

## Energy Efficient Homes: An Introduction to Carbon Footprints<sup>1</sup>

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Seeing a footprint in nature gives us insight into where someone, or something, came from and where it was going. Footprints also tell us about the creatures that leave them, such as information about their size, weight, and speed. In the same way, carbon footprints tell us about our energy use and the environmental impacts of our daily actions.

### Quick Facts

- A class from the Massachusetts Institute of Technology has estimated the carbon dioxide emissions of people in a wide variety of lifestyles—from the homeless to multimillionaires. The study concluded that in the United States, even those with the lowest usage of energy are still producing, on average, more than double the global per-capita average. (Chandler 2008)
- The U.S. Department of Energy predicts that home energy use accounts for 21% of U.S. carbon dioxide emissions (DOE 2008)
- Transportation accounts for 32% of carbon dioxide emissions in the United States, so many people try to lower their vehicle mileage. Some walk or bike whenever possible; others carpool, take public transportation, or invest in fuel-efficient cars. (DOE 2008)
- Florida is the fifth highest carbon dioxide polluting state in the United States, preceded by Texas, California, Pennsylvania, and Ohio. (EReduc 2008)

### Terms to Help You Get Started

The following is a progression of terms to help broaden your understanding of carbon issues.

- **Greenhouse Effect** The rise in temperature that happens as greenhouse gases in the atmosphere trap energy from the sun.
- **Greenhouse Gases (GHG)** These are gases in the atmosphere that act like an insulating blanket, reducing loss of heat into space and maintaining global temperatures through the *greenhouse effect*. These gases allow sunlight to

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enter the atmosphere freely. Some infrared radiation (heat) reflects back towards space when sunlight hits the Earth's surface.

Greenhouse gases absorb this infrared radiation and trap heat in the atmosphere. Many gases exhibit these “greenhouse” properties. Some of them occur in nature (water vapor, carbon dioxide, methane, and nitrous oxide), while others are exclusively human-made (like gases used for aerosols).

- **Fossil Fuels** Deposits beneath the earth's surface contain fossil fuels that formed from decayed plants and animals that lived up to 300 million years ago. Coal, oil and natural gas, are fossil fuels and are considered non-renewable sources of energy. Combustion of fossil fuels currently meets over 85% of modern society's energy demands.
- **Carbon dioxide** (chemical formula:  $\text{CO}_2$ ) is a chemical compound composed of two oxygen atoms bonded to a single carbon atom. Carbon dioxide is an important greenhouse gas because it transmits visible light but strongly absorbs infrared radiation. All animals, plants, fungi, and microorganisms produce carbon dioxide during respiration. Plants use it during photosynthesis. Burning fossil fuels or vegetable matter generates carbon dioxide as a byproduct.
- **Carbon Cycle** The carbon cycle consists of four major sources of carbon linked by pathways of exchange. The sources are the atmosphere, the global biosphere, the oceans, and the sediments. Movements of carbon between the major sources happen through a range of chemical, physical, geological, and biological processes. The ocean contains the largest active source of carbon in the carbon cycle.
- **Life Cycle Assessment** A life cycle assessment (LCA, also known as life cycle analysis, ecobalance, and cradle-to-grave analysis) is the consideration of the potential environmental impact of a given product, service or event.
- **Carbon Neutral** Being carbon neutral loosely refers to zero total carbon release by balancing the amount of carbon released with the amount sequestered or offset.
- **Carbon Offset** A carbon offset is a bookkeeping transaction where a reduction or sequestration of carbon emissions at one point theoretically replaces the carbon output at another point so that the overall result reflects a reduction of carbon released into the atmosphere.
- **Sequestration** When something is locked away and is not readily available in the environment. The term carbon sequestration describes carbon locked away in plant material such as trees or in soils.
- **Deforestation** The conversion of forest areas to non-forest land for use as farmland, pasture, urban use, development, or wasteland. Generally, the removal or destruction of forest cover has resulted in a degraded environment with reduced biodiversity.
- **Kyoto Protocol** The Kyoto Protocol is an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC). Countries that ratify this protocol agree to reduce their emissions of carbon dioxide and five other greenhouse gases (GHG), or buy offsets if they maintain or increase emissions of these greenhouse gases. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and enacted on 16 February 2005—180 nations have ratified the treaty to date. Only 60% of the major greenhouse gas-producing countries are included in this 180. As of December 2007, the US has not accepted the protocol. The first commitment period of the Kyoto Protocol ends in 2012, and international talks began in May 2007 about future commitments.
- **Cap and Trade** A central authority (usually a government or international body) sets a limit or cap on the amount of a pollutant that can be produced. Companies or other groups are issued credits that represent the right to release a specific amount of pollutants. The total amount of allowances and credits cannot exceed the cap. Cap and trade systems work under the idea that companies that need to increase their polluting emissions must buy credits from those who pollute less. A trade (also referred to in this sense as an emissions trade) is the transfer of allowances between companies. In effect, the

buyer is paying a charge for polluting, while the seller is rewarded for having reduced emissions. In theory, those that can reduce their emissions most cheaply will do so, achieving the pollution reduction at the lowest possible cost to society. Since the cap is reduced over time, polluting will become more expensive and innovation in emissions reduction will continue to be rewarded.

