

Cool School Challenge



Class Transportation Survey

TEACHER GUIDE

Students will learn to measure, analyze and interpret transportation data. They will better understand the impact of their transportation choices on CO₂ emission levels. The term “CO₂ footprint” is introduced and students will consider how to reduce their CO₂ footprint with regards to getting to and from school.

Objectives:

Students will be able to:

- Measure the CO₂ emissions produced by a classroom of students getting to and from school.
- Analyze their personal as well as their class' contribution to CO₂ emissions.
- Brainstorm ways to reduce their CO₂ footprint, both as individuals and as a class.

Class Time:

- 30 minutes to calculate and collect all the data.
- 20 minutes to answer general questions and discuss results.

Materials:

- Internet access (either at home or school)
- Class Transportation Survey Introduction
- Class Transportation Survey Student Worksheet
- School population data (how many students attend your school)

Teacher Directions:

1. Lead a discussion using the [Introduction](#) to this lesson or have students read it themselves.
2. Provide each student with a [Class Transportation Survey - Student Worksheet](#) and assign the pre-lab questions as homework. *Students will need this information to figure out their transportation CO₂ footprint.*

Grade level: 7-12

Subjects:

Science; Math; Social Studies;
World Studies

Concepts:

CO₂ footprint; transportation CO₂
footprint

Washington State EALRs:

Science: 1.3, 2.1, 3.2

Math: 1.2, 1.5, 3.1, 3.3, 5.2, 5.3

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3. Students complete the worksheet to calculate their personal transportation CO₂ footprint [This can be done as homework too, if preferred].
4. As a large group, record each student's data in the "Class Transportation Data Summary" (or assign a Recordkeeper to collect this information). Then calculate the total CO₂ emissions for the entire class by adding all the results together.
5. Have students answer the General Questions on the worksheet.
6. Discuss students' answers and encourage them to think of ways to reduce their CO₂ footprint.

Extensions:

- Organize a carpool day and count the number of students who participate. Calculate the CO₂ savings.
- Challenge other classes to lessen their transportation footprint.

Glossary:

Carbon dioxide (CO₂) footprint – a measure of the CO₂ emissions generated through everyday individual activities. This includes activities such as transportation, electricity use, waste generated, etc.

Transportation CO₂ footprint – a component of the CO₂ footprint measuring only emissions from transportation activities.

Resources:

FuelEconomy.gov: This United States Department of Energy website provides information on the fuel economy as well as online calculators to determine the fuel efficiency of vehicles. www.Fueleconomy.gov

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Class Transportation Survey

INTRODUCTION

Roughly one-third¹ of U.S. greenhouse gas emissions come from the transportation sector: trains, planes, boats, trucks, cars, etc. In Washington State, transportation contributes nearly half of the region's greenhouse gas emissions, with cars and trucks in particular generating more than any other source. Choices made everyday about how to get to school, work, the mall, etc., directly impact the size of your CO₂ "footprint".

Your CO₂ "footprint" is basically a measurement of how much carbon dioxide is emitted into the atmosphere as a result of your individual actions. Transportation choices are just one component of a CO₂ footprint - but can often be the most significant.



How big is **your** transportation footprint? And how does it compare with that of your classmates?

Through this activity you'll conduct a survey to identify the different modes of transportation you and your classmates use to get to and from school. You'll then use this information to calculate the combined impact of those choices on your CO₂ footprint.

Before you begin:

1. Find out the round trip distance from your home to school. You can either do this by noting the mileage while doing the journey or go to www.mapquest.com and put in the correct addresses to calculate the distance.
2. If you travel to and from school in a car - alone or in a carpool - determine the average fuel economy of that vehicle in miles per gallon by checking www.fueleconomy.gov

¹ U.S. Environmental Protection Agency Inventory of Greenhouse Gas Emissions and Sinks, 2006.

Name: _____

Class: _____

Date: _____

Class Transportation Survey

Student Worksheet

Pre-lab assignment:

1. Find out the round trip distance from your home to school. You can either do this by noting the mileage while doing the journey or go to www.mapquest.com and put in the correct addresses to calculate the distance. Record this data in the table below.
2. If you travel to and from school in a car – alone or in a carpool – determine the average fuel economy of that vehicle in miles per gallon by checking www.fueleconomy.gov. Record this information in the table below.

Roundtrip distance to & from school	Fuel economy
_____ Miles	_____ Miles per gallon

Classroom Activity: How do you typically get to and from school? In the table below, find the option which best fits your mode of transportation and then answer the relevant section.

