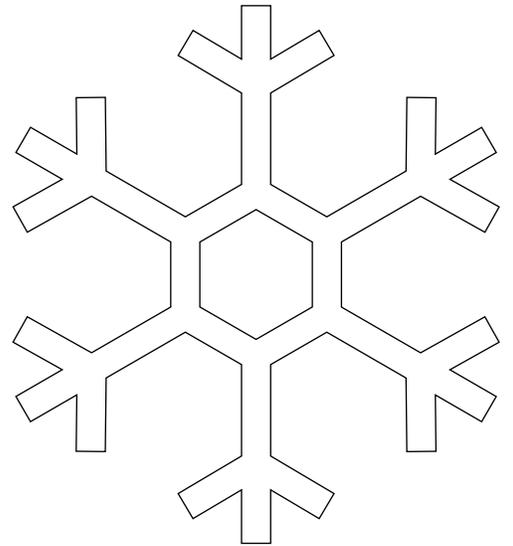
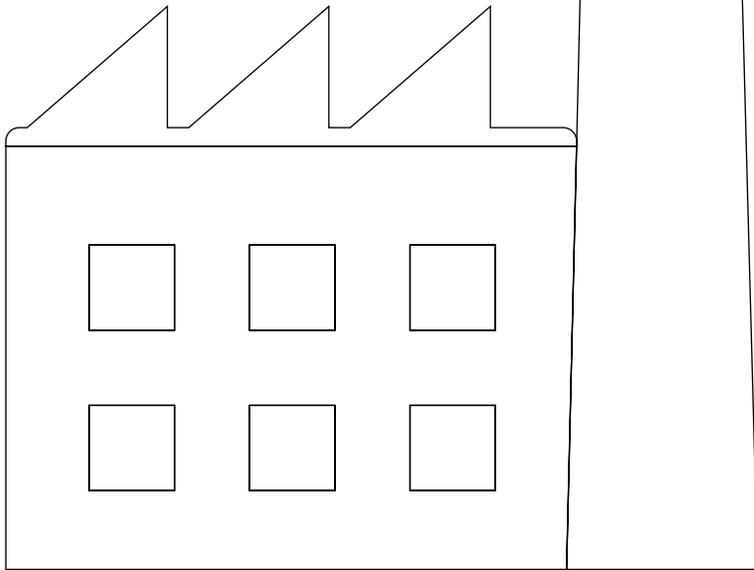
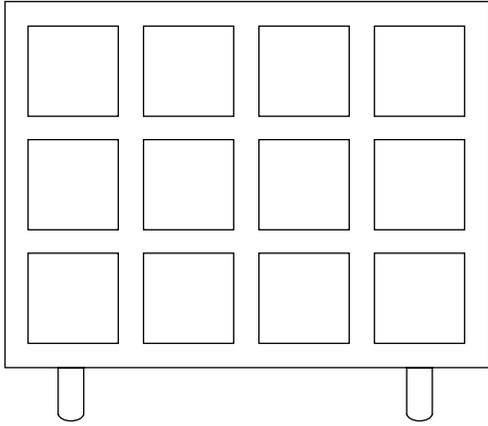
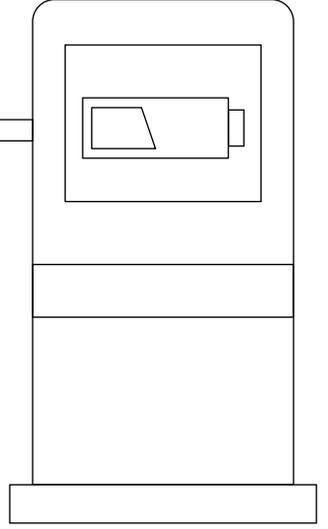
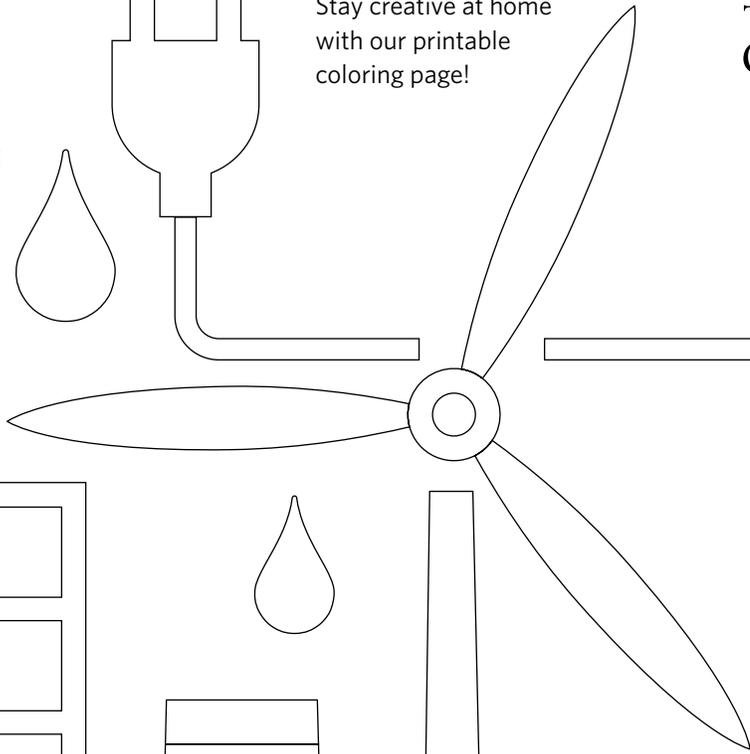
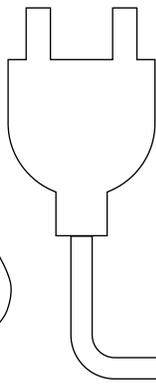
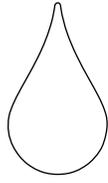
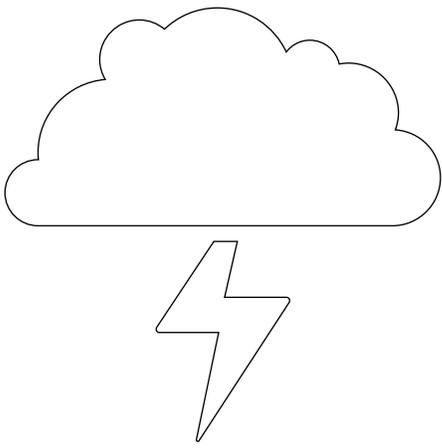
From renewable energy sources to coastal resilience, you've learned a lot about climate change and you have much to be proud of!

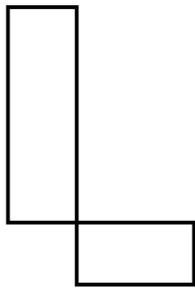
Download your digital climate badge and share your learnings with us on social media.



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