

Film Guide for Educators

Sustainable Transportation

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Key Concepts

Transportation and Carbon Footprint

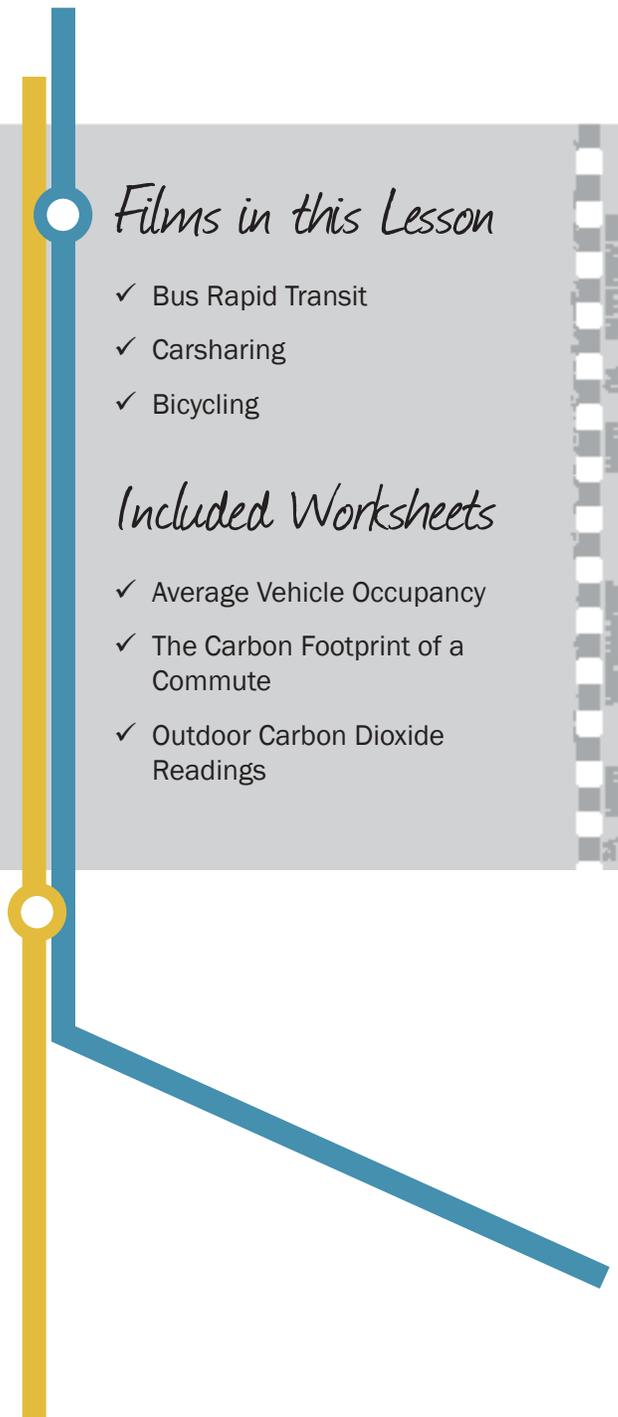
Carbon footprint is a “measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide.” In other words, carbon footprint is how much pollution we put in the air from our behavior. How we are able to get around makes a big difference when it comes to carbon footprint. In some areas, CO₂ emissions from motor vehicles can make up almost 50 percent of the carbon dioxide in the air. Sustainable commuting makes a difference!

Building Sustainable Bus Systems

Transportation systems that allow people to get around without an automobile have a big impact when it comes to pollution and air quality, especially in urban and suburban areas. But transit expansion projects can take decades, and they are very expensive. Bus Rapid Transit (BRT) is a way to improve public transportation that is relatively inexpensive and quick to implement, providing people with an affordable, quick, and sustainable transit option.

The Importance of Sharing a Ride

In cases where public transportation is not available and where distance or safety precludes walking or biking, sharing a ride can be the best option for a more sustainable commute. In addition to the ideas that are shared in this film (which focuses primarily on carsharing programs) you may want to also talk as a class about carpooling or combining car trips. We can make informed, wise decisions about when, where, and how we use privately-owned vehicles to get from place to place, and support businesses and programs that make it easier for people to make sustainable choices.



