**Climate Change: Greenhouse Gas Calculation Information**

<http://www.nature.org/popups/misc/art20625.html#energy>

**How was your personal impact calculated?**

**General Information**

The Nature Conservancy's carbon calculator determines carbon dioxide and other greenhouse gas emissions for personal and household behaviors. The following information explains how emissions are calculated.

**Reporting**

Greenhouse gas emissions are typically reported world wide in metric tons. Carbon dioxide emissions are calculated from the weight of carbon. Other emissions, such as methane and nitrous oixde, are reported in carbon dioxide equivalents so that the emissions can be compared. Short tons (equivalent to 2,000 lbs) are the units used to report emissions in this calculator. One metric ton can be converted to short tons by multiplying the total by 1.1023.

References to "CO2 emissions" or "carbon emissions" typically include emissions from all greenhouse gasses.

**Emissions Calculations**

For this calculator, emissions attributed directly from individual behaviors, such as miles flown, as well as indirect emissions, such as the CO2 emitted in building airports, are included in the overall emissions calculation.

**Total Emissions Per Person**

In 2004, the United States emitted 7074 million metric tons of carbon dioxide equivalent green house gasses[1](http://www.nature.org/popups/misc/art20625.html#1). This equates to 27 tons per person[2](http://www.nature.org/popups/misc/art20625.html#2). In this calculator, direct emissions (calculated from home energy use, personal transportation, diet and waste) make up 45% of the total U.S. emissions, with the remaining 55% representing indirect emissions.

To determine the indirect emissions for each user, we apply an indirect emissions factor to all personal behaviors. This is simply the ratio of total U.S. CO2 emissions to the total emissions for the personal behaviors we are considering. For example, direct emissions from one long flight is approximately 1 ton and indirect emissions add 1.2 tons, for total emissions of 2.2 tons. The emissions for specific behaviors included in the calculator are documented below.

For the specific behaviors evaluated in the calculator, we rely on data regarding typical consumption to determine an average contribution. In most cases, we also calculate high and low endpoints for each behavior. These three points are used to frame the specific responses for each behavior. For example, we used data from residential energy surveys to determine the average maximum emissions for a household that has not implemented energy saving behaviors and the average minimum for a household that has implemented many energy savings behaviors.

**Home Energy**

Home energy emissions are based on U.S. averages for household type and number of bedrooms. State is used to determine carbon dioxide equivalent emissions per kilowatt hour of electricity[3](http://www.nature.org/popups/misc/art20625.html#3) and climate zone[4](http://www.nature.org/popups/misc/art20625.html#4) which affects heating and cooling energy usage.

**Heating & Cooling**

*Average:* Household type and number of bedrooms are used to determine energy consumption and geographic location is used to scale heating and cooling consumption.[5](http://www.nature.org/popups/misc/art20625.html#5)

*Behaviors:* Data from residential consumption surveys asking about adequacy of insulation, occurrences of drafts, and thermostat settings was used to determined high and low end usage of space heating. Data about frequency of air conditioning usage was used to determined high and low end consumption rates.[6](http://www.nature.org/popups/misc/art20625.html#6) Choosing "Wherever possible" reduces energy emissions by 16%, "In some areas" is the average response, and "Very little" increases emissions by 13%.

**Lighting**

*Average:* On average lighting contributes 16% of of all household electrical usage for non-heating and cooling purposes.[7](http://www.nature.org/popups/misc/art20625.html#7)

*Behaviors:* CFL's use 2/3 less energy than standard incandescent bulbs.[8](http://www.nature.org/popups/misc/art20625.html#8) The response, "Everywhere possible", reduces the lighting contribution of electrical consumption for lighting by 2/3, and the "In some lights" response reduces consumption for lighting by 1/3.

