EPA May 1996 EPA230-K-96-001

GLOBAL CLIMATE CHANGE

Waste Reduction Can Make a Difference

Climate change and municipal solid waste—two environmental issues with an important underlying link.

Rising levels of greenhouse gases in the atmosphere are causing changes in the Earth's climate. The manufacture and distribution of products and the subsequent management of solid waste contribute to the emission of greenhouse gases. Recycling and preventing waste help reduce the release of greenhouse gases into the atmosphere.

This fact sheet illustrates the link between climate change and solid waste, explains how waste reduction can help slow the effects of climate change, and outlines the U.S. Environmental Protection Agency's (EPA's) efforts to address this important issue.

What Is the Greenhouse Effect?

The atmosphere that surrounds the Earth contains many types of gases, including those known as "greenhouse gases." Greenhouse gases absorb and retain heat from the sun. They regulate the Earth's climate by holding warmth in an atmospheric blanket around the planet's surface. Scientists call this phenomenon the "greenhouse effect."

Without greenhouse gases, the average temperature on Earth would be 5°F instead of the current 60°F. Excess greenhouse gases in the atmosphere, however, raise global temperatures.

United States Environmental Protection Agency. Policy, Planning and Evaluation/Solid Waste and Emergency Response

1. *The Earth's atmosphere contains greenhouse gases that hold the sun's warmth. In this way, greenhouse gases control global temperatures.*

2. *Human activity releases more greenhouse gases, upsetting the natural atmospheric balance. Increasing the density of greenhouse gases raises global temperatures.*

What Are the Consequences of Climate Change?

What's so bad about warm days and balmy nights? Why try to reduce greenhouse gas emissions? Unfortunately, increased concentrations of greenhouse gases in the atmosphere will not create a worldwide tropical paradise. The Earth's atmosphere supports a balanced variety of climates on which diverse ecosystems depend. Human activities that thicken the gaseous "greenhouse" around the planet threaten to disrupt that balance.

In the last 100 years, scientists have detected an increase of 1°F in the Earth's average surface temperature. There is international scientific concensus that human activity is responsible for some of this increase. A rise of only a few degrees in the Earth's average temperature could result in:

- Rising sea levels, causing inland and coastal flooding.
- Shifting weather patterns, affecting where crops are able to grow.
- Increased mortality from heat stress.
- The spread of infectious diseases.
- Alterations in ecosystems, resulting in the extinction or migration of species.

Such changes could damage communities and national economies as well as alter the natural world. Of course, many uncertainties remain. No one can predict the precise timing, magnitude, and regional patterns of future climate change. Nor can anyone foretell the abilities of humankind and nature to adapt to such changes.

Just as a heavy coat holds in your body heat on a winter day, greenhouse gases retain the Earth's heat. Imagine, though, if you couldn't take off your parka in August.

It is clear, however, that any climate changes will not be easily reversed. Because greenhouse gases remain in the atmosphere a long time, turning back climate changes may take decades or even centuries.

How Are EPA's Waste Reduction Programs Helping To Reduce the Effects of Climate Change?

The United States is committed to reducing greenhouse gases. In 1992, along with 160 other signatories to the United Nations Framework Convention on Climate Change, the United States entered into an international commitment to address global warming. In October 1993, the Climate Change Action Plan (CCAP) was initiated to carry out our country's commitment to reduce greenhouse gas emissions. The plan outlines more than 50 initiatives designed to reduce emissions of greenhouse gases to 1990 levels by the year 2000.

What Are Greenhouse Gases?

Some greenhouse gases occur naturally in the atmosphere, while others result from human activities.

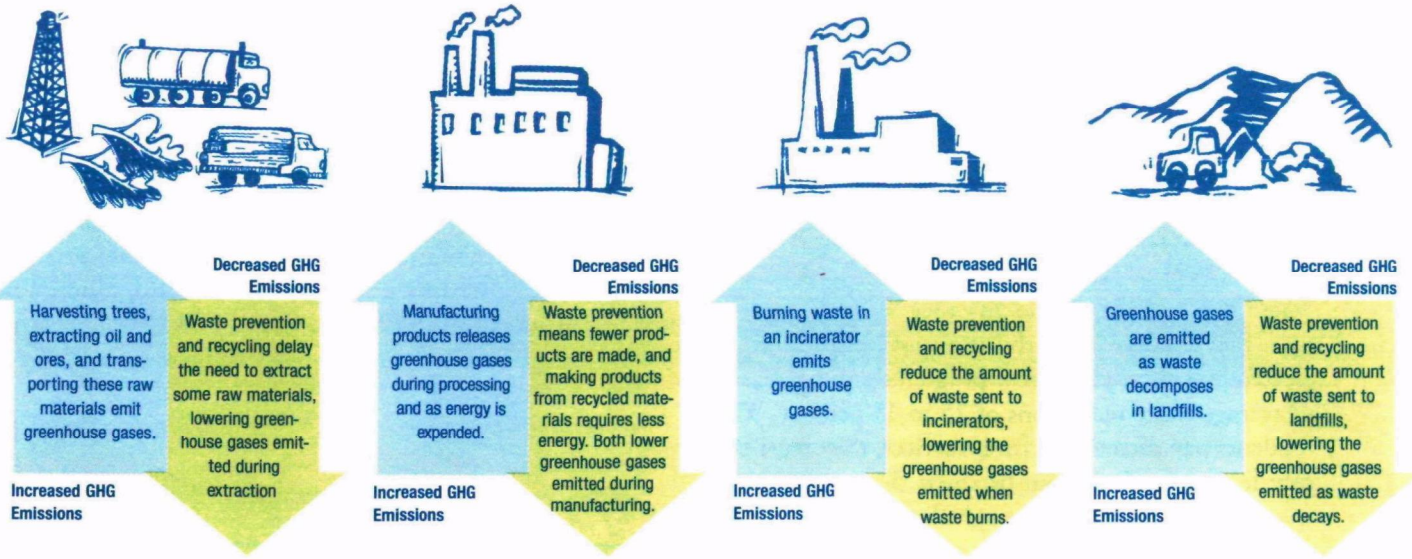
Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Human activities, however, add to the levels of most of these naturally occurring gases:

Carbon dioxide is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned.