Films in this Lesson

- ✓ Bus Rapid Transit
- ✓ Carsharing
- ✓ Bicycling

Included Worksheets

- ✓ Average Vehicle Occupancy
- ✓ The Carbon Footprint of a Commute
- ✓ Outdoor Carbon Dioxide Readings

Bicycling as Carbon Neutral/Healthy Living

Many cities are seeing a resurgence of bicycling. Not only are cities redesigning their streetscapes to include bike infrastructure, they are also creating inventive ways to encourage cycling for people who do not own bicycles. Bike share programs are popping up in strategic parts of the country from Denver to Washington DC. Cycling is a fast, “green,” inexpensive, and healthy way to get around, making it a great option for many people.

PRE-SCREENING ACTIVITIES: Putting it in Context

Before you watch the films, here are some activities to create context for your students.

Commuting and You

Discuss how we get to and from school every day and what factors influence our commuting decisions. Questions to include:

- What are the factors that influence how you decide to commute (money, health, time, safety, environmental sustainability, and others)?
- Do you think that environmental sustainability is something to prioritize when commuting from place to place? Why or why not?
- What are the pros and cons of your current commute? Are there realistic options that you can explore that would allow you to choose a more sustainable means of transportation?
- Is your area built in any way for safe bicycling? Do you feel comfortable walking?

Average Vehicle Occupancy

Activity: “Observing Neighborhood Driving”

Worksheet: Average Vehicle Occupancy

Through this activity, the students will learn about carpooling/ridesharing, and through their own observations, determine if people are carpooling near the school.

- Have a group discussion about carpooling. Students can first discuss the pros and cons with a partner before speaking with the whole class. Ask the students to explain carpooling (also known as ridesharing). What are drawbacks of sharing a ride? What are the benefits? How does it cut down on pollution from vehicles? Do we think people are carpooling in our neighborhood? Why or why not?
- Assign partners and explain that they will be calculating Average Vehicle Occupancy (AVO) to find out if people are carpooling in the area. Explain to them that they will need to stand with a clear view of the street (but always stay on the sidewalk!) and work together to carefully count how many people are in 30 cars that pass by.
- Hand out the “AVO” recording worksheet. Make sure the students understand that they will need to fill out the type of vehicle that passed by and the number of occupants in each vehicle. Review some examples of types of vehicles (SUV, hybrid, truck, car, etc.)
- Once outside, partners stand on a sidewalk with a good view of the street. Ask partners to do their best to record how many occupants are in each of the next 30 vehicles that go by. If they can’t see in a car that goes by (because of tinted windows or a high speed) they can let that car pass and count the people in the next car. For example: “car, one person,” or “SUV, four people.”

- Partners should add up the total number of people counted in the vehicles, and divide that number by the total number of vehicles (30 vehicles). Students find their own average. If you have time to find the class average, you can add up each average and divide by the total number of teams.
- Discuss the numbers you collected. What does this information say about how our city is doing when it comes to carpooling? If we did this exercise at another time of day, do you think we would get different results? Were you surprised or disappointed with our results? Why do you think most people in the area do or don't carpool? Can you think of any ways to encourage carpooling? Would we need changes to government policy? What about changes to street design (for example, high occupancy vehicle lanes on highways)? Or new and better business models?

Film Synopses and Discussion Questions

Each of the forms of transportation illustrated in these films (bus rapid transit, cycling, and carsharing) have potential as an alternative to a privately-owned vehicle used by an individual or family. These are also considerably more sustainable ways of getting around. Each has different benefits and drawbacks, which after watching all three, could be discussed as a class.

Bus Rapid Transit (BRT)

SYNOPSIS: BRT provides faster, more reliable bus service, and has the potential to meet more remote locations in a city. Exclusive lanes for bus-only use,

special waiting stations up on a platform with advance payment, and buses are given priority at intersections.