## One Step at a Time

Growing concern about environmental issues and global warming has led many people to try to cut their carbon output by driving less and increasing their home's energy efficiency. When thinking about your impact, it is generally best to begin by estimating your carbon footprint to set a point of reference. This will help you see the difference that your changes will make. A carbon footprint is usually a simple monthly or annual figure giving an estimate of carbon dioxide output measured in tons.

While some people try to shrink their carbon footprint, others try to erase it completely. When people set a goal of carbon neutrality, they generally cut their energy use and emissions as much as possible, and then offset the rest. Offsets allow you to pay a fee to reduce the total global greenhouse emissions instead of having to make more extensive and costly reductions of your own. For instance, you may choose to buy offsets that invest in protecting or restoring forests, promoting renewable energy or energy efficiency rather than installing solar panels or wind turbines on your home.

In order to attract consumers who value and watch their own carbon footprints and want to support products that do the same, some companies have begun to include carbon footprints on their labeling. The labels approximate the CO<sub>2</sub> produced by making, packaging, shipping, and disposing of a product. All of this information comes from a life cycle assessment of each product that reviews all of the possible environmental impacts that a product can have during its lifetime.

## Calculating Carbon Footprint

To find out how much CO<sub>2</sub> home electricity produces, the calculator divides your estimated use by the price of power in your area. The calculator multiplies this number by the state's emissions factor, a number that associates the type of energy the state uses to carbon output. For example, areas that produce power by burning coal will have different emissions than the areas that use natural gas or nuclear. Calculators also factor in natural gas, heating oil, and propane use.

In some areas, utilities give their customers the option of buying a portion of their power from renewable sources. This reduces the state's reliance on fossil-fuel power and helps create a market for green power. Carbon calculators usually give credit for those who buy green power.

Carbon footprints also include the CO<sub>2</sub> produced by transportation. Because most people do not record their fuel use, calculators generally only ask for estimated mileage and the cars make, model, and year. The mileage and the car's estimated fuel economy are then used to determine fuel usage. This figure is multiplied by the emissions factor of gasoline or diesel fuel, and is converted to pounds of CO<sub>2</sub>. Some calculators also ask for an estimate of air travel.

After collecting all the information, the calculator gives a carbon footprint in tons of CO<sub>2</sub> output. Most calculators put this into perspective by comparing your footprint to national averages or world averages. What do you do after figuring out how much CO<sub>2</sub> your life produces? In the next section, we will learn how to lower your footprint a few sizes.

## Reducing Carbon Footprints

A carbon footprint can help measure and keep track of changes in your daily activities. It can let you know how much a particular event or activity contributes to your energy use and CO<sub>2</sub> output. It can also help you figure out what changes in your lifestyle may make the biggest impact.

According to the US Department of Energy (DOE), home energy use makes up 21% of the nations CO<sub>2</sub> emissions, so having an efficient home can go a long way toward reducing your carbon footprint. Installing compact fluorescent lighting, upgrading attic insulation, or replacing old windows can drastically reduce energy use and carbon emissions from your home energy use. For more information about reducing home energy use, see *Energy Efficient Homes: Easy Steps to Improving Your Home's Energy Efficiency*.

Some of the most effective ways to reduce your carbon footprint are small changes at home that cost nothing and even save money on your power bill. Things like turning off lights when you leave a room, taking shorter showers, or unplugging appliances and electronics when they are not being used can really add up.

According to the US DOE, transportation accounts for 33% of CO<sub>2</sub> emissions in the United States. With this in mind, another cost effective way to reduce your carbon footprint is to limit driving. Making lists and organizing errands and appointments can help to eliminate unnecessary trips around town. It may also be helpful to rethink your transportation options. You may be able to walk, bike, carpool, or take public transportation to avoid car miles and lower your carbon footprint.

Online carbon calculators can only go so far in their accuracy and generally do not fully account for things you buy, what you eat, and how much garbage you produce. All of these play an important part in your carbon footprint. To reduce impacts of things you purchase consider durability, where it was made, what it was made of, and how far it was shipped. Ideally, you would buy clothing and household items that are made locally of natural materials. Food that comes from local farms and is organically produced uses less energy for shipping and does not use petroleum-based fertilizers. These considerations drastically lower the carbon emissions from these items.

Lastly, recycling, composting, and buying items with less packaging reduce your waste stream. Energy needed to produce packaging and dispose of it has a significant effect on your carbon footprint.

## Broader Perspective

In the end, individual efforts to reduce emissions can go only so far. Significant reduction in the emissions of CO<sub>2</sub> and other greenhouse gases require significant government regulation and corporate action. Decreasing their carbon footprints does let people see how much carbon they produce and how they can change. To see how Florida rates on energy consumption and carbon emissions, visit the Web site [http://www.eredux.com/states/state\\_detail.php?id=1114&state=FLORIDA](http://www.eredux.com/states/state_detail.php?id=1114&state=FLORIDA).

It is important to remember that every purchasing decision that we make has an impact and reflects our views on society and global climate change. For more ideas on how to make your home more energy and water efficient, see *Energy Efficient Homes* at [http://edis.ifas.ufl.edu/TOPICTOPIC\\_SERIES\\_Energy\\_Efficient\\_Homes](http://edis.ifas.ufl.edu/TOPICTOPIC_SERIES_Energy_Efficient_Homes).

## Resources

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