Falling Behind

New England Must Act Now to Reduce Global Warming Pollution

Environment Maine
Research & Policy Center

Natural Resources Council
of Maine

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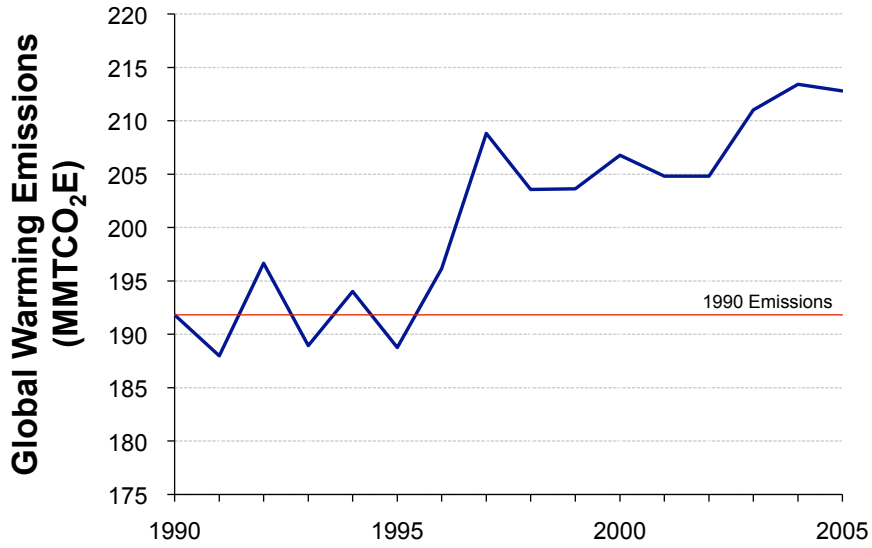
Executive Summary

Global warming has the potential to disrupt New England's environment and way of life. Coastal flooding, smoggier summers, the loss of reliable ski seasons, threats to the region's vibrant fall foliage displays, and a host of other impacts could result if global warming pollution worldwide continues to increase.

Recognizing the danger, in 2001 the New England governors and Eastern Canadian premiers adopted a landmark commitment to reduce the region's emissions of global warming pollution to 1990 levels by 2010 and to 10 percent below 1990 levels by 2020.

An analysis of global warming emission data for 2005, the most recent year available, holds both good news and bad news for the region.

Figure ES-1: Emissions across New England Have Been Rising



The bad news is that New England is not on track to meet the targets for global warming pollution reductions set by the New England governors in 2001.

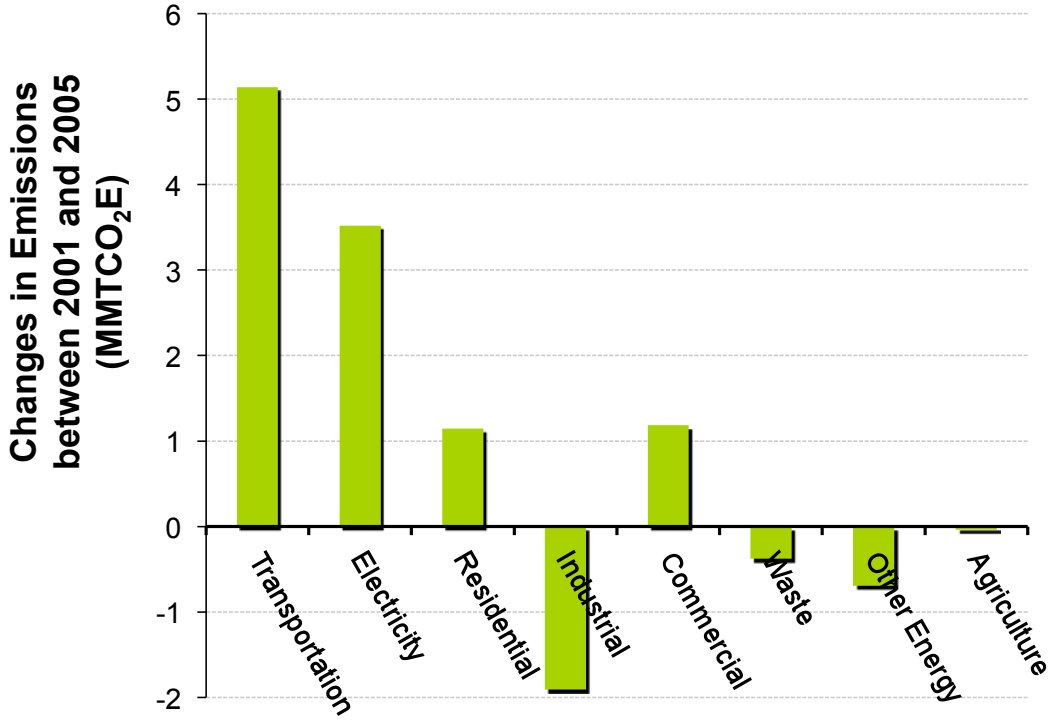
Emissions were 8 million metric tons (carbon dioxide equivalent) greater in 2005 than they were in 2001. (See Figure ES-1.) Indeed, New England is significantly farther away from achieving the governors' goal than it was when the commitment was originally made.

Since the Climate Change Action Plan was signed in 2001, global warming emissions have increased in most sectors of New England's economy.

- **Transportation emissions increased by 7 percent between 2001 and 2005, accounting for the largest share of the increase.** This change primarily reflects greater use of gasoline to fuel cars and light trucks, increased use of diesel fuel for heavy-duty trucks, and expanded consumption of jet fuel.
- **Emissions from electricity generation increased by 8 percent.** Increased electricity generation at natural gas and coal-burning power plants, partially driven by increased per-capita electricity consumption, resulted in higher emissions.
- **Emissions from fossil fuel consumption in residential and commercial buildings also increased.** New England experienced a colder winter in 2005 than in 2001, largely accounting for the increase in emissions. Emissions from the region's industrial sector, meanwhile, have decreased since 2001, as a result of a sharp drop off in natural gas consumption likely caused by higher natural gas prices and industry shrinkage.

The good news for New England is that global warming pollution fell slightly from 2004 to 2005—the first year-to-year decrease since 2001—and that several indicators suggest that the

Figure ES-2: Changes in Global Warming Emissions in New England between 2001 and 2005 by Sector



decrease in emissions continued and accelerated in 2006.

- **Global warming emissions in New England dropped by 0.3 percent from 2004 to 2005.** (See Figure ES-1.) A reduction in emissions from oil consumption in the residential, commercial and transportation sectors was the leading reason for the decline. Oil prices increased sharply during 2005, and demand for home heating oil was down slightly due to the warmer winter, both of which may have triggered the decline in oil use.

- **Global warming emissions are likely to have declined at an even faster rate from 2005 to 2006.** Fossil fuel consumption declined in many sectors of the New England economy during this period. Carbon dioxide emissions from power plants—New England's second-largest source of global warming pollution—declined by 11 percent from 2005 to 2006. Sales of gasoline, diesel fuel and home heating oil also declined. High energy prices—coupled with energy efficiency efforts in some states—may have been responsible.

Emissions of global warming pollution increased in five of the six New England states from 2001 to 2005.

- **Connecticut** saw emissions increase by 4 percent between 2001 and 2005. An increase in emissions from home heating oil and transportation were the leading reasons for the increase.

- **Maine** experienced a 2 percent increase in emissions between 2001 and 2005. Maine was also the only New England state to achieve falling global warming emissions in both 2004 and 2005. Emissions in the electricity sector dropped by a third between 2001 and 2005, due to reduced production of electricity from oil and natural gas fired power plants. Emissions from transportation, however, grew significantly.

- **Massachusetts** emissions increased by 2 percent between 2001 and 2005, with the transportation and electricity sectors driving the increase. Electricity consumption grew faster in Massachusetts than in any other state at 9 percent over the period.

- **New Hampshire** posted the greatest increase in emissions between 2001 and 2005, with emissions rising by 26 percent. The increase was largely due to a significant increase in electricity generation in the state, with two of New Hampshire's three largest power plants having come on line since 2001. These plants serve the broader New England electric grid.

- **Rhode Island** was the only state to experience a drop in emissions between 2001 and 2005, with emissions falling by 7 percent. The bulk of the drop, however, was due to reductions in power production—reductions that were countered by increases in production at other power plants in the region. Notably, however, emissions from the state's transportation sector decreased by 7 percent during a period when transportation emissions were on the rise region-wide.

- **Vermont** experienced a 1.2 percent increase in emissions between 2001 and 2005. The biggest contributor to Vermont's increase in emissions since 2001 is the transportation sector, which saw emissions increase by 0.16 $MMTCO_2E$.

- Emissions declined in four of the six states from 2004 to 2005, although shifts in power production among the states—all of which feed New England's common electric grid—are responsible for a large share of the year-to-year variation in state emissions.

- Energy consumption data for 2006 suggest that most New England states reduced their emissions compared to 2005. Massachusetts, for example, produced fewer emissions from electricity production and lowered its consumption of gasoline, highway diesel fuel, home heating oil, and natural gas.

New England has made progress in adopting policies to reduce global warming pollution, but more remains to be done to reduce the threat of global warming.

To fulfill its commitment, New England must reduce emissions 10 percent below 2005 levels by 2010 and 19 percent below 2005 levels by 2020. The progress the region likely achieved in 2006 is a good start. However, further action will be required to ensure that New England achieves the level of emission reductions necessary to prevent the worst effects of global warming.

The New England states should:

- Adopt mandatory, enforceable caps on global warming pollution from all sectors of the economy. The level of the emission cap should be set based on the reductions science says are necessary to prevent the worst impacts of global warming, which mirror the New England governor's agreement.

- Enforce and, where possible, strengthen transit systems and clean energy policies and programs already adopted by the states, such as:

  - The Regional Greenhouse Gas Initiative (RGGI), which caps emissions from electric power plants. RGGI's emission reduction target—10 percent below projected 2009 levels by 2019—is inadequate and should be strengthened.

  - The Clean Cars program, which has been adopted by every New England state other than New Hampshire.

  - Energy efficiency efforts, including product standards and building efficiency codes, which can save New Englanders' money on their energy bills while reducing emissions.

  - Renewable electricity standards and other efforts to promote renewable energy.

  - Consumer-funded home and business heating efficiency programs designed to reduce heating oil and natural gas use.

- Build a more sustainable transportation system for the region that would reduce emissions by:

  - Investing in the region's rail infrastructure and developing a long-term rail plan.

  - Improving transit in suburbs and smaller cities.

  - Encouraging downtown redevelopment in a sustainable, pedestrian friendly way.

  - Supporting transit-oriented, compact residential and commercial development.

  - Reallocating the costs of driving, such as pay-as-you-drive insurance and elimination of parking subsidies.

  - Considering global warming pollution in transportation planning and development projects.

Introduction

When the members of the Conference of New England Governors and Eastern Canadian Premiers signed the Climate Change Action Plan in 2001, they made a bold commitment to reducing the region's contribution to global warming. The regional agreement—the first of its kind in North America—set the stage for other cooperative efforts, such as the Regional Greenhouse Gas Initiative, and paved the way for the adoption of clean energy policies in each of the New England states. Indeed, the example New England has set in working cooperatively to address global warming has even served as a model for regional efforts in other parts of the country, most notably the western United States.

New Englanders have good reason to take leadership in fighting global warming, with so much to lose. Global warming threatens to cause dramatic changes in everything from the way we enjoy the outdoors to the fundamentals of New England's economy. In the next century, New England could see coastal flooding, displacement of critical animal and plant habitat, death of hardwood trees responsible for vibrant fall displays, loss of a reliable ski season, and damage from more severe storms.[1]

In order to avoid the worst effects of global warming, scientists say we need to act boldly and act now. Yet, as the data in this report show, New England's actions to date have not been enough to keep the region on track to meet the commitment laid out by the region's governors in 2001. While a recent decline in emissions is good news, the time has come for New England states to strengthen their commitment to reducing global warming pollution by adopting mandatory, enforceable caps on global warming pollution.

New England has a wealth of opportunities to reduce emissions of global warming pollution. Energy efficiency, for example, could already reduce carbon dioxide emissions in the region by over 20 percent.[2] Strong leadership on clean energy, combined with the certainty of a cap on emissions, can ensure that New England remains a leader in the effort to prevent the worst impacts of global warming.

Global Warming Emissions in New England Have Risen Since 2001

The Climate Change Action Plan

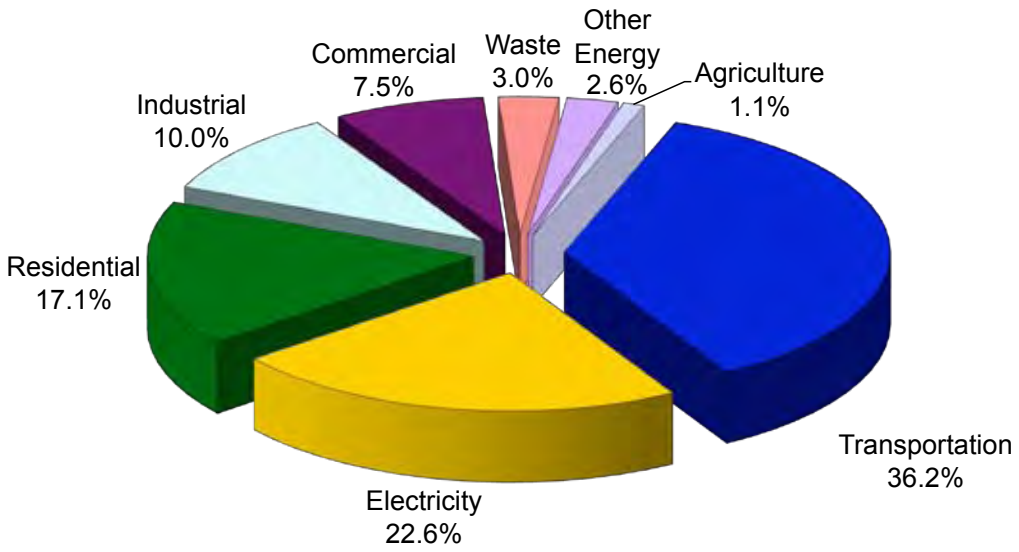
In July 2000, the Conference of New England Governors and Eastern Canadian Premiers adopted a resolution to "examine the regional impacts of global warming, discuss options for reducing greenhouse gas (GHG) emissions, and clarify the need for this region to adapt to climate change and explore methods for doing so."[3] The recommendations that came out of that investigation formed the basis for the Climate Change Action Plan, which was adopted at the conference the following year.