- What are the critical components that distinguish Bus Rapid Transit (BRT) from regular bus service?
- Where are the best Bus Rapid Transit Systems in the world?
- What are the benefits of Bus Rapid Transit?
- How is BRT less expensive than building other forms of public transit, like a subway, for example?
- Why is it important to improve bus ridership?
- What are some of the problems with buses in your community?
- What changes do you think would bus riding more popular? Would BRT be a good option?

Carsharing

SYNOPSIS: Carsharing reduces the number of car trips an individual takes, and allows people to avoid buying a car. It also encourages transit ridership, walking, and biking, except at times when a car is necessary.

- What are the personal benefits of carsharing or ridesharing?
- What are the shared benefits of carsharing or ridesharing?
- How has carsharing been incorporated into public transportation systems?
- How do cities support car sharing?

Bicycling

SYNOPSIS: Many trips people take each day are within reasonable biking or walking distance. Investing in cycling infrastructure by cities is necessary to help reduce traffic congestion and pollution, as well as provide an affordable form of transportation and exercise.

- How is a cycling network a crucial component of a sustainable transportation system?
- Why is street design essential to making cycling more popular?
- Since New York City is expected to have one million more residents by 2030, how is cycling a better option than adding more infrastructure for cars?
- What are some of the benefits of cycling?

Concluding Questions

- How does each of these films convey a sustainable way of getting around our cities and towns?

- Do you think one of these choices would work better for your community than others? Which one and why?
- Could these methods of getting around be used in conjunction with each other? For example, do you think people would bike to a BRT station?

POST-SCREENING ACTIVITIES:

Making the Connection

How does transportation relate to Carbon Footprint?

Activity: “Human Graphs”

Worksheet: The Carbon Footprint of a Commute

- Hand out the “Carbon Footprint of a Commute” worksheet. Ask the students to compare the carbon output numbers and discuss if they are surprised by any of the comparisons.
- Be sure to go over what an SUV is (Sports Utility Vehicle) and what a hybrid car is, and have the class list some examples of each. Be sure to have some strong and clear definitions before moving on to making the graphs.
- Put the large printed icons down on the floor or ground. Explain that we will be graphing the footprint of Maria, a hypothetical resident who lives in the area near the school and commutes 5 miles each morning to her job (10 miles total per day).

- Have the students find the numbers on the handout and recreate them using their bodies by standing in lines, each person representing a pound of carbon. The first comparison you might want to try is walk/bike vs. SUV. (There will be 16 students in a line above the SUV icon and no one above the bike/walk icon, a dramatic difference).

Activity: Bar Graph Maria's Commute

To further understand the differences between modes of transportation and carbon output, have the students make bar graphs, and answer the accompanying questions using the graphing sheet provided on the second page of the worksheet. Each student should refer to the numbers for a 10-mile commute listed on the first page of the worksheet.

The 350 Campaign

Activity: CO₂ and Parts Per Million levels

Worksheet: Outdoor Carbon Dioxide Readings

- Explain that we measure CO₂ in Parts Per Million (PPM) and that scientists have documented that these levels are rising in the atmosphere rapidly. Review that this is because we burn fossil fuels, and a major way we burn those fuels is by driving cars and trucks.
- Read the "Outdoor Carbon Dioxide Readings" handout as a class. Look at the various numbers and compare them.
- Focus on 389 (the world average today), 400 (high but typical in high traffic areas) and 450 (if the world average reaches this level, we will face very difficult environmental challenges). The key thing to learn from this handout is that the level of carbon dioxide in the atmosphere is going up.

- Let the students know that scientists are recommending we bring our CO₂ levels down to 350 PPM, which is now considered a relatively low reading.
- Now that students have a firm grasp on PPM readings, explain to the students that there is a movement to reduce carbon emissions to the point where the world average will read as 350 PPM instead of the 389 levels we have now.
- Show the students the Streetfilm titled "San Francisco: 350 Climate Action" at www.streetfilms.org/san-francisco-350-climate-action/ (running time 3:23). Then have them visit the site 350.org.
- After you view this film and website ask students the following questions:
 - How is transportation discussed by the 350 movement?
 - Do you think it is possible for us to achieve the goals of the 350 movement? Why or why not?
 - What are the pros and cons of each alternative form of transportation (walking, biking, bus, train)?

