

Climate Change Educator's Guide

Answers to Student Worksheets

GRADES 3-5

1. Investigate Our Energy Sources

Find the steam engine. How did coal make the steam engine work?

Burning coal boils water, which makes steam. The steam, which is held in a boiler under high pressure, pushes a piston that powers an engine.

Find the light bulb. Describe the connection between coal and the “Second Industrial Revolution” in 1882.

The “Second Industrial Revolution” started when power plants — fueled by burning coal — began bringing electricity to factories, offices, and homes.

2. Investigate Our Energy Use

Find the big chunk of coal in the Climate Change Today area. It weighs one metric ton, or 2,200 pounds! If we burn it to generate electricity, it could . . .

... illuminate **22,000** 100-watt light bulbs for
... run a refrigerator for about **2** years
... produce about **2.5 metric tons** of CO₂ (carbon dioxide).

3. Investigate Weather and Climate

What's the difference between weather and climate?

Weather describes the conditions over the next few days. Climate describes the average weather over many years.

Describe the tools scientists use to study weather and climate.

Scientists use satellites, buoys and floats, and ocean gliders.

4. What Can We Do?

List some things that you could do at home to save energy and lower your family's carbon dioxide emission.

Answers will vary. They may include: Switch to compact fluorescent light bulbs, install energy-efficient appliances, and turn off appliances and electronics when not in use. Take shorter showers. Ride in cars less; instead, ride your bike or take public transportation. In the winter, dress more warmly instead of turning up the thermostat; keep blinds and curtains closed at night and open during the day. In the summer, raise the thermostat to 78°, and turn on a ceiling fan instead of the AC.

GRADES 6-8**1. Investigate the Evidence for Climate Change**

Answers may vary. Types of evidence include ice core, tree rings, brain coral fossil, and sediment core.

2. Investigate the Consequences of Climate Change

Describe a way in which climate change affects human society.

Answers will vary. They may include: Droughts could disrupt agriculture, causing starvation. Storm surges and rising sea levels could displace the hundreds of millions of people who live on or near seacoasts. Changes in temperatures and the distribution of rainfall could lead to disease outbreaks.

Choose a plant or animal (including humans). Describe how it has been or might be affected by warming temperatures.

Answers will vary. They may include: Melting Arctic sea ice and permafrost (frozen land) is disturbing the places where many polar animals hunt, nest, and breed. Changes in ocean water threaten populations of phytoplankton. These microscopic plants form the base of the ocean's complex food chains, so this could affect animals throughout the ocean.

