CALCULATING YOUR HOUSEHOLD'S CARBON FOOTPRINT:

A Do-It-Yourself Method -- Condensed Version *

How much carbon dioxide (CO_2) does your household put into the atmosphere each year?

As of 2007, the average U.S. household emits 54,600 pounds of CO_2 per year. The average German household emits only half as much: 27,700 pounds. Where does your household stand? What can all households do to reduce their emission of greenhouse gases?

Calculating your household's carbon footprint is simple. You will need to specify five components: your annual use of electricity, annual use of natural gas (or other fuel) for heating, annual gallons of gasoline for driving, annual miles of flying, and annual output of solid waste (exclusive of what you recycle). Once you have these five figures, enter them in **Part A** and follow instructions. For explanations of how to obtain the five components, and the meaning of the emission factors, see **Part B**.

Part A. Do-It-Yourself Calculator, Condensed

	Energy units		Emission factor		Outputs of CO2 (pounds)
1. Electricity					
Annual kWh's of electricity - - - - -	_____	X	1.64	=	_____
*See Part B for how to obtain this. If you don't pay your own utilities, see **Questions** below.*					
2. Heating					
Annual CCF's of natural gas - - - -	_____	X	12.06	=	_____
See Part B for how to obtain this, and what to do if you heat with propane or fuel oil.					
3. Driving					
Annual gallons of gasoline used - - -	_____	X	19.36	=	_____
See Part B for how you to obtain this from the annual miles each vehicle is driven, and the miles-per-gallon (MPG) for each vehicle. To estimate MPG see Part B.					
4. Flying					
Annual miles of flying - - - - - - - -	_____	X	1.30	=	_____
See Part B for how to obtain flying miles.					
5. Solid waste					
Annual gallons of garbage discarded	_____	X	2.0	=	_____
Exclusive of recycling. See Part B for how to estimate your garbage.					

Total carbon footprint, in pounds of CO2 per year - - - - - - - - - - _____

Part B. Explanations of Procedures

1. Electricity. Find out your household's yearly kWh's: _____ and insert in Part A. Multiply this by the emission factor of **1.64 pounds** of CO2 per kWh to get your yearly pounds of CO2 from electricity. If you haven't kept your bills, see next page.

   *Generating electricity in Michigan emits more CO_2 than is true in other parts of the country because Michigan uses a higher percentage of fossil fuel (mostly coal) in making electricity than do many other states. DTE estimates an emission factor of about **2 pounds** of CO2 per kWH. We are using the more conservative factor from the widely-respected on-line calculator of the Climate Trust, at www.carboncounter.org, which says that the national average is 1.39 pounds of CO_2 per kWh.*

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* Questions or comments are welcome. Contact Don Pelz: donpelz@umich.edu, or 734-973-5493. 10/15/07

If you haven't kept your electricity bills over the past year, and are a DTE customer, you can get them on-line as follows:

-- Go to www.DTEenergy.com. Using the account number from one of your bills, register and sign in (invent a password).

-- You should be at the "Account Summary" screen. At the end of the line starting with "Last Payment," click "View Payment Activity."

-- The next screen should have a grid labeled, "Bill Statement Detail". Click "View More" at the bottom of that grid. This shows your monthly usage of electricity for the past few years. Print out the results and insert annual total in Part A above.

If you are a Consumers Power customer, go to their website and follow a similar procedure.

2. Heating. If you heat with natural gas, find out your yearly CCF's:_____, and insert in Part A (one CCF means 100 cubic feet.) If you are a DTE or Consumer's customer, you can obtain this on-line as above.

   Our do-it-yourself calculator is derived from the Climate Trust calculator at www.carboncounter.org which deals not with CCF's but with "therms" of natural gas -- a measure of its energy content. One therm of natural gas yields **12.06 pounds** of CO_2 per therm. Natural gas bills, however, come in CCF's. One CCF roughly contains one therm of energy, so that emission factor is what we use in Part A.

   If you use some other heating fuel than natural gas, see **Questions** below.

3. Driving. You will need the annual miles for each of your vehicles (estimate this if you don't have exact figures) and the average MPG per vehicle. If you don't know the latter, go to the EPA website: http://mpgtune.com/epaDataLookup.php, and it will give you the official MPG for each of your vehicles by year, make and model. For each vehicle, estimate the average MPG between city and highway driving.

