

COMMON SENSE ON CLIMATE CHANGE

**Practical Solutions
to Global Warming**



**Union of
Concerned
Scientists**

Mark Twain might as well have been talking about **global warming** when he famously remarked, “Everybody talks about the weather, but nobody ever does anything about it.” For years we have heard so much about the causes of climate change, that we’ve missed the fact that there are **simple, practical solutions** that can slow this growing problem. Technologies exist today that can cut emissions of heat-trapping gases and make a real difference in the health of our planet. And these solutions will be good for our economy, reduce our dependence on foreign oil, and enhance our energy security.

A Challenge We Can Meet

Global warming doesn’t just mean balmy February days in northern climes. It also means increasingly hot days in the summer, and a host of negative impacts that are already under way and are expected to intensify in the coming decades.

- * More heat waves will likely increase the risk of heat-related illnesses and deaths.
- * Cities and towns along the nation’s major rivers will experience more severe and frequent flooding.
- * Some areas will likely experience more extensive and prolonged droughts.
- * Some of our favorite coastal and low-lying vacation areas, such as parts of the Florida Keys and Cape Cod, will be much less appealing as sea levels rise, dunes erode, and the areas become more vulnerable to coastal storms.
- * Many families and businesses, who have made their living from fishing, farming, and tourism could lose their livelihoods, and others who love hunting, boating, skiing, birdwatching, and just relaxing near lakes, streams, and wetlands will see some of their favorite places irretrievably changed.

The solutions to climate change are here and it's time we put them to use. If we get started today we can tackle this problem and decrease the unpleasant outcomes that await us if we do nothing. The steps we need to take are common sense. And, more often than not, they will save consumers money. The cost of inaction, however, is unacceptably high.

We Must Act Now

The scientific consensus is in. Our planet is warming, and we are helping make it happen by adding more heat-trapping gases, primarily carbon dioxide (CO₂), to the atmosphere. The burning of fossil fuel (oil, coal, and natural gas) alone accounts for about 75 percent of the increase in CO₂. Deforestation—the cutting and burning of forests that trap carbon—accounts for about another 20 percent.

Procrastination is not an option. Scientists agree that if we wait 10, 20 or 50 years, the problem will be much more difficult to address and the consequences for us will be that much more serious.

We're treating our atmosphere like we once did our rivers. We used to dump waste thoughtlessly into our waterways, believing that they were infinite in their capacity to hold rubbish. But when entire fisheries were poisoned and rivers began to catch fire, we realized what a horrible mistake that was.

Our atmosphere has limits too. CO₂ remains in the atmosphere for about 100 years. The longer we keep polluting, the longer it will take to recover and the more irreversible damage will be done.

CO₂ remains in the atmosphere for about 100 years.

Common Sense Solutions

Fuel-efficient vehicles. Renewable energy. Protecting threatened forests. These common sense solutions won't only reduce global warming, many will save us money and create new business opportunities.

Best of all, these solutions exist now. We just need to insist that business and government take the necessary steps to make them available and affordable. Then we have to let consumers know what to do and provide incentives to help all of us make better choices.

The following five sensible steps are available today and can have an enormous impact on the problem ➔

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We Know How to Make Better Cars and SUVs

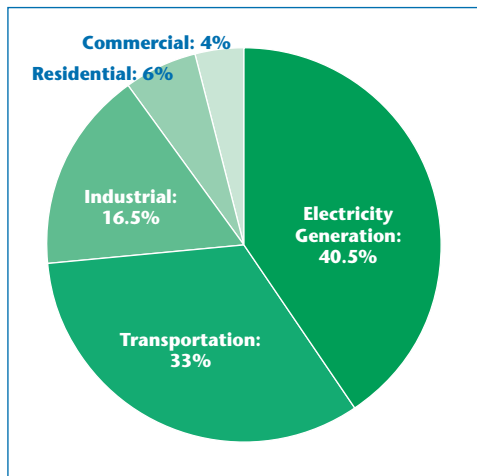
The technology exists to build cars, minivans, and SUVs that are just as powerful and safe as vehicles on the road today, but get 40 miles per gallon or more.

Studies from both the Union of Concerned Scientists and the National Academy of Sciences agree that these levels are achievable. Better transmissions and engines, more aerodynamic designs, and stronger yet lighter material for chassis and bodies can cost-effectively increase the average mpg of today's automotive fleet from 24 to 40 mpg by 2012. This would be equivalent to taking 44 million cars off the road—and it would save individual drivers thousands of dollars in fuel costs over the life of a vehicle.

