PlaNYC

INVENTORY OF NEW YORK CITY GREENHOUSE GAS EMISSIONS

SEPTEMBER 2011

A GREENER, GREATER NEW YORK

The City of New York
Mayor Michael R. Bloomberg

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A GREENER, GREATER NEW YORK

Foreword by Michael R. Bloomberg, Mayor of New York City

New York City already has one of the lowest per capita greenhouse gas (GHG) emissions levels among major global cities, one-third the U.S. average. But we have a responsibility and the tools necessary to do more.

Cities are at the forefront of both the causes and effects of climate change. Urban areas are estimated to be the source of approximately 70 percent of global GHG emissions. At the same time, cities located on a coast, as New York is, face increased climate risks. Regardless of action or inaction by national governments or international bodies, municipalities have many of the tools to decrease emissions and are taking concrete actions to do so.

In 2007, we set a goal of reducing our GHG emissions by more than 30 percent by 2030, compared to 2005 levels. As part of PlaNYC, our comprehensive agenda to create a greener, greater New York, we have launched a series of actions that are yielding significant progress toward this goal. These efforts will help reduce our contributions to climate change and yield tremendous environmental and economic benefits to the city.

Regular, accurate GHG emissions inventories allow us to focus our policy initiatives on the most effective GHG mitigation strategies, such as improving the energy efficiency of existing buildings through landmark green buildings legislation. They also provide transparent data for New Yorkers to use in holding elected officials accountable. Having a thorough understanding of our GHG emissions is also critical as we work to achieve our goal of reducing emissions by 30 percent.

This year's carbon inventory, covering 2010 emissions, demonstrates that we continue to reduce citywide GHG emissions. In addition, our City government emissions are below our base year levels and are now decreasing at a rate necessary to achieve a 30 percent reduction by 2017.

Combating climate change is one of the great challenges of our age, and as this report shows, New York City continues to lead the way in achieving real results.

Mayor Michael R. Bloomberg

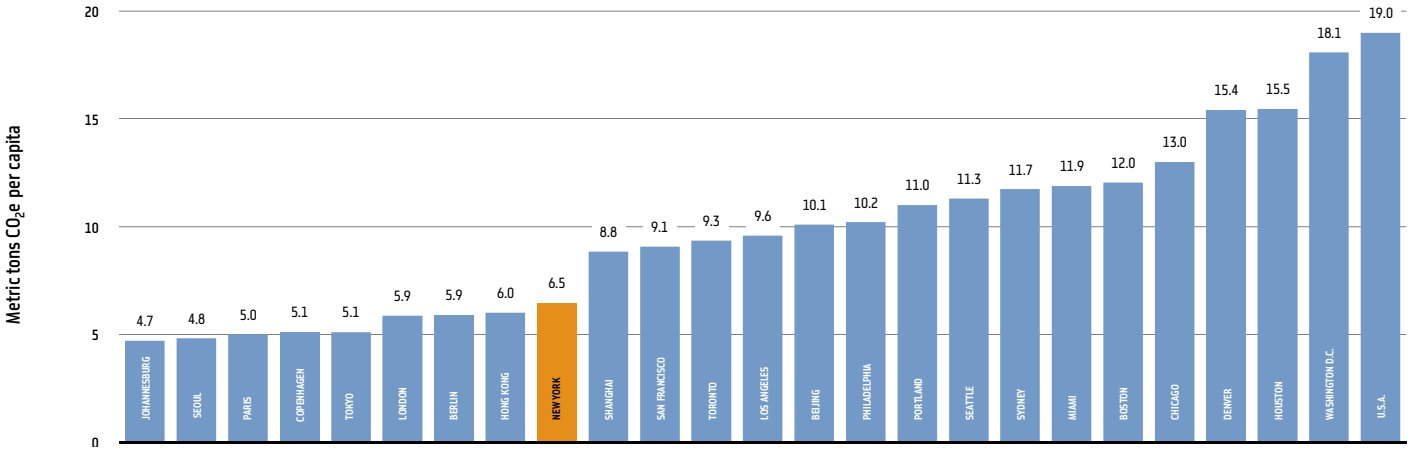
Comparison of New York City to Other Cities

Due to the high population density of New York City's built environment and extensive public transit system, New Yorkers' activities emit far less carbon than those of residents of comparable American cities and emit about a third as much carbon as the activities of the average U.S. resident. Driving this are the city's high rate of commutation by public transit and walking and low per capita electricity consumption.

GHG EMISSIONS COMPARISONS

When compared to other large cities in the United States and abroad, New York City has one of the lowest per capita carbon emissions levels and the lowest of any large American city.

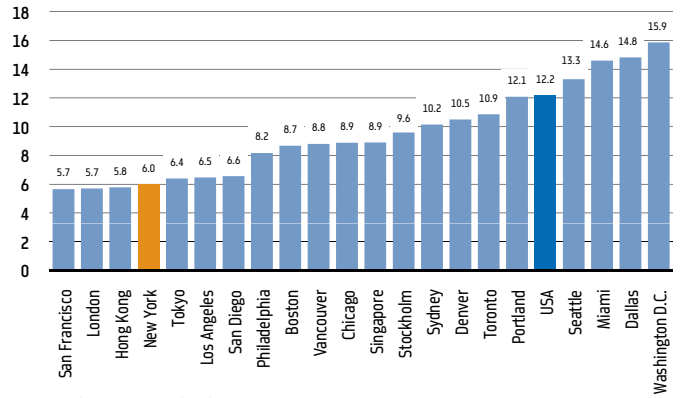
Per Capita Greenhouse Gas Emissions for U.S. and International Cities (excluding Agriculture and Non-Local Processes*)



* City greenhouse gas inventories do not typically include all sources of emissions included in the U.S. greenhouse gas inventory, including emissions from agriculture, chemical production, fossil fuel extraction and refinement, cement production, and other industrial sources. To allow for comparability between city and U.S. per capita GHG emissions, the U.S. per capita GHG emissions have been reduced by 2.3 metric tons per person, which, based on the U.S. GHG inventory, is the U.S. per capita share of GHG emissions from sources not accounted for in city inventories. Per the Kyoto Protocol, national inventories do not include emissions from aviation and shipping. Accordingly, city inventories also exclude these emissions sources.

