

## Classroom Activities to Supplement the Emissions Calculator

### **Activity 1 - Ready, Set, Goal!**

#### **Daily Transportation Log**

The student will record their daily trip activity for one week in the on-line TravelMatters Transportation Log. As the calculator is designed to create and save individual emissions profiles for users, data entered into the transportation log can be stored in the *TravelMatters* profile, too. Based on their weekly emissions, students can extrapolate their monthly emission and enter these data into the TravelMatters calculator. Students can then compute their emissions for every month during a quarter or semester, based on estimates from one month's travel, experimenting with replacing their usual travel modes with new ones. Discuss how and why individual CO<sub>2</sub> emissions may vary between months.

This on-going activity will encourage students to utilize consistently the calculator as a resource tool in order to see their progress in reducing emissions through transportation decisions. Students should use the log as a way to keep track of travel modes that they use on a daily basis, and the differing emissions rates of each, in addition to being able to quantify their total CO<sub>2</sub> emissions.

### **Activity 2 - The Classroom Community**

#### **Class Emissions Profile**

This is a simple introductory - but important - activity that will underscore the idea that individual travel decisions *do* matter. The activity will help students appreciate how everyone's monthly activities indeed have a "global" effect.

The effect can be visualized by doing the following activity: Each student first computes his or her own emissions for Month One. Then, using butcher paper or a chalkboard, design a classroom bar graph, having each student color in his/her estimated (projected) emissions for the next 3-6 months.

Raising group consciousness about the links between transportation decisions and consequent CO<sub>2</sub> emissions can motivate individuals to take responsibility for their actions in order to improve the air quality of the community and reduce greenhouse gas emissions. Visualizing the amount that an individual contributes, and the amount emitted by a whole "community" can teach how each individual has a part to play in reducing their own emissions.

Students should also discuss what other sectors of our community contribute greenhouse gases, and what decisions can be made, at the local level, to affect the global problem of climate change.

### **Activity 3 - Hey, You – Reduce CO<sub>2</sub>!**

#### **Transportation Policy Planner**

For this activity, students will need to apply math and analytical skills to determine how to reduce incrementally their travel emissions by 10%. Based on a student's monthly emissions, the goal of reducing CO<sub>2</sub> emissions by 10% can be a feasible monthly goal that the whole family can strive to achieve.

Starting with one month's emissions, students should determine 10% of this total. Based on the amount that is needed to be reduced, students devise a "transportation policy plan" that details what decisions and changes could be made to effectively reduce transportation emissions incrementally by 10%.

This "planning project" might require the student to research what and how alternative fuels reduce CO<sub>2</sub> emissions compared to conventional fuels (gas and diesel). Also, students may wish to contact their local transit planning agency to determine what alternative fuels are currently being used in their region's mass transit fleets.

Maps of the region could also be used as visual aids for determining alternative routes that may result in more efficient travel and/or provide alternative, less congested routes for walking and biking. This knowledge will inform appropriate strategies for determining the most efficient mass transit or car usage that should be employed to achieve the student's particular reduction goals.

#### **Activity 4 – What's the Most Efficient Way to Travel?**

This activity encourages students to investigate the most efficient ways for achieving long distance travel. Break the students into two groups. Ask them to use the TM Calculator to determine the emissions resulting from a round-trip from their hometown to LA, Chicago, and New York. Have **Group A** travel by *car*; have **Group B** travel by *airplane*. Who produces the most carbon emissions? Discuss the results.

#### **Activity 5 – A Vehicle for Change**

This activity underscores how each of our actions can and will impact climate change. It should also show students that reducing greenhouse gas emissions does not have to be difficult.

Ask students to consider five trips that they make on a monthly basis, such as going to and from sports and music practice, visiting relatives, etc. How would using an alternative mode of transportation for these five trips change their greenhouse gas emission? Ask students to enter these changes into the emissions calculator and compare the results of monthly emissions. How much greenhouse gas emissions are saved (or produced) when the students change their transportation mode?

#### **Activity 6 – Survey Says**

Ask students to survey three people outside of the classroom (a relative or friend) to determine their reason for using or not using public transportation. Discuss the results with

the class. Then, come up with solutions that address some of the reasons why friends and relatives may not be using public transportation. After completing this lesson, students should have a better understanding of why careful planning is important in public transportation. If transportation systems are not convenient, people will be less inclined to use them.

### **Activity 7 – Driving Can be Taxing**

This lesson is designed to introduce students to the concept of “internalizing” the externalities cause by driving.

Ask students to think about the following question: “If there were an increased carbon tax, would you try to cut down on your emissions?” For example, if there were a \$50 charge for each ton of carbon dioxide one emits each year would you change your habits? Students can project their yearly emissions by multiplying their current monthly emissions by 12. Some discussion points could include asking students to consider how much they would be willing to pay, and what strategies they would employ to avoid an increase in fuel taxes.

### **Activity 8 – Planning for Public Transportation**

This lesson highlights the importance of strategically planning for development and growth while making it accessible by inhabitants to alternative forms of transportation.

Get in contact with your town hall to acquire plans for a new development in the city. Investigate how the neighborhood is being planned. Study the plan to try to determine if it will promote using public transportation based on the design of the development and its layout (i.e., where it is going to be located; what main streets the development is going to be connected to; the accessibility of the development by foot). After studying and discussing the development’s plan, ask students to use the emissions calculator as if they were residents of the neighborhood. How do the hypothetical emissions compare to the students’ current emission rates? Ask students to consider whether they think that new development under examination encourages public transit use, walking, or biking.

### **Activity 9 – Visualize Your Emissions (This activity is more advanced than the other activities.)**

This activity requires an understanding of the basic principles of mass and volume. In groups, students will work together to create an alternative way to depict CO<sub>2</sub> emissions by volume so that an individual can better visualize the amount of CO<sub>2</sub> they emit each month.

Currently in the results page of the TravelMatters calculator, total emissions for monthly travel are represented in terms of 20-pound barbecue briquette bags. For this demonstration, volume was computed by taking the individual’s total CO<sub>2</sub> emissions, in pounds (displayed in the results page of the calculator) for the month, then determining what percentage of this total amount is comprised only of carbon in order to convert the total amount into twenty-pound briquette bags:

Methodology:

Atomic Weight of C = 12

Atomic Weight of O= 16

Atomic Weight of O= 16

Atomic Weight of CO<sub>2</sub>= 44

$12 [C]/44 [CO_2] = 27\%$  of the weight of CO<sub>2</sub> is carbon

$0.27 \times \text{Your Monthly } CO_2 \text{ Emissions} = \text{ANSWER (carbon equivalent)}$

**ANSWER/One 20-pound bag = Number of twenty-pound briquette bags**

Ask students to brainstorm about the different ways CO<sub>2</sub> volume can be translated into mass and depicted by an ordinary object (such as a school bus; this would require students to determine the volume of a school bus by first calculating its dimensions). Have students make posters of how volume of CO<sub>2</sub> emissions could be represented. The methodology that students devise for converting emissions should be explained and discussed.