**Appliances**

*Average:* Appliances typically contribute 84% of all household electrical usage for non-heating and cooling purposes, with electronic appliances contributing to 15% of the electrical load.[9](http://www.nature.org/popups/misc/art20625.html#9)

*Behaviors:* ENERGY STAR appliances can save anywhere from 10% to 50% in appliance energy usage over conventional appliances. Unplugging electronic equipment when not in use can reduce electric consumption up to 50% for these devicies. "Sometimes" response represents 10% ENERGY STAR usage and occasionally unplugging equipment, "All of the time" is 50% usage, and almost always unplugging equipment "Rarely" is 0% usage.Unplugging electronic equipment when not in use addresses some of the typical electrical load of those appliances.[10](http://www.nature.org/popups/misc/art20625.html#10)

**Hot Water**

*Average:* Hot water consumption is determined from household type and number of bedrooms.[11](http://www.nature.org/popups/misc/art20625.html#11)

*Behaviors:* Energy from hot water can be saved by reducing the hot water thermostat, adding insulation to the tank and installing a low-flow shower head. This data was used to determine average high end and low end consumption rates.[12](http://www.nature.org/popups/misc/art20625.html#12) Choosing "As much as possible" reduces hot water emissions by 38% and "Somewhat" by 14%.

**Driving and Flying**

Emissions from driving personal vehicles and air transportation are included in the calculator, but emissions from public transportation are omitted.

**Personal Vehicles**

*Average:* Emissions factors are determined based on the type of car selected and then multiplied by the number of miles driven per car, assuming gasoline-based vehicles.[13](http://www.nature.org/popups/misc/art20625.html#13)

*Behaviors:* Replacing a clogged air filter can improve your car's gas mileage by as much as 10%.[14](http://www.nature.org/popups/misc/art20625.html#14) You can improve your gas mileage by around 3.3 percent by keeping your tires inflated to the proper pressure.[15](http://www.nature.org/popups/misc/art20625.html#15) Transportation emissions are reduced by these amounts if the user selects a positive response to these answers.

**Air Travel**

*Average:* Air travel per-mile emissions are significantly affected by the length of the flight because a high percentage of fuel use and emissions are expended on take-off. We estimate an average length of 300 miles for a short flight.[16](http://www.nature.org/popups/misc/art20625.html#16)

**Food and Diet**

*Average:* Agricultural activity (crop, land, and animal including management, and including farm vehicles) accounts for 7% of all greenhouse gas emissions in the United States, with 91% of that being from methane and nitrous oxide emissions.[17](http://www.nature.org/popups/misc/art20625.html#17)

*Behaviors:* Vegan and vegetarian diets emit 72% and 42% less than the typical American diet, respectively. A heavy meat diet emits 24% more than the average.[18](http://www.nature.org/popups/misc/art20625.html#18) For the organic food responses, "Most of the time" reduces your emissions by 29%, "Sometimes" reduces emissions by 15%, and "Never or rarely" is the average emissions figure. [19](http://www.nature.org/popups/misc/art20625.html#19)

**Recycling and Waste**

*Average:* 246 million short tons of waste were landfilled in 2004.[20](http://www.nature.org/popups/misc/art20625.html#20) This produces 2.1 tons of carbon dioxide equivalent greenhouse gases per year per person.[21](http://www.nature.org/popups/misc/art20625.html#21)

*Behaviors:* Recycling household trash can reduce your overall waste stream, and thus emissions by 42%.[22](http://www.nature.org/popups/misc/art20625.html#22) Composting can reduce emissions by 24%.[23](http://www.nature.org/popups/misc/art20625.html#23)

**Results**

Averages are based on US EPA Inventory of Greenhouse Gas Emissions and Sinks[24](http://www.nature.org/popups/misc/art20625.html#24) and behavior emissions (savings or additions) are determined from the answers submitted.

World average for greenhouse gas emissions are 3.2 billion metric tons carbon dioxide equivalent. This equates to 5.5 short tons per person.[25](http://www.nature.org/popups/misc/art20625.html#25)

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