Methane is emitted during the production and transport of coal, natural gas, and oil; the decomposition of organic wastes in municipal solid waste landfills; and the raising of livestock.

Nitrous oxide is emitted during agricultural and industrial activities as well as during combustion of solid waste and fossil fuels.

The Link Between Waste Management and Greenhouse Gases



EPA is implementing several initiatives aimed at lowering the greenhouse gases caused by solid waste generation and disposal. EPA estimates that waste prevention and recycling initiatives—including composting—can reduce greenhouse gas emissions by at least 5.6 million metric tons of carbon equivalent (MMTCE) by the year 2000 and perhaps by as much as 10 MMTCE by that time. Ten MMTCE is almost 10 percent of the total U.S. goal for greenhouse gas reduction under CCAP and is equivalent to taking 7.7 million cars off the road for 1 year.

Waste reduction curtails greenhouse gas emissions in several ways, including:

- **Energy savings and reduced emissions.** Making goods from recycled materials typically requires less energy than making goods from virgin materials. Less energy is necessary to extract, transport, and process raw materials and to manufacture products when products are reused, fewer products are created, or products are made with less material (i.e., light-weighting). When energy demand decreases, fewer fossil fuels are burned and less carbon dioxide is emitted to the atmosphere.
- **Reduced emissions from incinerators.** Waste prevention and recycling divert materials from incinerators, avoiding the greenhouse gases that would be emitted during incineration.
- **Reduced methane emissions from landfills.** Waste prevention and recycling—including composting—divert organic wastes from landfills, reducing the methane that organics generate during decomposition.
- **Increased storage of carbon in trees.** Paper product waste prevention and recycling slows the harvest of trees (i.e., more trees are left standing). Forests take large amounts of carbon dioxide out of the atmosphere and store it in wood.

Greenhouse gases that are not naturally occurring include byproducts of foam production, refrigeration, and air conditioning called **chlorofluorocarbons** (CFCs), as well as **hydrofluorocarbons** (HFCs) and **perfluorinated carbons** (PFCs) generated by industrial processes.

Some gases, like CFCs, destroy the **ozone** layer. This reduces ozone's effect as a greenhouse gas but also diminishes its capacity to protect us from the sun's harmful ultraviolet rays.

Each greenhouse gas differs in its ability to absorb heat in the atmosphere. HFCs and PFCs are the most heat absorbent. Methane traps over 20 times more heat than carbon dioxide, and nitrous oxide absorbs 270 times more heat than carbon dioxide.

EPA's efforts to encourage waste reduction and reduce greenhouse gas emissions include the following programs:

- **WasteWi$e.** WasteWi$e is a voluntary partnership between EPA and U.S. businesses to prevent waste, recycle, and buy and manufacture products made with recycled materials. In 1994, the program's first year, 370 companies reduced or recycled over 1 million tons of waste.
- **Pay-As-You-Throw Programs.** EPA is providing technical and outreach assistance to encourage communities to implement pay-as-you-throw systems for solid waste. These systems charge residents a fee for each bag of trash they leave at the curb for disposal. The incentives created by pay-as-you-throw programs typically result in average waste reductions of 25 to 45 percent. When residents pay directly for trash services, they tend to recycle more and seek out products that result in less waste when discarded. Through their purchasing choices, consumers will send a message to manufacturers.
- **EPA/CBOT Partnership.** With support from EPA, the Chicago Board of Trade (CBOT) links buyers and sellers of recyclables through a nationwide, online recycling commodity exchange. Traders peruse online information about recyclables' specifications, price terms, quantities, and locations. Exchange activities increase markets for products made with recycled materials, thereby diverting more materials from the waste stream.

The Balance Sheet: Measuring Climate Change Benefits of Waste Reduction

EPA is researching ways to estimate and compare the greenhouse gases generated by the following waste management options: waste prevention, recycling, composting, landfilling, and incineration. The goal is to have the ability to estimate the greenhouse gases emitted by each waste management option for six types of materials: paper (office paper and newspaper), corrugated cardboard, aluminum and steel cans, plastic (HDPE, LDPE, and PET), food scraps, and yard trimmings. Research to date indicates that waste prevention and recycling can significantly reduce greenhouse gas emissions.

For More Information

To learn more about EPA's effort to minimize global climate change through waste reduction, call EPA's RCRA Hotline at 800-424-9346. Individual climate change fact sheets are also available for EPA waste reduction programs that are helping to curb greenhouse gas emissions. For more information on WasteWi$e, call 800 EPA-WISE; For general information on climate change, use EPA's Fax-On-Demand Line at 202-260-2860 or write to: EPA, Climate Policy and Programs Division (2122), 401M Street, SW, Washington, DC, 20460. You can access EPA's website on global warming at: http://www.epa.gov/globwarm

Greenhouse Gases Generated by Two Waste Management Scenarios: The Office Paper Case