The Carbon Boom

State and National Trends in Carbon Dioxide Emissions Since 1990

Environment Maryland Research & Policy Center · April 2007

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Environment Maryland Research & Policy Center
3121 St. Paul St., Suite 26
Baltimore, MD 21218
(410) 467-0439
www.environmentmaryland.org

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Executive Summary

The early effects of global warming are already evident across the United States and worldwide. The past nine years have all been among the 25 warmest for the contiguous United States, a streak unprecedented in the historical record. If emissions are left unchecked, temperatures will continue to rise, and the effects of global warming will become more severe. This report examines trends in U.S. global warming pollution nationally and by state and concludes that the failure to limit emissions nationwide has allowed global warming pollution to grow out of control.

In February 2007, the Intergovernmental Panel on Climate Change (IPCC), a United Nations body charged with assessing the scientific record on global warming, found that the evidence of global warming is "unequivocal" and concluded, with more than 90 percent certainty, that human activities are responsible for most of the observed rise in global average temperatures since the mid-20th century. If current trends in emissions continue, the IPCC projects that temperatures will increase anywhere from an additional 1.1° to 6.4°C (2° to 11.5°F). The consequences of this increase in global temperatures will vary from place to place but will include sea level rise, heat waves, drought, increasingly intense tropical storms, loss of plant and animal species, decreased crop yields, decreased water availability, and the spread of infectious diseases.

The United States is the largest worldwide contributor to global warming, releasing almost a quarter of the world's carbon dioxide, the primary global warming pollutant. Power plants, cars, and light trucks are the largest U.S. sources of carbon dioxide.

Existing technology could substantially reduce global warming pollution by making power plants and factories more efficient, making cars go farther on a gallon of gasoline, and shifting the country to clean, renewable energy sources, such as wind and solar power. Unfortunately, the U.S. government so far has rejected mandatory limits on global warming pollution, allowing carbon dioxide emissions to rise unabated.

Using the most recent state fossil fuel consumption data from the Department of Energy, this report examines trends in carbon dioxide emissions nationally and by state for the 15 years spanning 1990 to 2004. Our major findings include the following:

Carbon dioxide pollution is on the rise.

- Carbon dioxide pollution from fossil fuel consumption is on the rise in the United States, increasing by 18 percent between 1990 and 2004.

- Electric power plants and the transportation sector—particularly cars and light trucks—drove the increase in emissions nationwide. Between 1990 and 2004, U.S. carbon dioxide emissions from the electric power sector jumped by 28 percent and from the transportation sector by almost a quarter (23 percent).

- Carbon dioxide emissions increased the most in the Southeast, Great Lakes/Midwest, and Gulf South regions over the 15 year period. The states experiencing the largest absolute increases in carbon dioxide emissions between 1990 and 2004 are Texas, Florida, Illinois, North Carolina, and Georgia.

The electric power sector was the primary factor driving the increase in U.S. carbon dioxide emissions between 1990 and 2004.

- The electric power sector accounted for more than half (55 percent) of the U.S. emissions increase. Rising electricity demand from residential, commercial and industrial consumers spurred this rapid increase in carbon dioxide emissions from the electric power sector.

- Coal-fired power plants accounted for most of the increase in carbon dioxide emissions from the electric power sector. Between 1990 and 2004, U.S. carbon dioxide emissions from coal-fired power plants increased by a quarter, accounting for three-fourths of the emissions increase in the electric power sector and 42 percent of the nation's overall increase in carbon dioxide emissions.

- The states that experienced the largest absolute increases in carbon dioxide emissions from coal-fired power plants between 1990 and 2004 are Illinois, Texas, Missouri, North Carolina, and Indiana.

- Between 1990 and 2004, U.S. carbon dioxide emissions from natural gas consumption in the electric power sector increased by more than two thirds (almost 70 percent), accounting for 13 percent of the nation's overall increase in carbon dioxide emissions.

- The states that experienced the largest absolute increases in carbon dioxide emissions from natural gas-fired power plants between 1990 and 2004 are Florida, Texas, Arizona, California, and Nevada.

The transportation sector also played a major role in driving up U.S. carbon dioxide emissions between 1990 and 2004.

- The transportation sector accounted for 40 percent of the nation's overall increase in carbon dioxide emissions during this time period.

- Cars and light trucks were responsible for most of the increase in carbon dioxide emissions from the transportation sector. Between 1990 and 2004, carbon dioxide emissions from motor gasoline consumption increased by almost a quarter (22 percent), accounting for more than half of the emissions increase in the transportation sector.

- The states with the largest absolute increases in carbon dioxide emissions from motor gasoline consumption between 1990 and 2004 include Texas, Florida, California, Georgia, and Arizona.

The longer we wait to reduce global warming pollution, the harder the task will be in the future. Many U.S. states have started taking important steps to cut global warming pollution within their borders, but the global warming problem also demands a national solution. Key components of an action plan to cut global warming pollution include:

- Establishing mandatory, science-based limits on global warming pollution that reduce emissions from today's levels by the end of the decade, by at least 15-20 percent by 2020, and by at least 80 percent by 2050.

- Reducing our dependence on fossil fuels by making our homes and businesses more energy efficient, making our cars and SUVs go farther on a gallon of gasoline, and generating more electricity from renewable energy sources.

Introduction

Science is clear that the world faces dramatic consequences if we fail to rein in global warming pollution from the burning of fossil fuels. Science is also clear that what we do now to reduce emissions can make a difference – not in stopping global warming entirely but in avoiding the worst consequences of a warming world.

As dire as the predictions of a warmer world are, the good news is that we have technology at our disposal now to begin making significant cuts in global warming pollution. Automakers have technologies on the shelf to make cars that go much farther on a gallon of gasoline. America has the know-how to build houses, office buildings, and factories that use much less energy. And we know how to generate electricity from the sun, wind, and other natural forces.

The states are beginning to put real muscle behind policies designed to curb global warming pollution. California, which emitted more carbon dioxide in 2004 than all but a dozen countries worldwide,[1] enacted the first-ever statewide cap on global warming pollution and has committed to reduce its global warming emissions by 80 percent below 1990 levels by 2050. California and other nine states have adopted limits on carbon dioxide emissions from cars and light trucks. In 2005, seven New England states formed the Regional Greenhouse Gas Initiative to cap global warming emissions from the region's power plants at current levels and reduce them by 10 percent by 2019; another three states have committed to join the program. More than 20 states and Washington, DC have committed to obtaining more of their electricity from wind, solar, and other clean, renewable sources. In addition, several states and regions have adopted, or are considering adopting, long-term goals for reducing global warming pollution.

Momentum also is building at the federal level to take serious action to cut global warming pollution and move toward a cleaner energy future. Fresh from his Academy Awards victory for *An Inconvenient Truth*, former Vice President Al Gore, in testimony before Congress in March 2007, called for immediately freezing emissions of carbon dioxide and cutting emissions by 90 percent by 2050.[2] Several members of Congress and scientists have issued similar calls to action.[3]

Despite the leadership of the states and a renewed public focus on global warming, we face significant challenges moving forward. The Bush administration has been a staunch opponent of mandatory limits on global warming pollution, domestically and internationally. Many large corporations continue to fight mandatory limits and other common sense clean energy solutions. Utilities and power generators also are proposing to build a vast new fleet of coal-fired power plants across America. If even a fraction of the proposed number is built, it will become far more difficult to achieve reductions in global warming pollution on the scale necessary to avoid the worst effects of global warming.

This report shows that U.S. emissions of carbon dioxide have increased steadily since 1990. Until the U.S. government enacts science-based, mandatory limits on global warming pollution and moves us toward a cleaner energy future, emissions will continue to climb, increasing the likelihood that future generations will live with serious – and potentially devastating – impacts of global warming.

Temperatures Rising: The Consequences of Global Warming

In February 2007, the Intergovernmental Panel on Climate Change (IPCC), a United Nations body charged with assessing the scientific record on global warming, found that the evidence of global warming is "unequivocal" and concluded, with more than 90 percent certainty, that human activities are responsible for most of the observed increase in global average temperatures since the mid-20th century.[4]

Water vapor, carbon dioxide, and other gases in the atmosphere trap some of the sun's radiation close to the earth's surface, warming the planet enough for life to flourish. Without these gases, the earth would be too cold for life to survive. In the last 150 years, however, human activities – primarily the burning of fossil fuels – have substantially increased the concentration of these gases in the atmosphere. As a result, more of the sun's heat is being trapped close to the earth's surface, causing global average surface temperatures to rise. Since 1750, the concentration of carbon dioxide in the atmosphere has increased by 35 percent. Concentrations of other global warming gases have increased as well.[5]

Early Signs of Global Warming

According to the IPCC, global average surface temperatures increased by more than 1.4°F (0.8°C) since the second half of the 19th century.[6] Since 1975, temperatures have been increasing at a faster rate of about 0.36°F per decade.[7] The past nine years have all been among the 25 warmest years on record for the contiguous United States, an unprecedented streak in the historical record.[8] Globally, 11 of the last 12 years (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature.[9] The December 2006-February 2007 winter season was the warmest on record globally,[10] and 2006 was the warmest year on record for the contiguous United States.[11]

The early effects of global warming are evident across the United States and worldwide.

- In September 2006, University of Colorado-Boulder researchers found that between April 2004 and April 2006, the Greenland ice sheet, the Earth's second-largest reservoir of fresh water, lost ice mass at about two and a half times the rate of the previous two-year period.[12]

- Warmer oceans may be contributing to more severe hurricanes. A September 2006 study and others have shown that global warming is the primary cause of rising sea surface temperatures in the Atlantic and Pacific Ocean hurricane formation regions.[13] According to a study by the National Center for Atmospheric Research, global warming contributed to the devastating 2005 hurricane season,

causing about half of the extra hurricane-fueling warmth in the waters of the North Atlantic in 2005.[14]

- In the western United States, snowpack has declined over the last 50 years, threatening the region's scarce water supplies.[15]

- The World Health Organization estimates that global warming already claims the lives of 150,000 people each year.[16]

Consequences of Increased Warming

As temperatures continue to rise, the effects of global warming will become more severe. According to the IPCC, if historical trends in emissions continue, temperatures could rise by an additional 1.1° to 6.4°C (2° to 11.5°F).[17] Many scientists and policy-makers (such as the European Union) recognize a 2°C (3.6°F) increase in global average temperatures over pre-industrial levels as a rough limit beyond which large-scale, dangerous impacts of global warming would become unavoidable.[18] Even below a 2°C increase, significant impacts from global warming are likely, such as damage to many ecosystems, decreases in crop yields, sea level rise, and the widespread loss of coral reefs.[19]

Beyond 2°C, however, the impacts of global warming could become much more severe, including eventual loss of the Greenland ice sheet, triggering a sea-level rise of seven meters over the next millennium (and possibly much faster)[20] and displacing millions of people.[21] At temperature increases of 3°C to 4°C, far more dramatic shifts could take place, including a potential shutdown of the thermohaline circulation, which carries warmth from the tropics to Europe; melting of the West Antarctic ice sheet, triggering an additional five to six meter rise in sea level; major crop failures in many parts of the world; and extreme disruptions to ecosystems.[22]

Global Warming Pollution in the United States

Sources of Carbon Dioxide

Burning fossil fuels – coal, oil, and natural gas – produces the majority of U.S. global warming pollution. Carbon dioxide (CO_2) emissions comprised 84 percent of U.S. global warming emissions in 2005 (Figure A). Other global warming pollutants include methane, nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).[23]

Power plants are the nation's largest source of carbon dioxide emissions from energy consumption, contributing 40 percent of emissions from energy sources in 2005 (Figure B). Passenger vehicles are the next largest source, contributing 20 percent of emissions. Other transportation sources contribute an additional 13 percent of emissions. The remaining 27 percent of U.S. carbon dioxide emissions from energy sources comes from the direct consumption of fossil fuels in the commercial, industrial, and residential sectors.[24]

Figure A. U.S. Global Warming Emissions, 2005[25]

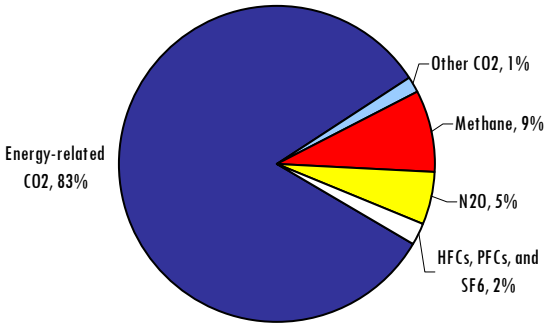
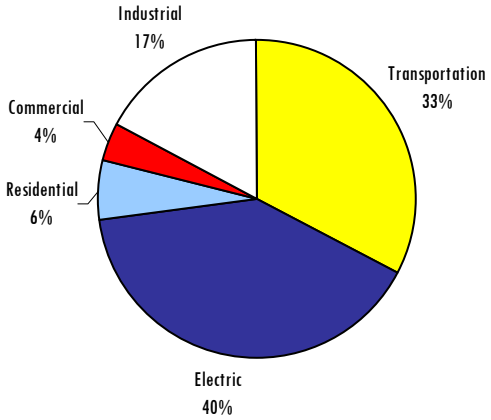


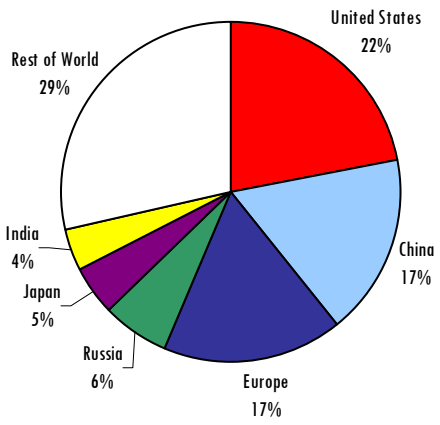
Figure B. Sources of U.S. Carbon Dioxide Emissions from Energy Consumption, 2005[26]