The Climate Change Action Plan includes a commitment to reach specific emissions reductions targets for the region as a whole:

- Reduce emissions to 1990 levels by the year 2010.
- Reduce emissions to 10 percent below 1990 levels by the year 2020.
- Reduce regional emissions enough to "eliminate any dangerous threat to the climate," which was acknowledged to be 75 to 85 percent below 2001 levels according to scientific knowledge at the time.[4] In 2007, the governors agreed to 2050 as the deadline for these reductions.

Notably absent from the Climate Change Action Plan was a mechanism to enforce deviations from the commitment. This is the primary weakness of the plan, and it can been seen in the lack of significant progress toward the regional goals. The most recent emission data show that, as of 2005, the region was still farther from the goal than in 2001.

Figure 1: Global Warming Pollution in New England by Source in 2005 ($MMTCO_2E$)[5]



Global Warming Pollution in New England

New England produced significantly more global warming pollution in 2005 than it did in 2001, the year of the New England governors' historic commitment to the regional Climate Change Action Plan.

More than 90 percent of New England's global warming pollution comes from the combustion of fossil fuels. Other sources of global warming pollution in the region include industrial processes, solid waste and sewage, and agriculture. (See Figure 1.)

New England Is Not on Track to Meet the 2010 Emission Reduction Target

New England is not on track to meet the Climate Change Action Plan target of reducing global warming emissions to 1990 levels by 2010.[6] When the 2001 agreement was made, emissions were 13 million metric tons of carbon dioxide equivalent ($MMTCO_2E$) above 1990 levels. Rather than leveling off or falling, global warming emissions have continued to grow through most of this decade. (See Figure 2.)

Calculating Global Warming Emissions

This report includes estimates of global warming emissions produced from all fuels, processes and waste products of the economy. Emissions related to changes in land use patterns and forestry are not included in these estimates. For a full explanation of the methodology behind our emissions estimates, see Methodology.

Figure 2: Global Warming Emissions in New England since 1990

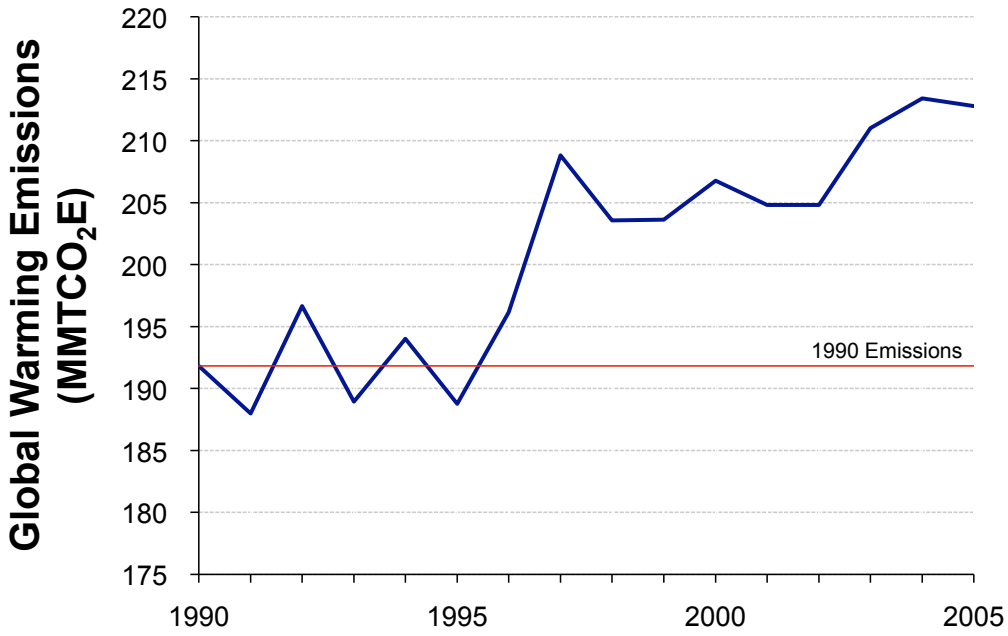
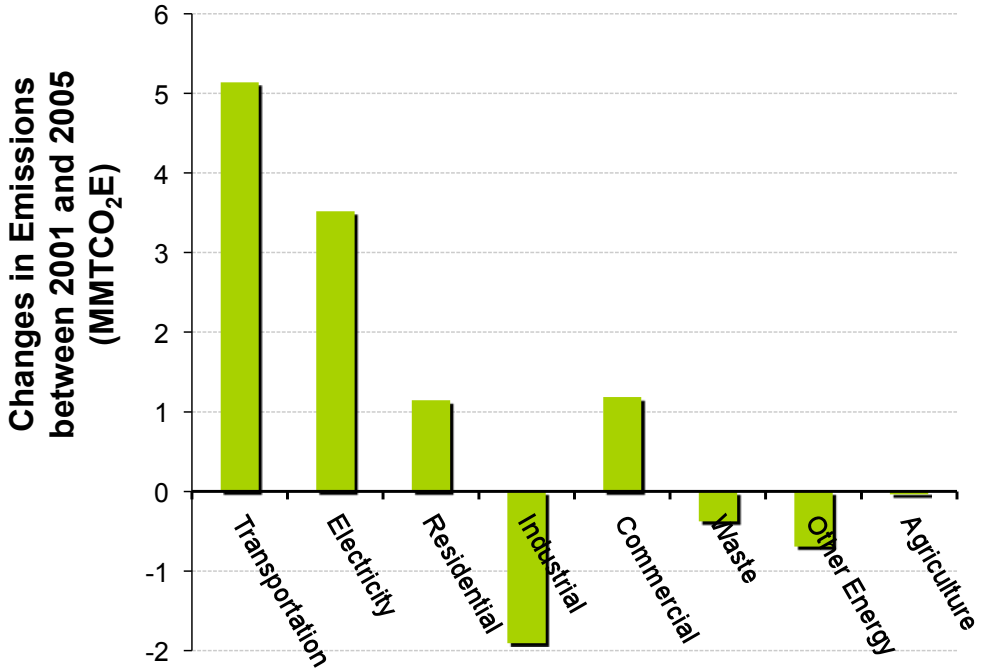


Figure 3: Changes in Global Warming Emissions in New England Between 2001 and 2005



Calculations based on the recent release of the Energy Information Administration's 2005 state energy consumption data show that, almost halfway to the 2010 deadline, New England was significantly further from the goal than it was in 2001 when the agreement was signed by its governors. To meet the 2010 target, New England must reduce annual emissions by 21 $MMTCO_2E$ between 2005 and 2010, or 10 percent below 2005 levels.

Transportation and Electricity Have Driven Emissions Increases in New England

The two main drivers of the increase in global warming pollution in New England since 2001 are increases in emissions from transportation and electricity generation. (See Figure 3.)

Transportation

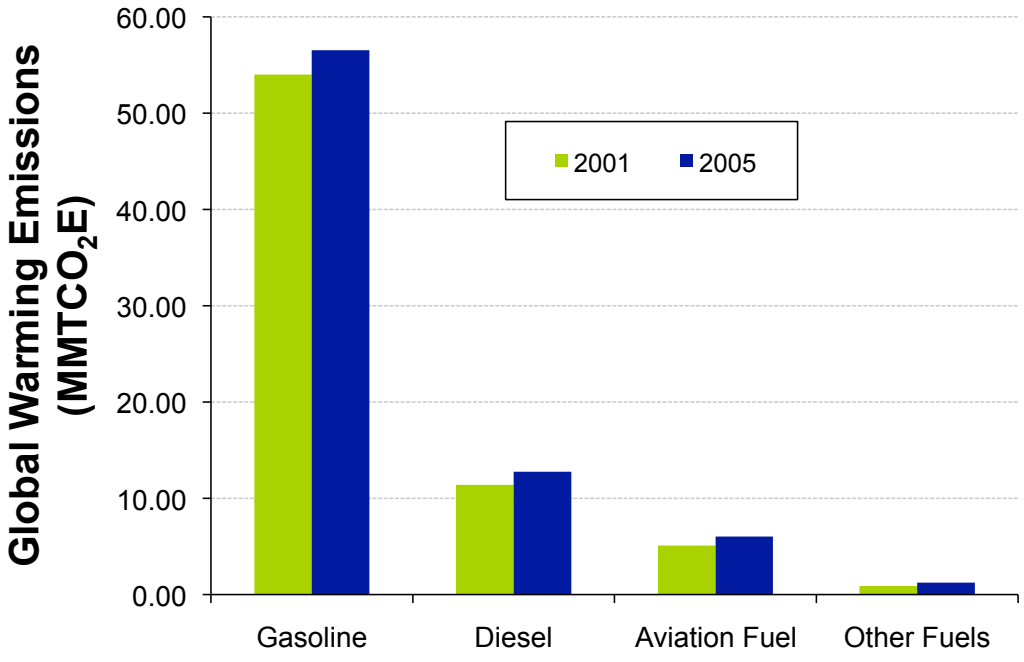
Transportation was responsible for the greatest increase in global warming pollution in the region since 2001. Transportation sector emissions increased 5.1 $MMTCO_2E$, an increase of 7 percent over 2001.

More Miles Traveled in Less Fuel-Efficient Vehicles

Almost half the increase in CO_2 emissions from transportation was from an increase in the consumption of gasoline. (See Figure 4.) Emissions from gasoline increased 5 percent, the result of more people driving more miles with less efficient vehicles such as sport utility vehicles (SUVs), vans, and pickup trucks.[7]

Between 2001 and 2005, the number of registered SUVs, vans, and pickup trucks in New England increased by 22 percent, while the number of passenger cars actually decreased.[8] During the same time period, the average fuel efficiency of passenger cars increased across the United States

Figure 4: New England's Global Warming Emissions from Transportation



from 22.1 to 22.9 miles per gallon (MPG), while the efficiency of vans, light trucks, and SUVs dropped 8 percent from 17.6 to 16.2 MPG.[9] At the same time, the average New Englander traveled 1.4 percent more miles in 2005 than in 2001.[10] These factors combined to accelerate the growth in global warming pollution from transportation.

Maine and Massachusetts saw the biggest increases in emissions from gasoline consumption between 2001 and 2005, while Rhode Island's emissions actually decreased.

Diesel Fuel Consumption on the Rise

Diesel fuel use accounted for a quarter of the increase in carbon dioxide emissions from the transportation sector, rising 1.4 $MMTCO_2E$ between 2001 and 2005. (See Figure 4.) The largest consumer of diesel fuel is heavy trucks, which were driven 7 percent more miles per year over the same period nationwide.[11] Massachusetts, followed by Connecticut, had the greatest increase in diesel fuel usage between 2001 and 2005, while Vermont's diesel consumption decreased.

Aviation Fuel and Other Fuels

The small remaining increase in carbon dioxide from the transportation sector not explained by increases in gasoline and diesel consumption came largely from aviation fuel. Emissions from aviation fuel rose 0.9 $MMTCO_2E$ between 2001 and 2005, an 18 percent increase. Across New England, another increase of 0.3 $MMTCO_2E$ came from changes in the use of liquified petroleum gas, natural gas, and residual fuel oil.

Electricity Production

Carbon dioxide emissions from electricity production in the region accounted for the second-largest increase in emissions since 2001, driving emissions up by 3.5 $MMTCO_2E$ or 8 percent.

Emissions from electricity production in the region are mainly influenced by three factors: the demand for electricity, the amount of electricity used within the

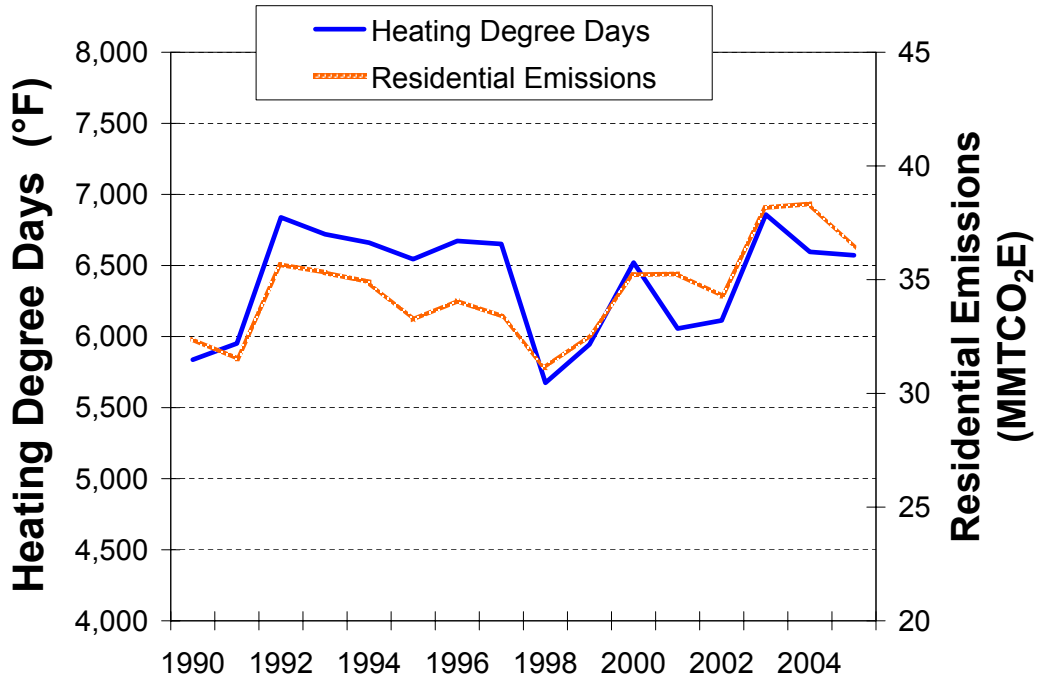
Regional Greenhouse Gas Initiative

The New England states are among 10 throughout the Northeast taking part in the Regional Greenhouse Gas Initiative (RGGI), a first-of-its-kind program to limit emissions of carbon dioxide from power plants in the region. RGGI will cap carbon dioxide emissions from power plants at projected 2009 levels through 2014 and cut emissions by 10 percent by 2018.