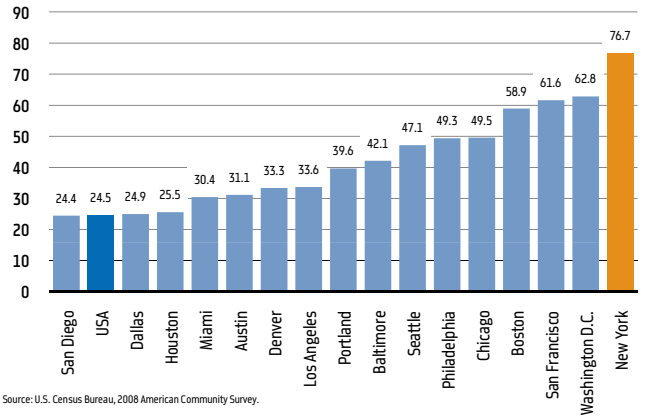
Sources: U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008 (April 2010); city greenhouse gas inventories; Arup; The Carbon Disclosure Project; New York City Mayor's Office of Long-Term Planning and Sustainability analysis. Year of reported values range from 2004 to 2009.

Annual Electricity Consumed Per Capita, MWh



Source: See Appendix for sources of city and U.S. electricity consumption

Percentage of Commuters Using Non-Automobile Transportation



Source: U.S. Census Bureau, 2008 American Community Survey.

Electricity consumption is one indicator of building energy efficiency. New York City has among the lowest levels of per capita electricity use. This is driven largely by the fact that most New Yorkers live in apartment buildings and have smaller homes than the average American.

One factor behind New York City's low per capita carbon emissions is its transit system. When compared to other U.S. cities and the U.S. average, New York City has the highest use of non-automobile transportation.

Executive Summary

Human activities such as industrial processes, fossil fuel combustion, and changes in land use are disturbing the natural balance of GHGs in the atmosphere. The continuous addition of these gases to our atmosphere results in destabilizing impacts on climate and weather patterns. Even small changes in average temperatures can result in an increase in frequency and intensity in severe weather events, ecosystem changes, loss of animal and plant species, stresses to human health, and other effects.

To mitigate these serious consequences of climate change, the global community and world's cities have a responsibility to work together to reduce GHG emissions. In 2007, the City of New York committed to a 30 percent reduction in citywide (community) GHG emissions below 2005 levels by 2030, and a 30 percent reduction in City government emissions below fiscal year (FY) 2006 (Jun 1, 2005 to June 30, 2006) levels by 2017. These goals are codified in law and through an Executive Order, as well as a requirement that the City produce an annual assessment and analysis of its GHG emissions.

Despite a dramatically warmer summer in 2010, both citywide and City government emissions declined from 2009 to 2010. Citywide greenhouse gas emissions decreased by 1.1 percent below 2009 levels, while City government GHG emissions decreased by 4.6 percent below FY 2009 levels.

This report presents the results of the citywide inventory for calendar year (CY) 2010 and the City government inventories for both FY and CY 2010. In 2010, New York City was responsible for 54.3 million metric tons of carbon dioxide equivalent ($MgCO_2e$) emissions, while City government operations resulted in 3.5 million metric tons in both FY and CY 2010. These figures include GHG emissions generated by energy consumption (including emissions related to electricity generation outside the city), vehicle traffic and transit operations within the city, emissions from landfills in the city and from solid waste disposed outside the city (which was not included in previous inventories), in-city wastewater treatment facilities, the electricity distribution network within the city, and emissions from the transportation of solid waste outside of the city. On a per capita basis, the average New Yorker was responsible for some 6.5 metric tons of GHG emissions in 2010, compared with 19.0 for the average American, excluding non-local emissions such as the agriculture sector.

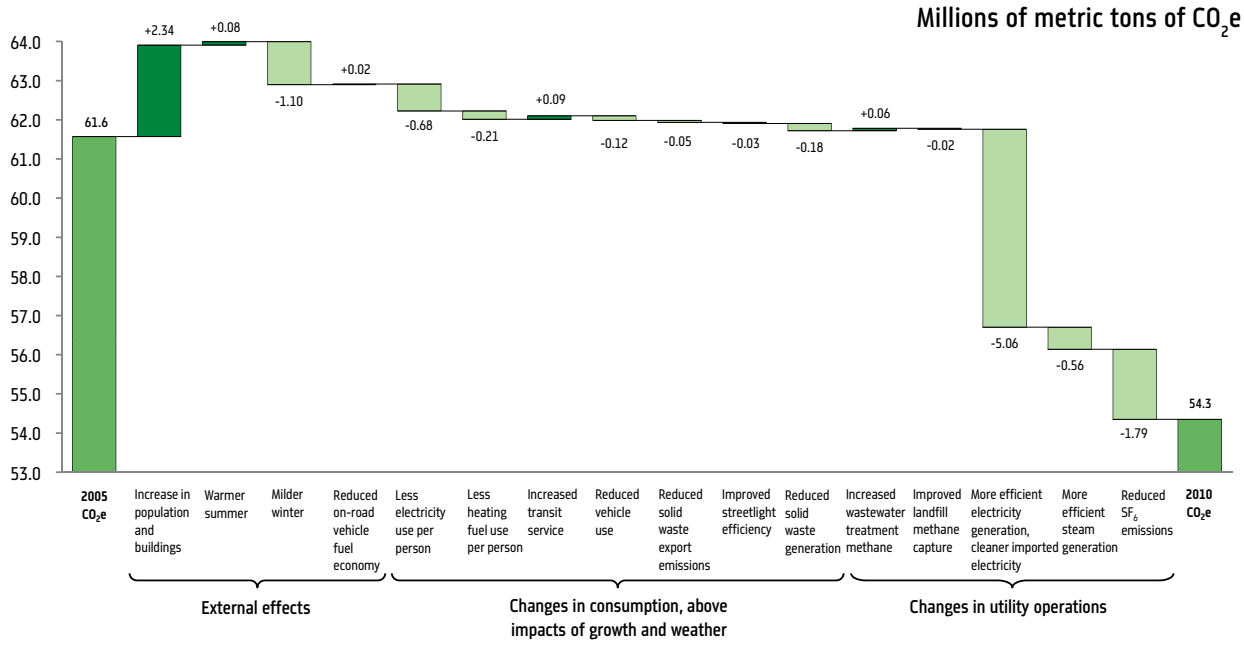
Per capita electricity use in New York City declined from 2009 to 2010, after taking out the estimated impact of weather, demonstrating that New Yorkers are using electricity more efficiently. When counting only those factors under the City's control, citywide emissions decreased by 0.2 percent, and FY 2010 City government emissions decreased 1.1 percent.