The United States Emits the Most Carbon Dioxide

The United States is the largest global contributor of carbon dioxide emissions, releasing 22 percent of the world's total carbon dioxide emissions in 2004 – more than China and India combined or all of Europe (Figure C).[27] On a per-capita basis, the United States emits twice as much carbon dioxide as the United Kingdom or Japan, more than five times as much as China, and 19 times as much as India.[28]

Figure C. Energy-Related Carbon Dioxide Emissions by Country, 2004[29]



Since World War II, U.S. carbon dioxide emissions from energy use have increased at a rate of just under two percent per year.[30] The U.S. Energy Information Administration (EIA) projects that U.S. emissions will continue to rise by an average of 1.2 percent per year between now and 2030. Should this occur, in 2030 the United States will release 37 percent more carbon dioxide than it does today.[31] Such an increase in emissions would make it impossible for the world to achieve the emission reductions needed to prevent the worst repercussions of global warming, since at least one-fourth of carbon dioxide emissions from burning fossil fuels remains in the atmosphere for more than 500 years.[32]

U.S. Action to Curb Global Warming Pollution

The U.S. Government Has Failed to Act

Because carbon dioxide emissions from burning fossil fuels can persist in the atmosphere for hundreds of years, the decisions we make today will have ramifications for generations. Leading scientists now indicate that we only have a narrow window of time left – possibly a decade – to reduce emissions below today's levels and start the process of stabilizing concentrations of global warming gases at a level that averts devastating and irreversible impacts.[33] In a December 2005 speech, James Hansen, director of NASA's Goddard Institute for Space Studies, stated, "The Earth's climate is nearing, but has not passed, a tipping point, beyond which it will be impossible to avoid climate change with far ranging undesirable consequences." These consequences, he said, would "constitute practically a different planet."[34]

Despite the urgency to act, the Bush administration has so far rejected mandatory limits on global warming emissions and has pursued an energy policy that commits the United States to an even greater reliance on fossil fuels. The Bush administration's policy on global warming is to allow global warming emissions to continue to increase while committing only to cut the country's "greenhouse gas intensity"—how much we emit per unit of economic activity.[35]

States Take Action to Cut Global Warming Pollution

In the absence of federal leadership, states across the country have taken action to reduce their global warming emissions. These state policies not only will cut global warming pollution but could provide momentum for action at the federal level. For example, key actions include:

- In September 2006, California Governor Arnold Schwarzenegger signed into law the Global Warming Solutions Act (AB 32), the first-ever statewide cap on global warming pollution. The law will reduce annual global warming emissions in California by 25 percent by 2020 (equivalent to 1990 levels). Governor Schwarzenegger has further committed the state to reduce its global warming emissions by 80 percent below 1990 levels by 2050.[36]

- In September 2006, California Governor Schwarzenegger also signed into law a bill (SB 1368) requiring the California Energy Commission to establish a global warming emissions standard for electricity used in California, whether it is generated in-state or imported from power plants in other states. The standard will require that new long-term investments in power generation come from facilities with emissions as low as, or lower than, emissions from a clean and efficient natural gas power plant.[37]

- In 2005, the governors of Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont agreed to the Regional Greenhouse Gas Initiative (RGGI) to cap global warming emissions from the region's power plants at current levels and reduce them by 10 percent by 2019. Former Maryland Governor Robert Ehrlich signed legislation requiring the state to join RGGI by June 2007; Massachusetts Governor Deval Patrick signed on in February 2007; and Rhode Island Governor Donald Carcieri announced in his 2007 State of the State address that Rhode Island will join RGGI as well. The RGGI states recently finalized a model rule to implement the program, and each of the RGGI states will put the rule in place in 2007. [38]

- In February 2007, the governors of Arizona, California, New Mexico, Oregon, and Washington announced the Western Climate Action Initiative. Within six months, the governors will set a regional global warming emissions-reduction goal; within 18 months, they will develop "a design for a regional market-based multi-sector mechanism, such as a load-based cap-and-trade program" to achieve the emissions-reduction goal.[39]

- Nine states—Connecticut, Maine, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont and Washington—have adopted California's clean cars program, which limits carbon dioxide emissions from cars and light trucks. The Maryland State Senate and House of Delegates have passed legislation—which the governor has pledged to sign—to opt in as well. Beginning in model year 2009, California's program will require automakers to reduce the average amount of global warming pollution from their cars, light trucks and SUVs. By 2015, new cars will be required to emit 34 percent and light trucks 25 percent less global warming pollution on average.[40]

- More than 20 states and Washington, DC have committed to obtain a growing portion of their electricity from wind, solar, and other clean, renewable sources. These state renewable electricity standards will reduce total annual carbon dioxide emissions by 105 million metric tons by 2020—the equivalent of taking 17.1 million cars off the road.[41]

In addition, several states have adopted, or are considering adopting, long-term goals for reducing global warming emissions. For example:

- In February 2007, New Jersey Governor John Corzine established a statewide goal to reduce global warming emissions to 1990 levels by 2020 and to 80 percent below 2006 levels by 2050.[42]

- In February 2007, Illinois Governor Rod Blagojevich announced a statewide goal to reduce global warming emissions to 1990 levels by 2020 and to 60 percent below 1990 levels by 2050.[43]

- In February 2007, Washington Governor Christine Gregoire established a statewide goal to reduce global warming emissions to 1990 levels by 2020, 25 percent below 1990 levels by 2035, and 50 percent below 1990 levels by 2050.[44]

- In 2006, Arizona established a statewide goal to reduce global warming emissions to 2000 levels by 2020 and to 50 percent below 2000 levels by 2040.[45]

- In 2005, Oregon established a statewide goal to reduce global warming emissions to 10 percent below 1990 levels by 2020

and 75 percent below 1990 levels by 2050.[46]

- In 2005, New Mexico established a statewide goal to reduce global warming emissions to 2000 levels by 2012, 10 percent below 2000 levels by 2020, and 75 percent below 2000 levels by 2050. In October 2006, Governor Richardson unveiled a roadmap for achieving the 2020 goal.[47]

- In 2001, the New England Governors and Eastern Canadian Premiers established a regional goal to reduce global warming emissions to 1990 levels by 2010, at least 10 percent below 1990 levels by 2020, and by 75-85 percent in the long term.[48]

Despite these state actions, the lack of a national strategy has allowed and will continue to allow U.S. carbon dioxide emissions to rise, as examined in detail in the pages that follow.

Report Findings: Global Warming Pollution on the Rise

This report examines trends in carbon dioxide emissions from fossil fuel use for the 15 years spanning 1990 to 2004.[a] The international community uses 1990 as its emissions baseline from which all emission reduction targets are calculated. Using the most recent state fossil fuel consumption data from the U.S. Energy Information Administration (EIA), we estimated U.S. carbon dioxide emissions from fossil fuel consumption nationally and by state, economic sector, and fuel source.

Emissions are attributed to the state where fossil fuels were burned; as such, the data do not take into account that some states generate little electricity within their borders and import much from neighboring states' power plants. Emissions from those power plants are attributed to the states in which they are located, rather than the states that consumed the power.

Our key findings include:

- Carbon dioxide pollution is on the rise in the United States, increasing by 18 percent between 1990 and 2004.

- The electric power sector was responsible for more than half (55 percent) of the U.S. emissions increase during this time period. Coal-fired power plants drove the increase in carbon dioxide emissions from the electric power sector.

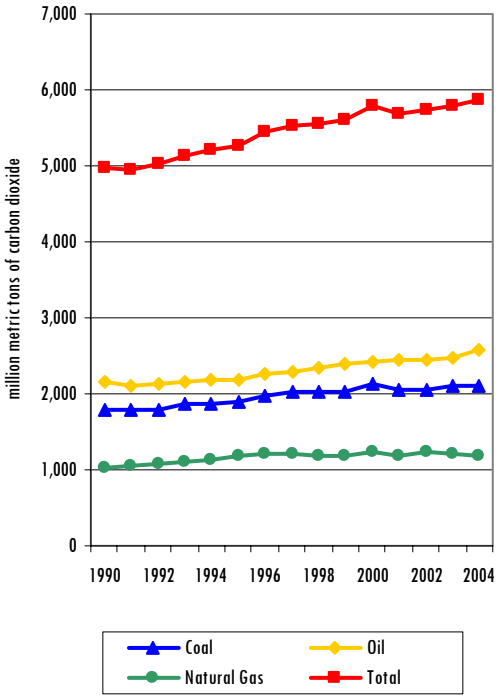
- The transportation sector also was a significant factor in rising U.S. carbon dioxide emissions, accounting for 40 percent of the increase in U.S. emissions between 1990 and 2004. Rising carbon dioxide emissions from cars and light trucks drove the increase in transportation sector emissions.

[a] The carbon dioxide emission estimates included in this report include consumption of fossil fuels for energy use as well as non-fuel uses of fossil fuels (for example, consumption of natural gas in fertilizer manufacturing). The estimates also include energy consumed by airplanes and ships in international travel (international "bunker fuels"). The estimates do not include carbon dioxide emissions from natural gas flaring, emissions from geothermal energy use, emissions from U.S. territories, and emissions not related to fossil fuel consumption (for example, some industrial process emissions and carbon dioxide fluxes from soils). Those comparing emission estimates in this document with those in other published sources should be aware of these differences. For more information, please see "Methodology."

CARBON DIOXIDE POLLUTION IS ON THE RISE

Between 1990 and 2004, U.S. carbon dioxide emissions from fossil fuel consumption increased by 18 percent, from 4.98 billion metric tons of carbon dioxide to 5.87 billion metric tons.[b] During this time period, carbon dioxide emissions from coal consumption increased by more than 17 percent, oil consumption by almost 20 percent, and natural gas consumption by almost 16 percent (Figure D). Oil is used primarily in the transportation sector; the vast majority of coal is used to generate electricity; and natural gas is used mainly for heating and powering our homes and businesses and in industry.

Figure D. U.S. Emissions of Carbon Dioxide from Fossil Fuel Consumption, Total and by Fuel Source, 1990-2004



[b] Our national numbers are based on the sum of the 50 states and Washington, DC. Refer to the methodology for a detailed description of what this sum does and does not include.

WHAT'S IN A SECTOR?

Commercial Sector: The commercial sector consists of service-providing facilities and equipment belonging to businesses; federal, state, and local governments, including institutional living quarters and sewage treatment facilities; and other private and public organizations, such as religious, social, or fraternal groups. This sector uses energy primarily for space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment.

Electric Power Sector: The electric power sector consists of electricity only and combined heat and power plants with the primary purpose of selling electricity, or electricity and heat, to the public.

Industrial Sector: The industrial sector consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector includes manufacturing; agriculture, forestry, fishing and hunting; mining, including oil and gas extraction; and construction. Energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. The industrial sector also uses fossil fuels as raw material inputs.

Residential Sector: The residential sector consists of living quarters for private households. This sector uses energy primarily for space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances.

Transportation Sector: The transportation sector consists of all vehicles with the primary purpose of transporting people and/or goods from one physical location to another, including automobiles, trucks, buses, motorcycles, trains and other rail vehicles, aircraft, and ships, barges, and other waterborne vehicles. Vehicles with a primary purpose not related to transportation, such as construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts, fall in the sector of their primary use.

Source: Energy Information Administration

The electric power and transportation sectors drove the increase in carbon dioxide emissions nationwide.[c] Between 1990 and 2004, U.S. carbon dioxide emissions from the electric power sector jumped by 28 percent and from the transportation sector by almost a quarter (23 percent), as shown in Table 1.

Regionally, carbon dioxide emissions grew the most in the Southeast over the 15 year period, with emissions increasing by 183 million metric tons (31 percent). In the Great Lakes/Midwest and Gulf South states, carbon dioxide emissions increased by 171 million metric tons and 146 million metric tons, respectively, a 16 percent increase in both regions (Table 2).

Texas emitted more carbon dioxide than any other state in 2004 (Table 3). Texas also experienced the greatest absolute increase in emissions between 1990 and 2004. In 1990, Texas emitted 560.5 million metric tons of carbon dioxide; by 2004, the state's emissions had grown to 659 million metric tons of carbon dioxide (Table 4).

In addition to Texas, the states that experienced the largest absolute increases in carbon dioxide emissions between 1990 and 2004 are Florida, Illinois, North Carolina, Georgia, Missouri, Arizona, Indiana, Virginia, and Alabama (Figure E).

Table 1. Trends in Carbon Dioxide (CO_2) Emissions, by Sector, 1990-2004

Sector	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
Commercial	223.6	232.7	9.1	4%
Electric	1,808.3	2,312.2	504.0	28%
Industrial	1,045.5	1,033.7	-11.8	-1%
Residential	339.5	369.4	29.9	9%
Transportation	1,561.8	1,924.6	362.8	23%
Total	**4,978.8**	**5,872.7**	**893.9**	**18%**

Table 2. Regional Trends in Carbon Dioxide (CO_2) Emissions, 1990-2004[d]

Region	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
Southeast	600.3	783.5	183.2	31%
Great Lakes/ Midwest	1,101.2	1,272.3	171.1	16%
Gulf South	929.0	1,074.8	145.8	16%
Mountain West	359.7	471.2	111.5	31%
Mid-Atlantic	664.0	766.2	102.2	15%
Plains	321.4	398.3	77.0	24%
Pacific West	513.6	578.4	64.8	13%
Northeast	489.6	527.9	38.3	8%
National	**4,978.8**	**5,872.7**	**893.9**	**18%**

Table 3. Top 10 States for Carbon Dioxide (CO_2) Emissions, 2004

Rank	State	2004 CO_2 Emissions (mmt)
1	TX	659.0
2	CA	385.4
3	PA	276.6
4	OH	261.8
5	FL	255.4
6	IN	236.2
7	IL	233.8
8	NY	212.8
9	LA	190.0
10	MI	185.8

[c] It is important to note that there are two ways to account for emissions caused by electric power plants. One way is to allocate emissions to the power plants themselves. Another way is to split those emissions among the economic sectors that consume electricity – primarily the commercial, residential, and industrial sectors. In this report, we assign emissions to the power plants themselves. The 28 percent increase in carbon dioxide emissions from power plants would not have occurred without increases in demand from residential, commercial, and industrial consumers.