Further Resources

- 350.org: www.350.org
- 1Sky: www.1sky.org/
- The No Impact Project, including film, book, and curriculum: www.noimpactproject.org/
- "Bike vs Car vs Transit." <http://www.streetfilms.org/bike-vs-car-vs-transit/>

WORKSHEETS

Average Vehicle Occupancy (AVO)

For each vehicle that drives by, write the type of vehicle (car, SUV, van, truck, taxi) and number of occupants.

Vehicle Type	Number of People
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

Vehicle Type	Number of People
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	

Notes:

Calculate the AVO:

- Find the AVO by dividing the total number of people in the cars by the total number of cars.
- The higher the AVO, the better your community is doing at carpooling.

Your Block's AVO: _____

The Carbon Footprint of a Commute

Let's say Maria lives in the neighborhood near your school and 5 miles from her job. That means her total commute is 10 miles per day.

If she:

rode in an SUV, her 10-mile commute would generate 16 pounds of carbon dioxide.

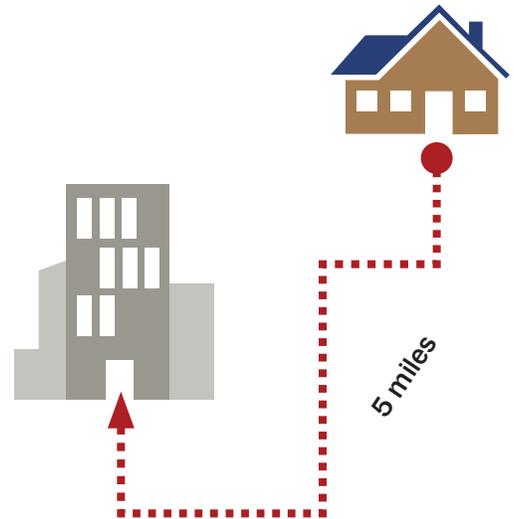
rode in an average car, her drive would release 12 pounds of carbon dioxide.

rode in a hybrid car, this commute would emit 4 pounds of carbon dioxide each day.

took the bus, she would create 5 pounds of carbon dioxide.

rode the train or subway she would put 2.5 pounds of carbon dioxide into the atmosphere.