This would be equivalent to taking **44 million CARS** off the road...

Because transportation accounts for over 30 percent of US annual CO₂ emissions, raising fuel economy is one of the most important things we can do to slow climate change.

Source of US CO₂ Emissions



Source: Energy Information Administration, 2000

The first step is to require Detroit to offer consumers more fuel-efficient vehicles by raising the average gas mileage—the Corporate Average Fuel Economy (CAFE)—of their fleets. It is especially important to bring SUVs up to the same standards as cars.

The government can also help by offering tax credits to consumers who buy advanced technology vehicles like today's hybrids (a combination of gasoline and self-charging electric battery engine) and new fuel cell vehicles that will hit the market within the next decade. This will give millions

of people the incentive to do the right thing and help automakers create a market for clean technologies. Honda and Toyota already have highly fuel-efficient hybrid vehicles on the market that get 61 and 52 mpg in the city, respectively.



Consumer Solution:

When you buy your next car, look for the one with the best fuel economy in its class. The vehicle you drive has the single largest impact on climate change of any action you take. For each gallon of gas you burn, 20 pounds of heat-trapping CO₂ is released into the atmosphere. And better gas mileage not only reduces global warming, but also will save you thousands of dollars at the pump over the life of the vehicle. Check the fuel economy sticker on the cars you're considering and look for new technologies like hybrid engines.



Consumer Solution:

If you own more than one vehicle, use the less fuel-efficient one only when you can fill it with passengers—a full minivan may be kinder to the environment than using two midsize cars. Use your gas miser for travel with one or two passengers. And whenever possible, join a carpool or take mass transit.

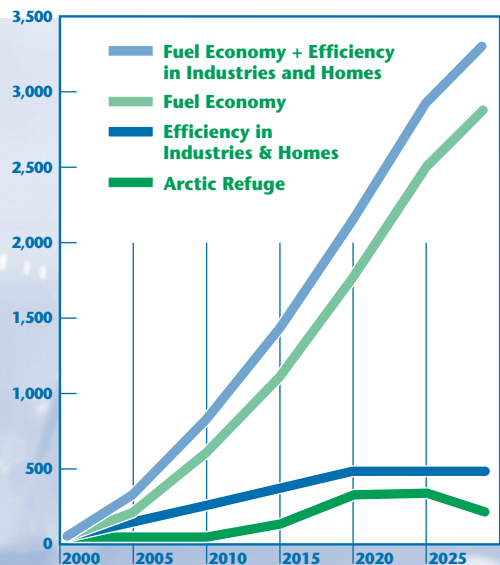


Drilling

While we'll undoubtedly have to rely on fossil fuels for some time to come, it is irresponsible to increase oil drilling and consumption to meet our energy needs. Burning more fossil fuels will simply bring more climate change and make us more dependent on foreign oil. Our government should invest in the development of clean, 21st century technologies and support the companies that are trying to bring us into a new cleaner energy age, not drag its feet by rewarding those who prolong a 20th century fossil fuel economy.

Oil Savings from Fuel Economy Standards and Efficiency in Industries and Homes vs. Potential Arctic Refuge Supply

(in million barrels of oil)



Source: Union of Concerned Scientists, 2001

We Must Modernize America's Electricity System

More than half of America's electricity is produced from outdated, coal-burning power plants that dump pollutants and heat-trapping gases into our atmosphere. In fact, power plants are the single largest source of CO₂—40 percent of the US total.

However, cost-effective, clean energy sources do exist. By increasing our use of clean renewable energy, investing in energy efficiency, and reducing pollution from fossil fuel plants we can save money for consumers, reduce heat-trapping emissions, and lessen the need for new coal or gas power plants.