[d] **Great Lakes/Midwest:** Illinois, Indiana, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin; **Gulf South:** Arkansas, Louisiana, Mississippi, Oklahoma, and Texas; **Mid-Atlantic:** Delaware, District of Columbia, Maryland, North Carolina, Pennsylvania, Virginia, and West Virginia; **Mountain West:** Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming; **Northeast:** Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont; **Pacific West:** Alaska, California, Hawaii, Oregon, and Washington; **Plains:** Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota; and **Southeast:** Alabama, Florida, Georgia, South Carolina, and Tennessee.

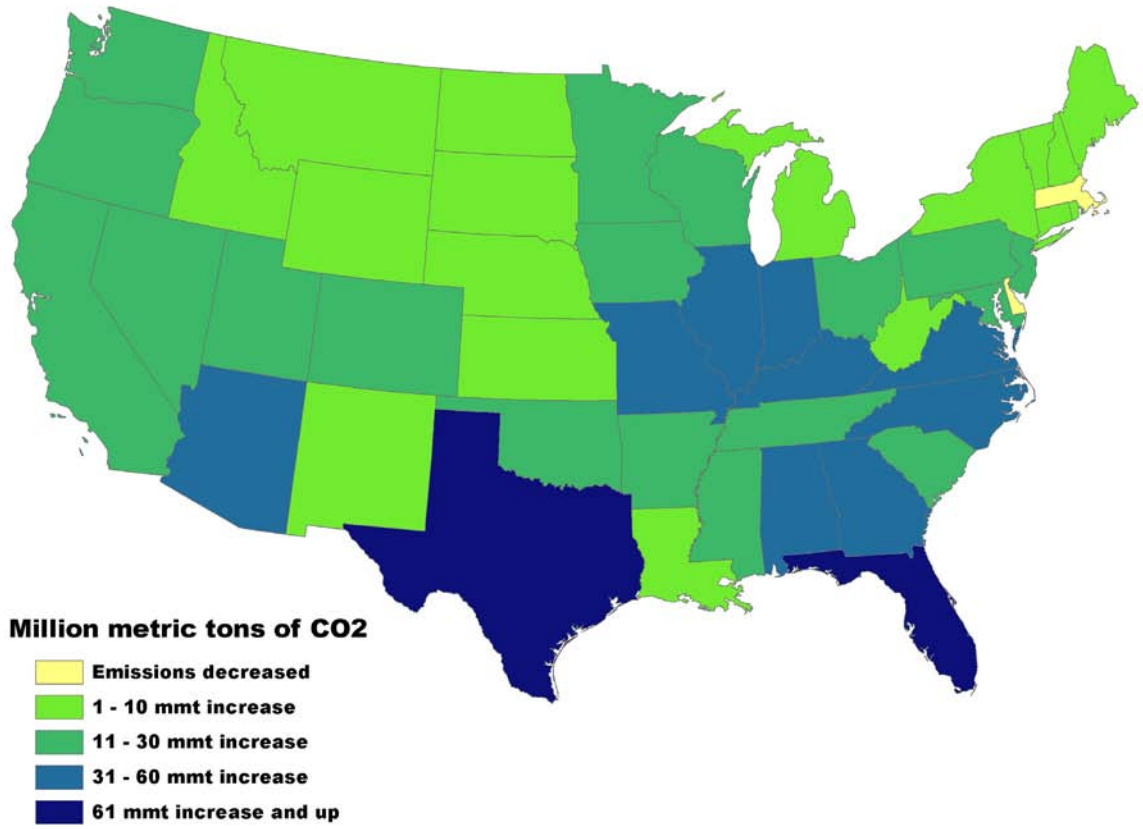
Table 4. Top 10 States for Absolute Increases in Carbon Dioxide (CO_2) Emissions, 1990-2004

Rank	State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
1	TX	560.5	659.0	98.5	18%
2	FL	186.9	255.4	68.5	37%
3	IL	191.9	233.8	41.9	22%
4	NC	110.0	149.2	39.2	36%
5	GA	138.0	173.7	35.7	26%
6	MO	102.6	137.9	35.3	34%
7	AZ	62.4	95.9	33.5	54%
8	IN	203.9	236.2	32.2	16%
9	VA	94.3	126.4	32.1	34%
10	AL	109.4	141.2	31.8	29%

The regional story changes slightly when we look at carbon dioxide emissions between 2000 (a peak year before emissions declined slightly in 2001) and 2004. The Southeast still comes out on top for the largest absolute increase in carbon dioxide emissions, rising by more than 29 million metric tons over this five year period, or four percent. But the Mountain West and Pacific West also experienced significant increases in carbon dioxide emissions, jumping by 25 million metric tons (six percent) and 20 million metric tons (almost four percent), respectively. In the Mountain West, the transportation and electric power sectors drove this increase. In the Pacific West, however, it was the transportation sector and industrial sector—not the electric power sector—that pushed up carbon dioxide emissions.

Appendix A shows trends in carbon dioxide emissions for each state from 1990 to 2004.

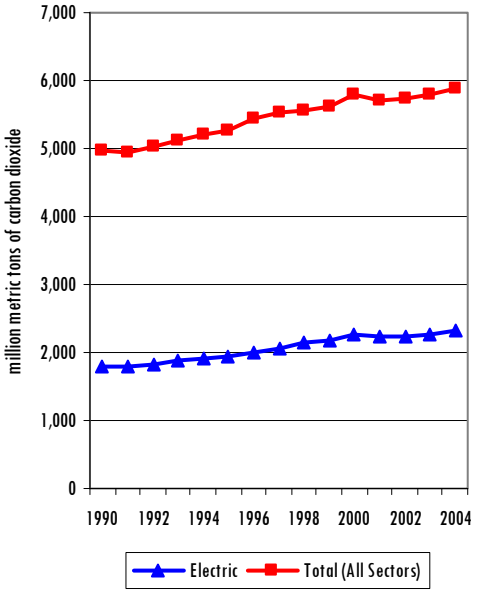
Figure E. State Trends in Rising Carbon Dioxide Emissions, 1990-2004



The Electric Power Sector Accounted for More than Half of the Increase in U.S. Carbon Dioxide Emissions

Between 1990 and 2004, U.S. carbon dioxide emissions from the electric power sector jumped by more than a quarter (28 percent), from 1.8 billion metric tons in 1990 to 2.3 billion metric tons in 2004 (Figure F). Overall, the electric power sector was responsible for more than half (55 percent) of the nation's increase in carbon dioxide emissions between 1990 and 2004.[e]

Figure F. Trends in Carbon Dioxide Emissions from the Electric Power Sector, 1990-2004



The electric power sector releases carbon dioxide primarily by burning coal and natural gas. Emissions from coal- and natural gas-burning power plants increased between 1990 and 2004, helping to drive up U.S. carbon dioxide emissions nationwide.

- Coal-Fired Power Plants -

Coal has the highest carbon content of any fossil fuel per unit of energy, meaning that burning coal for electricity produces more carbon per unit of energy than does burning oil or natural gas, which contain about 25 percent and 45 percent less carbon than coal, respectively.[49] While coal-fired power plants produced 51 percent of U.S. electricity in 2004,[50] they emitted 83 percent of carbon dioxide emissions from electricity generation.[51]

Nearly all of the coal burned in the United States fuels coal-fired power plants. The electric power sector accounted for almost all (91 percent) of the U.S. carbon dioxide emissions from coal consumption in 2004. As such, coal-fired power plants played a key role in driving up carbon dioxide emissions nationwide. Between 1990 and 2004, U.S. carbon dioxide emissions from coal-fired power plants increased by a quarter (25 percent), from more than 1.5 billion metric tons in 1990 to more than 1.9 billion metric tons in 2004 (Figure G). Coal-fired power plants accounted for three-fourths of the carbon dioxide emissions increase in the electric power sector and 42 percent of the nation's overall increase in carbon dioxide emissions between 1990 and 2004.

[e] Again, the commercial, industrial, and residential sectors consume the power generated by the electricity sector, but carbon dioxide produced from this electricity generation is attributed to the electric power sector, not the sectors of end use. The increase in carbon dioxide emissions from the electric power sector would not have occurred without growing demand from residential, commercial, and industrial consumers.

Figure G. Trends in Carbon Dioxide Emissions from Coal-Fired Power Plants, 1990-2004

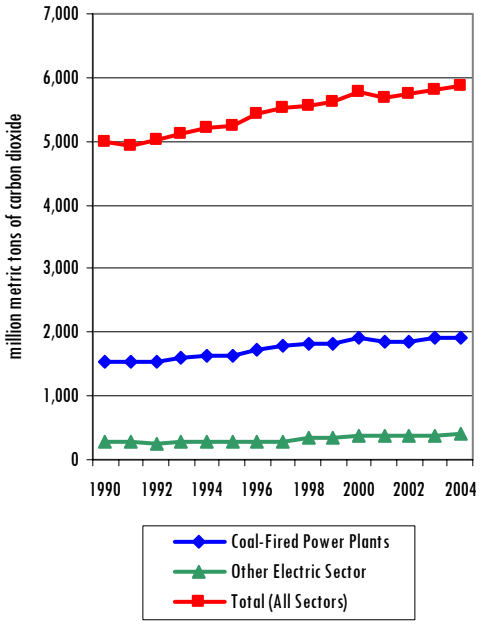
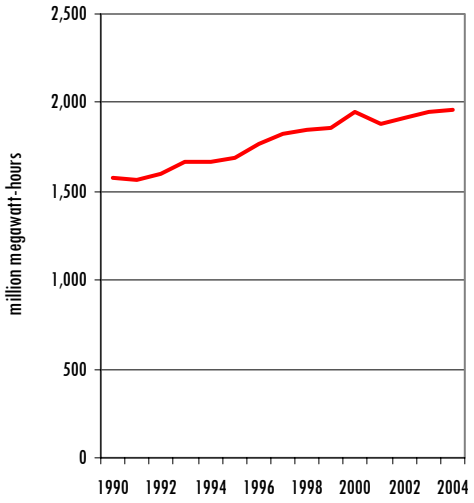


Figure H. Net Electricity Generation from Coal, 1990-2004



This increase in carbon dioxide emissions from coal-fired power plants has outpaced the increase in new coal-fired generating capacity in the United States. Between 1990 and 2005, coal-fired power plant operating capacity increased by more than 12,000 megawatts (MW), or four percent,[52] while carbon dioxide emissions from coal-fired power plants increased by a quarter. That said, net electricity generation from coal increased by almost a quarter (24 percent) between 1990 and 2004, suggesting that existing coal-fired power plants operated at a higher capacity over time to meet rising demand (Figure H).[53]

The Great Lakes/Midwest region (Illinois, Indiana, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin) experienced the most dramatic increase in carbon dioxide emissions from coal-fired power plants, rising from 450 million metric tons in 1990 to 556 million metric tons in 2004, an increase of 23 percent. Carbon dioxide emissions from coal-fired power plants also increased significantly in the Mid-Atlantic and Southeast regions, rising by a quarter in each region (Table 5).

Table 5. Regional Trends in Carbon Dioxide (CO_2) Emissions from Coal-Fired Power Plants, 1990-2004[f]

Region	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
Great Lakes/ Midwest	450.4	556.1	105.7	23%
Mid-Atlantic	263.9	329.2	65.2	25%
Southeast	238.0	298.4	60.4	25%
Plains	141.4	198.4	57.0	40%
Gulf South	191.7	245.9	54.2	28%
Mountain West	186.4	217.8	31.4	17%
Pacific West	11.0	18.1	7.1	65%
Northeast	48.7	51.0	2.3	5%
National	**1,531.6**	**1,914.9**	**383.3**	**25%**

Texas' coal-fired power plants released the most carbon dioxide in 2004 (Table 6), but Illinois ranked highest for the largest absolute increase in carbon dioxide emissions from coal-fired power plants between 1990 and 2004. In 1990, Illinois's coal-fired power plants emitted almost 56 million metric tons of carbon dioxide; by 2004, the state's emissions from coal-fired power plants had grown to more than 91 million metric tons, an increase of 64 percent (Table 7). In addition

[f] See note 'd' for a list of the states in each region.

to Illinois, the states that experienced the largest absolute increases in carbon dioxide emissions from coal-fired power plants between 1990 and 2004 are Texas, Missouri, North Carolina, Indiana, Alabama, Kentucky, South Carolina, Virginia, and Georgia (Figure I).

