

# Teachers

Our students need  
us to help them  
create the best  
possible future



Let's be climate  
change heroes



Preparing today's children for a climate changed world

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# The Carbon Cycle and its Role in Climate Change

## Climate Heroes Lesson Plans: Grades 8–10

### Take a bite of dinner, a breath, or a drive in a car—you are part of the carbon cycle.

Carbon is the chemical backbone of life on Earth and a key element in many important processes. Carbon compounds help to regulate the Earth’s temperature, make up the food that sustains us, and provide a major source of energy to fuel our global economy.

#### What is the carbon cycle?

Carbon(C) is the basic building block of life. Many nonliving things also contain carbon. Carbon is the fourth most common element in the universe, after hydrogen, helium, and oxygen. Every organism needs carbon for structure, energy, or both. Humans use carbon for both energy and structure—in fact the human body is about half carbon, not counting the water.

Carbon atoms are not created or destroyed—they move from one form to another. The carbon in your body was most recently part of a plant or an animal that you ate. Before that plant or animal consumed the carbon, it was in the atmosphere as a molecule of carbon dioxide. You release carbon when you exhale, or go to the bathroom, or get a haircut. When you die and decompose, you release all your stored carbon. On a global scale, carbon moves between the atmosphere, the oceans, the biosphere—the living organisms on the planet, including you—and the geosphere—the rocks, sediments, and fossil fuels. Anything that adds carbon to the atmosphere can be called a “source.” Anything that removes carbon from the atmosphere can be called a “sink.”

#### The difference between short-term and long-term cycles

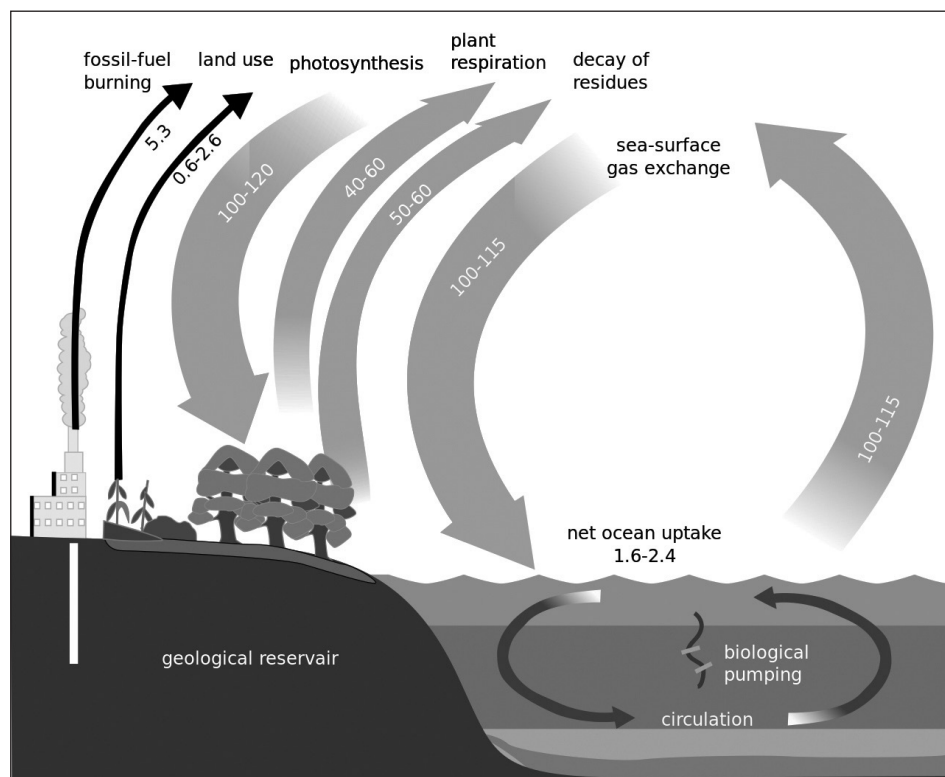
Short-term carbon cycles involve carbon that moves through living organisms. It operates on a time scale of days to thousands of years. Plants use solar energy to drive the process of photosynthesis where they combine carbon dioxide from the atmosphere with water to produce sugars and oxygen. Plants and animals “burn” these sugars to get energy to grow. The process of burning the sugars releases some carbon back to the atmosphere as carbon dioxide in a process called respiration. As the organisms grow, they store carbon in their tissues. When they die, they release their carbon to the soil, to the ocean floor, or the atmosphere.

The long-term carbon cycle involves carbon stored in rocks and fossils on a timescale of millions of years. As the ocean floor spreads and is pushed under the continents, the rock that was the ocean floor gets pushed deeper and deeper. As it gets deeper into the Earth it heats up, melts, and can rise back to the surface, releasing carbon dioxide. The long-term carbon cycle also includes fossil fuels.

Fossil fuels were formed millions of years ago from deceased animals and plants. Rapidly covered by sediment, the organic matter and stored carbon in these dead bodies turned into coal, petroleum, and oil rather than decaying. The rise in extraction and burning of fossil fuels alters the carbon cycle by releasing previously stored carbon.

#### The planet’s carbon budget

It may be helpful to think of the earth as having a carbon “budget.” As with financial budgets, the ideal is to have it balanced. For a carbon budget, balanced would mean that all the carbon produced by sources would be taken up by sinks. When humans burn fossil fuels, we release carbon into the atmosphere. Humans also release carbon into the atmosphere when we clear forests for agriculture. We are currently adding carbon more quickly than the planet’s natural sinks can remove it. This extra carbon accumulates in the atmosphere, contributing to climate change.



## Carbon Cycle Climate Change Heroes Lessons

### Overview

The purpose of these lessons is to further explore the role carbon plays in the carbon cycle and its effects on climate change. Before this lesson, students would have explored the kinetic molecular theory and early models of an atom. Students should be comfortable with the concept that carbon is an atom that is found in both organic and inorganic matter.

### Big idea

The biosphere, geosphere, hydrosphere, and atmosphere are interconnected, as matter cycles and energy flows through them.

### Learning standards

- Matter cycles within biotic and abiotic components of ecosystems:
  - carbon, water, nitrogen, and phosphorus cycle
  - human impacts on sources and sinks (e.g., climate change, deforestation, agriculture).
- Sustainability of systems
  - A systems approach to sustainability sees all matter and energy as interconnected and existing in dynamic equilibrium (e.g., carbon as a key factor in climate change, greenhouse effect, water cycle, etc.).

Please see the Environmental Justice Action Group posters page at [bctf.ca/SocialJustice.aspx?id=27811&libID=27801](http://bctf.ca/SocialJustice.aspx?id=27811&libID=27801) for resources on climate change, including the following carbon cycle lesson plans:

### Activity 1

What is the carbon cycle?  
How do atoms combine and recombine?

### Activity 2

What is a carbon sink?

### Activity 3

How does carbon move through the carbon cycle?

### Activity 4

How does carbon cycle through the troposphere?

### Activity 5

How do you solve a problem like the climate crisis?