City government GHG emissions are now below the FY 2006 base year level and current annual reductions are at the level necessary to achieve a 30 percent reduction by 2017. The reductions in City government emissions indicate that the City's efforts to meet its PlaNYC goal of a 30 percent reduction in City government emissions below FY 2006 levels by FY 2017 continue to show returns. The City's investments in energy efficiency upgrades to its buildings laid out in the *Long-Term Plan to Reduce Energy Consumption and Greenhouse Gas Emissions of Municipal Buildings and Operations* are beginning to show results. Reductions are expected to increase going forward as additional investments are made and the benefits of energy efficiency projects and operational changes take effect.[1] These results, along with reduced emissions from solid waste export and the continued increased efficiency of streetlights, show the initial impact of concerted efforts to make City government more energy efficient. Significant reductions in methane emissions from wastewater treatment plants due to investments to repair system leaks have also contributed to reductions in City government emissions since FY 2009.

This annual inventory provides critical information on the trends of GHG emissions and the many factors that influence changes to emissions over time. As more data become available, future inventories will document the impact of the City's ongoing sustainability efforts outlined in PlaNYC, including efforts to make the city's buildings more energy-efficient, clean the city's power supply, develop more sustainable transportation options, and reduce fugitive GHG emissions from solid waste, wastewater treatment, and other sources.

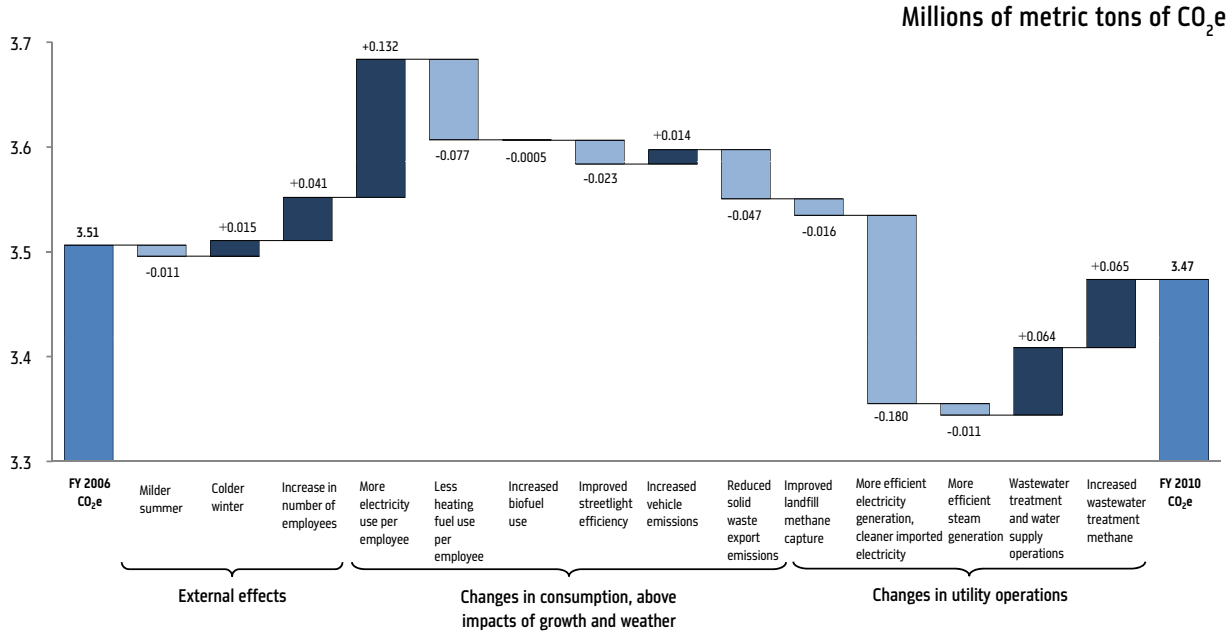
2005 to 2010 Changes in New York City Greenhouse Gas Footprint

New York City's carbon footprint decreased 11.7% from 2005 to 2010, due to milder weather, reduced electricity and heating fuel use, reduced vehicle use, reduced solid waste generation, new power plants and cleaner imported electricity, more efficient steam generation, and reduced SF_6 emissions



FY 2006 to FY 2010 Changes in New York City Government Greenhouse Gas Footprint

From FY 2006 to FY 2010, the City government's carbon footprint decreased 0.9%. Combating an increase in GHG emissions from electricity use and wastewater treatment and water supply operations, a net decrease resulted from more efficient electricity generation and cleaner imported electricity, less heating oil use per employee, reduced solid waste export emissions, and improved streetlight efficiency




Credit: New York City Economic Development Corporation

Introduction

New York City reduces citywide greenhouse gases for fourth consecutive year–City government emissions reduced below base year levels and on track to achieve PlaNYC target

The City of New York established the goal of reducing citywide GHG emissions by 30 percent below 2005 levels by 2030 in its 2007 comprehensive sustainability plan, PlaNYC, and reaffirmed this goal in the 2011 update to the plan. Following the release of PlaNYC, Mayor Bloomberg signed Executive Order 109 in October 2007, which mandated even more aggressive greenhouse gas reductions for City government facilities and operations of 30 percent below FY 2006 levels by 2017.

To inform both the citywide and City GHG reduction efforts, the City released its first comprehensive GHG inventory in April 2007 (*2005 Inventory*), establishing the base levels from which the citywide and City government GHG reduction targets are based.[2] In January 2008 the New York City Council passed Local Law 22 of 2008, requiring the City to complete annual updates to the citywide and City government inventories and to document progress the City is making toward achieving its goals. In accordance with this law, the City released its first annual updated GHG inventory in September 2008 (*2007 Inventory*)[3] and annual updates in September 2009 (*2008 Inventory*)[4] and September 2010 (*2009 Inventory*).[5] This document (*2010 Inventory*) is the City's fourth annual greenhouse gas inventory update.