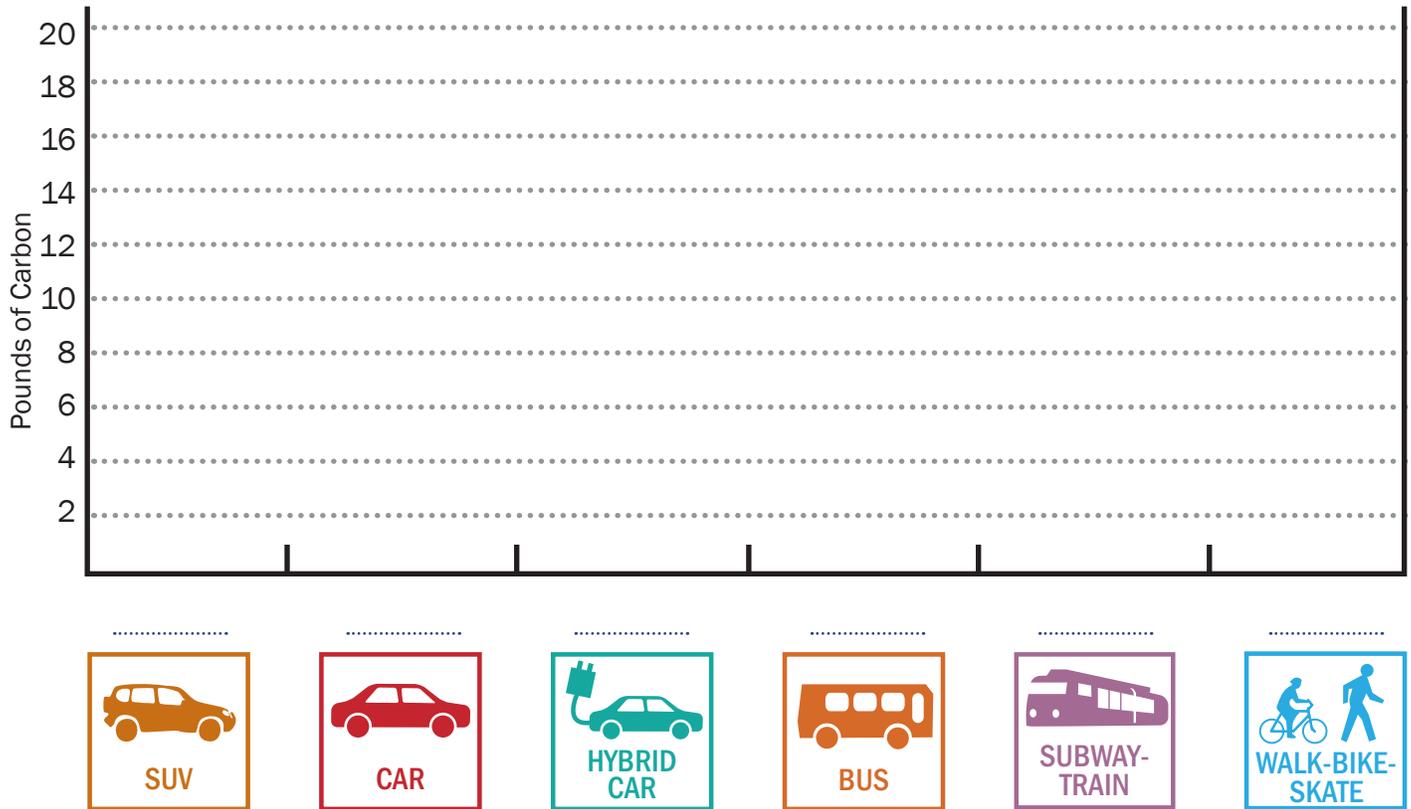
walked, biked, or skated, Maria's commute would create no carbon dioxide beyond her normal respiratory output.



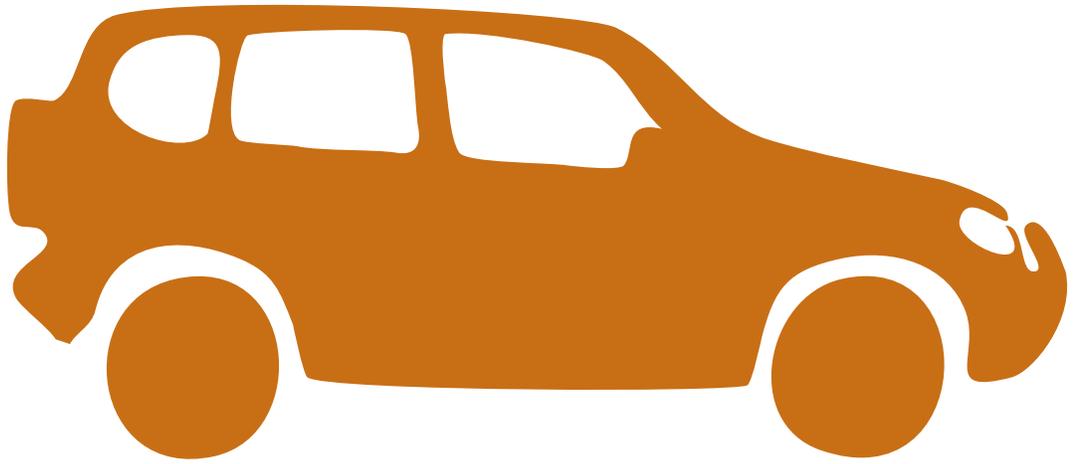
How many trees would Maria have to plant each year to offset the carbon output of her commute?