3. What Can We Do?

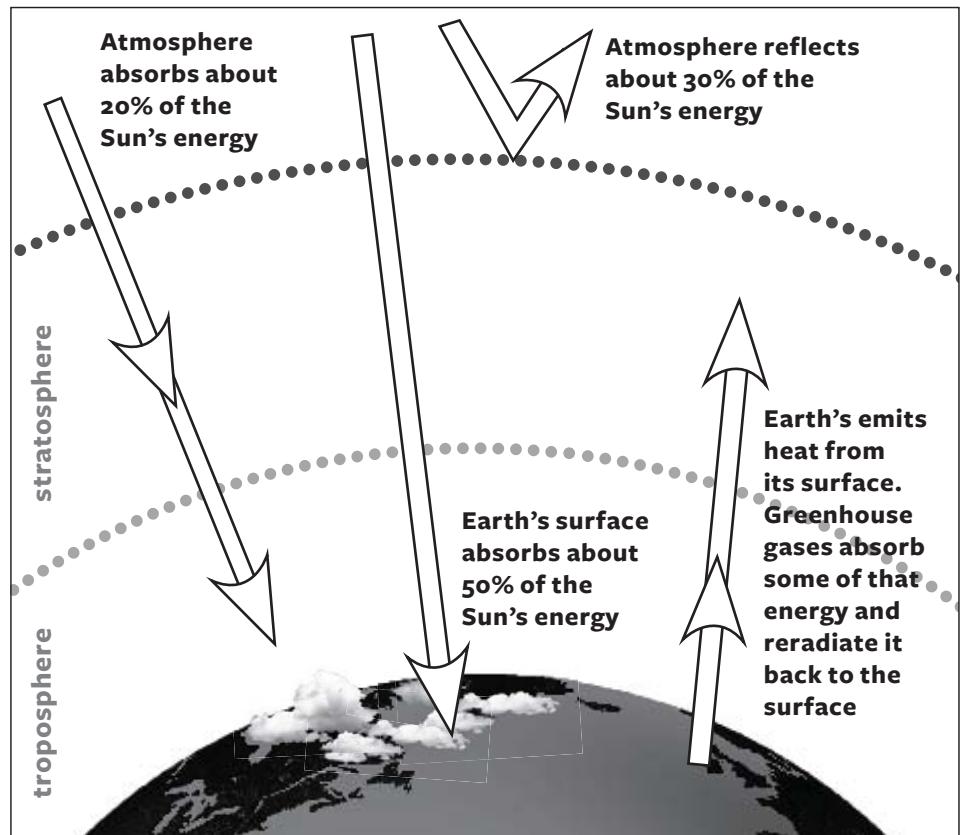
What actions can your school or community take to reduce carbon dioxide emissions?

Answers will vary. They may include: Conduct school- or community-wide campaigns — using leaflets, posters, or announcements in school assemblies — that promote actions that individuals can take to slow climate change. Work with local organizations to promote public transportation, tree-planting, energy-efficient construction, and large-scale recycling programs. Get involved in Earth Day and other renewable-energy or conservation-oriented activities.

GRADES 9-12

1. Investigate How Climate Works

Answers will vary. They may include: Clouds in the atmosphere help control temperatures on Earth by reflecting and absorbing light and heat coming into and leaving our planet. The ice-covered poles reflect the Sun's energy, and the huge temperature difference between the frozen poles and the equator drives wind and ocean currents. Evaporation of ocean waters brings moisture to land areas and transfers energy to the atmosphere where it helps drive weather systems.

**2. What Can We Do?**

What actions can your school or community take to reduce carbon dioxide emissions?

Answers will vary. They may include: Conduct school- or community-wide campaigns (e.g., using leaflets, posters, or announcements in school assemblies) that promote actions that individuals can take to slow climate change. Work with local organizations to promote public transportation, tree-planting, energy-efficient construction, and large-scale recycling programs. Get involved in Earth Day and other renewable-energy or conservation-oriented activities.

3. Investigate Energy Solutions

Why is "clean" electricity key to solving climate change?

Plants that produce electricity are responsible for more than 30 percent of global CO₂ emissions each year, by far the largest source of those emissions. In addition, CO₂ emissions from electricity production are growing much faster than emissions from other sources.

What do you think governments like ours should do?

Answers will vary. They may include: Directly tax carbon emissions. Invest in alternative energy technologies. Raise fuel-efficiency standards for trucks and cars. Build public transportation systems. Give tax breaks to homeowners who use less energy. Support research on renewable energy. Give prizes for innovation in green buildings and sustainable development. Protect forests, plant trees, and work to prevent deforestation worldwide. Work with governments around the world to protect shared resources like the oceans and the atmosphere.

EXPLORE CLIMATE CHANGE IN THE HALL OF PLANET EARTH

Answers will vary. They may include: Scientists study a marine sediment core from the tropics to understand seasonal changes in biological activity in the waters from which the sediments were deposited. Light layers, formed during winter, are richer in biologically produced carbonate, while dark layers, formed during summer, contain fewer biologically produced sediments and more silts and clays. The nearly 3,000 years spanned by this sediment core includes the onset of the Younger Dryas, a cold period marked in the core by a general lightening of sediment color, the direct result of increased biological productivity.