   On the following table, enter the total yearly miles for each vehicle (column **a**) and its average MPG (column **b**). To get the gallons of gasoline used by each vehicle (column **c**), divide **a** by **b** and enter in **c**:

	a. Miles		**b**. MPG		**c**. Gallons
Vehicle #1	_____	÷	_____	=	_____
Vehicle #2	_____	÷	_____	=	_____
Vehicle #3	_____	÷	_____	=	_____
			Total gallons per year		_____

   Enter total gallons in the Part A calculator and multiply this by **19.36 pounds** of CO_2 emitted by burning one gallon of gasoline, to get your carbon output.

4. Flying. For all the members of your household, enter the total number of miles flown in the past year (if two or more persons went on the same trip, count each person separately). Total miles flown: _____. Enter this in the Part A calculator and multiply it by **1.30 pounds** of CO_2 per passenger mile to get your carbon output.

   How do I find out the flying distances between cities? Go to the Climate Trust calculator above. Under Air select "Exact"; click "Add up your miles" and you will be asked to indicate cities for each trip, and airports in each city. Click "Submit" and you will get a table of miles between cities. Count a round trip as two trips.

5. Garbage (solid waste). Another significant source of CO_2 emissions is discarded trash and garbage. In part this comes from the CO_2 emitted during the manufacture and transportation of packaging – i.e., cardboard, plastic, and glass, as well as junk mail.

Partly, it comes from decomposition of food and other organic waste in landfills, producing methane which is 23 times more potent than CO_2 as a greenhouse gas; this is expressed in equivalent pounds of CO_2.

Count as garbage only what you discard; exclude what you recycle. To estimate your annual gallons of solid waste, a typical garbage can holds 32 gallons; this is a round can xx inches in diameter and xx inches high. *[Dimensions of this and other cans to be filled in*.] Take your usual gallons per week, times 52 to get _____ gallons of garbage per year. Enter this in the Part A calculator and multiply by **2.0 pounds** of CO2 per gallon to get your carbon output.

The emission factor for CO2 from solid waste is taken from a workbook called the "Low Carbon Diet" sponsored by the Empowerment Institute (ww.empowerment institute.net), which spells out a program for reducing your household energy use.

Questions

What if I don't pay my own utilities? How can I estimate the carbon effects of my electricity and heating?

What you can do is estimate the approximate CO2 output for a residence *similar* to yours. Go to the Climate Trust calculator at www.carboncounter.org and click "Individual." You will see three panels for Home, Car, and Air CO_2 emissions. Under Home, select "Estimate." It will ask for your State (be sure to enter Michigan), your Home Type and Home Size. Enter your choices and it will give approximate total home emissions in metric tons of CO2 for a residence like yours. Multiply by 2205 pounds per metric ton to get your **total pounds of CO_2 per year**. Unfortunately, this does not separate electricity from heating; we know of no way to do this without the utility bills. As a rough guess, assign half to each.

What if I use propane or fuel oil for heating rather than natural gas?

Go to the Climate Trust calculator www.carboncounter.org, select "Exact" under Home, and you will see entries for Fuel Oil and Propane, as well as Natural Gas. Enter your annual gallons of either Fuel Oil or Propane (leave the other entries at 0), and it will give you the tons of CO2. Multiply that by 2205 pounds per (metric) ton and you get the **pounds of CO2** . In Part A, enter this figure at the right. Cross out "Natural gas" and substitute "Propane" or "Fuel Oil," but do NOT use the emission factor for natural gas.

How much would I have to reduce each energy component to save (say) 2500 pounds of CO2 per year, and how much money would that save?

To cut your total CO_2 output by 2500 pounds a year, you could achieve this by reducing each component enough to save 500 pounds, as follows.

(To estimate money saved, DTE charges a local residence a total of about $0.089 per kWh, and $1.024 per CCF. Gasoline is running ± $3.00 per gallon.)

One pound of CO_2 is emitted by:	*To save 500 pounds of CO_2 in each component, reduce:*	*Approx $ saved*
0.61 kWh's of electricity	electricity by 305 kWh's per year	$ 27
0.083 CCF's of natural gas	natural gas by 42 CCF's per year	$ 48
0.05 gallons of gasoline (at 25 MPG this means 1.25 miles)	gasoline by 25 gallons per year (at 25 MPG this means 625 miles per year)	$75
0.77 miles of flying	flying by 385 miles per year	± $300??
0.5 pounds of garbage	garbage by 250 gallons per year (this is about eight 32-gallon cans)	??
	Total money saved	*± $450??*