

Teacher Guide

Your Family's Carbon Footprint

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Activity Focus: Students estimate the amount of greenhouse gas they contribute to the atmosphere each year—their carbon footprint—using the EPA's web-based *Personal Emissions Calculator*. Students collect, interpret, and visualize data about their family's and their classmates' greenhouse gas emissions.

Major Concepts: Human activities, such as using energy and producing waste (garbage), emit greenhouse gases into the atmosphere; thus each individual makes a carbon footprint on the Earth's atmosphere. Consequently, each individual is responsible for additions to greenhouse gases in the Earth's atmosphere and for contributions to global warming. Individuals can reduce their carbon footprint by reducing their energy use and solid waste disposal.

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

- state that carbon dioxide, methane, and nitrous oxides are the main human produced greenhouse gases
- explain how their daily activities contribute greenhouse gases, creating a carbon footprint
- describe ways they could reduce their greenhouse gas emissions
- transform data into a graphic form
- calculate basic descriptive statistics

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

- Copy the *Your Family's Carbon Footprint* data interpretation and visualization activity (make 1 copy per student).
- Provide each student/group with graph paper for answering the data transformation questions. You may want to provide each group with a transparency of grid paper where they can record their transformations.
- 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.
- Students will need internet access in order to use the EPA's *Personal Emissions Calculator* http://epa.gov/climatechange/emissions/ind_calculator.html For more accurate results, have students ask their parents to assist by answering the following questions before going to the online calculator:

How do you heat your home? _____

How much does your family spend per month on electricity? _____

How much does your family spend per month on natural gas? _____

- How much does your family spend per month on heating oil? _____
- On average how many miles does your family drive per week? _____
- What is the average gas mileage for your family car(s)? _____
- Does your family recycle newspaper? _____
- Does your family recycle glass? _____
- Does your family recycle plastic? _____
- Does your family recycle aluminum/steel cans? _____
- Paper and art supplies/materials for making brochures.

Procedures: Students may work individually to calculate their own carbon footprint and may work as a group to complete the remaining parts of the activity.

1. Introduce the activity by asking students to identify some of the energy sources they use on a daily basis. List these on the board and organize by activity (e.g., transportation, heating/cooling, and lighting). Point out that these activities emit greenhouse gases into the Earth's atmosphere. State that in this activity the students will be investigating (estimating) how much greenhouse gas their family contributes to global warming, their family's carbon footprint. Have students answer the "what I currently know and think" questions before starting the activity. You may want to discuss these items as a class.
2. To complete the *Explore and Explain* portion of the activity, students will need to access the EPA's *Personal Emissions Calculator* http://epa.gov/climatechange/emissions/ind_calculator.html. Students complete Tables 1 and 2 and answer questions 4 and 5.
3. For the *Extend* portion of the activity, have each student share their individual/family data, and have students place their data on the blackboard or on a projected overhead transparency. Organize students into small groups of 3-4 or have students work independently on completing the rest of the activity. If students are working in small groups, have them read and discuss each question as a group before recording a consensus response.
4. Discuss the activity as a class, asking students to share their responses to the questions. Have several groups share their data transformations and explain how and why they re-visualized the data (You may want to provide each group with a transparency of grid paper). Use the data set to focus the discussion.
5. 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.
6. Have students create a brochure that could be used to inform families about actions they could implement to reduce greenhouse gas emissions, and why it is important to do so. Alternatively, this project could be assigned as homework.

7. 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 human activities release greenhouse gases into the atmosphere?
- How might these activities contribute to the greenhouse effect and global warming?
- What could people do to reduce their greenhouse gas emissions?

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

The burning of gasoline (oil), coal, and natural gas releases which greenhouse gas?

Which of the following gases is not considered a greenhouse gas?

- A. Nitrous oxides
- B. Methane
- C. Carbon dioxide
- D. Carbon monoxide

Which greenhouse gas is reduced when families recycle?

- A. Nitrous oxides
- B. Methane
- C. Carbon dioxide
- D. Carbon monoxide

Bibliography

EPA Personal Emissions Calculator

http://epa.gov/climatechange/emissions/ind_calculator.html

U.S. Department of Commerce. Projections of the number of households and families in the United States. <http://www.census.gov/prod/1/pop/p25-1129.pdf>

Appendix: Data Masters

Table 1: Pounds of Carbon Dioxide Equivalent Emitted Per Year

Activity	Total from Activity	Running Total
Transportation		
Home Energy		
Waste (Before Recycling)		
Waste (After Recycling)		
Grand Total		

Note: Waste produces methane; the calculator converts this to the equivalent of pounds of carbon dioxide.

Table 2: Potential Family Reduction in Greenhouse Gas Emissions Per Year

Activity	Amount of Greenhouse Gas Reduction
More energy efficient car	
Drive less	
Turn down thermostat in the winter and up in the summer	
Use compact florescent light bulbs	
Recycle	

Table 3. Pounds of Carbon Dioxide Equivalent Emitted Per Year for Class

	Mean	Median	Mode	Range
Transportation				
Home Energy				
Waste Disposal				