Unfortunately, the cap may not be strong enough to actually affect emissions in the early years of the program. With fuel prices higher than expected and many electricity producers switching away from carbon-intense petroleum fuel, emissions were 48.1 $MMTCO_2E$ in 2005, and likely fell in 2006, while allowances for RGGI will allow producers to emit 50.6 $MMTCO_2E$ every year through 2014.[15]

RGGI allowances should be retired early to keep New England's carbon dioxide emissions from the electricity sector in line with Climate Action Plan targets of 1990 levels by 2010 and 10% below by 2020. For the emissions regulated by RGGI, that would mean capping carbon dioxide from electricity production at 44.6 $MMTCO_2E$ by 2010 and 40.1 $MMTCO_2E$ by 2020.

Figure 5: New England's Residential Emissions Rise with Colder Winters [16]



region that is generated here, and the fuels used to produce that electricity.

Per capita electricity demand in the region increased by 7 percent between 2001 and 2005 to 9 megawatt-hours per person per year.[12] Since the region's population only increased 1.2 percent over this time period, the increase in emissions from electricity is mostly the result of greater usage per person.[13] Residential and commercial electricity demand grew equally, while industrial electricity consumption in New England decreased due to plants generating their own electricity or shutting down altogether.

Another change between 2001 and 2005 is that the amount of power produced in the region increased by 17 percent. The result is that New England was less dependent on power imports from outside the region than it was in 2001. In 2001, power imports from New York and Canada supplied 11 percent of the region's electricity; by 2005, imports accounted for only 4.7 percent of our electricity.[14] Part of the increase in electric-sector emissions, therefore, is merely the result of shifting pollution that had occurred at power plants outside the region to plants within New England.

The third factor that influences electric sector emissions is the carbon-intensity of the power plants used to generate electricity. New England's power plants produced 8 percent fewer emissions per unit of electricity produced in 2005 than they did in 2001. Most of the change in emissions intensity is due to the trend away from the use of oil to generate electricity in New England—emissions from oil-burning power plants in the region declined by half between 1998 and 2005. Much of the electricity that had been produced with petroleum is now produced with cleaner-burning natural gas.

Trends in Other Sectors

Residential and Commercial Energy Use

Residential and commercial buildings release a significant amount of global warming emissions from the direct combustion of fossil fuels such as heating oil and natural gas.

Carbon dioxide emissions from fossil fuel burned in commercial buildings increased by 1.2 $MMTCO_2E$, or 8 percent, between 2001 and 2005. The rise was driven by increases in heating oil used in Massachusetts, Maine, and New Hampshire, and was partially mitigated by an overall decrease in commercial natural gas usage in New England.

Carbon dioxide emissions from fossil fuel burned in homes increased by 1.2 $MMTCO_2E$, a 3 percent increase. Part of the increase is the result of cooler winters; the relatively warm winters of 2001 and 2002 were followed by colder winters the following three years. (See Figure 5.) In Massachusetts, rising oil prices led many homeowners to conserve heating oil, or even convert to heating systems fueled by natural gas, leading to a large fall in heating oil emissions in the state, and only a small increase regionwide.

Emissions from Other Sources

The industrial sector, including emissions from energy usage and industrial processes, reduced emissions by 1.9 $MMTCO_2E$ since 2001, and emissions from agriculture and waste decreased slightly.

State-Level Trends

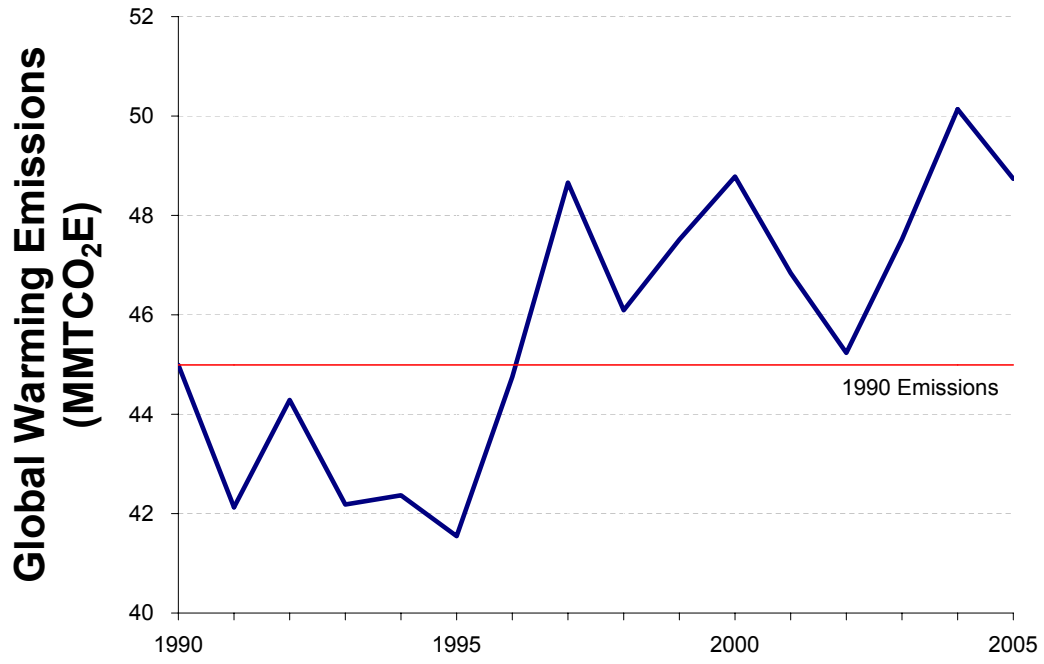
Connecticut

Connecticut's global warming emissions rose 1.9 MMTCO$_2$E, or 4 percent, between 2001 and 2005. (See Figure 6.) Connecticut's largest increase in emissions over this four year period came from home energy use, which jumped over 10 percent. The winter of 2005 was significantly colder than the winter of 2001, leading people to use more fuel to heat their homes, which was a big factor in the increase.

Transportation accounted for 37 percent of the net increase in emissions in Connecticut. Most of transportation's contribution came from trucks and other diesel consumers, and gasoline was the next largest piece.

Connecticut did experience reduced emissions from natural gas use in commercial buildings, which fell 0.5 MMTCO$_2$E.

Figure 6: Global Warming Emissions in Connecticut since 1990



Maine

Maine, where global warming emissions rose 0.5 $MMTCO_2E$ or 2 percent between 2001 and 2005, was the only New England state to reduce global warming emissions in both 2004 and 2005.

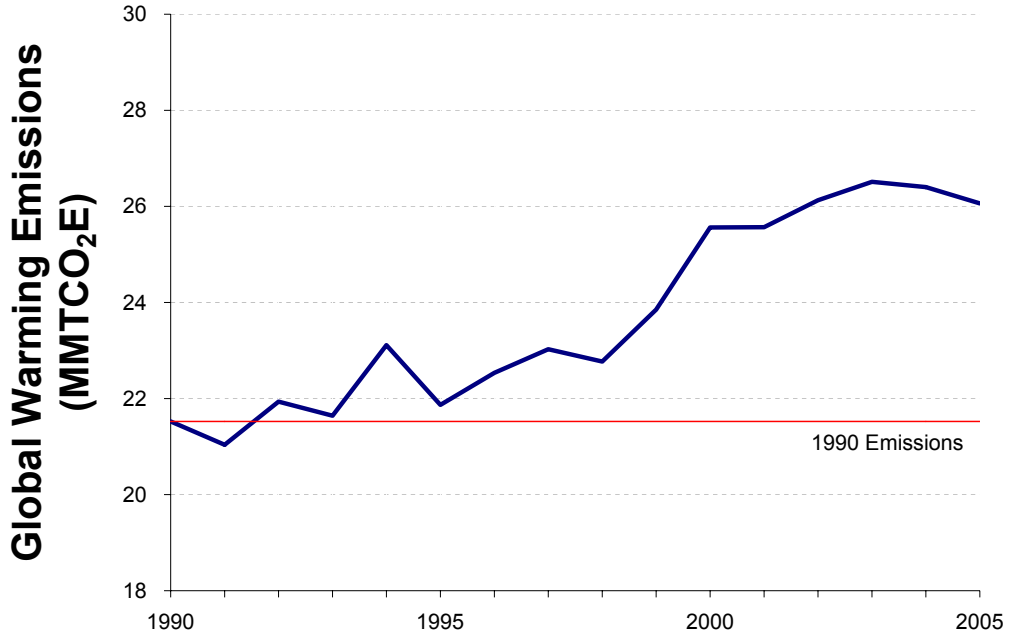
The electricity sector led the way in decreasing emissions with a one-third drop since 2001, or 1.9 $MMTCO_2E$. The drop came from a decreased usage of all fossil fuels for electricty production, and particularly natural gas.

The biggest reason for the decrease in electricity generation from fossil fuels was greater use of other electricity sources, such as hydroelectric power and biomass. Another reason for the decrease is that total electricity production fell 3.7 percent, largely because of a 16 percent drop in grid electricity used by industries. This is mostly the result of paper and textile mills shutting down over the last few years. Additionally, some mills and factories switched from grid electricity to generating their own power, but total emissions directly from industrial fuel used for energy also declined 16 percent.

Maine's decrease in emissions from electricity production was outweighed by increases elsewhere, especially transportation, which grew by 1.7 $MMTCO_2E$. The increase was dominated by gasoline, which generated 4 percent more pollution due to growth in vehicle travel and greater use of SUVs and other inefficient passenger vehicles. Aviation fuel and diesel also contributed to transportation's emissions rise.

Maine also saw significant increases in emissions from the residential and commercial sectors, largely because of the colder winter in 2005 than in 2001. Residential emissions increased 0.8 $MMTCO_2E$, or 20 percent, and commercial emissions increased 0.5 $MMTCO_2E$, or 32 percent.

Figure 7: Global Warming Emissions in Maine since 1990



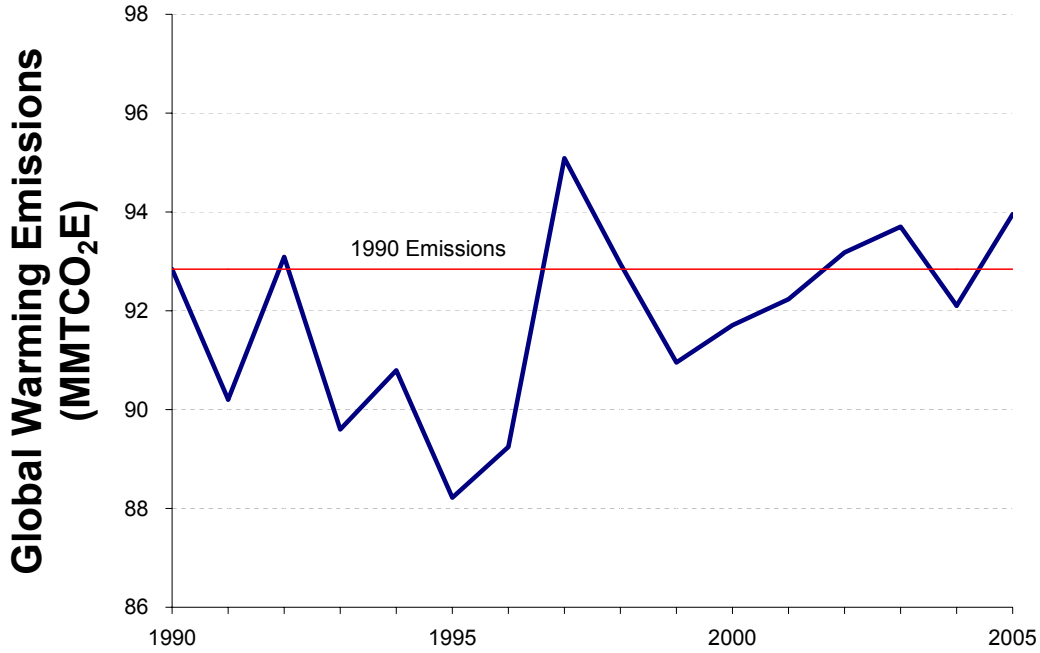
Massachusetts

Massachusetts, where global warming emissions rose 1.7 $MMTCO_2E$ or 2 percent from 2001 to 2005, is responsible for 44 percent of all New England emissions. Massachusetts also experienced an emissions increase of 1.9 $MMTCO_2E$ between 2004 and 2005. The biggest emission increases since 2001 have come from the transportation and electricity sectors, while the largest decreases have come from the industrial, residential, and waste sectors.

Transportation emissions rose 2.7 $MMTCO_2E$ or 8.5 percent from 2001. The increase was split roughly evenly between gasoline, aviation fuel, and diesel emissions.[17] Population grew only 0.3 percent during the time period, but people drove more SUVs and other less efficient cars, drove cars and trucks longer distances, and took more flights.

Emissions from electricity generation increased 2.4 $MMTCO_2E$, or 11 percent, since 2001. While some of the additional electricity was exported to other states in the region, electricity consumption grew faster in Massachusetts than in any other state at 9 percent, despite the slowest population growth.

Figure 8: Global Warming Emissions in Massachusetts since 1990



New Hampshire

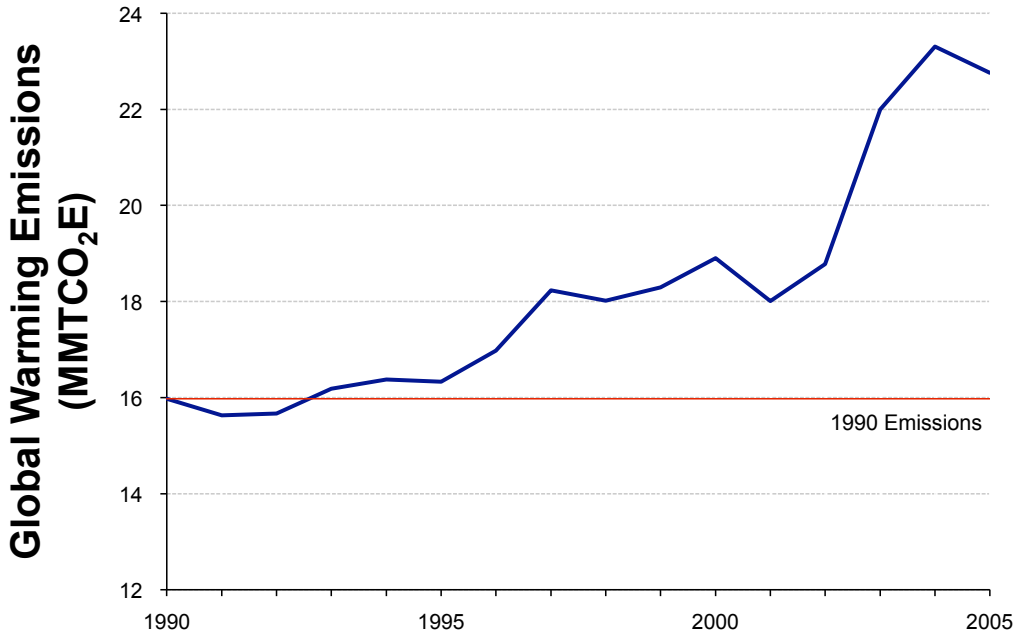
In New Hampshire, global warming emissions rose 4.8 $MMTCO_2E$, or more than 26 percent, since 2001, making the state responsible for most of New England's rising emissions through 2005.