Table 6. Top 10 States for Carbon Dioxide (CO_2) Emissions from Coal-Fired Power Plants, 2004

Rank	State	2004 CO_2 Emissions (mmt)
1	TX	146.6
2	OH	121.5
3	IN	117.4
4	PA	111.6
5	IL	91.5
6	KY	84.4
7	WV	81.6
8	GA	74.4
9	MO	73.4
10	AL	71.1

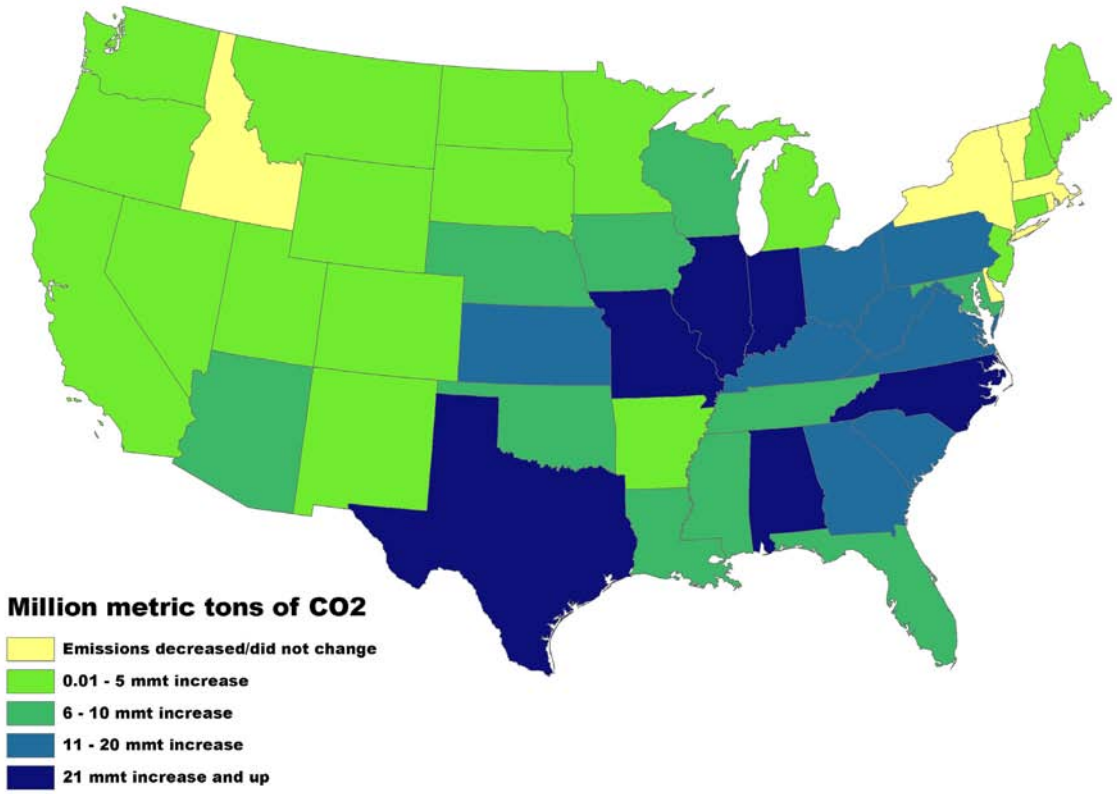
Not surprisingly, the increase in carbon dioxide emissions from coal-fired power plants in these states correlates strongly with an increase in electricity generation from coal. Appendix B shows trends in electricity generation and carbon dioxide emissions from coal-fired power plants for each state from 1990 to 2004.

Utilities and power generators are proposing to build a vast new fleet of coal-fired power plants across America. As of June 2006, utilities had approximately 150 new coal-fired power plants on the drawing board.[54] If U.S. power companies build a new fleet of coal-fired power plants—even a fraction of the proposed number—it will become far more difficult to achieve reductions in global warming pollution on the scale necessary to avoid the worst effects of global warming. If all of the planned coal-fired power plants are built, they would increase annual electricity-related carbon dioxide pollution by more than 25 percent above 2004 levels (an increase of 590 million metric tons). This translates to a 10 percent increase in overall U.S. carbon dioxide pollution (compared with 2004) and a 2.4 percent increase in global emissions.[55]

Table 7. Top 10 States for Absolute Increases in Carbon Dioxide (CO_2) Emissions from Coal-Fired Power Plants, 1990-2004

Rank	State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2 Emissions, 1990-2004	Net Electricity Generation from Coal, 1990 (million MWh)	Net Electricity Generation from Coal, 2004 (million MWh)	Generation Increase, 1990-2004 (million MWh)	Percent Increase in Generation, 1990-2004
1	IL	55.7	91.5	35.8	64%	55.0	94.4	39.4	72%
2	TX	119.8	146.6	26.8	22%	120.9	148.9	28.0	23%
3	MO	47.4	73.4	26.0	55%	48.8	75.0	26.2	54%
4	NC	46.1	69.4	23.3	50%	49.8	75.5	25.7	52%
5	IN	94.8	117.4	22.5	24%	96.9	120.6	23.7	24%
6	AL	50.5	71.1	20.5	41%	53.7	74.8	21.2	39%
7	KY	67.1	84.4	17.2	26%	70.5	86.1	15.6	22%
8	SC	21.8	36.5	14.8	68%	23.4	38.9	15.5	66%
9	VA	21.8	34.3	12.6	58%	23.9	35.7	11.8	49%
10	GA	61.9	74.4	12.5	20%	68.5	80.0	11.4	17%

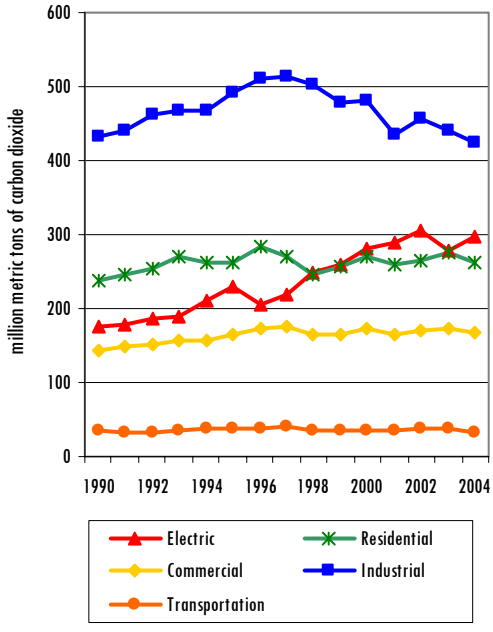
Figure I. State Trends in Rising Carbon Dioxide Emissions from Coal-Fired Power Plants, 1990-2004



- Natural Gas-Fired Power Plants -

The electric power sector accounted for only one quarter (25 percent) of the total U.S. carbon dioxide emissions from natural gas consumption in 2004, but it drove the nationwide increase in carbon dioxide emissions from burning natural gas between 1990 and 2004. Between 1990 and 2004, carbon dioxide emissions from natural gas consumption in the electric power sector increased from 176 million metric tons to 298 million metric tons, an increase of more than two thirds (almost 70 percent), as shown in Figure J. Overall, natural gas-fired power plants were responsible for 13 percent of the nation's increase in carbon dioxide emissions during that 15 year time period.

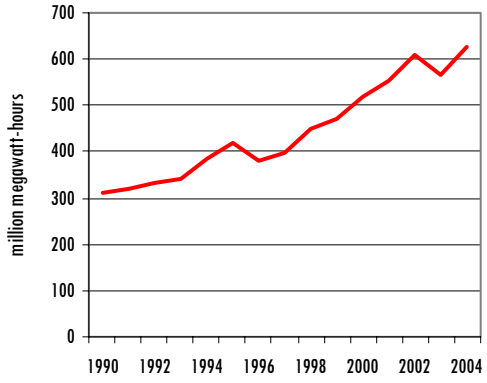
Figure J. Trends in Carbon Dioxide (CO_2) Emissions from Natural Gas Consumption by Sector, 1990-2004



The industrial sector accounted for more than one third (36 percent) of carbon dioxide emissions from natural gas consumption in 2004. Carbon dioxide emissions from natural gas consumption in the industrial sector fell slightly (by 2 percent) between 1990 and 2004 after peaking in the mid-1990s. This drop is likely due to rising natural gas prices that cut consumption. Emissions also increased by 10 percent and 18 percent, respectively, in the residential and commercial sectors, though consumption in these sectors is highly dependent on weather.

The increase in natural gas-related carbon dioxide emissions from the electric sector correlates with a boom in building new natural gas power plants, particularly in the 1990s. Between 1990 and 2004, natural gas generation capacity tripled from almost 133,000 MW to 408,000 MW.[56] Net electricity generation from natural gas plants more than doubled over the same time period (Figure K).[57] The boom in natural gas power plant construction was in part predicated on the notion that natural gas supplies would remain cheap for the foreseeable future. In recent years, however, natural gas prices have doubled, squeezing the pocketbooks of consumers and the profit margins of industry, both of whom have become increasingly dependent on natural gas for electricity, heat, hot water and as a raw material.

Figure K. Net Electricity Generation from Natural Gas, 1990-2004



The Southeast (Alabama, Florida, Georgia, South Carolina, and Tennessee) experienced the most dramatic increase in carbon dioxide emissions from natural gas-fired power plants, more than tripling from nearly 11 million metric tons in 1990 to almost 43 million metric tons in 2004. Carbon dioxide emissions from natural gas-fired power plants also increased significantly in the Mountain West and Northeast states. In the Mountain West, carbon dioxide emissions from natural gas-fired power plants increased almost six-fold from nearly 5 million metric tons in 1990 to 28 million metric tons in 2004 (Table 8).

Table 8. Regional Trends in Carbon Dioxide (CO_2) Emissions from Natural Gas-Fired Power Plants, 1990-2004[g]

Region	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
Southeast	10.9	42.9	31.9	292%
Mountain West	4.8	28.0	23.1	480%
Northeast	20.7	41.1	20.4	98%
Pacific West	36.5	53.2	16.7	46%
Gulf South	92.7	107.5	14.8	16%
Great Lakes/ Midwest	5.0	13.6	8.6	172%
Mid-Atlantic	3.2	9.4	6.2	196%
Plains	2.0	2.6	0.5	26%
National	**176.0**	**298.3**	**122.3**	**70%**

Texas' natural gas-fired power plants released the most carbon dioxide in 2004 (Table 9), but Florida ranked highest for the largest absolute increase in carbon dioxide emissions from natural gas-fired power plants between 1990 and 2004. In 1990, Florida's natural gas-fired power plants emitted more than 10 million metric tons of carbon dioxide; by 2004, the state's emissions from natural gas-fired power plants had tripled.

In addition to Florida, the states that experienced the largest absolute increases in carbon dioxide emissions from natural gas-

[g] See note 'd' for a list of the states in each region.

fired power plants between 1990 and 2004 are Texas, Arizona, California, and Nevada (Table 10). As with coal, the increase in carbon dioxide emissions from natural gas-fired power plants in these states correlates strongly with an increase in net electricity generation from natural gas.

Appendix C shows trends in electricity generation and carbon dioxide emissions from natural gas-fired power plants for each state from 1990 to 2004.

Table 9. Top 10 States for Carbon Dioxide (CO_2) Emissions from Natural Gas-Fired Power Plants, 2004

Rank	State	2004 CO_2 Emissions (mmt)
1	TX	75.3
2	CA	42.7
3	FL	32.1
4	NY	14.1
5	LA	13.3
6	AZ	12.9
7	OK	10.9
8	MA	8.6
9	NJ	7.7
10	MI	7.6

Table 10. Top 10 States for Absolute Increases in Carbon Dioxide (CO_2) Emissions from Natural Gas-Fired Power Plants, 1990-2004

Rank	State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2, 1990-2004	Net Electricity Generation from Natural Gas, 1990 (million MWh)	Net Electricity Generation from Natural Gas, 2004 (million MWh)	Generation Increase, 1990-2004 (million MWh)	Percent Increase in Generation, 1990-2004
1	FL	10.1	32.1	22.0	218%	18.6	76.6	58.0	311%
2	TX	62.0	75.3	13.3	21%	136.2	186.8	50.6	37%
3	AZ	1.3	12.9	11.6	879%	2.3	28.3	25.9	1111%
4	CA	34.3	42.7	8.4	25%	74.2	100.5	26.3	35%
5	NV	1.3	7.6	6.3	474%	2.2	16.4	14.2	639%
6	AL	0.3	6.3	6.0	2021%	1.0	16.0	15.0	1472%
7	MA	3.4	8.6	5.3	156%	6.1	21.0	14.9	243%
8	OR	0.4	4.8	4.4	1093%	0.8	13.5	12.7	1545%
9	NJ	3.6	7.7	4.1	114%	6.9	16.0	9.1	131%
10	MI	3.6	7.6	4.0	109%	7.8	15.1	7.3	93%

Transportation Sector Also Drove Increase in U.S. Carbon Dioxide Emissions

The transportation sector burns the most oil in the U.S. economy, accounting for almost three-fourths (74 percent) of the total U.S. carbon dioxide emissions from oil consumption in 2004. The transportation sector includes all vehicles with the primary purpose of transporting people and/or goods from one physical location to another, including automobiles, trucks, buses, motorcycles, trains and other rail vehicles, aircraft, and ships, barges, and other waterborne vehicles.[58]

Between 1990 and 2004, carbon dioxide emissions from oil consumption in the transportation sector increased by almost a quarter (24 percent). At the same time, the industrial sector increased its carbon dioxide emissions from oil consumption by almost 63 million metric tons, or more than 17 percent. The residential sector increased its carbon dioxide emissions from oil by just 7.8 million metric tons (8 percent), while emissions from oil consumption in the commercial and electric sectors declined between 1990 and 2004 (Figure L). Emissions from the commercial and residential sectors are highly dependent on weather and can vary from year to year.

As a result, the transportation sector was a key factor in driving up carbon dioxide emissions overall. Between 1990 and 2004, U.S. carbon dioxide emissions from the transportation sector jumped by almost a quarter (23 percent), from almost 1.6 billion metric tons in 1990 to more than 1.9 billion metric tons in 2004 (Figure M). Overall, the transportation sector was responsible for 40 percent of the nation's increase in carbon dioxide emissions between 1990 and 2004.