A study by the Union of

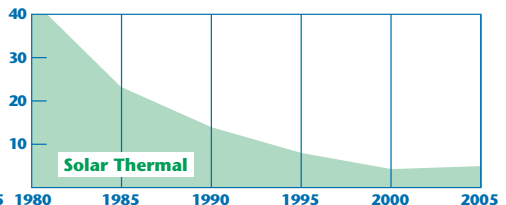
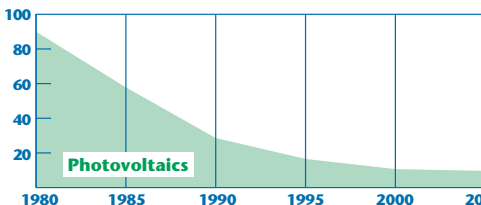
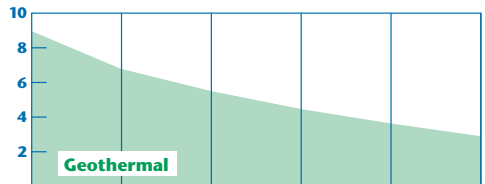
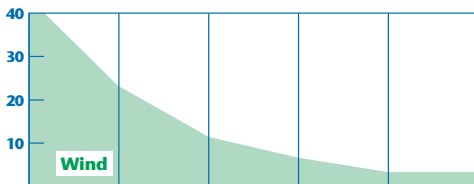
Concerned Scientists found that we could reduce power plant CO₂ emissions by 60 percent compared to government forecasts for 2020. Consumers could save a total of \$440 billion—reaching \$350 annually per family by 2020.

20 Percent Renewables by 2020

A national standard requiring 20 percent of our electricity from renewable energy sources by 2020 is an attainable goal. We are already using clean, safe, renewable sources such as solar, wind, geothermal, and biomass (fuel from plant matter) to produce clean energy. Costs for these technologies have dropped dramatically since they were first introduced decades ago. For instance, the cost of wind energy has decreased from 40 cents per kilowatt hour in 1980 to between 3 and 6 cents today.

Renewables Success Story: Price declines with R&D and growth

(in cents per kWh)



Source: US Department of Energy, 1997

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Twelve states have already adopted standards requiring utilities to offer more renewable energy to consumers. One of the most successful to date is Texas, the heart of the nation's fossil fuel industry and now the biggest market for new renewable energy plants in the United States. If Texas can do it, so can the rest of the nation.

To be most effective, a national renewable standard should be implemented in concert with measures to reduce the pollution coming from coal, oil, and gas power plants. The current mix of pollutants pouring from power plants causes smog, acid rain, and mercury poisoning as well as global warming. Addressing all four major pollutants (sulfur dioxide, nitrogen oxides, mercury, and CO₂) at once allows utilities to take an integrated approach to pollution control, reducing industry costs and greatly increasing the public health benefits.



Consumer Solution:

In some states, you can switch to electricity companies that provide 50 to 100 percent renewable energy. In other states, utilities offer “green power” choices. Ask your electric company to provide you with “Green-e” certified renewable power.



Nuclear power

Nuclear power plants do not emit heat-trapping gases, which might make them an attractive solution to climate change. But the wastes they do produce pose lethal hazards for future generations, and because their safety is often poorly regulated, there is a risk of catastrophic accidents.

Like large power plants that use oil and coal, as well as major pipelines and refineries, these facilities are vulnerable to terrorism and sabotage. Renewable energy facilities—such as windmills and solar panels—contain no radioactive, explosive, or flammable materials. And, since they are also decentralized, they are inherently less attractive targets.



Coal

Some have likened the public relations term “clean coal” to “safe cigarettes.” This term is applied to technologies intended to allow coal to burn with little pollution. But government reports show that these coal technologies have yet to prove effective. For example, the coal project at Fort Lonesome, Florida, deemed “the world’s most advanced” plant of its kind by the Energy Department in 1996, emits seven times more pollution than a similar-sized natural gas plant. The fact is, coal-burning power plants remain the single biggest source of industrial air pollution. We have better options.

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3

We Can Increase Energy Efficiency in Our Homes and Businesses

Like better technology for transportation and power generation, the technology for more efficient motors, appliances, windows, homes, and manufacturing processes is here today. These simple solutions save consumers money and can have an enormous impact on climate change at the same time. For instance, in the past two decades, energy-efficiency standards

for household appliances kept 53 million tons of heat-trapping gases out of the air each year.