The bulk of the increase was due to the construction of two large natural gas-fired power plants in the state, which supply power to the entire New England region. Electricity production in New Hampshire jumped 62 percent between 2001 and 2005 as a result of the added capacity. The increase in natural gas-fired power plant emissions was responsible for 53 percent of New Hampshire's total emission increase over that time. New Hampshire, however, did drive some of the rise in electricity sector emissions regionwide, due to a 9 percent increase in electricity consumption.

New Hampshire also saw significant increases in emissions from the commercial and residential sectors, largely because of the colder winter in 2005 than in 2001. Commercial emissions increased 0.6 $MMTCO_2E$, or 48 percent, and residential emissions increased 0.3 $MMTCO_2E$, or 11 percent.

Transportation emissions also increased 0.2 $MMTCO_2E$. This is only a 2.4 percent increase, but would have been twice as large if use of aviation fuel had not dropped. Gasoline consumption increased significantly from greater usage of less efficient cars and a surge in vehicle travel.

Figure 9: Global Warming Emissions in New Hampshire since 1990

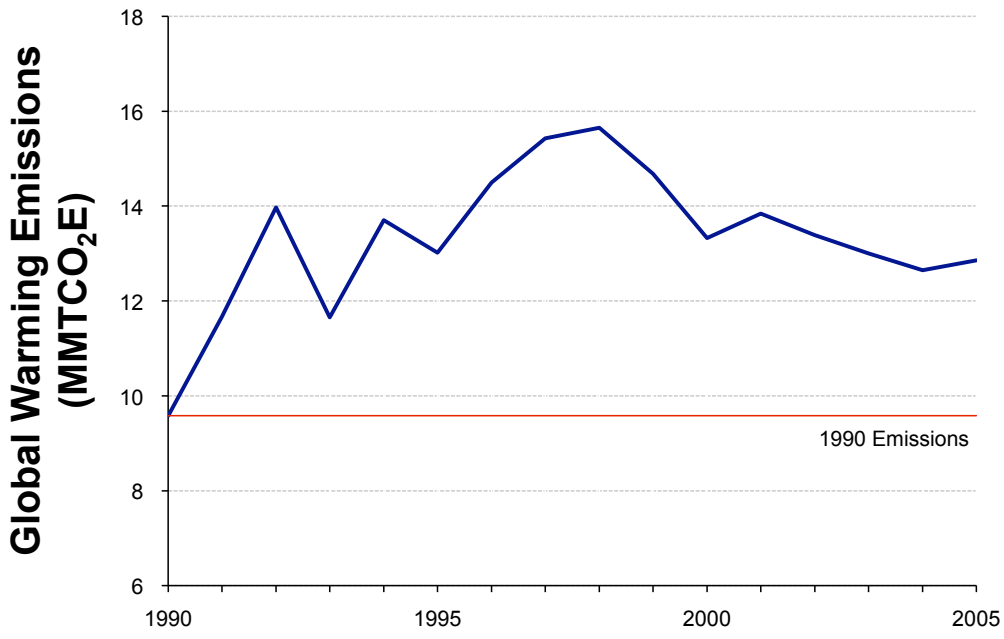


Rhode Island

In Rhode Island, global warming emissions fell 1.0 $MMTCO_2E$, or more than 7 percent. The bulk of the drop since 2001 was due to a 19 percent fall in electricity production, despite electricity consumption growing by 9 percent. In other words, Rhode Island's emissions "dropped" largely because it increased the proportion of its power it drew from other states in the region—causing emissions in those states to increase.

However, Rhode Island was also the only state in the region to experience a decrease in emissions from the transportation sector between 2001 and 2005—a 0.3 $MMTCO_2E$, or 7 percent decline. The drop came equally from lower usage of gasoline and aviation fuel despite a 0.8 percent population growth.[18]

Figure 10: Global Warming Emissions in Rhode Island since 1990



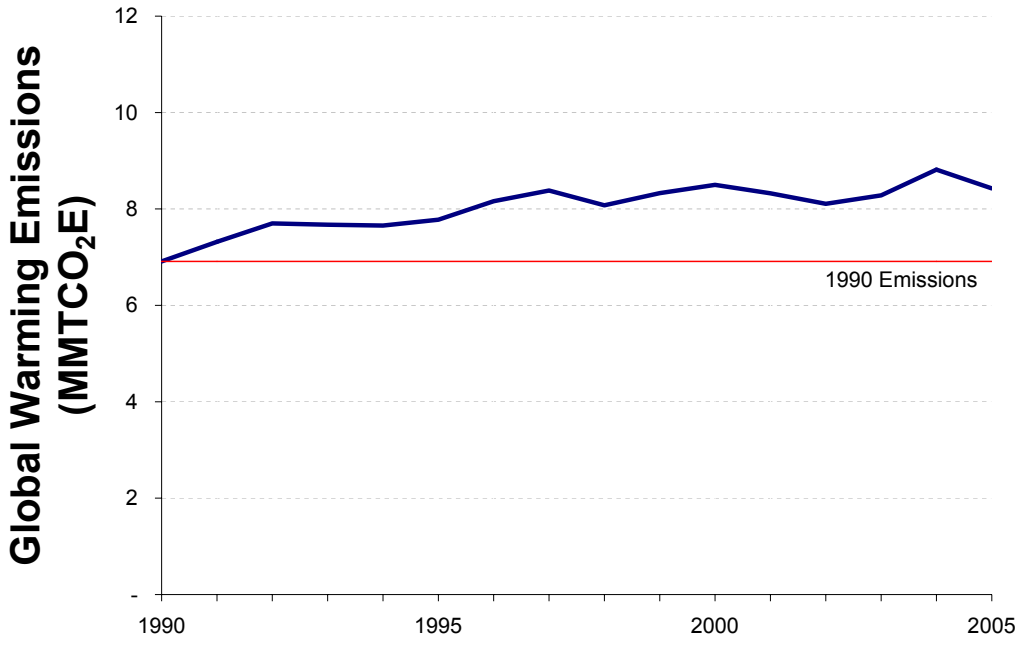
Vermont

Vermont's global warming emissions rose 0.1 $MMTCO_2E$ or 1.2 percent since 2001. The biggest contributor to Vermont's increase in emissions since 2001 is the transportation sector, which rose 0.16 $MMTCO_2E$. The transportation increase was evenly split between gasoline consumption, which grew despite fewer cars being registered because they were less efficient and driven further, and aviation fuel consumption. Diesel consumption fell 0.08 $MMTCO_2E$.

Industrial and residential emissions also increased significantly in Vermont, 0.11 and 0.07 $MMTCO_2E$, respectively. The increase was dominated by higher petroleum consumption, but natural gas consumption also increased slightly in both sectors. The residential trend tracks other states, which is largely due to weather.

Vermont's emissions from the waste, agriculture, commercial, and electricity sectors all declined between 2001 and 2005. The state's emissions from electricity production, while already low, fell 0.04 $MMTCO_2E$, despite increasing overall electricity production, due to a decreasing reliance on natural gas and coal fired power plants.

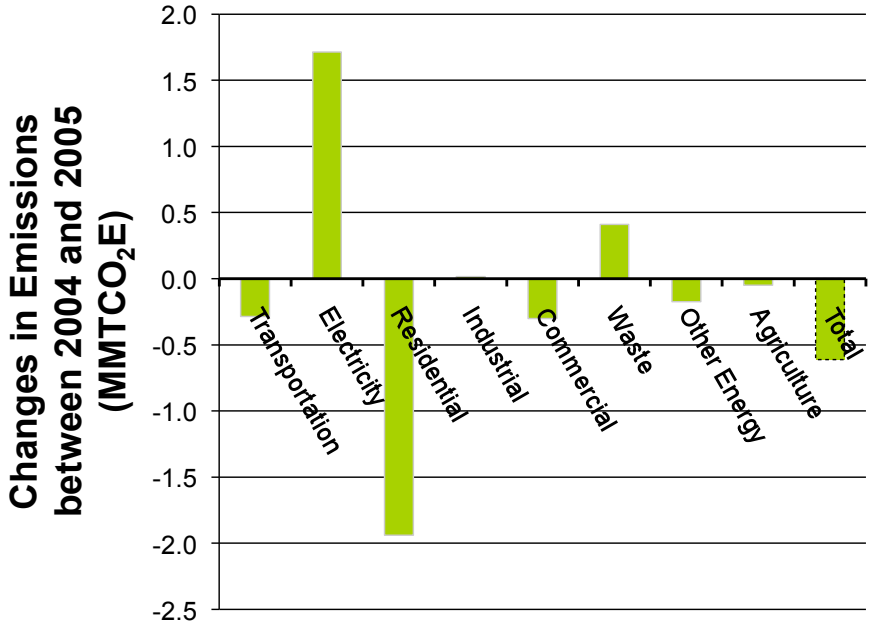
Figure 11: Global Warming Emissions in Vermont since 1990



Emissions Dropped Slightly in 2005 and Likely Dropped Farther in 2006

While New England's global warming emissions increased significantly in the first half of this decade, there is a silver lining: global warming pollution in the region declined from 2004 to 2005—the first one-year decrease in emissions since the Climate Change Action Plan targets were set in 2001. Total emissions in New England dropped 0.6 $MMTCO_2E$ between 2004 and 2005, which is 0.3 percent of all New England emissions. Emissions declined in

Figure 12: Changes in New England Emissions between 2004 and 2005 by Sector



four of the six New England states (all but Massachusetts and Rhode Island).

The complete set of data required to calculate New England's 2006 global warming pollution emissions is not yet available. But several indicators—particularly statistics regarding trends in fossil fuel use—suggest that emissions also declined from 2005 to 2006, and likely by an even greater degree than from 2004 to 2005.

Reduced Oil Consumption Resulted in Lower Emissions in 2005

New England's global warming pollution reduction from 2004 to 2005 was made possible by a significant decrease in petroleum consumption, which fell 2.3 $MMTCO_2E$. The difference was most visible in heating oil use in homes, but was also seen in the transportation, and commercial sectors.

There are two factors that likely played key roles in reducing oil consumption in New England in 2005. The first was a winter that was somewhat warmer in 2005 than in 2004, triggering reduced demand for oil for space heating. The second, and likely larger factor, was the surge in oil prices that began in earnest in 2005. Higher oil prices caused New England businesses and consumers to make significant changes during 2005. Power plants used less oil to generate electricity, drivers reduced their use of gasoline and diesel fuel, and many homeowners likely thought twice before setting the thermostat to reduce home heating oil expenses.

Not all trends in the region were positive during 2005, however. Most of the 2005 drop in petroleum emissions at electric power plants was offset by a large increase in the amount of CO2 emitted from coal-fired power plants in Massachusetts. In fact, the net decrease in New England's global warming pollution in 2005 would have been twice as large if it weren't for coal, which produced 1.3 $MMTCO_2E$ more than in 2004. Unusually high oil and natural gas prices in 2005 made coal-fired power plants more cost-competitive and increased generation from coal.

The question New Englanders face in interpreting the drop in emissions from 2004 to 2005 is whether the drop is the beginning of a trend or temporary blip. The good news for the region is that the trend toward lower emissions appears to have continued—and probably even strengthened—from 2005 to 2006. It remains unclear, though, whether the changes experienced during 2006 are merely the result of historically high energy prices or whether they represent the beginning of a more fundamental shift toward a cleaner energy infrastructure for New England.

The Fall in Emissions Continued, and Probably Accelerated, in 2006

The bulk of New England's global warming pollution comes from just a few activities: the burning of fossil fuels in electric power plants, the consumption of gasoline and diesel fuel in cars and trucks, and the use of oil and natural gas to heat and power homes and businesses.

From 2005 to 2006, the consumption of fossil fuels in each of these categories declined virtually across the board in New England—in some cases, sharply. Among the most important trends:

- Emissions of carbon dioxide from electric power plants in New England declined by 11 percent from 2005 to 2006.[19] Power plant emissions fell in every state, with the largest declines occurring in Maine and Massachusetts.

The emission reductions were largely due to a continued shift away from petroleum for power generation. However, consumption of electricity in the region also declined by 2.2 percent, with reductions in every New England state.[20]

- Sales of gasoline in New England declined by approximately 2.7 percent, with reductions occurring in every state other than Connecticut and Maine.[21]

- Consumption of diesel fuel for highway use declined by approximately 2.4 percent, with reductions in all states other than Maine and Vermont.[22]

- Consumption of home heating oil declined by 16 percent, with reductions in every New England state.[23]

- Consumption of natural gas outside of the electric power sector declined by 9 percent, with reductions in all states other than Maine.[24]

The end result is that New England likely saw a significant reduction in global warming pollution from 2005 to 2006; even greater than the small reduction posted from 2004 to 2005.

However, the region has experienced year-to-year reductions in emissions before, only to see global warming pollution increase once again. To achieve the significant, sustained emission reductions science tells us are necessary to avoid the worst impacts of global warming, the region must commit to policies and practices that will ensure fundamental changes in the way the region obtains and uses energy.

Policy Recommendations

New England states have already taken some momentous steps towards stopping global warming, including:

- **Clean Cars Programs**: Connecticut, Maine, Massachusetts, Rhode Island, and Vermont have passed the California-based standards for clean, efficient new cars and trucks. We encourage New Hampshire to quickly adopt these standards.

- **Renewable Electricity Standards**: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island have passed mandatory minimum levels for renewable energy in their states by future years.

- **Regional Greenhouse Gas Initiative**: All New England states have joined together to limit global warming emissions from power plants in the area, although the caps are weak enough that they may not limit emissions in the early years, and do not get the states close to 1990 emissions in 2010.

- Other polices, including consumer-funded heating efficiency programs, strong appliance efficiency standards, building efficiency programs, and promotion of energy efficiency and renewable energy as the front-line solution to electricity needs.

