NAME: _____

Student Worksheet

Activity One

Writing a Short Report on Carbon Offsets

Write a short report on carbon offsets. It sounds straightforward: You or your school has a carbon footprint that you are unable to reduce to zero. You give money to some organization that is doing something that reduces greenhouse gas emissions. Perhaps they say that they can reduce CO_2 emissions by one ton for every $10 dollars you give them. Sounds good, but many people are skeptical of the whole concept. Here are some of the questions and controversies you can address in your report:

1. Can all these companies be trusted?
2. Does anyone oversee the program and validate legitimate organizations?
3. Are carbon offsets a "license to pollute" that postpones a needed change in lifestyle?
4. What about projects that would have been done anyway—like a logging company replanting trees after they log? Should that count as an offset?
5. What types of projects can be used as offsets?
6. Can you buy carbon offsets at airports to offset your share of the CO_2 that will be emitted by the plane you are getting on?

Many of these questions can be answered at:
http://www.carboncatalog.org/providers/

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Activity Two

Payback Time

How long does it take for a device that cuts greenhouse gas emissions to pay for itself in reduced energy bills? The object of this activity is to estimate the payback time for installing some energy-saving devices at your school. First choose one of these improvements that your school could benefit from:

1. Replacing incandescent bulbs with fluorescent bulbs.
2. Replacing single-pane windows with double-pane windows. (These are also called "double-glazed")
3. Installing a solar hot water heater.
4. Installing photovoltaic cells.

First you will need to find the amount your school spends on the electricity or fuel to power the current system. Next, estimate the amount of savings each month after installing the new system. Finally, divide the cost of the new system by the monthly savings. The result will be the number of months the new system takes to pay for itself. When looking for information, try to find independent sources, rather than using estimates from the companies selling the systems.

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Activity Three

Set Up a Carpool Organization

People can't carpool if they don't know each other's names, addresses, and personal schedules. The easiest way to connect people who could carpool is through the Internet. Ask a teacher who teaches computer skills to help you set up a website where people can exchange information about carpooling. This is the information that the site should provide:

- Name and address of parents and students
- Phone number
- E-mail address
- Route taken to and from school
- Capacity of vehicle
- Schedule of any before or after school activities the student participates in

Get help making the site as user-friendly as possible. For example, clicking on the location of your home on a map could reveal the homes of all nearby students and show the routes they take to school.

The other option is to pass out questionnaires to gather all the above information and then sorting it all out by hand.

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Activity Four

Create a Bike Route Map

Learn the safest ways to travel to school by bike. A map of bike routes surrounding your school may already exist. Try one of the following sources to find a map: bike shops, book stores, and on-line search for your town name and "bike lane," "bike route," or "bike map."

Use this information to create a map that focuses on the needs of students who want to travel to your school by bike. Ride some of the routes on the map you found to see if it is accurate. On your map you should use different colors to indicate different levels of safety for the routes. Definitely distinguish between bike lanes that put you beside traffic and the much safer bike routes that are completely isolated from traffic.

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Activity Five

Calculate the Carbon Footprint of Your Feet

You may have read that running has no carbon footprint. Not quite. It would be more accurate to say that the carbon footprint for running is too small to worry about. If you are curious just how small it is, do this calculation. The footprint comes from three places: Energy used to manufacture the shoes, the footprint related to the extra food you have to eat to make up for the extra calories you burn, and the CO_2 you exhale. You will have to do a little guesswork, but you can calculate all of these. The result will be the footprint of running to school.

1. **Manufacturing your running shoes:** Multiply the cost of your running shoes when they were new times 0.50 and divide by what you think will be the total life of the shoes in years. Multiply this by the fraction of the shoes use that would be used for running to school. The answer will be pounds of CO_2.
2. **Extra food you have to eat:**
   a. Assume you have the diet of the average American your age of about 2100 kilocalories (kcal) per day. Multiply this by 365 days in the year.
   b. Running burns about 100 kcal per mile. Multiply this by the round-trip distance to school and then by the number of days in the school year.
   c. Divide the result in b. by the result in a. and multiply by 100. This is the percent increase in your food footprint.
   d. Assume you have an average food footprint of 7500 pounds (lbs.) per year. Use the percent increase from part c. to find your yearly increase.
3. **CO_2 Exhaled:** This will be the least accurate part.
   a. Assume that the added exertion of running causes you to exhale an extra 0.014 lbs. of CO_2 per minute.
   b. Multiply this by 60 min./hr. and divide by 6 mi./hr to get pounds per mile.
   c. Multiply the answer in part b. by the round-trip distance to school and then by the number of days in the school year. This is the pounds of CO_2 you exhale per year running to school.
4. Add parts 1. 2. and 3. This is your foot footprint. Compare this to the footprint of about 1.0 lb./mi. for a car.

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Activity Six

Comparing Light Bulbs

You may remember that compact fluorescent bulbs are much more efficient than incandescent (tungsten filament) bulbs. Why do you think that is? A 100-watt incandescent bulb provides about as much light as a 25-watt fluorescent bulb. Where did that 75-watt difference go?

For this activity you will need one bulb of each kind. They should be rated as providing the same amount of light. The 100 and 25-watt bulbs mentioned above are a good combination. Somewhere on the packaging of fluorescent bulbs you should be able to find a note as to which incandescent bulb it is equivalent to. You will also need a thermometer.

1. Put one of the bulbs in a lamp with a fixture that allows the bulb to point up. Do not turn the light on yet.
2. Hang the thermometer from a string so that the thermometer bulb is about 6 inches above the top of the light bulb.
3. Record the temperature on the thermometer and turn on the lamp.
4. Record the temperature every 15 seconds for 2 minutes.
5. Turn the lamp off and *WAIT FOR THE BULB TO COOL.*
6. Replace the bulb with the other bulb and repeat step 4.
7. Graph temperature vs. time for both bulbs.
8. Draw a conclusion from the results as to why fluorescent bulbs are more efficient than incandescent bulbs.