ESA21
Environmental Science Activities for the 21st Century

Fossil Fuels: Capstone

Fossil Fuels in Our Lives

Our modern way of life is intimately dependent upon fossil fuels. There are very few aspects of our daily life that are not, in some way, touched by our usage of them. Just examine what is required to read this activity on your computer screen. If you are in the U.S. and plugged into the local electrical system, the majority of the electricity powering the computer came from the burning of coal. The plastic in the keyboard and computer came from crude oil or natural gas feedstock. The smelters that were used to create the wires in the computer and in the electric and phone lines used some sort of coal or petroleum fuel source.

Could all of this usage of fossil fuels be replaced? That is a very important question. The consumption of fossil fuels to provide energy could be replaced by other fuels such as wind, nuclear, and hydroelectric, although it is not going to happen overnight. However, there are many other uses of fossil fuels where replacements are not going to be easy, as the list of viable alternatives is quite short and expensive. How do you replace the use of natural gas for making artificial fertilizers? You could go back to the process of using manure, but it would come at a very heavy price and might result in reduced food crops, which could seriously impact a world population that is still growing. How do you replace the use of crude oil for plastic? There is some work on using plant materials to create biodegradable plastics, but it is still years off. And what of the use of oil as a lubricant or wax? The product that we used to use for this (whale oil) is in very short supply.

Our nation currently consumes 20.0 million barrels of oil, 6.0 billion cubic feet of natural gas, and 3.0 million short tons of coal every day[1]. These rates have been growing, and are projected to continue to grow over the coming years. As fossil fuel stocks become depleted, it will have a serious impact on our lives. Shortages will lead to higher prices for the products that use them, which given the ubiquitous nature of their usage, means that inflation will take off like a rocket. This will lead to unstable economic and political situations. If history has any say in this matter, this will mean going to war. Some would say that the most recent war that the U.S. is fighting in Iraq is just the first in a line of wars that will be fought over fossil fuels.

In this capstone activity, we are going to try to look at our individual fossil fuel usage. It would be nice if we could actually calculate how much each on of us is responsible for using. However, a great deal of our personal fossil fuel usage is hidden from us and almost impossible to calculate. For instance, the food that we eat was produced using oil in the fertilizer spread on the crops, fuel in the tractors that plowed the field, and diesel in the trucks that brought the food to market, amongst other things. The newspaper you read in the morning required fossil fuels to create the paper, run the presses, and deliver the paper. Every product that you use during your day has a similar story.

Rather than try to calculate the total amount of fossil fuels that you use, we are going to only look at some rather direct usage that we can track very easily. For the purposes of this activity, we are going to investigate how much fossil fuel we use to transport ourselves and to power our homes. This usage is just a fraction of the total amount of usage for which we are responsible. All of our usage from industrial and commercial processes combined amounts to over 8.2 barrels of oil, .7 tons of coal, and 53 tcf of natural gas per person in the U.S. per year[2]. Even these numbers do not account for transporting products to market or to your home.

Activity

To aid us in our estimation, we will use an online calculator that will convert the measurable items that we use into amounts of fossil fuel that have been consumed. This calculator is able to do this based upon some assumptions about the mix of fuel in this country. To use the calculator, you will need to find out or estimate the following quantities about your lifestyle:

- The average number of miles that you drive each year, and the mileage of your car(s).
- The number of miles that you drive/fly each year on airlines, buses, trains, taxis, and motorcycles.
- The amount of electricity that you use in your home each year.
- The amount of natural gas, propane, kerosene, or heating oil that you use in your home each year.
- The amount of gasoline that you use in your lawnmower/weed eater each year.

Plugging these numbers into the calculator will allow you to estimate how much of each fossil fuel you are responsible for consuming each year. After doing this, answer the questions on the activity sheet below.

References

1 http://www.eia.doe.gov/emeu/cabs/usa.html
2 http://www.eia.doe.gov/emeu/aer/consump.html

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Activity Sheet
Fossil Fuel Capstone

Name:

Initial data

Car 1 miles driven		Motorcycle miles		Yearly electricity	
Car 1 mileage		Taxi miles		Yearly natural gas	
Car 2 miles driven		Train/Subway miles		Yearly heating oil	
Car 2 mileage		City bus miles		Yearly propane gas	
Airline miles		Interstate bus miles		Yearly kerosene	
		Mower gas gallons		People in home	

Oil usage = _____ barrels Coal usage = _____ tons Natural gas usage = ____ tcf

1. There are close to 300 million people living in the U.S. If every one of them used as much fossil fuel for these processes, how much usage would we have in the U.S. per year? Per day?

2. Estimate the number of miles that you travel by car each year for commuting purposes. Go back to the calculator and replace your car miles with either city bus or train/subway miles (depending upon what is available to you)? By how much did your fossil fuel usage change? Would you make this change? Why or why not?

3. It is estimated that the average home can save about 1,000 kwhr of electricity by replacing all of the incandescent light bulbs in the home with fluorescent ones. The average cost of doing this is $200, but it yields about $80 in savings each year. What would such a change to your fossil fuel usage? Would you make such a change? Why or why not?