Carbon accounting methodologies and protocols are continually evolving, and New York City has been a leading contributor to the development of updated standards both in the U.S and internationally. This inventory reports three items of information:

- Updates to past base year and interim year inventories, applying current protocols and methodologies and incorporating better data
- Total 2010 citywide GHG emissions for New York City and FY and CY 2010 GHG emissions from City government operation and facilities
- Factors resulting in changes in the city's GHG emissions levels

This inventory presents updates to past years' base and interim year inventory results, allowing for comparability of the most recent year's GHG levels with those from past years. The City government inventory is completed in compliance with the *Local Government Operations Protocol* (LGOP), and citywide calculations were also made using the LGOP, where applicable, as no citywide protocol exists at this time.[6] Updated data, amended methodologies, and a revised electricity emissions coefficient due to updated power plant data resulted in a decrease in government FY 2006 base year emissions levels of 1.8%, an increase in CY 2008 government base year emissions of 4.3%, and an increase in 2005 citywide emissions levels of 8.7%. Tables summarizing these changes are in Appendix A.

Understanding the causes driving changes in GHG emissions is necessary to develop policies to achieve additional carbon reductions. These changes reflect several factors, including: the impact of weather and population growth on energy use; an increase in cleaner imported power; new efficient in-city power generation; changes in the amount of methane (CH_4) emitted from the city's wastewater treatment plants and landfills; the impact of more efficient streetlights; and decreased sulfur hexafluoride (SF_6) emissions used for citywide electricity distribution.

As seen in past years' inventories, a significant factor influencing the change in emissions levels from the base years was changes to the electricity emissions coefficient due to the commissioning of two new state-of-the-art in-city power plants in 2006, and increasing amounts of hydropower imported into the city.

Weather has a significant effect on energy consumption, and its impact varies each year. Changes in heating degree days (HDD) and cooling degree days (CDD), which reflect the demand for energy required to heat or cool a home, business, institution, or industrial facility, are reported in Appendix L.

Consistent with standard international GHG reporting practice, all units in this inventory are reported in the International System of Units (SI), unless otherwise noted.

Credit: New York City Economic Development Corporation

Citywide Inventory

Citywide GHG emissions were 1.1 percent lower in 2010 than 2009 due to a milder winter, reduced SF_6 emissions, cleaner imported electricity, and more efficient steam generation

To most accurately and consistently assess and report a city's carbon emissions, a clear scope of analysis and boundaries specifying the emissions sources assessed is essential. Following standard international convention for the completion of city GHG inventories, the citywide inventory consists of all direct and indirect emissions from energy used by buildings, on-road transportation, and public transit (excluding aviation and marine transportation) within New York City; fugitive emissions from wastewater treatment, solid waste disposal in and outside the city, and electricity and natural gas distribution within New York City; and emissions associated with solid waste exported outside of the city.

Citywide 2010 inventory results

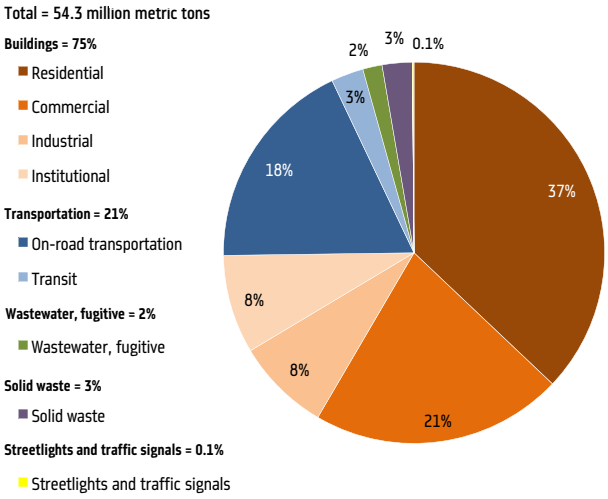
In 2010 total GHG emissions in New York City were 54.3 $MgCO_2e$, 11.7 percent below 2005 base year emissions of 61.6 $MgCO_2e$. 2010 GHG emissions are broken down as follows:

- Scope 1 GHG emissions (direct emissions from on-site fossil fuel combustion or fugitive emissions): 36,236,992 $MgCO_2e$
- Scope 2 GHG emissions (indirect emissions from energy generated in one location, but consumed in another, such as electricity and district steam): 18,112,658 $MgCO_2e$
- Scope 3 GHG emissions (sources not counted toward an entity's total emissions levels, such as biogenic CO_2 from biofuels—reported for information only): 14,321,140 $MgCO_2e$

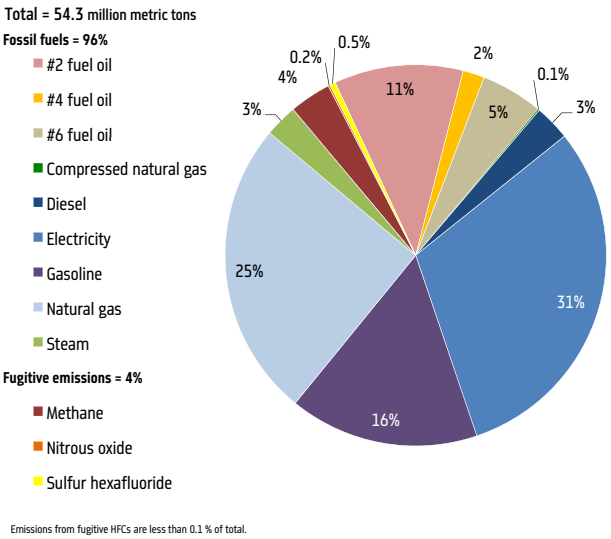
2010 citywide GHG emissions were 1.1 percent below 2009 levels of 55.0 $MgCO_2e$. While this annual reduction is less than reported last year, emissions were again lower despite continued growth in population and building floor area and a significant increase in summer temperatures in 2010. One year of data cannot be used to determine a certain trend. However, reductions reported in 2010 show that progress continues to be made toward achieving the City's GHG reduction goal. The full impact of many policies and programs launched by the City as part of PlaNYC—including the energy efficiency laws that are part of the Greener, Greater Building Plan and the creation of the New York City Energy Efficiency Corporation (NYCEEC)—and the development of related financing tools for energy efficiency in the private sector, have yet to be realized as the programs are now beginning to scale up.