Figure L. Trends in Carbon Dioxide Emissions from Oil Consumption by Sector, 1990-2004

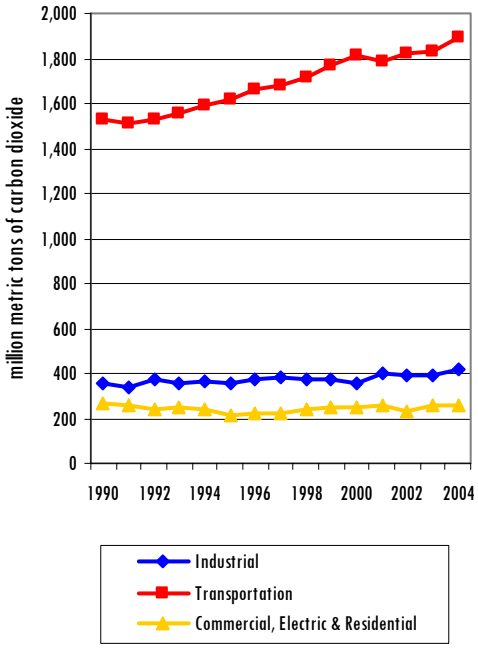
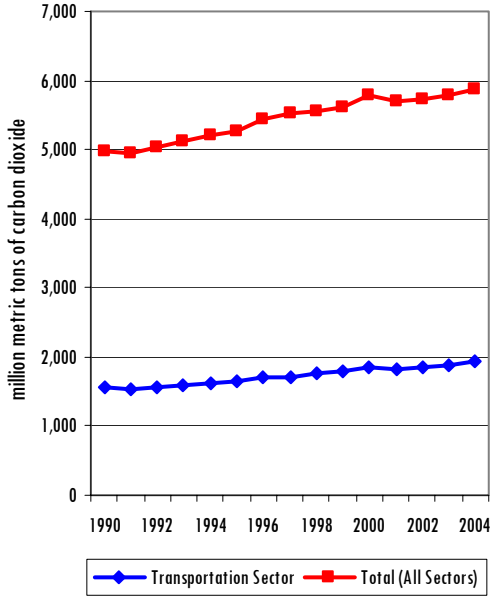


Figure M. Trends in Carbon Dioxide Emissions from the Transportation Sector, 1990-2004



Emissions from the transportation sector increased by double digit percentages in every region of the country. The Southeast (Alabama, Florida, Georgia, South Carolina, and Tennessee) experienced the most dramatic increase in carbon dioxide emissions from the transportation sector, rising from 210 million metric tons in 1990 to more than 285 million metric tons in 2004, an increase of 36 percent. Emissions from the transportation sector are growing most rapidly in the Mountain West region (Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming), which saw carbon dioxide emissions increase by 45 percent (Table 11).

California's transportation sector released the most carbon dioxide in 2004 (Table 12), but Texas' transportation sector ranked highest for the largest absolute increase between 1990 and 2004. In 1990, Texas' transportation sector emitted almost 151 million metric tons of carbon dioxide; by 2004, the state's transportation-related emissions had grown to 190 million metric tons of carbon dioxide, an increase of 26 percent (Table 13).

In addition to Texas, the states that experienced the largest absolute increases in carbon dioxide emissions from the transportation sector between 1990 and 2004 are Florida, Georgia, California, Ohio, Illinois, North Carolina, Arizona, Virginia, and Tennessee (Figure N).

Appendix D shows trends in carbon dioxide emissions from the transportation sector for each state from 1990 to 2004.

Table 11. Regional Trends in Carbon Dioxide (CO_2) Emissions from the Transportation Sector, 1990-2004[h]

Region	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
Southeast	210.0	285.5	75.4	36%
Great Lakes/ Midwest	267.8	333.1	65.3	24%
Gulf South	258.8	317.1	58.3	23%
Mid-Atlantic	177.3	224.1	46.8	26%
Mountain West	93.2	135.6	42.3	45%
Northeast	183.0	212.9	30.0	16%
Pacific West	284.4	313.7	29.3	10%
Plains	87.2	102.6	15.3	18%
National	**1,561.8**	**1,924.6**	**362.8**	**23%**

Table 12. Top 10 States for Carbon Dioxide (CO_2) Emissions from the Transportation Sector, 2004

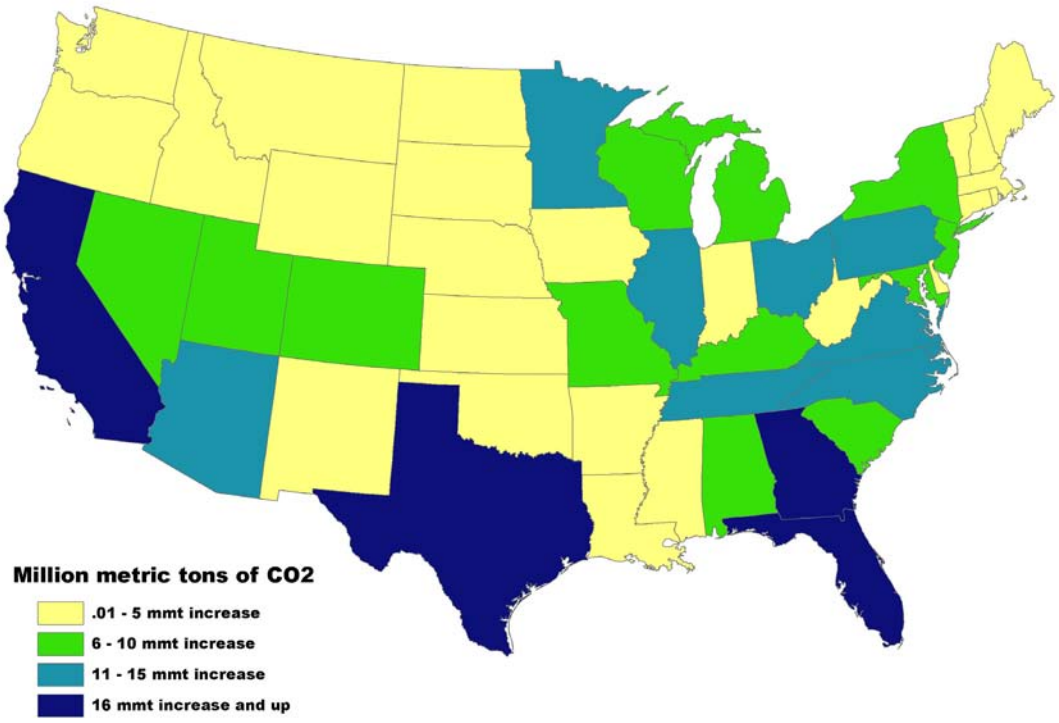
Rank	State	2004 CO_2 Emissions (mmt)
1	CA	217.9
2	TX	190.2
3	FL	109.5
4	NY	73.3
5	PA	70.0
6	OH	69.7
7	IL	66.5
8	GA	65.4
9	NJ	63.8
10	MI	54.8

Table 13. Top 10 States for Absolute Increases in Carbon Dioxide (CO_2) Emissions from the Transportation Sector, 1990-2004

Rank	State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
1	TX	150.9	190.2	39.3	26%
2	FL	80.5	109.5	29.0	36%
3	GA	47.9	65.4	17.4	36%
4	CA	201.0	217.9	16.9	8%
5	OH	54.8	69.7	14.9	27%
6	IL	53.0	66.5	13.5	26%
7	NC	37.8	51.1	13.3	35%
8	AZ	22.5	35.6	13.1	58%
9	VA	41.1	53.5	12.5	30%
10	TN	32.2	44.4	12.2	38%

[h] See note 'd' for a list of the states in each region.

Figure N. State Trends in Rising Carbon Dioxide Emissions from the Transportation Sector, 1990-2004

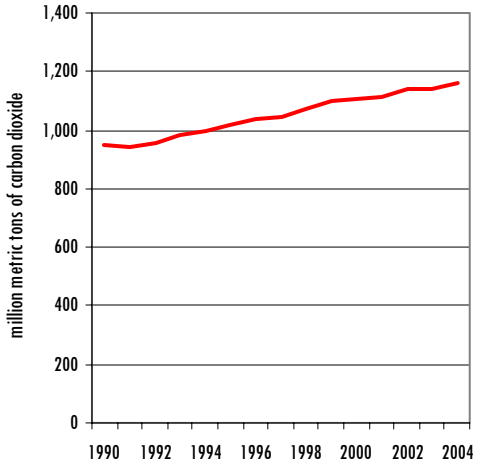


- Passenger Vehicles -

The vast majority of motor gasoline goes to power passenger vehicles—cars, SUVs, and other light trucks. Passenger vehicles are responsible for about one-fifth of all carbon dioxide emissions from energy consumption and 60 percent of the carbon dioxide emissions from the transportation sector.[59]

Between 1990 and 2004, carbon dioxide emissions from motor gasoline consumption increased by almost a quarter (22 percent), rising from 950 million metric tons to 1,159 million metric tons (Figure O). The rise in carbon dioxide emissions from motor gasoline consumption accounted for more than half (58 percent) of the increase in transportation-related emissions between 1990 and 2004 and almost a quarter (23 percent) of the overall increase in U.S. carbon dioxide emissions.

Figure O. Trends in Carbon Dioxide Emissions from Motor Gasoline Consumption, 1990-2004



Motor vehicles in Texas and California—the two most populous states—released the most carbon dioxide from motor gasoline consumption in 2004 (Table 14). Texas, Florida, California, and Georgia—the four states experiencing the largest absolute

increases in transportation-related carbon dioxide emissions between 1990 and 2004—also experienced the largest absolute increases in carbon dioxide emissions from motor gasoline consumption during that time period (Table 15).

Table 14. Top 10 States for Carbon Dioxide (CO_2) Emissions from Motor Gasoline Consumption, 2004

Rank	State	2004 CO2 Emissions (mmt)
1	CA	127.8
2	TX	98.4
3	FL	72.7
4	NY	46.8
5	PA	44.1
6	GA	43.1
7	OH	43.0
8	MI	41.2
9	IL	41.2
10	NJ	37.5

Table 15. Top 10 States for Absolute Increases in Carbon Dioxide (CO_2) Emissions from Motor Gasoline Consumption, 1990-2004

Rank	State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase, 1990-2004
1	TX	73.4	98.4	25.0	34%
2	FL	51.7	72.7	21.0	41%
3	CA	110.9	127.8	16.9	15%
4	GA	30.0	43.1	13.1	44%
5	AZ	14.3	23.3	9.0	63%
6	NJ	28.5	37.5	8.9	31%
7	NC	28.1	36.5	8.4	30%
8	VA	25.6	33.3	7.7	30%
9	SC	15.6	22.2	6.6	42%
10	MD	17.4	22.9	5.5	32%

Two of the major factors contributing to the rapid rise in carbon dioxide emissions from motor gasoline consumption are a dramatic increase in driving and the stagnating fuel economy of U.S. vehicles.

- Americans are Driving More -

Americans drove more in 2004 than they did in 1990. Over the 15 year period, the number of miles driven in America increased by more than a third (38 percent), reaching almost three trillion miles in 2004 (Figure P).[60] The reasons for the increase in driving are complex and interrelated but include sprawling development patterns, demographic shifts, low fuel prices for much of this time period, and massive public investment in highways coupled with insufficient investment in public transit, rail travel, bicycling and pedestrian infrastructure, and other transportation alternatives.[61] More driving means more carbon dioxide emissions from cars and light trucks. The states experiencing the largest increases in carbon dioxide emissions from motor gasoline consumption also experienced significant increases in vehicle travel (Table 16).

Appendix E shows trends in vehicle miles traveled and carbon dioxide emissions from motor gasoline consumption for each state from 1990 to 2004.

Figure P. Trends in Vehicle Miles Traveled, 1990-2004[62]

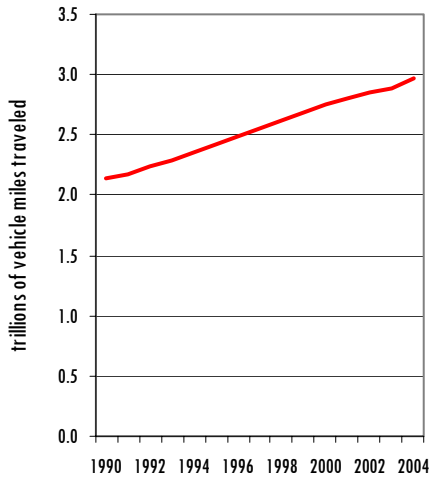


Table 16. Trends in Vehicle Miles Traveled (VMT) in States Experiencing the Largest Increase in Carbon Dioxide (CO_2) Emissions from Motor Gasoline Consumption, 1990-2004

State	CO_2 Emissions Increase, 1990-2004 (mmt)	CO_2 Percent Increase, 1990-2004	Increase in Vehicle Miles Traveled (millions)	VMT Percent Increase, 1990-2004
TX	25.0	34%	74,430	48%
FL	21.0	41%	86,447	79%
CA	16.9	15%	69,991	27%
GA	13.1	44%	42,398	60%
AZ	9.0	63%	21,881	62%
NJ	8.9	31%	13,921	24%
NC	8.4	30%	33,151	53%
VA	7.7	30%	18,699	31%
SC	6.6	42%	15,175	44%
MD	5.5	32%	14,748	36%

New York experienced a slight decline in carbon dioxide emissions from motor gasoline consumption between 1990 and 2004 while vehicle miles traveled went up. One potential explanation is the state's increased use of ethanol, which the Energy Information Administration assumes produces zero net carbon dioxide emissions upon consumption.[i] The production of ethanol does generate carbon dioxide emissions (for example, in the operation of tractors on farms and ethanol manufacturing plants), but those emissions are accounted for in the industrial sector. In 2004, ethanol consumption totaled 5 percent of motor gasoline by volume in New York, much higher than at any other point in the 15-year period for that state.[63] Ethanol use also may explain a slight decrease in carbon dioxide emissions in several other states between 2000 and 2004.