New England has yet to realize the benefits of many of these policies. For example, the Clean Cars program and RGGI only begin to take effect toward the end of this decade and will not deliver significant results until the mid-2010s.

Strengthening these policies can play an important role in helping New England to reach its goals. The emission reduction targets in RGGI, for example, are simply not as strong as they need to be to get us to the emission reduction targets in the Climate Change Action Plan. The states should either retire some pollution allowances each year, set a reserve price for allowances in the auction or reduce the emissions cap during the first review of the program.

In order to make the pollution cuts

consistent with those that scientists say are necessary to stop the worst affects of global warming, New England states must begin to make real system-wide changes immediately. The best way to ensure that the region achieves its global warming emission reduction goals is to make those goals mandatory by adopting strong, economy-wide global warming emission caps. Any global warming emission cap should include the following properties:

- The caps should be set at levels consistent with what science tells us is necessary to prevent the worst impacts of global warming. In general, the cap should ensure that emissions are reduced by 15 to 20 percent below 2000 levels by 2020 and by at least 80 percent below 2000 levels by 2050.

- Every state and sector of the economy should do its share to reduce global warming emissions.

- The caps must be mandatory and enforceable in order to have the desired impact.

- Trading of emission allowance can be used in sectors where it works well, provided that the system actually achieves the cap and uses proceeds from the programs for efficiency, clean energy and other public benefits rather than windfall profits to polluters.

- Complementary policies are essential to the overall effectiveness of the program, such as low carbon fuel standards, net zero energy building incentives, promoting transit alternatives, and including global warming emissions as a major part of environmental review for receiving state and local permits.

Because the transportation sector is the largest source of increased emissions from 2001 to 2005 and accounts for more than one third of all global warming emissions in New England, our leaders must turn their attention to transportation policy solutions. Meeting the emissions reductions will require that our states build a more sustainable transportation system, such as:

- Investing in the region's rail infrastructure and developing a long-term rail plan.

- Improving transit in suburbs and smaller cities.

- Encouraging downtown redevelopment in a sustainable, pedestrian friendly way.

- Supporting transit-oriented, compact residential and commercial development.

- Reallocating the costs of driving, such as pay-as-you-drive insurance and elimination of parking subsidies.

- Considering global warming pollution in transportation planning and development projects.

Methodology

To estimate global warming pollution in New England, emissions from each state were estimated using the Environmental Protection Agency's State Greenhouse Gas Inventory and Projection Tool (EPA Tool). The EPA Tool allows users to input state-specific data relevant to global warming pollution and uses that information to calculate total greenhouse gas emissions from each state for the years 1990 through 2005. In some cases the EPA Tool contains state-specific default data gathered from various governmental agencies.

Carbon Dioxide from Fossil Fuel Consumption

Unless otherwise noted, consumption data for all states and sectors was drawn from Energy Information Administration (EIA) State Consumption, Prices and Expenditures (SEDS) data available at www.eia.doe.gov/emeu/states/_seds.html. EPA Tool default data were used for all emissions factors.

Transportation Sector

SEDS data was adjusted to account for ethanol use in motor gasoline by multiplying the amount of transportation-sector motor gasoline (SEDS CSV consumption data code: MGACB) by the percentage of sector motor gasoline that does not include ethanol. This percentage was calculated by subtracting ethanol use in the transportation sector (SEDS code: ENACB) from transportation sector motor gasoline use, then multiplying by transportation sector motor gasoline use. Adjusted motor gasoline use in the transportation sector is then expressed by the following equation (using SEDS codes):

Ethanol-adjusted MGACB = MGACB*((MGACB-ENACB)/MGACB)

Because all lubricants serve only non-energy use, SEDS data (code: LUACB) provided inputs for non-energy state-level consumption for transportation sector lubricants.

International Bunker Fuels

This sector was discounted due to negligible use in the New England states.

Industrial Sector

Industrial non-energy consumption data for each fossil fuel source were calculated by multiplying state-level consumption data by the annual ratio of non-energy consumption to total consumption at the national level. This annual ratio was calculated using data from the EPA's U.S. Greenhouse Gas Inventory Reports: *Inventory of Greenhouse Gas Emissions and Sinks 1990-2005*, April 2007, Annex 2-1, available at www.epa.gov/climatechange/emissions/usinventoryreport.html. Table A-26 of this source displays non-energy consumption, while tables A-10 through A-25 display yearly consumption data by fuel source. The EPA Tool default data were used for non-energy consumption carbon storage factors.

SEDS data, coded "CLICB", was used for the "other coal" category in industrial consumption, since coal used in the production of synthetic natural gas is negligible in the New England states.

Mobile Combustion

EPA Tool defaults were used in all worksheets in the Mobile Combustion module, except as noted below. EIA SEDS statistics were used for diesel, distillate, and residual fuel data. Federal Highway Administration (FHWA) statistics drawn from table MF-24 of *FHWA Highway Statistics* annual reports, available at www.fhwa.dot.gov/policy/ohpi/hss/hsspubs.htm, were used for all gasoline figures, with the exception of aviation gasoline (drawn from SEDS data). Adjustments were made to module worksheets as follows.

Highway Emission Factors and VMT

Defaults were used for all data fields in sections one and two, with the exception of light duty gasoline vehicles (LDGV) and light duty gasoline trucks (LDGT) data in section two. State-level VMT defaults for LDGV and LDGT were adjusted to account for the fact that trucks are driven more vehicle miles traveled (VMT) annually than cars. This was accomplished by adding LDGV and LDGT default data and multiplying by the percentage of national VMT in cars and the percentage of national VMT in light trucks. This percentage was calculated using registered cars, VMT per car, and registered light duty trucks data from forms VM-1, MV-1, and MV-9 in the FHWA's *Highway Statistics*.

Aviation Factors and Fuel Consumption

EIA SEDS data were used to complete section two.

Marine Factors and Fuel Consumption

EIA SEDS statistics were used for marine distillate and residual fuel. FHWA statistics were used for marine gasoline data.

Locomotive Factors and Fuel Consumption

EIA statistics were used for locomotive distillate fuel use data.

Other Non-Highway Factors and Fuel Consumption

Zero "other gasoline" and "other diesel" use was assumed in section two. Since EIA diesel use data do not include construction statistics, default data were used for "diesel construction" in section four.

Agriculture

Estimates of number of cattle were updated from default numbers in the EPA Tool using the latest USDA *Cattle* data available

in January 2008 at usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1017. As with the EPA Tool's default numbers, year-long average estimates were calculated as a simple average between the most updated January counts for each state and an approximation for July counts of the same year, based on the proportional change in national totals of the same cattle category and year.

Heads of cattle estimates were broken down into several categories within the EPA Tool. Numbers of Dairy Cows, Dairy Cow Replacements, Beef Cows, and Beef Cow Replacements, and Bulls were taken directly from USDA data. Specifically, final estimates had been published for years 1999 through 2003, and revised estimates had been published for 2004 and 2005 in *Cattle* one year after the relevant date.

USDA estimates of Steer and Other Heifers in feedlots were aggregated among New England and other small states, so EPA Tool estimates were used. Estimates for Steer Stockers and Heifer Stockers were calculated using the EPA Tool methodology; subtracting the respective feedlot numbers from total Steer and Other Heifer categories. Finally, all default numbers for Calves and other livestock in the EPA Tool were used.

Wastewater

EPA Tool estimates on global warming pollution from wastewater were augmented with updated population estimates from the Census Bureau, as of January 2008.

Stationary Combustion

EPA Tool defaults were used for all emissions factors in the Stationary Combustion module. All other data were derived from EPA SEDS statistics. In all cases, consumption of the fuel type "other" was assumed to be zero.

Natural Gas and Oil

Due to energy production and transportation patterns in New England, only Natural Gas Transmission and Distribution sources were considered in this module. Other sources of global warming pollution in this module of the EPA Tool were not included in total emission estimates. Default emissions factors were used throughout.

Emission from Natural Gas Activities – Transmission

Data for miles of gathering and transmission pipeline were inconsistently available. The U.S. Office of Pipeline Safety (OPS) records pipeline miles as reported by utilities in its Transmission Data Annuals. Prior to 2001, utilities were not required to report pipeline data by state. Rather, they reported only total number of pipeline miles, which, in certain cases, were located in multiple states. Since the data could not be retroactively disaggregated, data from *Gas Facts*, published by the American Gas Association, were used for the years 1990 through 2000 and OPS data were used for the years 2001 through 2005. However, *Gas Facts* data for 1994 and 1996 were unavailable. In these two cases, transmission pipeline mileage data were averaged based on the years immediately preceding and following. (For example, data for 1994 were calculated as the average of data from 1993 and 1995.)

EPA Tool default factors were used to calculate the number of gas transmission stations and the number of gas storage compressor stations, while LNG compressor stations data were derived from

the Energy Information Administration's 2004 LNG report, *U.S. LNG Markets and Uses: June 2004 Update*. The EIA report shows two LNG compressor stations in Connecticut, six in Massachusetts, and none in any of the four remaining New England states. These data were assumed to be constant for all years since LNG has been used in New England throughout the period covered by this report and because no better data were found.

Emissions from Natural Gas Activities – Distribution

OPS Distribution Data Annual statistics were used for miles of distribution pipeline by pipeline type and for number of services by type. The number of unprotected steel services was taken as the sum of "steel unprotected bare" services and "steel unprotected coated" services using OPS data. Likewise, the number of protected steel services was taken as the sum of "steel cathodically protected bare" services and "steel cathodically protected coated" services using OPS data.

Other Sectors

All default numbers were used in Industrial Processes and Solid Waste Disposal, two further sectors within the EPA Tool. Global warming pollution from coal mining in New England was assumed to be zero. Land Usage Changes, which is the final sector of the EPA Tool, was left out of this report's findings.

Appendix

Table 1: New England Emissions by Source Type (MMTCO2E)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**179.05**	**175.50**	**184.27**	**176.15**	**180.97**	**175.02**	**181.49**	**192.85**	**188.13**	**187.78**	**191.10**	**188.17**	**187.74**	**194.41**	**196.27**	**195.39**
CO2 from Fossil Fuels	173.04	170.10	177.90	171.37	174.14	168.44	175.37	186.56	181.76	181.49	184.86	182.03	181.90	188.70	190.65	189.94
Stationary Combustion	0.98	1.03	1.11	1.09	1.08	1.07	1.10	1.02	0.95	0.96	1.01	0.92	0.90	0.91	0.92	0.93
Mobile Combustion	2.15	2.19	2.21	2.22	2.32	2.31	2.36	2.32	2.33	2.21	2.16	2.04	1.90	1.72	1.63	1.50
Natural Gas and Oil Systems	2.88	2.18	3.04	1.47	3.42	3.19	2.67	2.95	3.10	3.12	3.06	3.18	3.04	3.08	3.07	3.02
Industrial Processes	**2.10**	**2.03**	**2.20**	**2.60**	**2.96**	**3.90**	**4.40**	**6.76**	**7.02**	**7.14**	**7.56**	**7.60**	**8.00**	**8.04**	**8.86**	**8.77**
Agriculture	**2.39**	**2.33**	**2.40**	**2.44**	**2.39**	**2.36**	**2.30**	**2.33**	**2.44**	**2.45**	**2.30**	**2.33**	**2.37**	**2.33**	**2.34**	**2.29**
Enteric Fermentation	1.02	1.01	1.02	1.01	0.99	0.97	0.94	0.93	0.95	0.95	0.94	0.90	0.91	0.88	0.85	0.85
Manure Management	0.27	0.27	0.29	0.31	0.30	0.30	0.28	0.30	0.34	0.36	0.30	0.30	0.31	0.30	0.28	0.35
Agricultural Soil Management	1.09	1.04	1.09	1.12	1.10	1.08	1.08	1.10	1.14	1.14	1.06	1.12	1.16	1.15	1.21	1.09
Waste	**8.29**	**8.13**	**7.78**	**7.75**	**7.69**	**7.49**	**7.97**	**6.88**	**5.98**	**6.25**	**5.81**	**6.73**	**6.71**	**6.24**	**5.94**	**6.35**
Municipal Solid Waste	6.68	6.51	6.16	6.11	6.03	5.83	6.30	5.20	4.28	4.53	4.06	4.97	4.94	4.47	4.16	4.57
Wastewater	1.61	1.62	1.63	1.63	1.66	1.66	1.67	1.68	1.70	1.72	1.75	1.76	1.77	1.78	1.78	1.79
Total New England Emissions	**191.83**	**187.99**	**196.65**	**188.94**	**194.01**	**188.76**	**196.16**	**208.82**	**203.56**	**203.62**	**206.78**	**204.82**	**204.82**	**211.02**	**213.41**	**212.80**