While reporting overall GHG emissions levels indicates progress the City is making toward achieving its goals, understanding the drivers of these changes is critical to ensuring the most efficient development and implementation of policies necessary to keep the city's GHG reductions on track.

2010 Citywide CO_2e Emissions by Sector

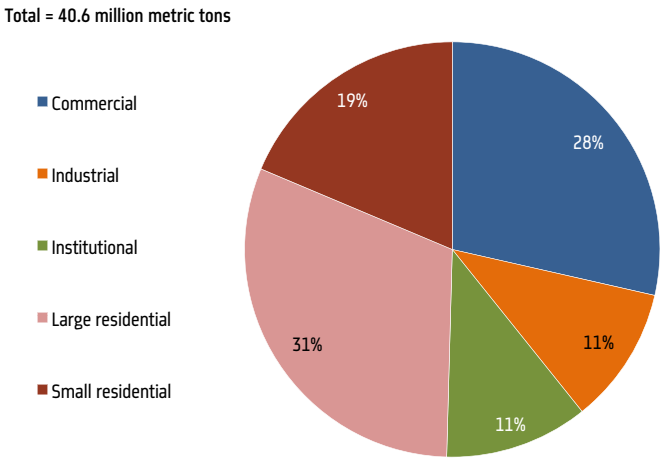


2010 Citywide CO_2e Emissions by Source

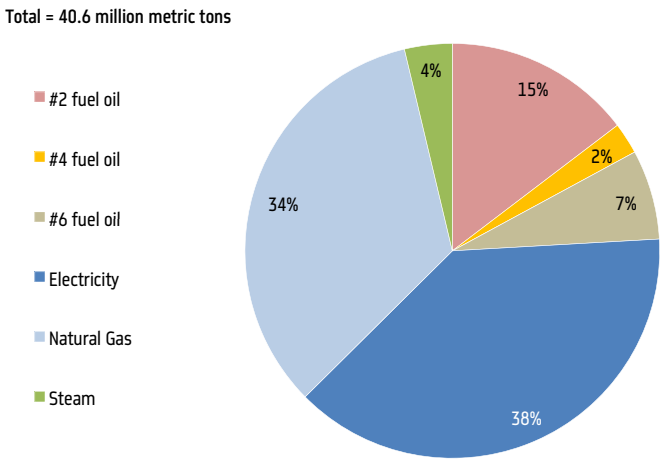


Emissions from fugitive HFCs are less than 0.1 % of total.

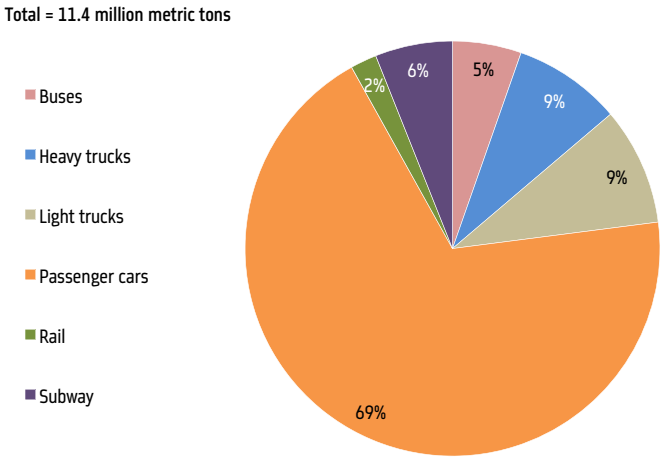
2010 Citywide CO_2e Buildings Emissions by Sector



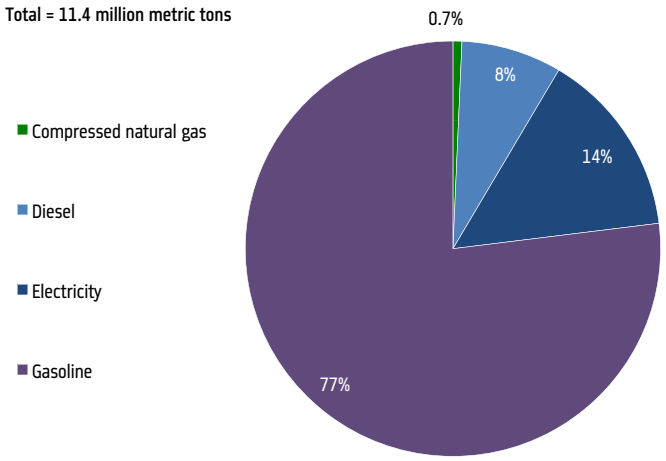
2010 Citywide CO_2e Buildings Emissions by Source



2010 Citywide CO_2e Transportation Emissions by Mode



2010 Citywide CO_2e Transportation Emissions by Source



2010 Citywide Emissions by Scope and GHG

SCOPE	GREENHOUSE GAS (METRIC TONS)					
	CO_2	CH_4	N_2O	HFCs	SF_6	CO_2e
Scope 1	33,633,326	94,743	1,108	9	11	**36,236,158**
Scope 2	18,079,146	338	84			**18,112,683**
Scopes 1 and 2	**51,712,472**	**95,081**	**1,192**	**9**	**11**	**54,348,841**