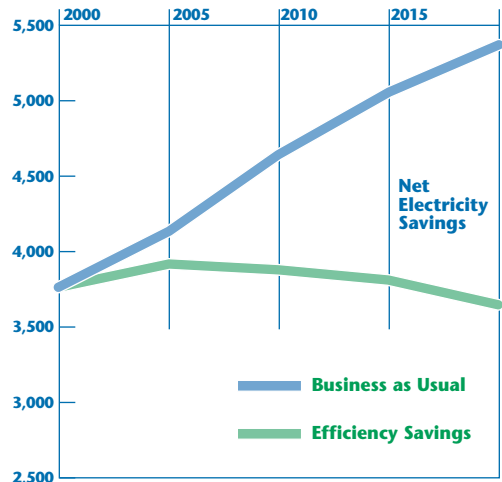
New or updated standards are now in place for many major appliances, including clothes washers, dishwashers, water heaters, furnaces, and boilers. Standards for air conditioners should be increased by 30 percent. Efficiency standards for commercial equipment like refrigerators, heaters, furnaces and public lighting also have significant room for improvement.

Many states and utilities have energy efficiency programs. They typically save consumers about \$2 in lower energy bills for every \$1 invested in efficiency. A federal matching fund created by a \$1 per household surcharge on monthly electric bills could provide over \$7 billion per year in funding for state energy efficiency and renewable energy programs.

...in the past two decades, energy-efficiency standards kept **53 million tons** of heat-trapping gases out of the air each year.

Net Electricity Savings from Common Sense Efficiency Policies

(in billion kilowatt-hours)





Source: Union of Concerned Scientists, 2001

 **Consumer Solution:**
Look for the Energy Star 

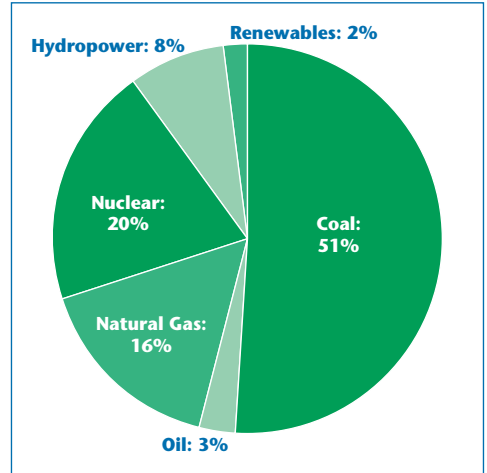
Star. When it comes time to replace appliances, look for the Energy Star label on new appliances. (Refrigerators, freezers, furnaces, air conditioners and water heaters use the most energy.) These items may cost a bit more initially, but the energy savings will pay back the extra investment within a couple years.

Household energy savings really can make a difference. If each household in the US replaced its existing appliances with the most efficient models available, we would save \$15 billion in energy costs and eliminate 175 million tons of heat-trapping gases.


 **Consumer Solution:**
Unplug a freezer. One of the quickest ways to reduce your global warming impact is to unplug the extra refrigerator or freezer you rarely use—except when you need it for holidays and parties. This can reduce the typical family's CO₂ gas emissions nearly 10 percent.

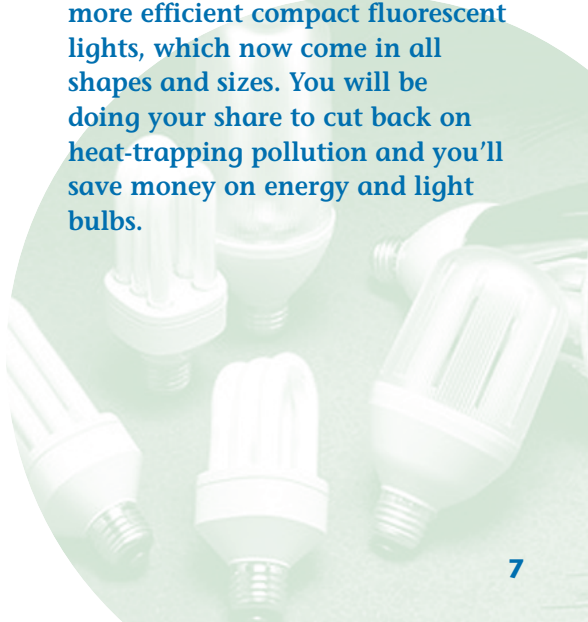
 **Consumer Solution:**
Home energy audits. Many utilities offer free home energy audits. Take advantage of this service. Simple measures, like installing a programmable thermostat to replace your old dial unit or sealing and insulating heating and cooling ducts, can each reduce a typical family's CO₂ emissions by about 5 percent.