[i] See the report methodology for a more detailed description of this assumption.

- The Efficiency of America's Vehicles Stalled in the Late 1980s -

The efficiency of America's vehicle fleet was poor in the 1960s and 1970s, until the 1973 oil crisis led Congress to establish the first minimum fuel economy standards for cars and light trucks in order to protect consumers from high gasoline prices and supply vulnerability resulting from U.S. dependence on foreign oil. In 1973, members of the Organization of Arab Petroleum Exporting Countries (consisting of the Arab members of OPEC, plus Egypt and Syria) announced that they would no longer ship petroleum to the United States and other countries that had supported Israel in its conflict with Syria and Egypt, causing oil prices to skyrocket. A second oil shock struck the United States in 1979 in the wake of the Iranian Revolution, causing prices to rise substantially once again.

In 1975, in the wake of the first oil shock, Congress established miles-per-gallon (MPG) standards for cars and light trucks. Those standards have proven to be among the most effective steps ever taken to reduce oil consumption. Cars today use 2.8 million fewer barrels of oil per day than they would have without the fuel economy increase.[64] Between 1975 and 1987, the average, real-world fuel economy of new cars and light trucks increased by nearly 70 percent – from 13.1 MPG to 22.1 MPG.[65] By 1978, thanks in part to the new standards, gasoline consumption began to fall. It was not until 1993 that the United States again used as much gasoline as it did in the late 1970s.[66]

Since the late 1980s, however, the fuel economy of America's vehicle fleet has not only stalled but has actually declined. America's vehicle fleet has changed dramatically, with increasing sales of less-efficient vehicles, such as SUVs. By 2004, SUVs and other light trucks accounted for more than half of all light-duty vehicle sales,

while the share held by cars had shrunk to less than half.[67] At the same time, Congress and several administrations have not increased fuel economy standards for passenger cars since first implementing the standards in 1975 and have raised light truck fuel economy standards only modestly. As a result, the average fuel economy of new vehicles *declined* by 5 percent between 1987 and 2005 even though we have witnessed significant improvements in other aspects of vehicle technology, including acceleration and power.[68] In 2005, new cars and light trucks achieved only 21 MPG on average, a lower fuel economy average than the new vehicle fleet achieved in 1982.[69]

Conclusion and Recommendations

The longer we wait to reduce global warming pollution, the harder the task will be in the future. Leading scientists say that we have a limited time to act to avoid a climate "tipping point."[70] Key components of an action plan to protect future generations from global warming should include the following priorities:

Require Steep Cuts in Carbon Dioxide Emissions

The United States should establish science-based, mandatory limits on global warming pollution that reduce total U.S. emissions from today's levels by the end of the decade, by at least 15-20 percent by 2020 and by at least 80 percent by 2050. These reductions are needed to stabilize concentrations of global warming gases in the atmosphere at a level that averts global warming's most devastating and irreversible impacts.

Obtain 20 Percent of our Electricity from Renewable Energy Sources

America has virtually limitless potential for the generation of power from natural forces. By ramping up our use of wind power, solar power, and other renewable forms of energy – and using much of that energy to replace power production at dirty, coal-fired power plants – the United States could dramatically reduce global warming emissions from electric power production. Requiring that 20 percent of our electricity come from renewable sources by 2020—when combined with a strong, mandatory cap on global warming pollution—would save more than 500 million metric tons of carbon dioxide equivalent relative to 2004 emissions levels. This is more than one third of the emissions reductions scientists say we need to achieve by 2020.[71]

Reduce Energy Consumption in our Homes and Businesses

Dramatic improvements in energy efficiency are possible in virtually every aspect of American life. Studies show that we could reduce our electricity consumption by as much as 20 percent at no net cost to the economy.[72] For now, the U.S. can encourage weatherization of buildings, deployment of more efficient appliances and equipment, and efficiency improvements in industry. Soon, using new technologies such as those in zero-energy homes, we can transform the way we consume energy and achieve even larger improvements in efficiency.

Stabilize Vehicle Travel

Americans are driving more than ever, leading to increased emissions of global warming pollutants. Americans need more transportation choices to reduce and eventually halt this growth in vehicle travel. Policies to provide these choices include encouraging the development of compact neighborhoods with a mix of land uses, where more tasks can be completed by foot, bike or transit; expanding the reach and improving the quality of transit service; and supporting programs to encourage carpooling, vanpooling, telecommuting, and other

alternatives to single-passenger car travel.

Make Cars and Trucks Go Farther on a Gallon of Gasoline

The creation of federal fuel economy standards for cars during the 1970s succeeded in reducing gasoline consumption and oil imports, as well as global warming pollution. But the fuel economy of new vehicles is now lower than it was during most of the Reagan administration.

In 2002, the National Academy of Sciences concluded that automakers could use a combination of existing and emerging technologies to achieve 37 MPG within 10-15 years while improving safety and maintaining performance.[73] The Union of Concerned Scientists has shown that with more aggressive use of high-strength, lighter-weight materials, we could hit the 40 MPG mark in 10 years.[74] Similarly, major improvements in fuel economy are possible for heavy-duty trucks, which are currently exempt from fuel economy standards.[75]

Replace a Portion of Vehicle Fuel with Biofuels or Other Clean Alternatives

Ethanol and biodiesel that are produced cleanly and sustainably have the potential to significantly reduce global warming emissions from transportation – especially if these biofuels are produced from plant wastes and cellulose. Other vehicle technologies – like "plug-in" hybrids, electric vehicles, and fuel cell vehicles – have the potential to dramatically reduce global warming emissions in the future.[76]

Methodology

The carbon dioxide emission estimates in this document reflect only emissions from fossil fuel consumption – including both fossil fuels used for energy and those used for "non-fuel" purposes, such as natural gas consumed in fertilizer production. These estimates also include fossil fuel consumption for international shipping and aviation ("bunker fuels"). The emission estimates in this report do not include carbon dioxide emissions from other sources (such as land use), carbon dioxide emissions from geothermal energy production, emissions from natural gas flaring, or emissions of other global warming pollutants.

All estimates are based on state-specific fossil fuel consumption data (in BTU) through 2004 from the U.S. Energy Information Administration (EIA), *State Energy Consumption, Price and Expenditure Estimates*.[77] In general, we followed the methodology for converting energy use data to carbon dioxide emissions found in U.S. EIA, *Documentation for Emissions of Greenhouse Gases in the United States 2004 ("Documentation 2004")*, December 2006. The following section describes sources of data used as well as places where we deviated from the methodology or data sources described in *Documentation 2004*.

Emissions are attributed to the state where fossil fuels were burned or sold. In the case of electric power plants, the energy use and emissions data is based on consumption of fuel at the power plant, not consumption of electricity by the end user. As such, the data does not take into account that some states generate little electricity within their borders and import much from neighboring states' power plants. Emissions from power plants are attributed to the states in which they are located, rather than the states that consumed the power. For petroleum, consumption data is based on sales; therefore, emissions are attributed to the state in which the fuel was purchased. This is particularly salient for the transportation sector, in which mobile sources may purchase fuel in one state and then drive or move out of state.

Adjustments to Energy Consumption Data

EIA state energy data for gasoline consumption incorporate ethanol used as a blending component. EIA assumes that ethanol produces no net emissions of carbon dioxide. The production of ethanol does generate carbon dioxide emissions (for example, in the operation of tractors on farms and ethanol manufacturing plants), but those emissions are accounted for in the industrial sector. Therefore, the ethanol component of gasoline must be separated from total gasoline consumption and treated separately for the purposes of calculating carbon dioxide emissions. To achieve this, we calculated the percentage of ethanol used in motor gasoline by volume for each state in 1990-2004 using EIA state energy data. We then reduced consumption of motor gasoline (in BTU) by this percentage, thus reducing estimated carbon dioxide emissions from gasoline use by a corresponding amount.

Adjustments Not Made

Documentation 2004 calls for several small adjustments to be made with regard to natural gas emissions to avoid double-counting of emissions related to injections of still gas, synthetic gas, and biogas (landfill gas) into

natural gas pipelines. The volume of these gases injected into pipelines is very small (EIA estimates that these adjustments are likely to account for, at most, a 0.1 percent difference in national emissions). For the sake of simplicity and to avoid the need to split out emission reductions into various sectors of the economy, we assumed that these reductions would have a minimal impact on total emissions and did not make them.

In addition, *Documentation 2004,* consistent with international norms, treats international bunker fuels as a separate category of emissions that are not attributed to the United States. State-by-state estimates of bunker fuel use for international aviation were unavailable. As a result, we opted not to adjust for bunker fuel use for aviation or shipping. This may result in somewhat higher transportation sector emissions in states with international ports or vigorous international air traffic compared with other analyses.

Adjustments for Non-Fuel Use

Many fossil energy sources are also used for non-fuel purposes (for example, petrochemicals used in the manufacture of plastics or natural gas used in the production of fertilizer). Energy sources used for non-fuel purposes emit carbon dioxide at different rates than those used as fuels. To account for this, we calculated or obtained the percentage of various energy products used for non-fuel purposes and accounted for the percentage of carbon that is "sequestered" (not emitted) from those uses.

State-specific information on the quantity of energy products used for non-fuel purposes is not available. Thus, we used national-level data from *Documentation 2004* (with some exceptions, noted below) to estimate the percentage of various fossil energy products used for non-fuel purposes from 2001-2004. For 1990 through 2000, we used non-fuel percentage estimates from U.S. EIA, *Documentation for Emissions of Greenhouse Gases in the United States 2001 ("Documentation 2001"),* December 2002. (The earlier data were used to provide a consistent data set for each year in the 1990s, some of which are excluded in later editions of *Documentation*.)

Exceptions to this are as follows:

- For non-fuel use of distillate and residual fuel oil and liquefied petroleum gases from 2001-2004, we determined that the data on non-fuel energy consumption provided in *Documentation 2004* were likely in error. As a result, we used values from *Documentation 2003* instead.

- For non-fuel use of natural gas, we assumed (per *Documentation 2004*) that non-fuel use of natural gas for the production of nitrogenous fertilizers was a non-sequestering use (e.g. that all of the carbon in the natural gas is emitted). For the sake of simplicity, we treated use of natural gas in fertilizer production in the same manner as we did use of natural gas for energy purposes. Because a breakout for other non-fuel uses of natural gas was not available in *Documentation 2001*, we calculated this figure for 1990 to 2000 based on data from *Documentation 2000*.

For all years, we used estimates of the percentage of carbon sequestered for non-fuel uses of energy from *Documentation 2004*. estimating carbon dioxide emissions from non-fuel uses of energy, we treated differences in the carbon coefficients of fuel and non-fuel uses of liquefied petroleum gases as trivial and used the coefficient for fuel uses for all consumption.

Carbon Coefficients and Emission Factors

Carbon coefficients for various fuels for 2001-

2004 were based on values in *Documentation 2004*. Coefficients for 1990 through 2000 were based on U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2001*, April 2003. For "other petroleum products," carbon coefficients for 2005 from *Documentation 2004* were used for all years.

Weighted emission factors were then calculated for fuel and non-fuel uses of various energy sources. The weighted emission factor for fuel uses was obtained by multiplying the carbon coefficient by the percentage of the source consumed for fuel uses, and then multiplying the product by a combustion factor. It was assumed that 99 percent of solid and liquid fuels were combusted and 99.5 percent of gaseous fuels combusted, per *Documentation 2004*. For non-fuel uses, the weighted emission factor was calculated by multiplying the carbon coefficient by the percentage of energy used for non-fuel purposes, and then multiplying the product by the percentage of carbon not sequestered. The weighted emission factors for fuel and non-fuel uses were then summed to arrive at an emission factor that, when applied to EIA's estimates of state energy consumption, yielded estimates of carbon dioxide emissions by fuel and by economic sector. We converted emissions from carbon to carbon dioxide by multiplying the resulting figures by 44/12.