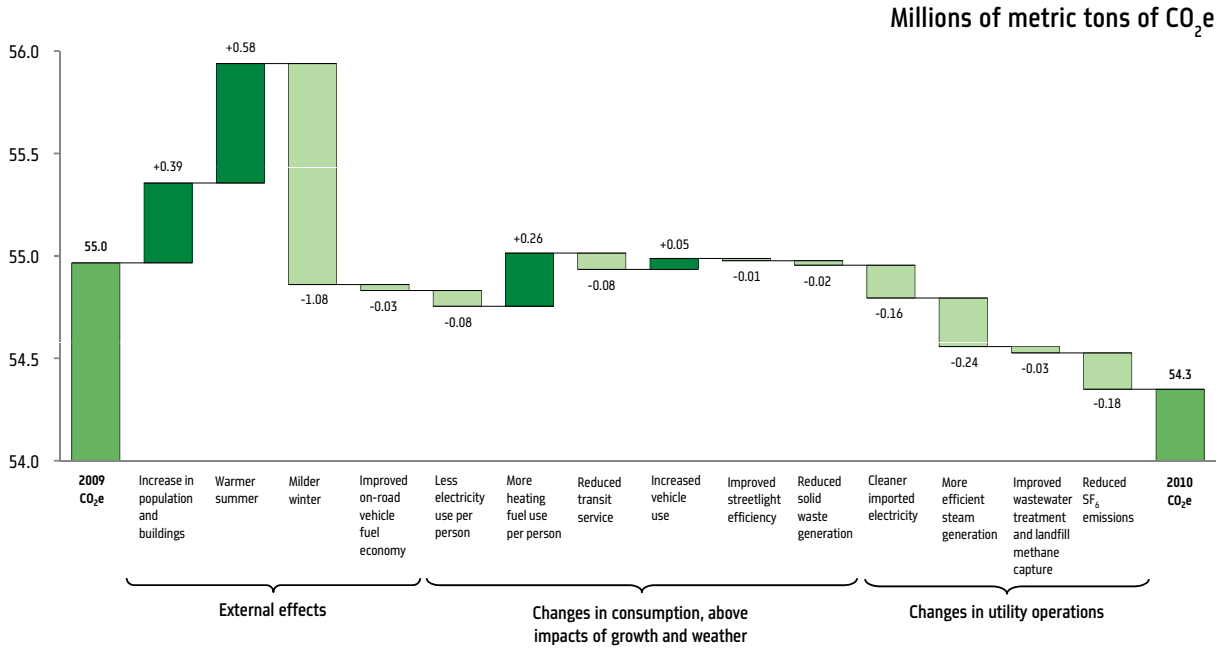
Changes to citywide emissions

To understand fully the causes of changes in New York City GHG emissions, the City analyzed all outside factors that might influence these changes, such as weather, changes in population and building floor area, and changes in how the city's electricity and steam supply are generated. Using these data, the City determined drivers that could be influenced by policy changes, such as per capita energy use or transit consumption.

Citywide 2005 to 2010 changes

When all factors influencing the changes in citywide GHG emissions from 2005 to 2010 were analyzed, milder winter temperatures, reductions in per capita energy use, changes to the carbon intensity of the city's electricity and steam supply, and a reduction in fugitive SF_6 from electricity distribution are most responsible for reducing the city's GHG emissions 11.7 percent. These reductions were offset by growth in both population and building floor area and warmer summer temperatures in 2010. When external factors of weather, population growth, fuel economy, and power supply carbon intensity are excluded, overall GHG emissions decreased 4.8 percent during this period. Details of these changes are presented in the Executive Summary.

New York City's carbon footprint decreased 1.1% from 2009 to 2010 due to a milder winter, improved on-road fuel economy, reduced electricity use, reduced transit service, reduced solid waste generation, cleaner imported electricity, more efficient steam generation, improved methane capture, and reduced SF_6 emissions



Citywide 2009 to 2010 changes

Citywide GHG emissions decreased by 1.1 percent from 2009 to 2010, driven by a milder winter, increased importation of cleaner electricity, reduced per capita electricity use, more efficient steam generation, reduced landfill and wastewater methane, reduced solid waste generation, and decreased fugitive SF_6 emissions from electricity distribution. These major reductions were most tempered by growth in population and building floor area and a much warmer summer, as cooling degree days were 76 percent higher in 2010 than in 2009. When weather, growth, fuel economy, and changes to the carbon intensity of the electricity and steam supply are excluded, citywide carbon emissions remained relatively stable, decreasing only 0.1 percent. Perhaps the most significant change is seen in a reduction in per capita electricity use, showing that New York City residents, workers, and visitors continue to use electricity more efficiently. Future inventories are expected to show impacts from the City's Greener, Greater Buildings laws, efforts to reduce the use of #6 heating oil (an initiative to improve air quality that also will reduce GHG emissions), and other initiatives of PlaNYC as the City continues to make progress toward its GHG reduction goals. Details of these changes are presented above.

Citywide inventory methodology

To calculate the impact of factors resulting in changes to citywide GHG emissions, the City compared the changes in CO_2e emissions and consumption of each energy source for each sector. The percentage of population change was applied to all non-building emissions sources, while the percentage change in building floor area was applied to building emissions sources to determine the expected net impact of these drivers on GHG emissions. To determine the impact of weather, the City conducted regression analysis for each building energy source, using monthly energy consumption data and heating degree and cooling degree data. The results of this analysis were used to determine the expected change in GHG emissions due to weather for electricity, fuel oil, natural gas, and steam. These results are shown in Appendix F.

The impact of revisions to various coefficients was determined by calculating and applying the change in carbon intensity for each energy source in each sector. Per capita trends were determined by subtracting the expected changes from population, building floor area, and weather, as well as the actual changes from revised coefficients, from the change in consumption for each energy source in each sector.

Data on consumption of citywide electricity and steam, and natural gas in the Bronx and Manhattan were provided by Consolidated Edison (ConEd). National Grid reported natural gas consumption data for Brooklyn, Queens, and Staten Island. The Long Island Power Authority (LIPA) reported electricity consumption data for the Rockaways area of Queens. Fuel oil use was estimated using fuel oil boiler permit data from the New York City Department of Environmental Protection (DEP), merged with the City property database to estimate the amount of fuel oil burned per square foot of building floor area. On-road transportation vehicle-miles-traveled data were provided by the New York Metropolitan Transportation Council (NYMTC). Energy consumption data for public transit were provided by the Metropolitan Transportation Authority (MTA) for New York City Transit (NYCT) subways and buses, Staten Island Railway (SIR), MTA Metro-North Rail Road (MNR) and Long Island Railroad (LIRR) commuter rail, and MTA Bus Company buses; by the Port Authority of New York and New Jersey (PANYNJ) for Trans-Hudson (PATH) commuter rail; and by New Jersey Transit (NJT) for its commuter rail and buses.

Data used to calculate fugitive and process CH_4 and process N_2O from wastewater treatment were provided by DEP. CH_4 emissions were calculated based on the destruction of volatile material in anaerobic digesters. Based on the measured concentration and flow of volatile organic solids, it is estimated that 15 cubic feet of digester gas is produced for every pound of volatile organic solids destroyed. N_2O emissions were calculated from the daily nitrogen load discharged by each of the City's 14 wastewater treatment plants in accordance with the LGOP.