US Electricity Generation (by Fuel)



Source: Energy Information Administration, 2000

 **Consumer Solution:**
Light bulbs matter. Lighting uses nearly one quarter of all the electricity in the United States, and much of this electricity is generated from polluting fossil fuel power plants. So replace your incandescent light bulbs with more efficient compact fluorescent lights, which now come in all shapes and sizes. You will be doing your share to cut back on heat-trapping pollution and you'll save money on energy and light bulbs.



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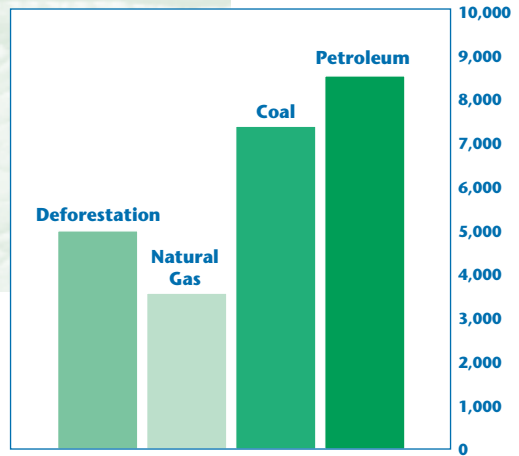
of all human-caused
CO₂ emissions each year.

We Must Protect Threatened Forests

In addition to sheltering more than half of the planet's species and providing benefits such as clean drinking water, forests play a critical role in climate change: they store carbon—the main ingredient of CO₂. When forests are burned, cleared, or otherwise degraded, their stored carbon is released into the atmosphere. Tropical deforestation now accounts for about 20 percent

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Comparison of Mean Annual Global Emissions from Deforestation (1989–1995) and Fossil Fuels (1990–1999)
(in million metric tons of CO₂)



Source: IPCC; US Department of Energy

Here in the United States, we should manage our forests in a way that helps our climate. For instance, the forests of the Pacific Northwest and Southeast could double their storage of carbon if timber managers lengthened the time between harvests and allowed older trees to remain standing. Looking beyond our borders, we should develop partnerships with developing countries to help them better conserve their forests. We should also set up a system that allows private companies to get credit for reducing carbon when they acquire and permanently set aside natural forests for conservation.



Consumer Solution:

When buying wood products, ask for labels indicating that the timber is sustainably harvested. The Forest Stewardship Council (FSC), for example, has established standards to determine whether forests are well-managed, with a minimum of impacts on biodiversity. Purchasing certified timber and wood products may make sense for the climate too. Forests that are well-managed are more likely to store carbon effectively because more trees are left standing and carbon-storing soils are less disturbed.



Consumer Solution:

You can also make a difference in your own backyard. Get a group in your neighborhood together and contact your local arborist or urban forester about planting trees on private property and public areas. In addition to storing carbon, trees planted in and around urban areas and residences can provide much-needed shade in the summer, reducing energy bills and fossil fuel use.



Tree Plantations

Clearing mature forests and replacing them with fast-growing younger trees is a mistake. To be sure, younger trees draw carbon out of the atmosphere more quickly. But cutting down mature forests releases large quantities of CO₂. And replacing natural forests with tree plantations destroys biodiversity—the web of life which many plants and animals depend on to survive.

We Must Support American Ingenuity

The Manhattan Project. The Apollo Program. The silicon chip. The Internet. Time and again, America has proven that putting together the best minds and the right resources can result in technological breakthroughs that change the course of human history.

Federal research money has already played an integral part in our progress in developing renewable energy sources and improving energy efficiency. In the past 20 years, the Department of Energy's efficiency initiatives have saved the country 5.5 quadrillion BTUs of energy and nearly \$30 billion in avoided energy costs. Federal research dollars have driven technological advances in fuel cells. This technology, which runs engines on hydrogen fuel and emits only water vapor, is key to moving our transportation system away from the polluting combustion engine and freeing the United States from its oil dependence.

Vigorous support for research and development is critical to achieving practical solutions. Yet today we invest far more in subsidies for the fossil fuel and nuclear industries than on R&D for renewable energy or advanced vehicle technologies. For instance, in 2001 Congress

appropriated \$736 million for fossil fuel and \$667 million for nuclear research, but only \$376 million for all renewable energy technologies combined. The President's Committee of Advisors on Science and Technology recommended we double spending on energy efficiency and renewable energy technologies. This is a good start. Vehicle research should also be increased and refocused on technologies and fuels that can deliver the greatest environmental gains.

