



Teacher Guide

Cool Career

Climate Scientist

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Typhoon Days

“When I was growing up in Hong Kong, I memorized the signals that showed typhoons were coming. I loved the wind, rain, and waves. And when typhoons hit, school was canceled,” Inez Fung says. This future climate scientist also loved exploring the beach, swimming in the sea, and staring up at the clouds. Her love of math started in elementary school. It paid off in college, when a professor introduced her to meteorology and to using math to explain the weather.

Long-term Forecast

Today Inez is famous for her computer simulations of Earth’s carbon cycle and how it affects the climate. She’s the first scientist to show that the increasing carbon dioxide (CO₂) in the atmosphere comes from sources such as power plants, car exhaust, and forest fires. And she’s the first to show where some of it goes—into trees, soil, and the ocean. It’s a huge task, but Inez is determined to find out just how fast this gas is causing the air around our planet to warm up.

A climate scientist studies how and why weather patterns change over long periods of time across the entire globe. Inez uses data from the atmosphere, land, oceans, and living things to study the factors that cause the climate to change. She also creates mathematical models to predict future climates. Other **climate scientists**

- > examine the most effective ways to control greenhouse gases, such as carbon dioxide.
- > use satellites in space to study clouds.
- > forecast weather using satellites and high-speed computers.
- > use past climate trends to predict future climate changes.



“I decided to apply mathematics to the future of climate and the future of the planet.”



Inez completed high school in Hong Kong and then came to the U.S. for college.

After you read about Inez Fung, do these activities.

Source or Sink?

Inez knows a lot about Earth's carbon cycle. She has figured out many of the sources and sinks of carbon dioxide (CO₂)—the places it's released and the places it's stored. Imagine you are a research assistant for Inez. Your job is to identify CO₂ sources and CO₂ sinks. Identify each thing on this list as a source or sink of CO₂ and explain the reason.

Answer key

1. Appliances: *[Source. Refrigerators, dishwashers, washers, and dryers use electricity, which usually comes from power plants that burn fossil fuels.]*
2. Plants: *[Sink. During photosynthesis, plants take in CO₂ from the air and use it to make sugars and other carbon-based compounds. Plants store the carbon compounds while they live but pass them to the soil and air when they die and decompose.]*
3. Fossil fuels: *[Source. Burning fossil fuels such as natural gas, oil, and coal in cars, factories, and power plants releases energy and sends CO₂ into the air.]*
4. Phytoplankton: *[Sink. Phytoplankton are microscopic aquatic organisms that absorb CO₂ from water. Just like plants, they use CO₂ during photosynthesis, storing carbon that is then transferred back to the ocean when the phytoplankton die.]*
5. Animals: *[Source. During cellular respiration, animal cells break down food compounds and release CO₂ as a waste product.]*
6. Wind-powered energy: *[Neither. Wind-powered energy generation is “carbon neutral.” That is, it is neither a carbon source nor a carbon sink—no CO₂ is produced or consumed, except in the construction of the wind farm itself.]*

Rain, Rain Gone Away

What would happen if precipitation patterns where you live changed as a result of global warming? Say rainfall decreased by 50 percent and stayed at that level. How would it affect plants and animals? Lakes and rivers? Your community's water supply? Write a paragraph about the possible impacts. *[Encourage students to think about possible effects of global climate change at a local level. Allow students to conduct research about the environment where they live and encourage them to include:*

- > *the current average annual precipitation and the new average precipitation after a 50 percent reduction.*
- > *how local plants and animals use water, and how they would be affected by a 50 percent reduction in rainfall.*
- > *how much water is used per year by the community or per household in the community.]*

STANDARDS ALIGNMENT

NGSS MS-ESS2.D.1: Weather and Climate: Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.

MS-ESS2.D.3: Weather and Climate: Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.

CCSS W.6-8.3: Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.