Fugitive CH_4 from in-city landfills was calculated from landfill gas collection data provided by the New York City Department of Sanitation (DSNY) and DEP per the LGOP. Fugitive CH_4 from exported solid waste was calculated using waste disposal figures for residential, commercial, and construction and demolition waste and applying emissions factors from EPA's Waste Reduction Model (WARM), excluding negative values typically used to estimate sequestered emissions from organic waste.[7] Fugitive CH_4 from natural gas distribution was calculated using data provided by National Grid and ConEd. Fugitive SF_6 from electricity distribution was calculated from data provided by ConEd.

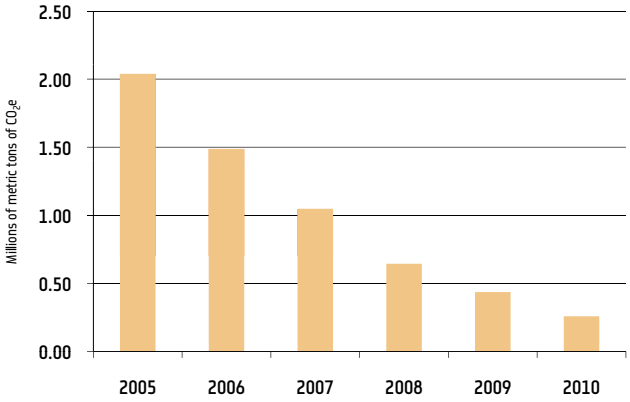
All DSNY-managed municipal solid waste (residential and certain institutional solid waste) generated in New York City is exported to landfills or waste-to-energy facilities outside of the city by private contractor. Fuel consumed by trains and trucks exporting solid waste out of the city is calculated using data provided by DSNY detailing the mass of waste transported, mode of transport, and distance to disposal facility. Fuel consumption was calculated by estimating how many trucks and trains are needed to transport the waste, and applying fuel economy figures to the weighted average distance to receiving landfills.

Fugitive emissions of hydroflourocarbons (HFCs) from municipal vehicle cooling and refrigeration systems were calculated from data provided by the New York City Department of Citywide Administrative Services (DCAS), including the number of regular vehicles and refrigeration vehicles in operation in the City government's vehicle fleet, as well as the type of refrigerant used by each system. The City estimated fugitive refrigerant emissions by applying a default emissions factor provided by the LGOP.

Scope 3 aviation emissions were calculated using fuel consumption data from the PANYNJ. Emissions coefficients in the LGOP were applied to the total volume of jet fuel and aviation gasoline loaded onto airplanes at LaGuardia and John F. Kennedy airports, as modeled by PANYNJ using the numbers of passengers departing from each airport during the year of analysis.

GHG emissions were calculated from all data acquired as described using emissions coefficients in the LGOP, unless otherwise noted. Fuel economy factors for on-road vehicle were calculated as described in the Updates and Revisions section of the Appendix. All emissions coefficients and fuel economy figures are reported in Appendices G, H, and I.

New York City Fugitive Sulfur Hexaflouride (SF_6) Emissions



ConEd has undertaken a major effort to detect and repair leaks of sulfur hexafluoride (SF_6) in its electricity distribution system since 2000. SF_6 is used to insulate electricity transmission equipment in small spaces typically found in dense urban areas like New York City. Because SF_6 has a global warming potential of 23,900 (its effect on atmospheric warming is 23,900 times that of CO_2), even small amounts of this gas leaking into the atmosphere can have a major impact on CO_2e levels. Since 2000, ConEd has made significant investments to detect and repair SF_6 leaks, resulting in total avoided emissions of 2.5 million $MgCO_2e$.

City Government Inventory

City government GHG emissions were 4.6 percent lower in FY 2010 than FY 2009 because of a milder winter, cleaner imported electricity, more efficient steam generation, improved methane capture at wastewater treatment plants, and improved streetlight efficiency

Every year (beginning with FY 2006 and CY 2008) the New York City government GHG inventory is calculated in accordance with the LGOP and based on operational control. It consists of emissions from operations, facilities, or sources wholly owned by the City government or over which the City has full authority to introduce and implement operational and health, safety, and environmental policies (including both GHG- and non-GHG-related policies).[8] Emissions from leased buildings, facilities, and vehicles are included.

The operation of New York City's government requires a considerable amount of energy in order to provide services to the millions of City residents, commuters, and visitors each year. The majority of annual emissions result from the operation of municipal buildings, wastewater treatment facilities, and the municipal vehicle fleet. Other significant sources include landfills, the exportation of solid waste, streetlights, and the water supply system.

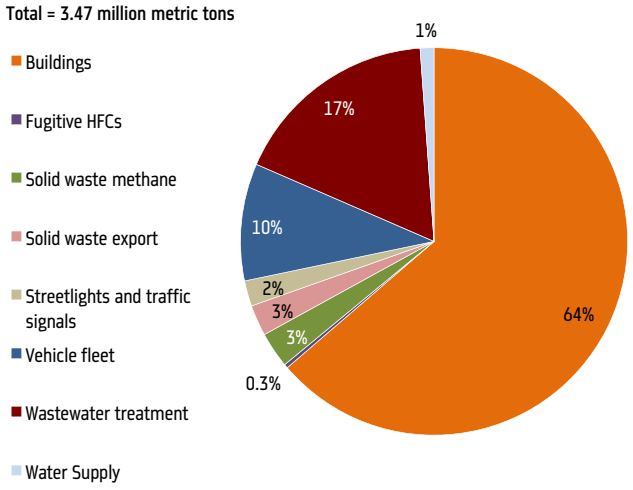
City Government FY 2010 inventory results

In FY 2010, New York City's government GHG emissions were 3.47 million $MgCO_2e$. This is a 4.6 percent decrease from FY 2009 emissions and a 0.9 percent decrease from those of base FY 2006. Current annual reductions have reached a level necessary to achieve a 30 percent reduction by 2017. Scope 1 GHG emissions were 1.93 million $MgCO_2e$ and Scope 2 emissions were 1.55 million $MgCO_2e$; these are broken down by GHG in the table on page 16. Scope 3 GHG emissions were 0.39 million $MgCO_2e$.