In addition, we should continue to study storing carbon underground (geologic carbon sequestration) as a potentially viable way to reduce CO₂ released into the atmosphere. CO₂ could be captured at the power plant or other production unit and returned underground. While this technology holds some promise, it is still under development and its environmental impacts must be fully explored before it is widely implemented.

The fuel cell ... which runs engines on hydrogen fuel and emits only water vapor, is key to moving our transportation system away from the polluting combustion engine.

Common Sense Solutions for the Long Haul

The solutions outlined on the previous pages are among the highest priorities if we are to begin to reverse climate change. However, additional measures must play an important role in a long-term solution to climate change.

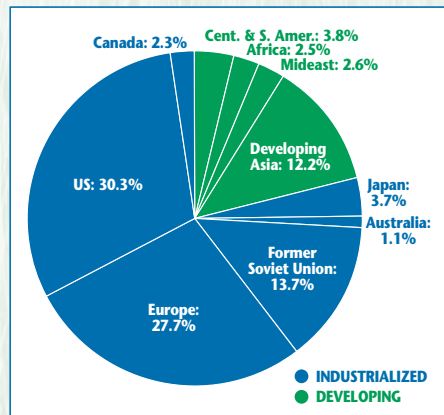
Reducing Other Heat-Trapping Gases. This guide focuses on reducing the primary heat-trapping gas, CO₂, dumped into our atmosphere. While reducing CO₂ emissions must remain our top priority, other gases contribute to climate change and should be addressed as well. Methane (CH₄) can be reduced through better practices in rice farming and cattle production. In addition, methane and other heat-trapping gases can be captured during mining, landfill, and oil exploration operations. CFC and other fluorocarbon emissions can be reduced by strictly enforcing the Montreal Protocol of 1988, an international treaty that calls for eliminating pollutants that deplete the ozone in the stratosphere.

Sustainable Farming. Soils store carbon just like trees. Sustainable farming practices can increase the carbon-storing organic matter in soil, and reduce or eliminate the use of nitrogen fertilizers that release heat-trapping gases into the atmosphere when they break down. In addition, “no-till” farming methods, which cause less soil disturbance and erosion, can further decrease the release of CO₂ and nitrous oxides (NO_x).

International Cooperation.

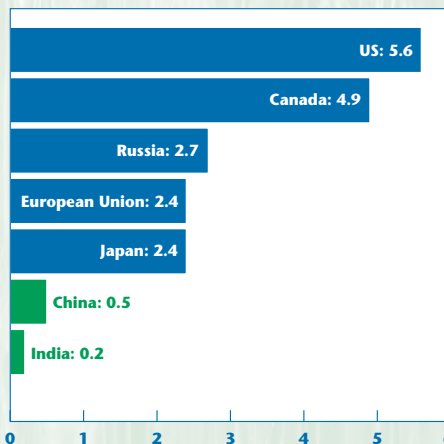
As the world’s foremost contributor of CO₂ emissions, the United States should lead international action on climate change. With only about 5 percent of the population, the United States now produces 25 percent of annual CO₂ emissions from fossil fuels—5.5 billion metric tons annually—and will remain the biggest source for years to come. During the past century, the United States, together with other industrialized countries such as Japan, Europe, the former Soviet Union, and Canada, has produced more than 60 percent of the CO₂ emissions that contribute to global warming.

Percent of Cumulative Global CO₂ Emissions From Industrial Sources, 1900–1999



Source: World Resources Institute, 2001

Per Capita CO₂ Emissions from Fossil Fuels (In tons of CO₂)



Source: World Resources Institute, 2001



Dumping in Our Oceans

Although a few government agencies and private-sector researchers are exploring the possibility of “fertilizing” our oceans with iron to enhance their natural capacity to absorb carbon, it is unwise to clean up our atmosphere at the expense of our oceans. This approach holds serious risks for marine animals and plants, disrupting the marine web of life.

Another form of marine sequestration, which involves injecting liquid carbon compounds into the deep ocean, is also being explored. Environmental consequences are not yet understood. We must fully evaluate its impacts before any widespread application.

While the United States has a clear-cut moral responsibility to lead the way internationally, we also have the financial and technical expertise that will help us reap the economic benefits of new markets for clean technology exports. If, however, we choose to sit on the sidelines as the rest of the world moves ahead, we will lose our competitive advantage to Europe and Japan.