Table 2: New England CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**32.39**	**31.52**	**35.67**	**35.32**	**34.89**	**33.23**	**34.08**	**33.38**	**31.13**	**32.57**	**35.22**	**35.25**	**34.27**	**38.16**	**38.34**	**36.40**
Coal	0.07	0.04	0.06	0.04	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.03	0.02	0.01	0.01
Petroleum	22.98	22.37	25.10	24.68	24.62	23.76	23.79	23.52	22.29	23.08	24.97	25.54	24.36	26.97	28.04	25.89
Natural Gas	9.34	9.10	10.50	10.59	10.25	9.45	10.27	9.84	8.83	9.47	10.24	9.70	9.89	11.17	10.29	10.50
Commercial	**17.37**	**17.96**	**17.82**	**16.34**	**17.90**	**17.09**	**17.92**	**18.47**	**16.47**	**14.74**	**16.30**	**14.75**	**14.79**	**17.42**	**16.23**	**15.93**
Coal	0.28	0.18	0.28	0.20	0.12	0.14	0.12	0.11	0.10	0.12	0.07	0.07	0.21	0.14	0.10	0.13
Petroleum	11.79	12.46	11.33	9.74	9.77	9.12	9.01	8.93	7.94	7.08	8.57	7.25	7.13	10.18	9.55	9.25
Natural Gas	5.30	5.32	6.21	6.40	8.00	7.82	8.79	9.42	8.43	7.53	7.67	7.42	7.44	7.10	6.58	6.55
Industrial	**14.48**	**15.78**	**20.77**	**18.99**	**20.24**	**17.28**	**18.27**	**17.87**	**17.66**	**17.82**	**17.14**	**15.61**	**14.68**	**12.30**	**12.43**	**12.53**
Coal	0.76	1.18	2.44	1.50	1.28	0.75	0.62	0.78	0.40	0.52	0.67	0.43	0.32	0.43	0.41	0.48
Petroleum	9.37	8.09	9.61	10.78	11.23	9.12	10.68	9.97	9.46	8.93	8.89	7.88	7.08	7.32	7.62	7.53
Natural Gas	4.35	6.51	8.72	6.71	7.72	7.41	6.96	7.12	7.80	8.37	7.59	7.30	7.28	4.55	4.39	4.52
Transportation	**64.20**	**62.23**	**62.02**	**63.14**	**63.47**	**63.61**	**66.24**	**67.76**	**68.18**	**71.19**	**72.42**	**71.79**	**73.68**	**73.84**	**77.22**	**76.93**
Petroleum	64.09	62.10	61.87	62.96	63.25	63.40	65.99	67.41	68.01	70.86	72.04	71.35	73.21	73.45	76.86	76.53
Natural Gas	0.10	0.12	0.16	0.18	0.22	0.21	0.24	0.35	0.18	0.34	0.38	0.44	0.47	0.39	0.36	0.41
Electric Power	**44.60**	**42.61**	**41.62**	**37.58**	**37.65**	**37.23**	**38.87**	**49.08**	**48.31**	**45.17**	**43.78**	**44.62**	**44.47**	**46.97**	**46.43**	**48.14**
Coal	17.13	17.99	17.25	16.23	16.52	17.12	18.03	20.07	16.86	15.33	18.19	17.70	17.96	17.94	17.95	19.03
Petroleum	22.86	19.11	17.35	14.49	12.51	9.50	10.87	17.94	21.44	20.11	14.69	12.28	8.08	10.34	9.17	9.70
Natural Gas	4.62	5.51	7.02	6.86	8.62	10.61	9.96	11.07	10.01	9.73	10.90	14.64	18.44	18.69	19.31	19.41
TOTAL CO2 from Fossil Fuels	**173.04**	**170.10**	**177.90**	**171.37**	**174.14**	**168.44**	**175.37**	**186.56**	**181.76**	**181.49**	**184.86**	**182.03**	**181.90**	**188.70**	**190.65**	**189.94**
Coal	18.25	19.39	20.04	17.98	17.95	18.04	18.79	20.97	17.38	15.99	18.94	18.21	18.53	18.53	18.48	19.65
Petroleum	131.08	124.14	125.25	122.65	121.38	114.89	120.35	127.78	129.13	130.06	129.15	124.31	119.86	128.26	131.24	128.91
Natural Gas	23.71	26.57	32.62	30.75	34.81	35.51	36.22	37.81	35.25	35.43	36.77	39.50	43.52	41.91	40.93	41.37

Table 3: Connecticut Emissions by Source Type ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**42.44**	**39.43**	**41.62**	**39.65**	**39.51**	**38.51**	**41.62**	**44.66**	**42.29**	**43.65**	**44.81**	**42.93**	**41.42**	**43.52**	**45.61**	**44.09**
CO2 from Fossil Fuels	41.01	38.07	40.49	38.63	37.93	37.13	40.23	43.30	40.95	42.33	43.49	41.67	40.15	42.34	44.48	43.00
Stationary Combustion	0.19	0.19	0.21	0.20	0.20	0.20	0.21	0.20	0.18	0.18	0.20	0.18	0.17	0.18	0.18	0.18
Mobile Combustion	0.52	0.54	0.51	0.53	0.56	0.56	0.57	0.56	0.55	0.53	0.52	0.48	0.45	0.41	0.38	0.34
Natural Gas and Oil Systems	0.70	0.63	0.41	0.30	0.83	0.61	0.61	0.61	0.61	0.61	0.60	0.60	0.66	0.58	0.57	0.57
Industrial Processes	**0.32**	**0.30**	**0.33**	**0.38**	**0.47**	**0.67**	**0.80**	**1.77**	**1.79**	**1.75**	**1.92**	**1.95**	**2.07**	**2.03**	**2.30**	**2.20**
Agriculture	**0.33**	**0.31**	**0.37**	**0.37**	**0.38**	**0.37**	**0.31**	**0.30**	**0.31**	**0.33**	**0.32**	**0.32**	**0.34**	**0.32**	**0.29**	**0.38**
Enteric Fermentation	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.09	0.09	0.09
Manure Management	0.04	0.04	0.07	0.07	0.07	0.07	0.04	0.04	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.10
Agricultural Soil Management	0.16	0.15	0.18	0.18	0.19	0.18	0.15	0.15	0.16	0.17	0.16	0.18	0.20	0.18	0.17	0.19
Waste	**1.91**	**2.09**	**1.97**	**1.78**	**2.01**	**1.99**	**2.02**	**1.93**	**1.70**	**1.79**	**1.73**	**1.63**	**1.40**	**1.66**	**1.93**	**2.07**
Municipal Solid Waste	1.51	1.68	1.56	1.38	1.60	1.59	1.62	1.52	1.29	1.38	1.31	1.20	0.97	1.22	1.49	1.63
Wastewater	0.40	0.40	0.40	0.40	0.41	0.40	0.40	0.41	0.41	0.41	0.43	0.43	0.43	0.44	0.44	0.44
Total Connecticut Emissions	**44.99**	**42.13**	**44.29**	**42.18**	**42.37**	**41.55**	**44.75**	**48.66**	**46.09**	**47.51**	**48.78**	**46.84**	**45.23**	**47.52**	**50.14**	**48.74**

Table 4: Connecticut CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**8.11**	**7.86**	**9.33**	**8.90**	**8.51**	**7.82**	**8.30**	**8.06**	**7.03**	**7.92**	**8.66**	**8.40**	**8.16**	**9.48**	**10.12**	**9.28**
Coal	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	6.06	5.82	7.01	6.60	6.23	5.58	5.91	5.85	5.11	5.84	6.40	6.17	5.95	7.04	7.78	6.84
Natural Gas	2.05	2.03	2.31	2.30	2.27	2.23	2.39	2.21	1.92	2.08	2.26	2.22	2.21	2.43	2.33	2.43
Commercial	**3.82**	**3.58**	**4.28**	**3.83**	**4.14**	**3.80**	**4.06**	**4.22**	**3.90**	**4.23**	**4.47**	**4.18**	**4.02**	**4.78**	**3.83**	**3.69**
Coal	0.02	0.03	0.04	0.03	0.03	0.05	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Petroleum	2.18	2.09	2.61	2.09	1.98	1.68	1.88	1.88	1.58	1.64	1.82	1.76	1.79	2.70	1.94	1.72
Natural Gas	1.61	1.47	1.63	1.71	2.14	2.07	2.17	2.32	2.30	2.58	2.64	2.41	2.22	2.07	1.87	1.95
Industrial	**3.15**	**3.33**	**3.59**	**3.62**	**3.23**	**2.97**	**3.42**	**3.35**	**3.23**	**3.28**	**3.32**	**2.63**	**2.54**	**2.94**	**2.76**	**2.54**
Coal	0.00	0.01	0.03	0.07	0.07	-	-	-	-	-	-	-	-	-	-	0.00
Petroleum	1.78	1.57	1.61	1.58	1.52	1.25	1.69	1.51	1.51	1.59	1.62	1.28	0.99	1.72	1.71	1.45
Natural Gas	1.36	1.75	1.94	1.96	1.64	1.72	1.73	1.84	1.72	1.69	1.70	1.35	1.55	1.22	1.05	1.08
Transportation	**14.67**	**14.55**	**14.61**	**14.79**	**14.72**	**14.41**	**15.19**	**15.23**	**15.47**	**16.77**	**16.22**	**16.91**	**16.84**	**17.32**	**19.18**	**17.61**
Petroleum	14.64	14.52	14.58	14.76	14.68	14.34	15.11	15.09	15.42	16.60	16.05	16.74	16.69	17.13	18.99	17.42
Natural Gas	0.03	0.03	0.03	0.03	0.04	0.07	0.08	0.14	0.05	0.17	0.17	0.17	0.15	0.19	0.19	0.19
Electric Power	**11.26**	**8.75**	**8.68**	**7.50**	**7.33**	**8.14**	**9.26**	**12.45**	**11.32**	**10.13**	**10.81**	**9.56**	**8.59**	**7.82**	**8.60**	**9.89**
Coal	3.55	3.55	3.57	3.37	3.49	3.73	3.81	4.17	2.98	1.40	3.36	3.70	3.17	3.88	4.08	3.89
Petroleum	7.02	4.38	4.38	3.49	2.84	2.84	4.48	6.95	7.22	7.03	5.61	4.13	1.90	1.67	1.35	2.58
Natural Gas	0.69	0.83	0.74	0.63	1.00	1.57	0.97	1.32	1.11	1.70	1.85	1.73	3.52	2.27	3.17	3.43
TOTAL	**41.01**	**38.07**	**40.49**	**38.63**	**37.93**	**37.13**	**40.23**	**43.30**	**40.95**	**42.33**	**43.49**	**41.67**	**40.15**	**42.34**	**44.48**	**43.00**
Coal	3.58	3.59	3.64	3.47	3.59	3.79	3.82	4.19	3.00	1.42	3.37	3.71	3.18	3.89	4.09	3.90
Petroleum	31.69	28.38	30.19	28.52	27.25	25.70	29.08	31.28	30.84	32.70	31.50	30.08	27.32	30.27	31.77	30.02
Natural Gas	5.74	6.10	6.65	6.63	7.08	7.64	7.33	7.83	7.10	8.21	8.62	7.87	9.65	8.18	8.62	9.08

Table 5: Maine Emissions by Source Type ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**19.69**	**19.18**	**19.99**	**19.56**	**21.02**	**19.68**	**20.29**	**20.56**	**20.19**	**21.23**	**23.08**	**23.05**	**23.58**	**24.03**	**23.84**	**23.47**
CO2 from Fossil Fuels	19.10	18.61	19.40	18.99	20.41	19.07	19.68	19.95	19.60	20.65	22.49	22.43	22.98	23.47	23.30	22.93
Stationary Combustion	0.24	0.29	0.30	0.30	0.30	0.31	0.31	0.30	0.28	0.29	0.30	0.28	0.27	0.26	0.26	0.27
Mobile Combustion	0.24	0.24	0.25	0.25	0.27	0.26	0.27	0.27	0.27	0.26	0.25	0.23	0.22	0.20	0.18	0.17
Natural Gas and Oil Systems	0.11	0.04	0.04	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.10	0.11	0.10	0.10	0.10
Industrial Processes	**0.87**	**0.85**	**0.92**	**1.03**	**1.00**	**1.14**	**1.14**	**1.27**	**1.32**	**1.34**	**1.30**	**1.30**	**1.31**	**1.29**	**1.37**	**1.40**
Agriculture	**0.46**	**0.47**	**0.47**	**0.48**	**0.48**	**0.46**	**0.49**	**0.56**	**0.60**	**0.60**	**0.47**	**0.49**	**0.53**	**0.53**	**0.57**	**0.51**
Enteric Fermentation	0.17	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14
Manure Management	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.10	0.10	0.05	0.05	0.06	0.05	0.05	0.05
Agricultural Soil Management	0.24	0.25	0.25	0.25	0.25	0.25	0.27	0.32	0.34	0.34	0.27	0.29	0.32	0.33	0.38	0.31
Waste	**0.50**	**0.53**	**0.55**	**0.58**	**0.61**	**0.59**	**0.61**	**0.64**	**0.67**	**0.69**	**0.70**	**0.73**	**0.72**	**0.67**	**0.62**	**0.68**
Municipal Solid Waste	0.35	0.38	0.40	0.42	0.45	0.43	0.46	0.48	0.51	0.53	0.54	0.57	0.56	0.50	0.46	0.52
Wastewater	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Total Maine Emissions	**21.52**	**21.04**	**21.94**	**21.64**	**23.11**	**21.87**	**22.54**	**23.03**	**22.77**	**23.85**	**25.56**	**25.57**	**26.13**	**26.51**	**26.40**	**26.06**

Table 6: Maine CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**3.03**	**3.04**	**3.05**	**3.18**	**3.26**	**4.00**	**4.13**	**3.97**	**4.28**	**4.07**	**3.95**	**3.96**	**3.53**	**4.74**	**5.22**	**4.75**
Coal	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	2.98	3.00	2.98	3.12	3.21	3.95	4.07	3.91	4.23	4.02	3.89	3.90	3.46	4.67	5.15	4.68
Natural Gas	0.03	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.08	0.07	0.07
Commercial	**2.18**	**2.16**	**1.73**	**1.68**	**1.71**	**1.41**	**1.55**	**1.55**	**1.60**	**1.48**	**1.78**	**1.45**	**1.79**	**2.16**	**2.10**	**1.92**
Coal	0.08	0.03	0.07	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
Petroleum	2.01	2.03	1.54	1.50	1.57	1.27	1.40	1.40	1.46	1.34	1.60	1.28	1.44	1.85	1.81	1.64
Natural Gas	0.09	0.10	0.12	0.12	0.13	0.13	0.14	0.15	0.13	0.14	0.17	0.16	0.35	0.30	0.29	0.27
Industrial	**3.47**	**4.10**	**5.47**	**5.20**	**6.48**	**5.09**	**5.35**	**4.73**	**4.02**	**3.74**	**4.62**	**3.63**	**3.01**	**2.50**	**2.77**	**3.04**
Coal	0.52	0.84	1.91	0.98	1.06	0.65	0.53	0.44	0.32	0.27	0.53	0.30	0.21	0.29	0.28	0.30
Petroleum	2.85	3.15	3.45	4.12	5.32	4.34	4.70	4.16	3.59	3.34	3.32	2.67	2.56	2.00	2.34	2.60
Natural Gas	0.11	0.12	0.11	0.09	0.09	0.10	0.12	0.13	0.12	0.13	0.77	0.66	0.24	0.20	0.15	0.15
Transportation	**8.27**	**7.57**	**7.45**	**7.60**	**7.73**	**7.30**	**7.53**	**7.90**	**7.71**	**7.98**	**8.58**	**7.65**	**8.75**	**9.28**	**8.67**	**9.39**
Petroleum	8.27	7.57	7.45	7.60	7.72	7.30	7.53	7.90	7.71	7.98	8.53	7.58	8.69	9.22	8.63	9.36
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.05	0.07	0.06	0.05	0.04	0.03
Electric Power	**2.14**	**1.73**	**1.70**	**1.34**	**1.24**	**1.27**	**1.12**	**1.80**	**1.99**	**3.38**	**3.57**	**5.74**	**5.89**	**4.79**	**4.53**	**3.83**
Coal	0.36	0.57	0.57	0.58	0.57	0.37	0.38	0.39	0.35	0.36	0.39	0.43	0.53	0.40	0.40	0.35
Petroleum	1.77	1.15	1.12	0.75	0.66	0.89	0.74	1.40	1.63	2.98	1.70	0.92	0.37	1.05	0.65	0.76
Natural Gas	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.03	1.47	4.39	4.99	3.33	3.48	2.71
TOTAL CO2 from Fossil Fuels	**19.10**	**18.61**	**19.40**	**18.99**	**20.41**	**19.07**	**19.68**	**19.95**	**19.60**	**20.65**	**22.49**	**22.43**	**22.98**	**23.47**	**23.30**	**22.93**
Coal	0.98	1.44	2.57	1.63	1.65	1.03	0.92	0.84	0.68	0.64	0.93	0.73	0.74	0.70	0.68	0.66
Petroleum	17.87	16.90	16.55	17.09	18.49	17.74	18.45	18.77	18.62	19.66	19.04	16.35	16.52	18.80	18.58	19.04
Natural Gas	0.24	0.26	0.28	0.27	0.28	0.30	0.31	0.34	0.30	0.35	2.52	5.34	5.71	3.97	4.04	3.23

