Climate Change

(Carbon Emissions)

Carbon Emissions

Every time we burn fossil fuels such as gas, coal or oil, carbon dioxide is released into the atmosphere. In a natural carbon cycle, carbon dioxide is re-absorbed by plants and trees. However, we are burning fuels where the carbon dioxide has been trapped under the earth's surface for millions of years, and we're doing it so quickly that plants and trees that are alive now have no chance of soaking it up (and it doesn't help that we're cutting down rainforests as well).

The effect of all this extra carbon dioxide in the atmosphere is that the overall temperature of the planet is increasing (global warming). Whilst the average global temperature is increasing, on a day-to-day level the climate is changing in unpredictable ways (from floods and hurricanes to heat waves and droughts). To try and reduce the risk of ever more extreme weather, we need to reduce how much fossil fuel we are burning. This isn't easy.

Using energy

We burn fossil fuels to create energy. From keeping warm in our house, to fuelling our cars, to growing our food, to manufacturing our MP3 players, energy is used. It is either burned directly (gas is burnt in your boiler for example, and petrol is burnt in your car) or it is burnt in a power station to drive turbines which generate electricity. Fossil fuels are also burnt at various stages in the process of creating food, products and services for our consumption. The total carbon which we as individuals are responsible for is called our carbon footprint.

Understanding your Footprint

You may have seen carbon calculators on the internet that ask you about the food and products you buy (for example WWF's eco-footprint calculator) because of the effect of your purchasing habits on your carbon footprint. The more energy-intensive the process of creating the food and products you buy, and transporting them to your door (or local shop), the more fossil fuels are burnt (and therefore the more carbon dioxide is released). However, measuring these indirect emissions accurately on a day-to-day basis is very difficult.

Easier to measure are the direct emissions that we are responsible for. This includes the amount of gas and electricity we use in our houses, the amount of petrol or diesel we burn in our car, and the number and distance of flights we take. The Carbon Account is a tool to help you measure these direct emissions.

Getting the carbon dioxide figures right for gas, petrol and diesel is quite straightforward, because a standard amount is released when each fuel is burnt. Electricity is more complicated, but each supplier generates fuel in different ways (using coal produces the most carbon dioxide, whilst using renewable energy like wind produce no direct emissions).

Try this! Visit EPAôs household carbon calculator. You can use the their online calculator to get a rough estimate of your personal or familyôs greenhouse gas emissions and explore the impact of taking various actions to reduce your emissions.

DETERMINE YOUR CARBON FOOTPRINT—Grades 6-8

Focus Questions: What is a carbon footprint and how does it relate to energy consumption? Why is it important to learn/care about reducing your carbon footprint?

Establish Set: Students should know that CO2 (carbon dioxide) is a polluting by-product of industrialization and manufacturing. Although we breathe out CO2, it is not considered a pollutant as the living things that produce our oxygen absorb our CO2 in a cyclical process. So, the CO2 emissions that are talked about in relation to polluting our environment are those that come from burning fossil fuels and natural resources that are nonrenewable (e.g. coal, oil, natural gas).

Objectives: Students will calculate their carbon footprint using http://www.nature.org/initiatives/climatechange/calculator/?src=l12 and then discuss the results. (Students may choose to calculate for themselves or for their familyð they should pay attention to the estimated CO2 emission and their actual. Students should note which activities cause a rise or decrease in their emissions).
Brainstorm ways to reduce individual and human race carbon footprints. (see tips http://www.nature.org/initiatives/climatechange/activities/art19630.html)
Students will make an argument for or against reducing their carbon footprint and the relevance of substituting renewable energy sources for nonrenewable.

Materials

- Internet access
- Computers

Procedure:

Students will be asked to explain what a carbon footprint is.
Students will be directed to the carbon footprint website. The teacher will explain and demonstrate the siteôs use. Students will continue the activity to determine their own carbon footprint. The teacher will circulate to answer questions.
Students will share personal carbon footprint info with the class.
The class will brainstorm ways to reduce personal carbon footprints as a group.