Appendix A. Energy-Related Carbon Dioxide Emissions from All Sources, 1990-2004: By State

carbon dioxide emissions (million metric tons)

State	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2, 1990-2004
AK	33.6	34.3	35.6	35.6	35.3	39.8	40.7	40.8	41.8	42.4	37.7	41.9	42.3	42.2	45.4	11.8	35%
AL	109.4	113.6	120.3	124.8	122.8	130.4	136.1	133.1	132.4	134.6	140.8	132.3	137.7	137.5	141.2	31.8	29%
AR	50.3	49.3	50.9	50.0	53.9	57.2	60.3	59.4	60.7	62.8	63.1	62.2	61.2	61.6	62.7	12.4	25%
AZ	62.4	63.2	66.0	68.4	71.1	66.0	67.9	71.1	76.0	79.9	85.6	87.8	87.2	88.7	95.9	33.5	54%
CA	357.8	346.8	349.5	341.1	357.9	346.8	346.3	348.8	358.6	362.1	377.4	381.7	377.7	383.8	385.4	27.6	8%
CO	65.8	67.0	68.0	71.8	72.3	72.2	75.0	75.2	77.4	79.4	84.1	92.0	90.1	88.8	91.4	25.6	39%
CT	40.4	39.6	39.9	37.9	37.3	36.6	39.6	42.7	40.3	41.5	42.8	41.2	39.7	41.7	43.5	3.2	8%
DC	4.4	4.4	4.3	4.5	4.5	4.4	4.3	4.3	4.3	4.1	4.3	4.0	4.1	3.9	4.0	-0.4	-10%
DE	17.8	17.9	17.6	19.1	18.4	17.4	18.0	16.8	16.2	16.3	16.6	16.1	15.9	16.6	16.6	-1.2	-7%
FL	186.9	188.0	190.2	193.5	200.9	205.8	212.1	217.7	230.3	229.8	238.2	236.3	239.5	243.5	255.4	68.5	37%
GA	138.0	130.7	130.3	139.8	142.6	150.8	154.7	155.9	157.2	159.7	167.8	160.3	165.1	167.9	173.7	35.7	26%
HI	21.3	19.4	20.4	18.7	20.0	19.9	19.0	18.6	18.6	18.4	18.6	19.1	20.4	21.4	22.3	1.0	5%
IA	62.9	64.8	63.2	66.5	67.6	70.9	74.1	73.5	76.5	77.3	78.2	77.5	78.0	77.5	79.1	16.3	26%
ID	11.2	11.8	11.1	12.3	12.4	13.2	13.6	13.6	13.9	14.7	15.4	15.3	14.8	14.1	15.4	4.2	38%
IL	191.9	192.9	188.8	204.5	204.1	207.8	220.9	224.2	215.4	224.9	232.3	223.0	226.0	226.6	233.8	41.9	22%
IN	203.9	200.9	198.1	202.7	202.3	207.6	212.4	216.5	218.0	224.1	237.3	227.1	228.4	233.7	236.2	32.2	16%
KS	67.7	66.9	64.1	70.6	70.9	68.9	73.9	70.4	69.5	72.3	74.5	71.0	75.1	77.5	76.1	8.4	12%
KY	118.8	120.3	124.0	134.5	132.7	138.0	140.1	144.3	142.5	147.0	147.3	147.8	148.1	143.9	150.4	31.6	27%
LA	183.7	182.1	187.7	190.7	195.0	196.1	197.0	203.6	191.5	188.4	203.0	188.0	195.8	186.4	190.0	6.4	3%
MA	82.7	81.7	83.5	80.6	80.9	78.2	79.1	85.3	83.3	80.9	81.9	81.4	82.5	83.6	82.4	-0.3	-0.4%
MD	69.9	69.1	67.1	69.3	70.4	69.8	71.9	72.2	75.3	78.0	77.6	77.4	77.2	79.8	81.0	11.1	16%
ME	18.4	17.9	18.6	18.0	19.2	18.1	18.7	19.1	18.9	20.0	21.8	21.9	22.5	23.0	22.8	4.4	24%
MI	179.1	178.1	177.0	177.8	185.6	188.4	193.8	191.7	190.8	198.6	193.5	188.2	186.1	182.8	185.8	6.6	4%
MN	77.7	77.7	78.8	83.3	84.8	87.4	92.2	89.8	89.9	90.6	95.8	92.8	95.0	98.9	98.3	20.7	27%
MO	102.6	102.3	102.0	100.2	107.7	114.7	120.8	124.5	129.3	129.7	124.7	129.9	130.3	136.7	137.9	35.3	34%
MS	47.7	47.8	47.6	50.2	49.8	51.1	53.8	55.4	56.3	60.9	60.7	69.1	62.2	62.3	65.0	17.4	36%
MT	27.5	28.8	30.0	27.7	30.6	30.2	27.4	29.4	31.5	32.2	31.3	32.7	30.8	32.8	34.9	7.4	27%
NC	110.0	109.7	119.9	125.3	120.8	127.0	139.3	141.5	141.5	140.3	147.8	143.0	144.5	145.3	149.2	39.2	36%
ND	44.3	45.2	46.9	47.3	47.6	47.5	48.3	47.0	48.2	49.1	50.5	51.2	51.0	50.6	49.2	4.9	11%
NE	32.4	33.2	32.0	35.4	35.3	37.9	39.0	40.3	42.3	41.1	40.9	42.3	41.6	42.5	42.5	10.2	31%
NH	14.5	14.2	14.2	14.7	14.7	14.8	15.3	16.6	16.7	16.8	17.4	16.7	17.4	20.4	21.7	7.2	50%
NJ	112.1	113.1	119.7	116.5	126.1	125.5	123.7	125.6	121.0	124.4	124.5	122.3	122.2	123.6	126.9	14.7	13%

Energy-Related Carbon Dioxide Emissions from All Sources, continued

carbon dioxide emissions (million metric tons)

State	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2, 1990-2004
NM	52.1	47.5	50.2	51.1	51.1	49.7	52.2	55.6	55.1	55.9	57.8	57.7	55.2	57.4	58.1	5.9	11%
NV	30.4	32.3	33.3	33.7	35.9	35.0	37.7	37.7	40.3	40.9	44.9	44.2	41.1	43.0	47.2	16.8	55%
NY	207.4	199.9	198.8	193.8	192.0	197.2	201.2	205.6	204.7	207.3	212.8	206.3	198.6	212.4	212.8	5.5	3%
OH	244.9	243.4	247.5	252.0	248.1	250.4	263.4	259.2	258.0	257.0	263.7	253.1	258.3	265.0	261.8	16.9	7%
OK	86.9	88.4	91.2	94.4	92.6	93.8	96.4	97.7	96.2	95.1	98.9	100.1	100.2	102.1	98.1	11.2	13%
OR	30.5	34.2	35.1	35.2	37.0	34.2	36.3	35.9	41.6	42.8	41.3	41.4	39.6	40.0	41.8	11.4	37%
PA	262.2	255.5	263.3	268.1	265.5	268.0	273.1	274.9	264.1	262.6	275.7	262.7	269.9	272.9	276.6	14.3	5%
RI	8.8	10.6	12.8	10.7	12.6	11.9	13.3	13.4	13.7	13.0	11.6	12.1	11.6	11.3	10.8	2.0	23%
SC	60.7	62.3	61.5	65.7	66.0	64.9	68.4	70.3	73.7	77.2	80.4	79.1	80.3	80.6	88.1	27.4	45%
SD	11.5	11.3	11.4	12.0	12.7	12.5	12.5	13.0	12.6	13.2	13.9	13.2	13.5	13.4	13.5	2.0	17%
TN	105.2	100.8	106.4	116.9	111.7	118.4	118.5	121.7	120.9	121.7	127.2	125.6	125.4	122.8	125.1	19.9	19%
TX	560.5	556.6	562.6	575.9	575.5	578.2	623.8	638.1	646.7	634.1	657.6	659.5	684.3	679.7	659.0	98.5	18%
UT	53.8	52.8	54.3	56.1	57.1	57.3	58.1	60.4	62.8	61.7	64.5	62.4	61.7	62.3	65.0	11.1	21%
VA	94.3	95.7	96.8	101.2	100.2	102.4	107.2	109.4	111.0	113.1	121.9	120.1	118.5	122.1	126.4	32.1	34%
VT	5.3	5.5	6.0	6.1	5.9	5.9	6.1	6.3	6.1	6.4	6.6	6.5	6.2	6.4	6.9	1.6	29%
WA	70.4	71.6	79.5	75.6	80.2	77.9	80.4	78.4	82.8	84.0	83.3	84.8	77.9	79.5	83.4	12.9	18%
WI	84.8	87.2	86.1	89.2	92.2	95.7	101.1	103.8	101.5	105.7	107.6	104.5	105.4	103.4	106.0	21.2	25%
WV	105.3	96.9	99.1	99.6	107.2	105.4	106.8	110.1	114.1	115.2	114.4	105.1	117.4	114.2	112.4	7.2	7%
WY	56.5	54.9	60.5	57.6	59.8	57.5	58.9	58.4	63.2	61.8	62.7	63.0	61.8	63.4	63.5	7.0	12%
U.S.	**4,978.8**	**4,940.2**	**5,023.8**	**5,128.0**	**5,198.6**	**5,256.9**	**5,444.7**	**5,519.1**	**5,554.9**	**5,611.0**	**5,780.0**	**5,694.9**	**5,737.2**	**5,791.7**	**5,872.7**	**893.9**	**18%**

Appendix B. Carbon Dioxide Emissions from Coal-Fired Power Plants, 1990-2004: By State

	carbon dioxide emissions (million metric tons)				electricity generation (million megawatt-hours)			
State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2, 1990-2004	Net Electricity Generation from Coal, 1990 (million MWh)	Net Electricity Generation from Coal, 2004 (million MWh)	Generation Increase, 1990-2004 (million MWh)	Percent Increase in Generation, 1990-2004
AK	0.4	0.6	0.2	38%	0.5	0.6	0.1	27%
AL	50.5	71.1	20.5	41%	53.7	74.8	21.2	39%
AR	19.5	24.5	5.0	26%	19.2	25.4	6.1	32%
AZ	31.1	38.6	7.5	24%	31.9	39.8	7.9	25%
CA	1.8	2.1	0.4	20%	2.6	2.2	-0.4	-15%
CO	30.2	35.7	5.5	18%	29.8	35.8	6.0	20%
CT	3.6	4.1	0.5	15%	3.6	4.3	0.7	18%
DC	0.0	0.0	n/a	n/a	0.0	0.0	0.0	n/a
DE	5.0	4.8	-0.3	-6%	5.1	4.8	-0.4	-7%
FL	56.8	63.4	6.6	12%	60.1	64.9	4.8	8%
GA	61.9	74.4	12.5	20%	68.5	80.0	11.4	17%
HI	0.002	1.7	1.7	69191%	0.002	1.6	1.6	67259%
IA	26.0	35.8	9.8	38%	25.8	35.3	9.5	37%
ID	n/a	n/a	n/a	n/a	0.04	0.1	0.1	126%
IL	55.7	91.5	35.8	64%	55.0	94.4	39.4	72%
IN	94.8	117.4	22.5	24%	96.9	120.6	23.7	24%
KS	25.2	35.9	10.6	42%	23.7	34.6	10.9	46%
KY	67.1	84.4	17.2	26%	70.5	86.1	15.6	22%
LA	18.2	24.0	5.8	32%	17.9	23.7	5.8	32%
MA	10.4	9.7	-0.7	-7%	11.4	10.5	-0.8	-7%
MD	21.5	27.5	6.0	28%	23.5	29.2	5.7	24%
ME	0.4	0.4	0.05	13%	0.5	0.4	-0.1	-20%
MI	62.5	65.2	2.7	4%	67.1	68.6	1.6	2%
MN	28.1	33.4	5.3	19%	28.2	34.0	5.8	21%
MO	47.4	73.4	26.0	55%	48.8	75.0	26.2	54%
MS	9.2	17.1	7.9	86%	9.5	17.5	8.0	83%
MT	15.4	18.1	2.7	18%	15.1	17.4	2.3	15%
NC	46.1	69.4	23.3	50%	49.8	75.5	25.7	52%
ND	27.0	29.2	2.2	8%	25.2	28.1	2.9	11%
NE	12.9	20.4	7.4	57%	12.7	20.5	7.8	62%
NH	2.9	4.1	1.2	42%	3.0	4.1	1.1	38%
NJ	6.9	10.6	3.7	53%	7.1	10.3	3.3	46%
NM	25.9	29.0	3.1	12%	25.8	29.3	3.4	13%
NV	15.2	17.8	2.6	17%	15.1	18.3	3.2	21%
NY	24.5	22.0	-2.5	-10%	25.9	22.9	-3.1	-12%
OH	109.4	121.5	12.1	11%	115.8	128.2	12.4	11%
OK	25.1	33.7	8.6	34%	25.7	33.8	8.1	32%
OR	1.3	3.3	2.0	147%	1.3	3.6	2.2	170%
PA	99.4	111.6	12.3	12%	106.7	117.2	10.5	10%
RI	0.0	0.0	n/a	n/a	0.0	0.0	0.0	n/a
SC	21.8	36.5	14.8	68%	23.4	38.9	15.5	66%
SD	2.9	3.7	0.8	28%	2.5	3.6	1.1	46%
TN	46.9	53.0	6.1	13%	51.8	58.3	6.5	13%
TX	119.8	146.6	26.8	22%	120.9	148.9	28.0	23%
UT	29.4	34.6	5.2	18%	31.5	36.6	5.1	16%
VA	21.8	34.3	12.6	58%	23.9	35.7	11.8	49%
VT	0.0	0.0	n/a	n/a	0.0	0.0	0.0	n/a
WA	7.4	10.4	3.0	40%	7.4	10.4	3.0	41%
WI	32.7	42.9	10.2	31%	33.2	42.1	9.0	27%
WV	70.2	81.6	11.4	16%	77.6	87.6	9.9	13%
WY	39.2	44.0	4.8	12%	38.9	43.3	4.4	11%
U.S.	**1,531.6**	**1,914.9**	**383.3**	**25%**	**1,594.0**	**1,978.6**	**384.6**	**24%**