Table 7: Massachusetts Emissions by Source Type ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**86.96**	**84.79**	**87.80**	**84.07**	**85.29**	**82.37**	**82.89**	**89.35**	**87.40**	**84.87**	**85.85**	**85.34**	**85.94**	**87.07**	**85.83**	**87.40**
CO2 from Fossil Fuels	83.88	82.62	84.50	81.79	82.02	79.13	80.11	86.35	84.26	81.76	82.79	82.38	83.26	84.29	83.12	84.77
Stationary Combustion	0.40	0.41	0.42	0.41	0.41	0.39	0.40	0.38	0.35	0.35	0.36	0.33	0.33	0.34	0.34	0.34
Mobile Combustion	0.93	0.95	0.97	0.95	1.00	0.99	1.03	1.00	1.01	0.94	0.92	0.85	0.79	0.71	0.69	0.64
Natural Gas and Oil Systems	1.75	0.81	1.91	0.90	1.87	1.86	1.35	1.62	1.79	1.82	1.77	1.77	1.56	1.74	1.69	1.65
Industrial Processes	**0.60**	**0.57**	**0.62**	**0.81**	**1.00**	**1.38**	**1.63**	**1.91**	**2.11**	**2.33**	**2.51**	**2.54**	**2.74**	**2.90**	**3.11**	**3.21**
Agriculture	**0.37**	**0.36**	**0.37**	**0.36**	**0.35**	**0.34**	**0.34**	**0.34**	**0.32**	**0.32**	**0.32**	**0.31**	**0.31**	**0.30**	**0.31**	**0.27**
Enteric Fermentation	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.10	0.08	0.09	0.08	0.08	0.08
Manure Management	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02
Agricultural Soil Management	0.21	0.20	0.21	0.21	0.20	0.20	0.20	0.20	0.19	0.19	0.20	0.20	0.20	0.20	0.21	0.17
Waste	**4.91**	**4.49**	**4.30**	**4.36**	**4.15**	**4.12**	**4.39**	**3.49**	**3.11**	**3.44**	**3.03**	**4.04**	**4.19**	**3.42**	**2.86**	**3.08**
Municipal Solid Waste	4.18	3.75	3.56	3.62	3.39	3.36	3.62	2.72	2.33	2.64	2.23	3.24	3.38	2.61	2.05	2.27
Wastewater	0.73	0.74	0.74	0.75	0.76	0.76	0.76	0.77	0.78	0.79	0.80	0.80	0.80	0.81	0.81	0.81
Total Massachusetts Emissions	**92.84**	**90.20**	**93.09**	**89.60**	**90.79**	**88.22**	**89.24**	**95.09**	**92.95**	**90.95**	**91.71**	**92.24**	**93.18**	**93.70**	**92.10**	**93.95**

Table 8: Massachusetts CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**15.01**	**14.23**	**16.31**	**16.43**	**16.27**	**14.69**	**14.50**	**14.33**	**13.15**	**13.96**	**15.53**	**15.87**	**15.88**	**16.18**	**14.97**	**14.80**
Coal	0.03	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.02	0.02	0.01	0.01
Petroleum	9.12	8.54	9.70	9.73	9.77	8.93	8.27	8.25	7.65	8.01	9.21	9.96	9.76	9.16	8.71	8.44
Natural Gas	5.86	5.67	6.59	6.69	6.50	5.75	6.22	6.07	5.49	5.94	6.32	5.91	6.09	7.00	6.25	6.35
Commercial	**8.40**	**9.18**	**8.93**	**7.96**	**8.85**	**8.94**	**9.02**	**9.41**	**8.02**	**6.14**	**6.69**	**5.86**	**5.86**	**7.00**	**6.56**	**6.59**
Coal	0.12	0.06	0.11	0.09	0.05	0.06	0.07	0.06	0.06	0.09	0.04	0.03	0.18	0.11	0.07	0.09
Petroleum	5.50	6.19	5.27	4.26	4.21	4.40	3.72	3.63	3.11	2.39	3.13	2.22	2.07	3.42	3.33	3.46
Natural Gas	2.78	2.93	3.55	3.61	4.59	4.47	5.23	5.72	4.85	3.66	3.53	3.61	3.61	3.48	3.15	3.03
Industrial	**5.92**	**5.30**	**7.09**	**7.27**	**6.32**	**5.55**	**5.91**	**6.08**	**6.03**	**6.67**	**6.40**	**7.12**	**7.04**	**4.74**	**4.57**	**4.78**
Coal	0.17	0.20	0.36	0.27	0.15	0.10	0.09	0.09	0.08	0.08	0.14	0.14	0.11	0.14	0.14	0.17
Petroleum	3.37	2.15	2.90	3.16	2.70	2.07	2.54	2.57	2.65	2.34	2.24	2.62	2.28	2.21	2.09	2.13
Natural Gas	2.38	2.95	3.83	3.84	3.47	3.37	3.28	3.42	3.30	4.26	4.02	4.36	4.65	2.38	2.34	2.47
Transportation	**28.91**	**27.62**	**27.42**	**27.87**	**28.05**	**28.46**	**29.75**	**30.16**	**30.12**	**30.94**	**32.04**	**31.60**	**31.72**	**31.50**	**33.41**	**34.27**
Petroleum	28.85	27.54	27.32	27.74	27.95	28.35	29.63	30.03	30.01	30.79	31.91	31.42	31.48	31.38	33.30	34.14
Natural Gas	0.07	0.08	0.10	0.12	0.10	0.10	0.12	0.13	0.11	0.15	0.14	0.18	0.24	0.12	0.11	0.14
Electric Power	**25.64**	**26.29**	**24.75**	**22.27**	**22.53**	**21.50**	**20.94**	**26.38**	**26.94**	**24.04**	**22.12**	**21.93**	**22.75**	**24.87**	**23.61**	**24.33**
Coal	10.36	10.79	10.01	8.97	9.34	9.71	10.49	11.35	9.98	10.30	10.39	9.87	10.59	9.82	9.46	10.72
Petroleum	11.90	12.16	10.62	9.05	7.72	4.81	4.85	8.63	11.34	8.74	6.90	6.76	5.21	5.84	5.53	5.26
Natural Gas	3.38	3.34	4.12	4.24	5.47	6.98	5.60	6.39	5.62	5.01	4.83	5.29	6.94	9.22	8.62	8.35
TOTAL CO2 from Fossil Fuels	**83.88**	**82.62**	**84.50**	**81.79**	**82.02**	**79.13**	**80.11**	**86.35**	**84.26**	**81.76**	**82.79**	**82.38**	**83.26**	**84.29**	**83.12**	**84.77**
Coal	10.68	11.06	10.52	9.35	9.54	9.88	10.66	11.51	10.13	10.47	10.57	10.05	10.91	10.08	9.68	11.00
Petroleum	58.73	56.58	55.80	53.94	52.35	48.57	49.00	53.11	54.76	52.27	53.39	52.99	50.81	52.01	52.97	53.43

Table 9: New Hampshire Emissions by Source Type ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**15.05**	**14.69**	**14.80**	**15.28**	**15.42**	**15.47**	**16.00**	**17.28**	**17.28**	**17.46**	**18.03**	**17.20**	**17.90**	**21.03**	**22.22**	**21.58**
CO2 from Fossil Fuels	14.68	14.31	14.41	14.94	15.01	15.07	15.60	16.90	16.91	17.09	17.67	16.78	17.50	20.69	21.82	21.20
Stationary Combustion	0.07	0.07	0.09	0.09	0.08	0.08	0.08	0.06	0.06	0.06	0.07	0.06	0.05	0.05	0.06	0.06
Mobile Combustion	0.19	0.20	0.20	0.21	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.20	0.19	0.18	0.16	0.15
Natural Gas and Oil Systems	0.11	0.11	0.09	0.05	0.10	0.10	0.10	0.11	0.09	0.09	0.09	0.16	0.16	0.11	0.17	0.17
Industrial Processes	0.11	0.11	0.12	0.13	0.17	0.25	0.29	0.35	0.37	0.40	0.43	0.46	0.49	0.53	0.57	0.60
Agriculture	**0.18**	**0.17**	**0.18**	**0.18**	**0.18**	**0.18**	**0.17**	**0.17**	**0.17**	**0.18**	**0.18**	**0.17**	**0.18**	**0.17**	**0.17**	**0.17**
Enteric Fermentation	0.07	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.08	0.08	0.07	0.07	0.07	0.06	0.07
Manure Management	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Agricultural Soil Management	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.09	0.08
Waste	**0.63**	**0.66**	**0.58**	**0.59**	**0.61**	**0.43**	**0.51**	**0.42**	**0.19**	**0.26**	**0.26**	**0.19**	**0.22**	**0.28**	**0.35**	**0.42**
Municipal Solid Waste	0.49	0.52	0.44	0.46	0.47	0.28	0.36	0.27	0.04	0.11	0.10	0.03	0.06	0.12	0.19	0.25
Wastewater	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16
Total New Hampshire Emissions	**15.98**	**15.63**	**15.67**	**16.19**	**16.38**	**16.33**	**16.98**	**18.23**	**18.02**	**18.30**	**18.90**	**18.01**	**18.78**	**22.00**	**23.31**	**22.76**

Table 10: New Hampshire CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**2.47**	**2.46**	**2.57**	**2.56**	**2.63**	**2.76**	**2.94**	**2.91**	**2.84**	**2.87**	**2.93**	**2.86**	**2.68**	**3.40**	**3.40**	**3.17**
Coal	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	2.14	2.15	2.22	2.21	2.27	2.41	2.56	2.53	2.50	2.51	2.52	2.47	2.28	3.00	3.00	2.75
Natural Gas	0.32	0.30	0.34	0.35	0.35	0.35	0.38	0.37	0.34	0.35	0.41	0.38	0.39	0.40	0.40	0.42
Commercial	**1.32**	**1.29**	**1.14**	**1.12**	**1.27**	**1.15**	**1.28**	**1.31**	**1.14**	**1.16**	**1.44**	**1.31**	**1.31**	**1.52**	**1.81**	**1.93**
Coal	0.02	0.05	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01
Petroleum	1.02	0.97	0.80	0.77	0.91	0.79	0.88	0.89	0.76	0.77	0.97	0.88	0.81	1.03	1.30	1.39
Natural Gas	0.27	0.27	0.31	0.33	0.34	0.35	0.38	0.40	0.36	0.39	0.47	0.41	0.49	0.49	0.51	0.53
Industrial	**0.83**	**0.84**	**1.15**	**1.39**	**1.18**	**1.08**	**1.37**	**1.37**	**1.37**	**1.35**	**1.56**	**1.22**	**1.11**	**1.05**	**1.13**	**0.96**
Coal	0.07	0.12	0.10	0.18	-	0.00	-	-	-	-	-	-	-	-	-	-
Petroleum	0.59	0.54	0.84	1.01	0.94	0.84	1.11	1.07	1.06	1.04	1.10	0.75	0.67	0.67	0.72	0.60
Natural Gas	0.17	0.18	0.20	0.20	0.23	0.24	0.26	0.30	0.31	0.31	0.46	0.47	0.44	0.38	0.41	0.36
Transportation	**5.21**	**5.31**	**5.27**	**5.39**	**5.53**	**5.76**	**5.91**	**6.23**	**6.84**	**7.10**	**7.24**	**7.25**	**8.10**	**7.54**	**7.77**	**7.43**
Petroleum	5.21	5.31	5.26	5.38	5.48	5.75	5.90	6.21	6.83	7.10	7.24	7.25	8.10	7.54	7.77	7.43
Natural Gas	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electric Power	4.85	4.42	4.28	4.46	4.41	4.32	4.11	5.09	4.73	4.61	4.49	4.14	4.30	7.17	7.71	7.70
Coal	2.86	3.08	3.10	3.30	3.12	3.31	3.36	4.15	3.55	3.27	4.06	3.70	3.67	3.84	4.01	4.07
Petroleum	1.99	1.34	1.15	1.15	1.22	0.90	0.75	0.91	1.17	1.32	0.39	0.41	0.57	1.74	1.61	1.08
Natural Gas	-	-	0.03	0.01	0.07	0.12	0.00	0.03	0.01	0.03	0.04	0.03	0.06	1.59	2.09	2.54
TOTAL CO2 from Fossil Fuels	**14.68**	**14.31**	**14.41**	**14.94**	**15.01**	**15.07**	**15.60**	**16.90**	**16.91**	**17.09**	**17.67**	**16.78**	**17.50**	**20.69**	**21.82**	**21.20**
Coal	2.96	3.26	3.25	3.51	3.14	3.33	3.38	4.17	3.56	3.27	4.07	3.71	3.68	3.85	4.02	4.08
Petroleum	10.95	10.30	10.27	10.53	10.82	10.68	11.20	11.62	12.33	12.74	12.21	11.77	12.42	13.98	14.40	13.26
Natural Gas	0.76	0.75	0.90	0.90	1.05	1.06	1.02	1.12	1.02	1.08	1.38	1.30	1.39	2.86	3.41	3.86

