

## Teacher Guide

### Energy, Fossil Fuels and the Carbon Cycle

**Developed by:** Dan Shepardson

**Activity Focus:** Students interpret and visualize data and information about energy, energy use, fossil fuels, and the carbon cycle.

**Major Concepts:** The burning of fossil fuels releases energy and carbon dioxide. Carbon dioxide is cycled through the environment via the carbon cycle. Atmospheric carbon dioxide has been steadily increasing. This increase in atmospheric carbon dioxide may be explained by the increase in fossil fuel use (burning).

**Objectives:** After completing this activity, students will be able to:

- identify carbon dioxide and energy as a by-product of the burning of fossil fuels
- distinguish between natural and human carbon dioxide sources and sinks
- explain how the burning of fossil fuels has resulted in the current increase in atmospheric carbon dioxide levels
- create an action plan for reducing their energy use and the release of carbon dioxide into the atmosphere

**Materials and Preparation:** You will need to prepare the following materials before conducting this activity.

- Copy the *Energy, Fossil Fuels, and Carbon Cycle* data interpretation and visualization activity (make 1 copy per student).
- Make a transparency or PowerPoint slide for each data set (appendix) for use in the class discussion. You may want to make a color copy of the data set for groups of students.

**Procedures:** Students may work individually or as a group to complete the activity.

1. Introduce the activity by asking students to identify some of the energy sources they use on a daily basis. List these energy sources on the board and organize by fossil fuel, nuclear, and renewable, and the purpose of their use (e.g., electricity, heating, transportation). If need be, ask students to explain the term fossil fuel. Indicate that in this activity students will be investigating how fossil fuel (energy) use impacts the environment. Have students answer the “what I currently know and think” questions before starting the activity.
2. Organize students into small groups of 3-4 or have students work independently on completing the activity.. If students are working in small groups have them read and discuss as a group each question before recording a consensus response. Students will work best in the same group throughout the module.

3. Discuss the activity as a class, asking students to share their responses to the questions. Ask other students to share additional information/responses. Show each data set (appendix) as students share their responses. Use the data set to focus the discussion.
4. Have students reflect on their ideas by re-answering the engage questions, writing their responses to the “what I now know and think” questions, and have them reflect on their own thinking by completing the “how my ideas and thinking have changed” question.
5. Collect student/group responses. Administer assessment item.

**Assessments:** The following assessments may be used as a pre/post activity assessment or as part of a module assessment.

- What are some human events or activities that release carbon dioxide into the atmosphere?
- Which of these might contribute the most carbon dioxide to the atmosphere?
- Describe/explain the evidence that indicates that atmospheric carbon dioxide is increasing.
- List and describe three new things you have learned from this activity.

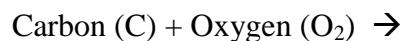
**Quiz:** The following quiz may be used as a post-activity assessment

Most carbon is found in the

- A. Atmosphere
- B. Vegetation and Soils
- C. Oceans
- D. Fossil fuels

Oil, natural gas, coal are called \_\_\_\_\_.

Complete the general formula for burning fossil fuels, such as coal:



Data from the Mauna Loa Observatory, HI provides evidence of what climate trend?

- A. Climate change
- B. An increase in carbon dioxide
- C. Burning fossil fuels results in more atmospheric carbon dioxide
- D. Energy use has increased over time.

## **Bibliography**

Energy Information Administration (2006) <http://www.eia.doe.gov/>

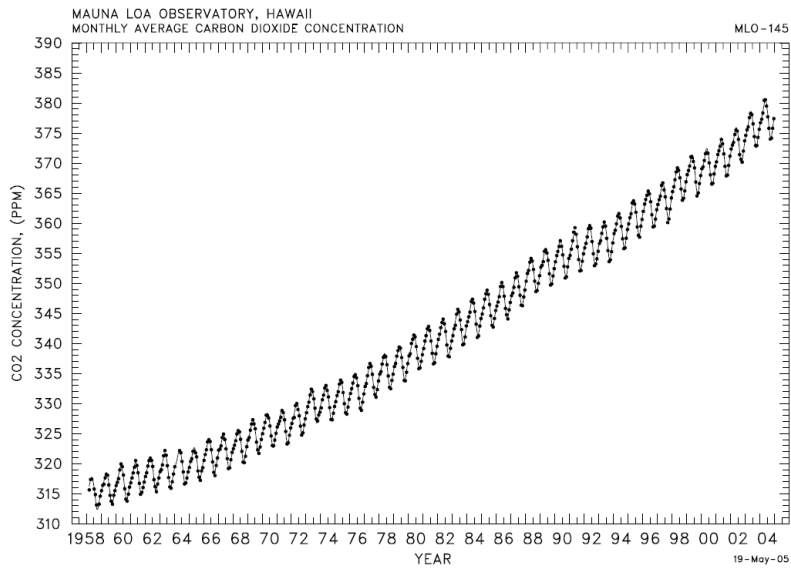
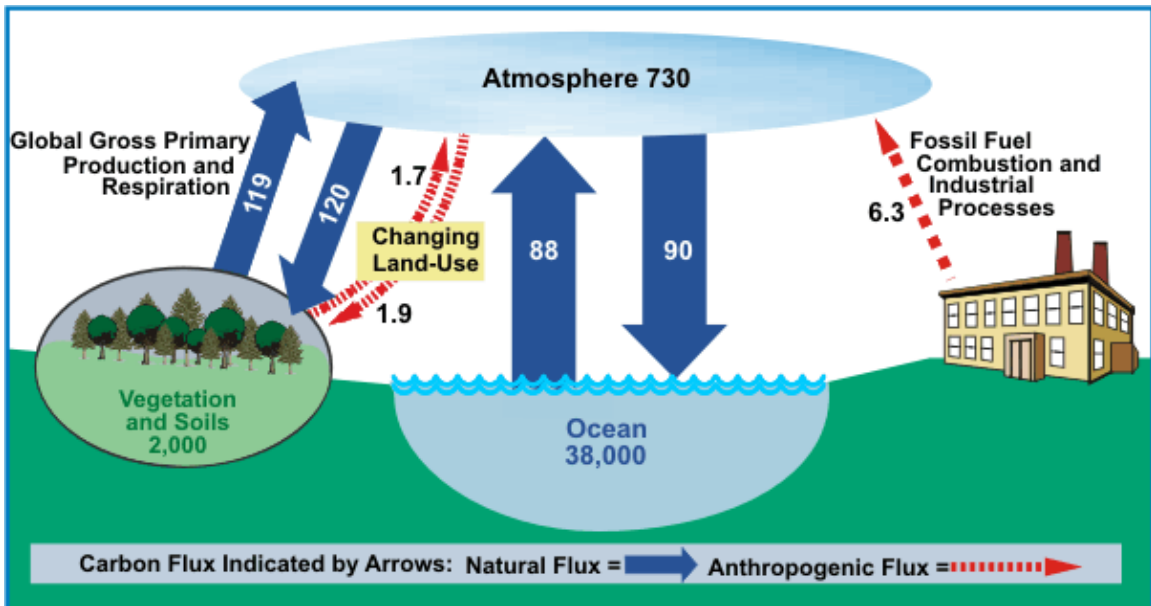
EPA (2002). *US Climate Action Report*.

<http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ResourceCenterPublicationsUSClimateActionReport.html>

EPA. Global Warming.

<http://yosemite.epa.gov/oar/globalwarming.nsf/content/indexarchive.html>

**Appendix:**



By Major Source, 1949-2005