Mode of Transit	Number of Trees
SUV	23 trees
CAR	16 trees
HYBRID CAR	6 trees
BUS	8 trees
TRAIN	2 or 3 trees
WALK/BIKE/SKATE	0 trees

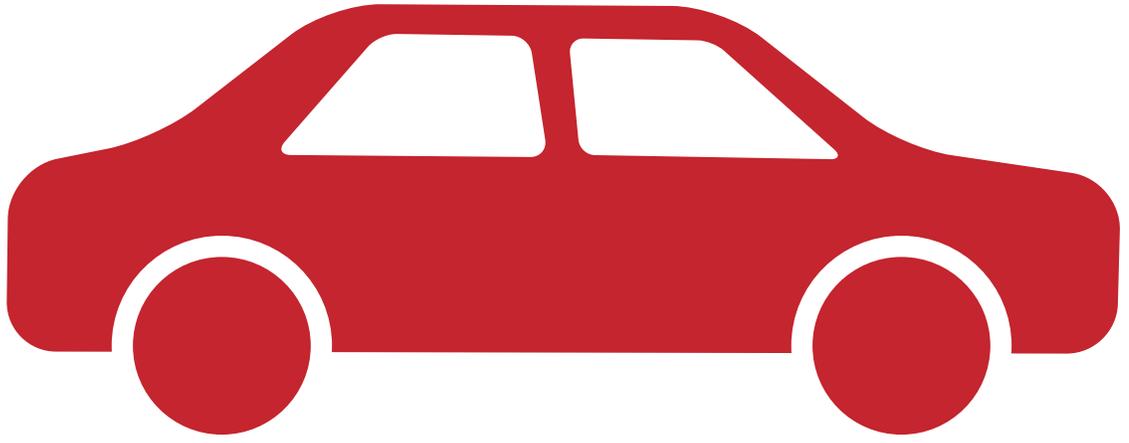
Graph the Carbon Footprint of a 10-mile Commute



Are there any practical changes you think your town or city could make so Maria could be convinced to commute in the most sustainable way?