Table 11: Rhode Island Emissions by Source Type ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**9.20**	**11.27**	**13.53**	**11.16**	**13.33**	**12.57**	**14.00**	**14.07**	**14.31**	**13.65**	**12.20**	**12.71**	**12.17**	**11.85**	**11.36**	**11.68**
CO2 from Fossil Fuels	8.91	10.79	13.03	10.87	12.84	12.09	13.51	13.60	13.83	13.18	11.73	12.28	11.74	11.43	10.95	11.28
Stationary Combustion	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Mobile Combustion	0.15	0.14	0.15	0.15	0.15	0.14	0.14	0.14	0.15	0.15	0.14	0.13	0.12	0.11	0.10	0.09
Natural Gas and Oil Systems	0.10	0.29	0.29	0.10	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.27	0.28	0.27	0.27	0.27
Industrial Processes	**0.08**	**0.08**	**0.09**	**0.10**	**0.13**	**0.20**	**0.23**	**1.11**	**1.09**	**1.00**	**1.11**	**1.08**	**1.14**	**1.03**	**1.22**	**1.08**
Agriculture	**0.04**	**0.04**	**0.05**	**0.06**	**0.04**	**0.04**	**0.04**	**0.04**	**0.05**	**0.05**	**0.05**	**0.05**	**0.04**	**0.04**	**0.05**	**0.04**
Enteric Fermentation	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Manure Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agricultural Soil Management	0.03	0.03	0.04	0.04	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.03
Waste	**0.26**	**0.28**	**0.30**	**0.33**	**0.20**	**0.21**	**0.22**	**0.22**	**0.21**	**(0.02)**	**(0.03)**	**0.00**	**0.04**	**0.08**	**0.02**	**0.06**
Municipal Solid Waste	0.14	0.15	0.18	0.20	0.07	0.09	0.10	0.09	0.08	(0.15)	(0.16)	(0.13)	(0.09)	(0.06)	(0.12)	(0.08)
Wastewater	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total Rhode Island Emissions	**9.58**	**11.67**	**13.97**	**11.66**	**13.71**	**13.02**	**14.49**	**15.43**	**15.65**	**14.68**	**13.33**	**13.85**	**13.39**	**13.00**	**12.65**	**12.86**

Table 12: Rhode Island CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**2.34**	**2.35**	**2.78**	**2.66**	**2.71**	**2.50**	**2.67**	**2.62**	**2.39**	**2.33**	**2.51**	**2.58**	**2.49**	**2.77**	**2.80**	**2.74**
Coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	1.37	1.40	1.69	1.58	1.75	1.55	1.57	1.62	1.49	1.43	1.48	1.60	1.51	1.67	1.73	1.67
Natural Gas	0.96	0.95	1.08	1.08	0.95	0.95	1.10	1.00	0.90	0.91	1.04	0.98	0.98	1.10	1.07	1.07
Commercial	**1.11**	**1.16**	**1.08**	**1.13**	**1.38**	**1.25**	**1.42**	**1.34**	**1.13**	**1.08**	**1.22**	**1.25**	**1.16**	**1.27**	**1.20**	**1.15**
Coal	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Petroleum	0.66	0.70	0.58	0.62	0.71	0.59	0.69	0.66	0.50	0.43	0.50	0.55	0.52	0.64	0.58	0.53
Natural Gas	0.44	0.45	0.49	0.50	0.66	0.66	0.72	0.68	0.62	0.64	0.72	0.70	0.64	0.62	0.62	0.62
Industrial	**0.66**	**1.79**	**2.95**	**0.99**	**2.63**	**2.23**	**1.82**	**1.66**	**2.56**	**2.14**	**0.69**	**0.56**	**0.53**	**0.57**	**0.61**	**0.64**
Coal	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum	0.43	0.35	0.42	0.49	0.44	0.37	0.35	0.35	0.32	0.31	0.26	0.24	0.29	0.34	0.32	0.32
Natural Gas	0.23	1.43	2.53	0.50	2.19	1.87	1.47	1.31	2.24	1.83	0.43	0.32	0.24	0.24	0.29	0.32
Transportation	**4.13**	**4.14**	**4.06**	**4.09**	**4.01**	**4.12**	**4.16**	**4.62**	**4.47**	**4.65**	**4.64**	**4.68**	**4.63**	**4.52**	**4.38**	**4.37**
Petroleum	4.12	4.13	4.04	4.08	3.99	4.09	4.12	4.57	4.45	4.64	4.62	4.66	4.61	4.50	4.36	4.32
Natural Gas	0.01	0.01	0.02	0.01	0.02	0.03	0.04	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.05
Electric Power	**0.67**	**1.36**	**2.17**	**1.99**	**2.12**	**1.98**	**3.44**	**3.36**	**3.28**	**2.97**	**2.66**	**3.21**	**2.93**	**2.29**	**1.96**	**2.39**
Coal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum	0.18	0.09	0.09	0.04	0.05	0.04	0.06	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Natural Gas	0.50	1.27	2.08	1.96	2.07	1.94	3.38	3.33	3.26	2.95	2.65	3.20	2.91	2.28	1.95	2.38
TOTAL CO2 from Fossil Fuels	**8.91**	**10.79**	**13.03**	**10.87**	**12.84**	**12.09**	**13.51**	**13.60**	**13.83**	**13.18**	**11.73**	**12.28**	**11.74**	**11.43**	**10.95**	**11.28**
Coal	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Petroleum	6.76	6.67	6.82	6.81	6.94	6.64	6.80	7.23	6.78	6.83	6.87	7.06	6.94	7.16	7.00	6.85
Natural Gas	2.14	4.11	6.20	4.05	5.89	5.44	6.71	6.36	7.04	6.34	4.85	5.21	4.79	4.26	3.94	4.42

Table 13: Vermont Emissions by Source Type ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy	**5.70**	**6.15**	**6.53**	**6.43**	**6.39**	**6.41**	**6.69**	**6.92**	**6.66**	**6.92**	**7.13**	**6.94**	**6.74**	**6.91**	**7.41**	**7.17**
CO2 from Fossil Fuels	5.45	5.70	6.07	6.16	5.93	5.95	6.23	6.47	6.21	6.49	6.69	6.49	6.29	6.49	6.99	6.76
Stationary Combustion	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.04
Mobile Combustion	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.15	0.14	0.11	0.11	0.11
Natural Gas and Oil Systems	0.10	0.29	0.29	0.10	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.27	0.28	0.27	0.27	0.27
Industrial Processes	**0.12**	**0.12**	**0.13**	**0.15**	**0.18**	**0.26**	**0.30**	**0.35**	**0.34**	**0.33**	**0.29**	**0.26**	**0.26**	**0.25**	**0.30**	**0.28**
Agriculture	**1.00**	**0.97**	**0.96**	**0.99**	**0.96**	**0.96**	**0.95**	**0.93**	**0.98**	**0.98**	**0.96**	**0.99**	**0.97**	**0.96**	**0.95**	**0.93**
Enteric Fermentation	0.52	0.50	0.51	0.51	0.49	0.49	0.48	0.48	0.50	0.50	0.50	0.49	0.49	0.48	0.47	0.46
Manure Management	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.15	0.15	0.15	0.15	0.16	0.16	0.15	0.15
Agricultural Soil Management	0.36	0.35	0.34	0.35	0.34	0.34	0.34	0.32	0.34	0.32	0.31	0.35	0.33	0.33	0.33	0.31
Waste	**0.08**	**0.08**	**0.08**	**0.10**	**0.12**	**0.15**	**0.22**	**0.18**	**0.10**	**0.10**	**0.12**	**0.13**	**0.14**	**0.15**	**0.16**	**0.05**
Municipal Solid Waste	0.02	0.01	0.01	0.03	0.05	0.08	0.15	0.11	0.02	0.02	0.04	0.05	0.06	0.07	0.08	(0.03)
Wastewater	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Total Vermont Emissions	**6.91**	**7.32**	**7.70**	**7.67**	**7.66**	**7.78**	**8.16**	**8.38**	**8.08**	**8.33**	**8.50**	**8.32**	**8.11**	**8.28**	**8.82**	**8.43**

Table 14: Vermont CO_2 from Fossil Fuels by Sector ($MMTCO_2E$)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential	**1.42**	**1.57**	**1.63**	**1.58**	**1.51**	**1.46**	**1.54**	**1.50**	**1.44**	**1.41**	**1.63**	**1.59**	**1.53**	**1.59**	**1.83**	**1.66**
Coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	1.31	1.46	1.50	1.45	1.38	1.34	1.41	1.36	1.31	1.28	1.48	1.44	1.39	1.43	1.67	1.50
Natural Gas	0.11	0.12	0.13	0.13	0.13	0.12	0.14	0.14	0.13	0.14	0.15	0.15	0.15	0.17	0.17	0.16
Commercial	**0.53**	**0.59**	**0.67**	**0.63**	**0.55**	**0.54**	**0.59**	**0.64**	**0.69**	**0.64**	**0.70**	**0.70**	**0.64**	**0.69**	**0.74**	**0.66**
Coal	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum	0.41	0.47	0.53	0.49	0.40	0.39	0.44	0.48	0.52	0.51	0.56	0.56	0.51	0.55	0.59	0.52
Natural Gas	0.11	0.11	0.12	0.13	0.14	0.14	0.15	0.16	0.16	0.12	0.14	0.13	0.13	0.15	0.14	0.14
Industrial	**0.45**	**0.43**	**0.51**	**0.53**	**0.41**	**0.37**	**0.40**	**0.68**	**0.45**	**0.64**	**0.55**	**0.45**	**0.45**	**0.50**	**0.59**	**0.57**
Coal	0.00	0.02	0.03	-	-	-	-	0.25	-	0.18	-	-	-	-	-	-
Petroleum	0.35	0.33	0.38	0.42	0.31	0.26	0.29	0.31	0.34	0.31	0.34	0.32	0.29	0.37	0.44	0.43
Natural Gas	0.10	0.09	0.10	0.11	0.10	0.11	0.10	0.12	0.11	0.15	0.21	0.13	0.16	0.13	0.14	0.14
Transportation	**3.00**	**3.03**	**3.22**	**3.41**	**3.44**	**3.56**	**3.70**	**3.63**	**3.58**	**3.75**	**3.70**	**3.70**	**3.65**	**3.68**	**3.81**	**3.86**
Petroleum	3.00	3.03	3.21	3.40	3.44	3.56	3.69	3.62	3.58	3.75	3.69	3.70	3.64	3.68	3.81	3.86
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electric Power	**0.04**	**0.06**	**0.05**	**0.02**	**0.02**	**0.02**	**0.01**	**0.02**	**0.06**	**0.04**	**0.12**	**0.04**	**0.02**	**0.03**	**0.02**	**0.01**
Coal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.05	0.03	0.07	0.04	0.01	0.02	0.02	0.01
Natural Gas	0.04	0.06	0.04	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.05	0.01	0.00	0.00	0.00	0.00
TOTAL CO2 from Fossil Fuels	**5.45**	**5.70**	**6.07**	**6.16**	**5.93**	**5.95**	**6.23**	**6.47**	**6.21**	**6.49**	**6.69**	**6.49**	**6.29**	**6.49**	**6.99**	**6.76**
Coal	0.02	0.03	0.05	0.01	0.01	0.01	0.00	0.26	0.01	0.19	0.00	0.01	0.00	0.00	0.00	0.00
Petroleum	5.08	5.30	5.62	5.77	5.53	5.56	5.84	5.77	5.80	5.87	6.14	6.06	5.84	6.05	6.53	6.31
Natural Gas	0.35	0.37	0.40	0.38	0.38	0.38	0.39	0.44	0.41	0.42	0.55	0.42	0.44	0.44	0.46	0.44

Notes

1. New England Regional Assessment Group, U.S. Global Change Research Program, *Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change,* Foundation Report, September 2001; Impacts from U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation, *Global Warming-State Impacts*, September 1997.

2. New England Climate Coalition, *Tomorrow's Energy Today: How to Ease New England's Energy Crisis and Curb Global Warming Pollution, Starting Now,* 21 June 2007.

3. The Committee on the Environment and the Northeast International Committee on Energy of the Conference of New England Governors and Eastern Canadian Premiers, *Climate Change Action Plan 2001*, August 2001.

4. Ibid.

5. "Other Energy" represents pollutants other than CO2 released from the energy sectors.

6. New England Climate Coalition et. al., *Climate Change Action Report Card 2007: 4th Assesment of the Region's Progress Towards GHG Emissions Reduction Targets*, November 2007.

7. Federal Highway Administration, *Highway Statistics 2001*, November 2002; Federal Highway Administration, *Highway Statistics 2005*, November 2006.

8. Federal Highway Administration, *Highway Statistics 2001*, November 2002; Federal Highway Administration, *Highway Statistics 2005,* November 2006*;* United States Census Bureau, *Population Estimates*, 27 December 2007.

9. See Note 7.

10. Ibid.

11. Ibid.

12. Capacity from Energy Information Administration, *Annual Electric Generator Report*: *2001-2005*, 2006. Usage calculated from Energy Information Administration, *Retail Sales of Electricity by State by Sector by Provider*, 26 October 2007.

13. Population change calculated from United States Census Bureau, *Population Estimates*, 27 December 2007.

14. ISO New England Inc., *Energy Sources in New England*, 2008.

15. Regional Greenhouse Gas Initiative, *Memorandum of Understanding*, 20 December 2005.

16. Heating degree days measures how much heating is necessary to keep buildings at a comfortable 65°F. The heating degree days used here are an average of the the six New England

states, weighted by 2005 population. National Climactic Data Center, *Heating and Cooling Degree Days*, 2008.

17. The emissions increases from gasoline, aviation fuel, and diesel were 0.97, 0.82 and 0.76 $MMTCO_2E$, respectively.

18. United States Census Bureau, *Population Estimates*, 27 December 2007.

19. U.S. Department of Energy, Energy Information Administration, *State Electricity Profiles 2006*, November 2007.

20. Ibid.

21. Based on prime supplier sales from U.S. Department of Energy, Energy Information Administration, *Petroleum Navigator*, downloaded from tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_R1X_a.htm, 5 March 2008.

22. Based on diesel consumption data from U.S. Department of Energy, Energy Information Administration, *Petroleum Navigator*, downloaded from tonto.eia.doe.gov/dnav/pet/pet_cons_821use_dcu_R1X_a.htm, 5 March 2008.

23. Ibid.

24. U.S. Department of Energy, Energy Information Administration, *Natural Gas Navigator*, downloaded from tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_SCT_a.htm and other state-specific reports, 5 March 2008.