Helpful website: http://knol.google.com/k/carbon-footprint#

Clearing up confusion

There is sometimes some confusion about the difference between carbon and carbon dioxide, and to understand the distinction, you'll need to remember your chemistry lessons. Carbon is the element that combines with oxygen to produce carbon dioxide. For every one molecule of carbon, there are two molecules of oxygen (hence CO2). Carbon on its own is not a greenhouse gas, but often CO2 is shortened to carbon for ease of reference.
As well as carbon dioxide, there are other gases (such as methane) which may cause climate change. Collectively, there are known as 'greenhouse gases' and in chemical terms, most of them are hydrocarbons.

Extension:

Have the students research a particular contributor to CO2 emissions and present data to the class.

Credits:

US Environmental Protection Agency,

World Wildlife Fund,

thecarbonaccount.com

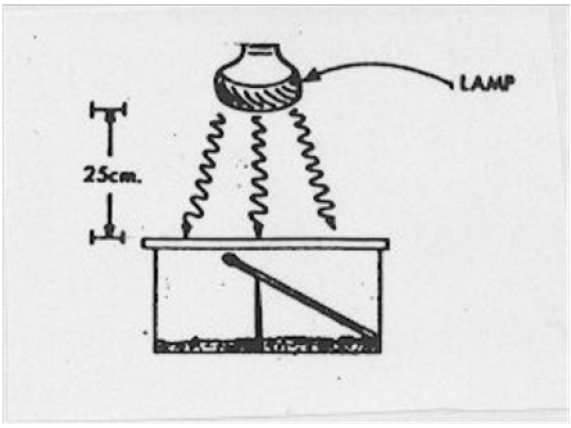
What is the Greenhouse Effect?

Materials:

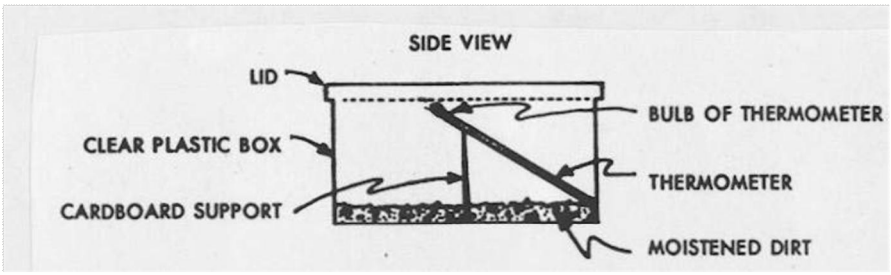
- One standard laboratory thermometer (-10°C to 110°C)
- One clear plastic shoe box with cover
- Outdoor reflector flood lamp, and mounting stand if sunlight is not available
- Soil and water
- Cardboard support for the thermometer

Method

1. Place about 2 cm of soil in the bottom of the clear plastic box. Thoroughly moisten the soil with water.
2. Cut out a piece of cardboard to divide the box in half. The cardboard should not quite reach the top of the box.
3. Lean the thermometer against the cardboard support with the bulb end up.



4. Put the box and lamp in a part of the room where the effects of the direct sunlight, heating, and cooling systems, and drafts will be reduced.
5. Put the lamp directly over the thermometer bulb at a distance of about 25 cm.



6. Record the thermometer reading at the start of the project as 0 minutes on the data table.
7. Turn on the light.
8. Record in your data table the temperature every minute for a total of 15 minutes.
9. Repeat steps 6-8 with the lid on the box.

After the Experiment:

1. Prepare a line graph of data you collected. Put temperature on the vertical axis and time on the horizontal axis. Use a dashed line for the uncovered box and a solid line for the covered box.
2. Which box gained temperature more rapidly? Which gained more heat?
3. What was the differenced in temperature between the uncovered and covered box at 5 minutes, 10 minutes, 15 minutes?
4. Write a paragraph describing the ñgreenhouse effectò you observed. Be certain to include data from your experiment in the paragraph.

See Data Sheet on next page.

Credits:

Wattwatchers

DATA SHEET

TIME (MINUTES)	COVERED TEMP. °C	UNCOVERED TEMP °c