The 1997 Kyoto Protocol is a good first step. As a responsible member of the world community, the United States must endorse the agreement, assume proactive leadership, and bring our enormous capability to solving the global warming problem.

JOIN US IN PROBLEM SOLVING

The Union of Concerned Scientists is dedicated to using sound science to guide the choices we make on the issue of climate change. We invite you to join with us in these efforts. Help us enact government policies that will bring practical solutions to consumers, providing you with choices that save money and increase the quality of life in your community.

Use this guide and our website at www.ucsusa.org to learn more about solutions to climate change, sign up for our action network, and support our work on climate change.

Climate Change 101

Our climate is changing because humans are adding large amounts of heat-trapping gases to the atmosphere. Our fossil fuel use is the main source of these gases. Every time we drive a car, use electricity from coal-fired power plants, or heat our homes with oil or natural gas, we release carbon dioxide (CO₂) and other heat-trapping gases. The second most important source of CO₂ is deforestation, mainly in the tropics, and other land-use changes. These gases act like a blanket, trapping heat and warming the Earth. The more of these gases we release, the thicker the blanket becomes.

How bad is the problem? Since pre-industrial times (about 1750), the atmospheric concentration of CO₂ has increased by 31 percent. Over the same period, atmospheric methane—another heat-trapping gas—has risen by 151 percent, mostly from agricultural activities like growing rice and raising cattle.

This heat-trapping blanket has warmed the Earth 1°F during the past century. This trend is rapidly increasing, according to the Intergovernmental Panel on Climate Change (IPCC), an international body of the world's leading climate experts. The IPCC concluded that average temperatures will likely increase 2.5° to 10.4°F by 2100 if heat-trapping emissions are not significantly reduced. But we don't have to look into the distant future for climate change. The year 1998 was the warmest year, of the warmest decade, of the last 1,000 years. Global warming is here now, and it's going to get worse if we do nothing.

Warmer temperatures are only part of the problem. Another highly likely consequence of global warming is rising sea level. As the temperature of water increases, it expands. Scientists predict sea level will rise 1 to nearly 3 feet over the next 100 years, putting low-lying areas and millions of people at risk. Coastal areas will be increasingly vulnerable to hurricanes and floods.

Other impacts of global warming will likely include

- * More extreme weather, including increasingly intense rainfall and drought
- * Disruption and degradation of critical habitats for many plants and animals, with an increase in the rate of extinctions
- * More coastal erosion, flooding during storms, and permanent submersion of low-lying coastal areas and islands
- * Heat waves and poor air quality, resulting in a greater risk of heat-related illness and death for vulnerable people like the elderly, the poor, and people with respiratory disease
- * Additional threats to human health—and additional health care costs—as mosquitoes and other disease-carrying insects and rodents spread diseases over larger geographical regions
- * Disruption of agriculture in some parts of the world due to increased temperature, water shortages, and sea-level rise in low-lying agricultural areas

The more temperatures increase, the more likely our climate will shift in substantial and unpredictable ways.

The heat-trapping gases blanketing the earth are already causing the climate to change. The good news is that the solutions described in this booklet can begin to slow climate change. It is important that we act responsibly and get started now.

However, we cannot reverse climate change overnight. While our primary goal must be to reduce the quantity of heat-trapping gases we release into our atmosphere, we must also take steps to limit the damage to our communities and sensitive ecosystems that will be caused by climate change in the coming decades.

Each year we do nothing to slow climate change, we will risk more irreversible damage to our environment and increase the bills for ourselves, our children and our grandchildren. From healthcare to treat heat-related illness to protection of our fresh water supply during droughts and increased energy costs as we blast our air conditioners for more days each summer—these costs are real and argue for action now.

Do we want to be responsible stewards of our environment and help slow global warming?

Our climate is changing because humans are adding large amounts of heat-trapping gases to the atmosphere. Practical solutions exist today to address this problem. If we get started now, we can avoid the worst outcomes—from devastating sea level rise that threatens coastal areas like Cape Cod and the Florida Keys, to more intense and longer droughts in California as well as more frequent and severe flooding along the Mississippi River. These changes will impact human lives and delicate ecosystems from coast to coast.

Read this booklet and visit
www.ucsusa.org
to learn how you can make
a difference.



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