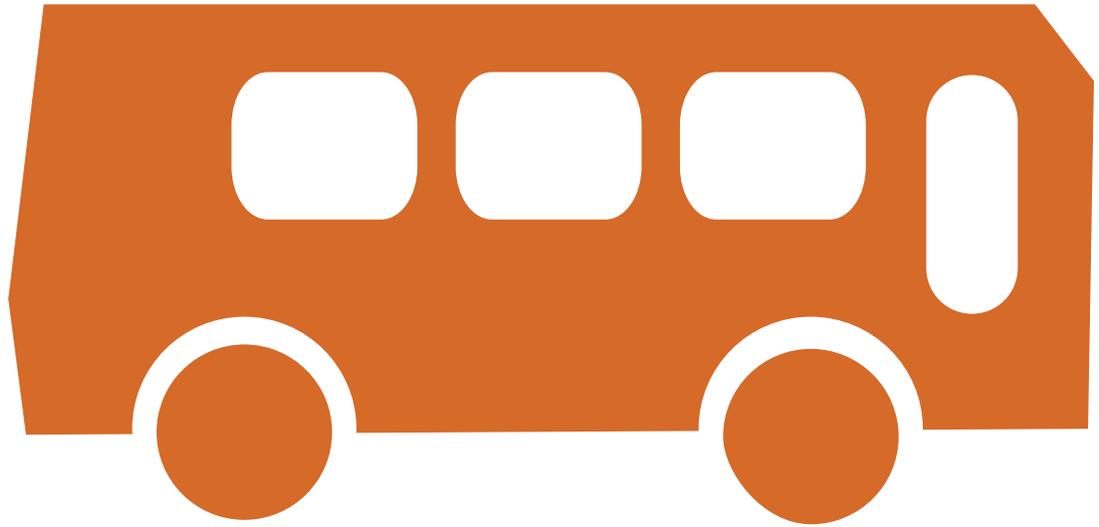
SUV



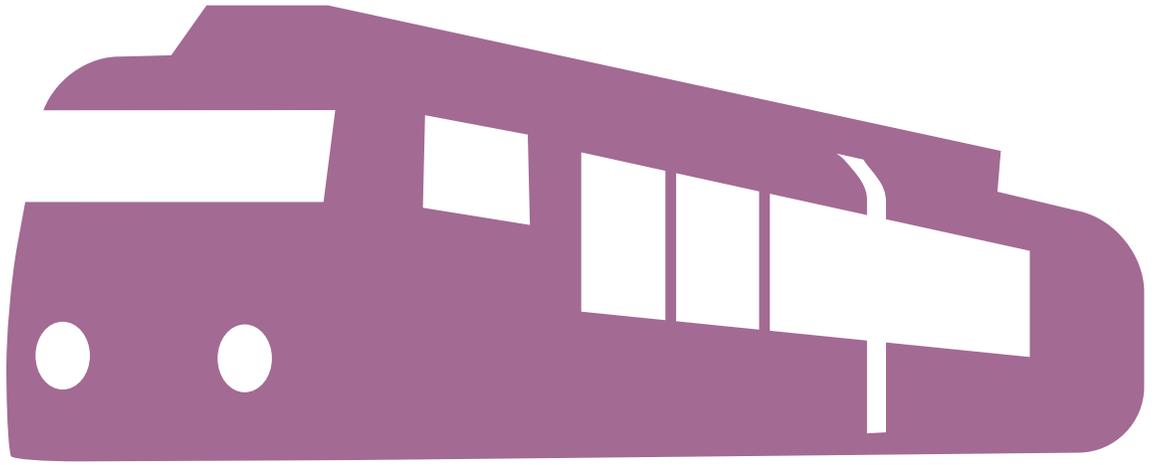
CAR



**HYBRID
CAR**



BUS



**SUBWAY/
TRAIN**



**WALK-BIKE-
SKATE**

Outdoor Carbon Dioxide Readings

280 ppm

Average CO₂ reading until around 1850

350 ppm

A very low reading for today's standards

389 ppm

Average worldwide outdoor reading today

400 ppm

Outdoor readings in areas with high traffic or industrial activity

450 ppm

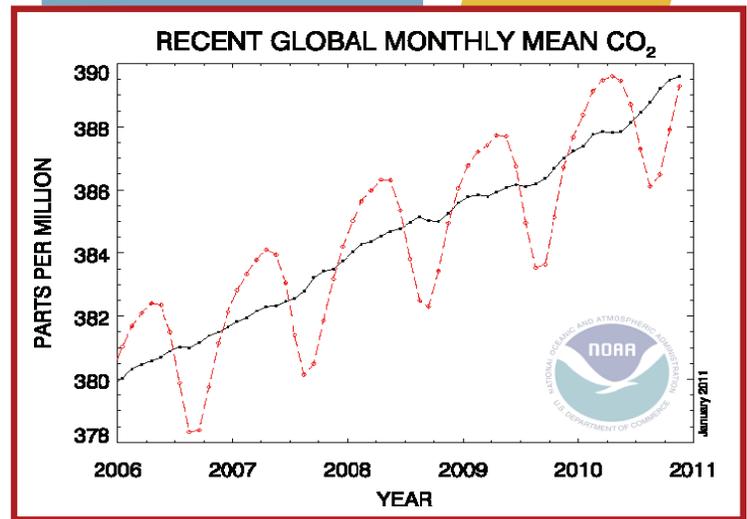
If CO₂ reaches and remains at this level worldwide, it is likely that climate change will be more extreme

1000 ppm

Predicted possible concentration of outdoor CO₂ in a century if we continue with our current habits

All carbon dioxide air readings are taken in Parts Per Million (PPM)

On average, we see an increase of at least 2 PPM per year



1. Scientists say that 350 parts per million of CO₂ in the atmosphere is the safe limit for humanity. Do you think that is a goal we can achieve? Why or why not?

2. Do you have any suggestions for ways cities could make transportation more sustainable?