Appendix C. Carbon Dioxide Emissions from Natural Gas-Fired Power Plants, 1990-2004: By State

	carbon dioxide emissions (million metric tons)				electricity generation (million megawatt-hours)			
State	1990 CO2 Emissions (mmt)	2004 CO2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO2, 1990-2004	Net Electricity Generation from Natural Gas, 1990 (million MWh)	Net Electricity Generation from Natural Gas, 2004 (million MWh)	Generation Increase, 1990-2004 (million MWh)	Percent Increase in Generation, 1990-2004
AK	1.9	2.0	0.1	7%	3.5	3.6	0.2	5%
AL	0.3	6.3	6.0	2021%	1.0	16.0	15.0	1472%
AR	1.7	2.2	0.5	26%	3.6	5.1	1.5	41%
AZ	1.3	12.9	11.6	879%	2.3	28.3	25.9	1111%
CA	34.3	42.7	8.4	25%	74.2	100.5	26.3	35%
CO	0.7	4.6	3.9	547%	1.3	10.7	9.5	733%
CT	0.7	3.2	2.5	357%	1.3	8.1	6.9	548%
DC	0.0	0.0	0.0	n/a	0.0	0.0	0.0	n/a
DE	0.6	0.7	0.1	17%	0.8	1.7	1.0	125%
FL	10.1	32.1	22.0	218%	18.6	76.6	58.0	311%
GA	0.1	2.5	2.4	2291%	0.8	6.2	5.4	646%
HI	0.0	0.0	0.0	n/a	0.0	0.1	0.1	n/a
IA	0.2	0.4	0.2	98%	0.3	0.8	0.5	147%
ID	0.0	0.6	0.6	n/a	0.1	1.7	1.7	2970%
IL	0.5	1.7	1.2	238%	1.4	3.4	2.0	138%
IN	0.4	1.2	0.9	250%	1.5	2.4	1.0	66%
KS	1.4	0.6	-0.9	-61%	2.5	0.8	-1.7	-67%
KY	0.02	0.3	0.2	1613%	0.03	0.6	0.6	1984%
LA	15.8	13.3	-2.5	-16%	39.5	45.8	6.3	16%
MA	3.4	8.6	5.3	156%	6.1	21.0	14.9	243%
MD	1.1	0.7	-0.5	-42%	1.5	1.2	-0.3	-22%
ME	0.01	3.5	3.5	33424%	0.1	9.8	9.8	19248%
MI	3.6	7.6	4.0	109%	7.8	15.1	7.3	93%
MN	0.3	0.7	0.4	143%	0.5	1.5	1.0	179%
MO	0.2	1.3	1.1	598%	0.3	2.9	2.6	823%
MS	3.6	5.8	2.3	64%	5.9	11.6	5.7	96%
MT	0.03	0.01	-0.02	-59%	0.1	0.03	-0.02	-42%
NC	0.2	1.2	1.0	657%	0.2	2.5	2.3	1150%
ND	0.0001	0.0002	0.0001	91%	0.1	0.01	-0.04	-87%
NE	0.2	0.2	-0.02	-9%	0.3	0.3	-0.01	-3%
NH	0.0	2.1	2.1	n/a	0.0	5.4	5.4	n/a
NJ	3.6	7.7	4.1	114%	6.9	16.0	9.1	131%
NM	1.4	1.7	0.3	20%	2.7	3.0	0.3	9%
NV	1.3	7.6	6.3	474%	2.2	16.4	14.2	639%
NY	12.5	14.1	1.6	13%	22.7	27.3	4.6	20%
OH	0.1	1.0	0.9	1379%	0.2	1.4	1.1	474%
OK	9.7	10.9	1.2	12%	18.2	23.3	5.0	28%
OR	0.4	4.8	4.4	1093%	0.8	13.5	12.7	1545%
PA	0.7	4.2	3.4	465%	2.8	9.8	7.0	247%
RI	0.5	1.9	1.4	293%	0.9	4.8	3.9	445%
SC	0.4	1.8	1.4	367%	0.8	3.8	3.0	382%
SD	0.01	0.1	0.1	581%	0.01	0.1	0.1	805%
TN	0.03	0.1	0.1	300%	0.2	0.3	0.1	34%
TX	62.0	75.3	13.3	21%	136.2	186.8	50.6	37%
UT	0.05	0.5	0.4	912%	0.1	0.9	0.8	521%
VA	0.5	2.6	2.1	397%	1.1	6.4	5.3	466%
VT	0.04	0.003	-0.03	-93%	0.1	0.003	-0.1	-95%
WA	0.01	3.8	3.8	36579%	0.3	8.5	8.2	2844%
WI	0.1	1.1	1.0	679%	0.3	2.4	2.0	590%
WV	0.01	0.1	0.1	975%	0.1	0.3	0.2	181%
WY	0.004	0.03	0.02	608%	0.3	0.1	-0.2	-68%
U.S.	**176.0**	**298.3**	**122.3**	**70%**	**372.8**	**709.0**	**336.2**	**90%**

Appendix D. Carbon Dioxide Emissions from the Transportation Sector, 1990-2004: By State

carbon dioxide emissions (million metric tons)

State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2, 1990-2004
AK	11.9	18.6	6.7	56%
AL	27.7	34.4	6.7	24%
AR	15.8	20.3	4.4	28%
AZ	22.5	35.6	13.1	58%
CA	201.0	217.9	16.9	8%
CO	18.8	28.5	9.6	51%
CT	14.5	18.5	4.0	28%
DC	1.8	1.6	-0.2	-9%
DE	4.5	4.9	0.4	9%
FL	80.5	109.5	29.0	36%
GA	47.9	65.4	17.4	36%
HI	11.0	12.2	1.1	10%
IA	15.9	19.8	3.9	24%
ID	6.2	8.5	2.3	37%
IL	53.0	66.5	13.5	26%
IN	40.0	43.9	3.9	10%
KS	18.9	19.1	0.2	1%
KY	25.9	33.6	7.8	30%
LA	48.7	52.7	4.0	8%
MA	28.5	33.0	4.4	16%
MD	23.3	30.7	7.3	31%
ME	8.2	8.6	0.4	5%
MI	47.0	54.8	7.8	17%
MN	23.3	34.6	11.3	48%
MO	33.1	39.9	6.7	20%
MS	20.0	25.4	5.5	28%

carbon dioxide emissions (million metric tons)

State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	Percent Increase in CO_2, 1990-2004
MT	5.7	7.6	1.9	33%
NC	37.8	51.1	13.3	35%
ND	4.5	6.2	1.6	36%
NE	10.2	11.9	1.7	16%
NH	5.1	7.7	2.5	49%
NJ	56.4	63.8	7.4	13%
NM	14.6	15.4	0.8	6%
NV	9.3	15.7	6.4	69%
NY	63.2	73.3	10.1	16%
OH	54.8	69.7	14.9	27%
OK	23.5	28.5	5.1	22%
OR	19.8	22.4	2.7	14%
PA	58.7	70.0	11.3	19%
RI	4.1	4.3	0.2	6%
SC	21.7	31.7	10.1	46%
SD	4.6	5.8	1.2	27%
TN	32.2	44.4	12.2	38%
TX	150.9	190.2	39.3	26%
UT	10.4	16.3	5.8	56%
VA	41.1	53.5	12.5	30%
VT	3.0	3.8	0.8	27%
WA	40.8	42.5	1.8	4%
WI	23.9	29.9	6.0	25%
WV	10.2	12.3	2.1	21%
WY	5.7	8.0	2.3	41%
U.S.	**1,561.8**	**1,924.6**	**362.8**	**23%**

Appendix E. Carbon Dioxide Emissions from Motor Gasoline Consumption and Trends in Vehicle Miles Traveled, 1990-2004: By State

	carbon dioxide emissions (million metric tons)				vehicle miles traveled			
State	1990 CO_2 Emissions (mmt)	2004 CO_2 Emissions (mmt)	Emissions Increase, 1990-2004 (mmt)	CO_2 Percent Increase, 1990-2004	VMT, 1990 (millions)	VMT, 2004 (millions)	Increase in VMT (millions)	VMT Percent Increase, 1990-2004
AK	2.1	2.4	0.3	14%	3,910	4,990	1,080	28%
AL	17.8	22.0	4.2	24%	42,347	59,035	16,688	39%
AR	10.5	12.2	1.7	16%	21,011	31,648	10,637	51%
AZ	14.3	23.3	9.0	63%	35,455	57,336	21,881	62%
CA	110.9	127.8	16.9	15%	258,926	328,917	69,991	27%
CO	12.8	17.4	4.5	35%	27,178	45,891	18,713	69%
CT	11.4	14.3	3.0	26%	26,303	31,608	5,305	20%
DC	1.4	1.2	-0.2	-16%	3,407	3,742	335	10%
DE	2.9	3.6	0.7	24%	6,548	9,301	2,753	42%
FL	51.7	72.7	21.0	41%	109,997	196,444	86,447	79%
GA	30.0	43.1	13.1	44%	70,222	112,620	42,398	60%
HI	3.1	3.9	0.7	23%	8,066	9,725	1,659	21%
IA	11.0	12.5	1.5	14%	22,993	31,538	8,545	37%
ID	4.0	5.2	1.2	31%	9,849	14,729	4,880	50%
IL	37.3	41.2	3.8	10%	83,334	109,135	25,801	31%
IN	21.9	26.4	4.5	20%	53,697	72,713	19,016	35%
KS	10.2	11.1	0.9	9%	22,849	29,172	6,323	28%
KY	15.1	19.0	3.8	25%	33,639	47,322	13,683	41%
LA	16.0	18.9	2.9	18%	37,963	44,607	6,644	18%
MA	20.6	24.5	3.9	19%	46,177	54,771	8,594	19%
MD	17.4	22.9	5.5	32%	40,536	55,284	14,748	36%
ME	5.2	6.1	1.0	19%	11,871	14,948	3,077	26%
MI	35.9	41.2	5.3	15%	81,091	103,326	22,235	27%
MN	16.5	20.8	4.4	27%	38,946	56,570	17,624	45%
MO	23.1	26.4	3.3	14%	50,883	68,994	18,111	36%
MS	10.5	13.8	3.3	32%	24,398	39,431	15,033	62%
MT	3.6	4.1	0.5	15%	8,332	11,207	2,875	35%
NC	28.1	36.5	8.4	30%	62,752	95,903	33,151	53%
ND	2.7	2.8	0.1	5%	5,910	7,594	1,684	28%
NE	6.2	6.8	0.6	10%	13,958	19,171	5,213	37%
NH	4.3	6.1	1.8	42%	9,844	13,216	3,372	34%
NJ	28.5	37.5	8.9	31%	58,923	72,844	13,921	24%
NM	6.6	8.1	1.5	23%	16,148	23,942	7,794	48%
NV	5.4	8.9	3.5	66%	10,205	19,354	9,149	90%
NY	50.6	46.8	-3.8	-8%	106,902	137,898	30,996	29%
OH	39.2	43.0	3.8	10%	91,303	111,654	20,351	22%
OK	14.0	15.9	1.9	14%	33,141	46,443	13,302	40%
OR	11.5	12.8	1.4	12%	26,738	35,598	8,860	33%
PA	39.1	44.1	5.0	13%	85,708	108,070	22,362	26%
RI	3.2	3.2	0.001	0.04%	7,364	8,473	1,109	15%
SC	15.6	22.2	6.6	42%	34,376	49,551	15,175	44%
SD	3.1	3.3	0.2	7%	6,989	8,784	1,795	26%
TN	20.9	26.2	5.4	26%	46,710	70,943	24,233	52%
TX	73.4	98.4	25.0	34%	156,578	231,008	74,430	48%
UT	6.0	8.8	2.8	46%	14,646	24,696	10,050	69%
VA	25.6	33.3	7.7	30%	60,178	78,877	18,699	31%
VT	2.4	3.0	0.6	23%	5,838	7,855	2,017	35%
WA	19.4	22.8	3.4	17%	44,695	55,673	10,978	25%
WI	17.7	20.8	3.1	18%	44,277	60,399	16,122	36%
WV	7.0	7.1	0.1	1%	15,418	20,302	4,884	32%
WY	2.4	2.6	0.2	8%	5,833	9,261	3,428	59%
U.S.	**950.1**	**1,159.0**	**208.9**	**22%**	**2,144,362**	**2,962,513**	**818,151**	**38%**

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[51] Based on our analysis of state-specific fossil fuel consumption data (in BTU) through 2004 from the U.S. Energy Information Administration, *State Energy Consumption, Price and Expenditure Estimates*. See the methodology for a detailed description of how we conducted this analysis.
[52] U.S. Energy Information Administration, *Electric Power Annual*, October 2006, Existing Capacity by Energy Source,

Table: "Existing Electric Generating Units in the United States, 2005," accessed March 21, 2007 at http://www.eia.doe.gov/cneaf/electricity/page/capacity/existingunits2005.xls. The total capacity only includes (1) plants where coal (anthracite, bituminous, lignite, subbituminous, waste/other coal, and coal-based synfuel) is listed as the primary energy source, and (2) plants listed as operating (not standby, backup, or out of service/retired).

[53] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2005,* July 2006, Table 8.2b. Accessed March 21, 2007 at http://www.eia.doe.gov/emeu/aer/elect.html.

[54] U.S. PIRG Education Fund, *Making Sense of the Coal Rush: The Consequences of Expanding America's Dependence on Coal*, July 2006.

[55] Ibid.

[56] U.S. Energy Information Administration, *Electric Power Annual*, October 2006, Existing Capacity by Energy Source, Table: "Existing Electric Generating Units in the United States, 2005," accessed March 21, 2007 at http://www.eia.doe.gov/cneaf/electricity/page/capacity/existingunits2005.xls. The total capacity only includes plants listed as operating (not standby, backup, or out of service/retired).

[57] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2005,* July 2006, Table 8.2b. Accessed March 21, 2007 at http://www.eia.doe.gov/emeu/aer/elect.html.

[58] U.S. Energy Information Administration, "Glossary," accessed March 26, 2007 at http://www.eia.doe.gov/glossary/glossary_t.htm. Vehicles with a primary non-transportation purpose (construction cranes, bulldozers, farming vehicles, warehouse tractors and forklifts) are classified in the sector of their primary use.

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[61] U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2001*, April 15, 2003.

[62] 1990-1995 data: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, 1995, Section V, Table VM-203, available at www.fhwa.dot.gov/ohim/summary95/section5.html; 1996-2004 data: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, 1995-2004, Section V, Table VM-3, available at http://www.fhwa.dot.gov/policy/ohpi/hss/hsspubs.htm.

[63] Based on our analysis of state-specific fossil fuel consumption data (in BTU) through 2004 from the U.S. Energy Information Administration, *State Energy Consumption, Price and Expenditure Estimates*. See the methodology for a detailed description of how we conducted this analysis.

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[66] See U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, 15 August 2005, Chapter 5.

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