If you get to and from school by...	Answer the following section:
Car, driving alone	Section A
Carpool – either with other students, or dropped off by a parent/guardian/other on the way to work or elsewhere	Section B
Walk, bike or other zero-emission mode	Section C
Bus – public or school bus	Section D

Section A:

Transportation = Car- driving alone



1. **Estimate gallons of gas consumed each day getting to and from school.**

Answer: _____ gallons of fuel consumed

2. **Calculate the CO₂ emissions of your commute.** Show your work. Each gallon of gasoline burned emits 20 lbs of CO₂. Show your work.

Answer: _____ lbs CO₂ emitted getting to and from school.

3. **Estimate your annual CO₂ emissions from getting to and from school.** Multiply your total from #2 above by 180 school days. Record the answer in the Class Transportation Data Summary.

Answer: _____ lbs CO₂ emitted getting to and from school each year.

4. **Estimate the CO₂ footprint of your school from transportation** What if every student at your school produced the same amount of CO₂ as you, just by getting to and from school? What would your school's CO₂ footprint from transportation be? Multiply your answer from #3 by the number of students at your school.

Answer: _____ lbs CO₂ generated per year.

Section B:

Transportation = Carpool



1. **Estimate gallons of gas consumed each day getting to and from school.**

Answer: _____ gallons of fuel consumed

2. **Calculate the CO₂ emissions of your commute.** Show your work. Each gallon of gasoline burned emits 20 lbs of CO₂. Show your work.

Answer: _____ lbs CO₂ emitted getting to and from school.

3. **Calculate your individual impact.** How many people shared your ride? Divide your total from #2 by the number of people in your carpool (include yourself!) to calculate the individual CO₂ emissions of each person in the carpool.

Answer: _____ lbs CO₂ emitted per person.

4. **Estimate your annual CO₂ emissions from getting to and from school.** Multiply your total from #3 above by 180 school days. Record the answer in the Class Transportation Data Summary.

Answer: _____ lbs CO₂ emitted per person per year.

5. **Estimate the CO₂ footprint of your school from transportation** What if every student at your school produced the same amount of CO₂ as you, just by getting to and from school? What would your school's CO₂ footprint from transportation be? Multiply your answer from #3 by the number of students at your school.

Answer: _____ lbs CO₂ generated per year.

Section C:

Transportation = Bus (public or school bus)



1) Estimate the amount of fuel used by the bus

The average bus drives 40 miles round trip. Buses get about 5 miles per gallon. Calculate the gallons of diesel used by your bus per trip.

Answer: _____ gallons of fuel consumed

2) Calculate the CO₂ emissions of your commute. Show your work.

Each gallon of diesel burned creates 22 pounds (lbs) of CO₂.

Calculate the amount of CO₂ generated by the bus for each roundtrip journey.

Answer: _____ lbs CO₂ emitted getting to and from school by bus.

3) Calculate the CO₂ emissions per passenger

How many people shared your ride? Estimate the number of students who rode the bus with you today.

Answer: _____ lbs CO₂ per passenger on the bus.

4) Estimate your annual CO₂ emissions from getting to and from school.

Multiply the total from #3 by 180 school days per year and record your answer in "Class Data Summary".

Answer: _____ lbs CO₂ emitted per year by taking the bus.

5) Estimate the CO₂ footprint of your school from transportation.

What if every student at your school produced the same amount of CO₂ as you, just by getting to and from school? What would your school's CO₂ footprint from transportation be? Multiply your answer from #4 by the number of students at your school.

Answer: _____ lbs CO₂ emitted per year by the whole school.

Section C:

Transportation = Walk, bike, skateboard, or other emission-free mode of transport

Your CO₂ footprint equals zero!

Record a "0" in the Class Transportation Data Summary.

If everyone in your school traveled as you did today, this part of the CO₂ school footprint would be zero!



Transportation Class Survey

General Questions

1. What is the most common way students in your class get to and from school? Why do you think this is the case?
2. Which mode of transportation generates the most CO₂ per person in your class?
3. How many students generated “zero” pounds of CO₂ from their commute?
4. Looking at the Class Data Summary, how many students in your class ride the bus to and from school?
5. What might be some ways to increase bus ridership?
6. If you do not currently walk or bike to school, would you consider either of these options as possible for you? Why or why not?
7. Does your school give incentives to students who carpool? What are these incentives and how effective are they?
8. What might be some new incentives your school might offer to encourage carpooling?
9. How might your class decrease its transportation CO₂ footprint?

Class Transportation Survey - Class Data Summary

Record each student's data in the table below and add up the CO₂ emissions for the entire class.

Student	Pounds of CO ₂ per year
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Student	Pounds of CO ₂ per year
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
TOTAL FOR THE CLASS:	