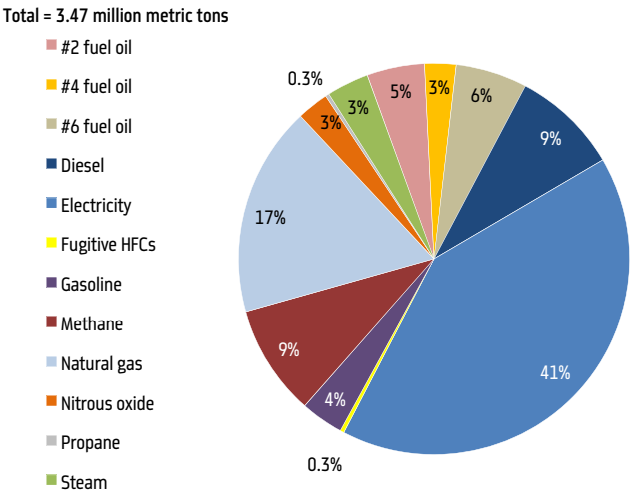
The majority of 2010 emissions by sector—91 percent—were from municipal buildings, wastewater treatment facilities, and the municipal vehicle fleet. The majority by source—76 percent—were from electricity, natural gas, methane, and diesel.

Not including DEP emissions, nearly half of 2010 buildings emissions—44 percent—result from energy provided to New York City's educational institutions, including elementary, middle and high schools, as well as the multitude of facilities associated with the City University of New York. Most of 2010 vehicle emissions—86 percent—are from the transportation of solid waste, New York City Police and Fire Departments, and the Department of Transportation. In accordance with the LGOP, wastewater treatment and water

FY 2010 Government CO_2e Emissions by Sector



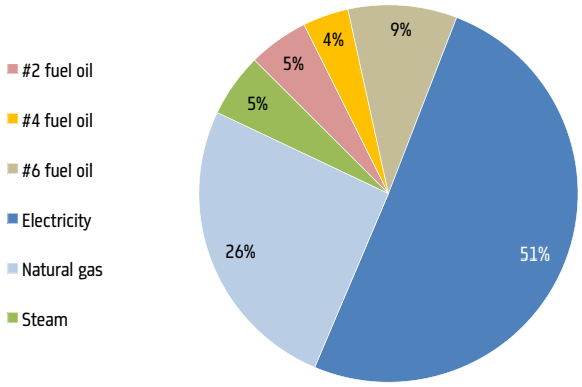
FY 2010 Government CO_2e Emissions by Source



Emissions from ethanol (E70 and E85), kerosene, jet fuel, and biofuel are less than 0.1% of total

FY 2010 Government CO_2e Buildings Emissions by Source

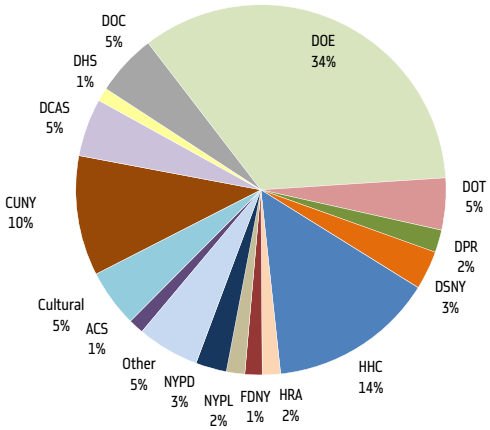
Total = 2.21 million metric tons



Emissions from biofuel are less than 0.1% of total

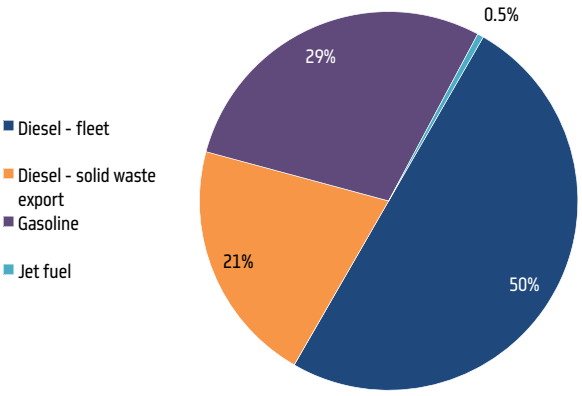
FY 2010 Government CO_2e Buildings Emissions by Agency

Total = 2.21 million metric tons



FY 2010 Government CO_2e Transportation Emissions by Source

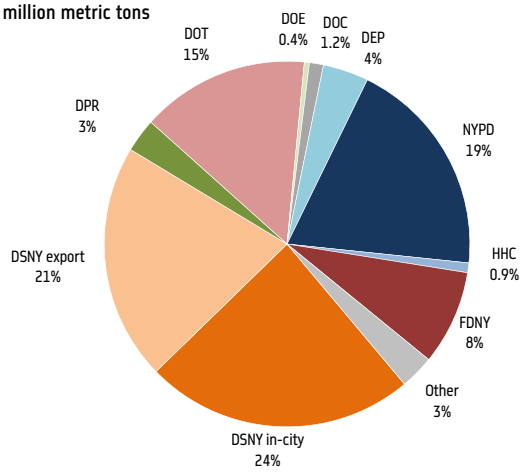
Total = 0.43 million metric tons



Emissions from biofuel are less than 0.1% of total

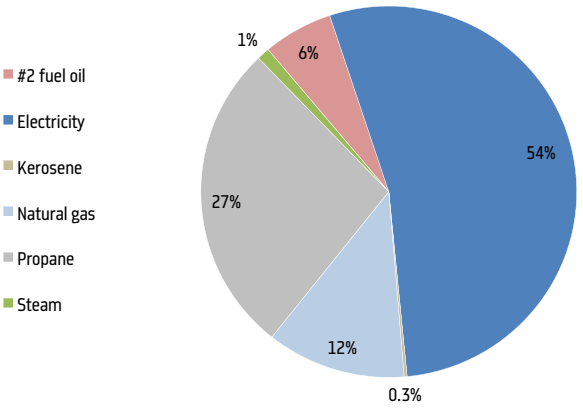
FY 2010 Government CO_2e Transportation Emissions by Agency

Total = 0.43 million metric tons



FY 2010 Government CO_2e Water Supply Emissions by Source

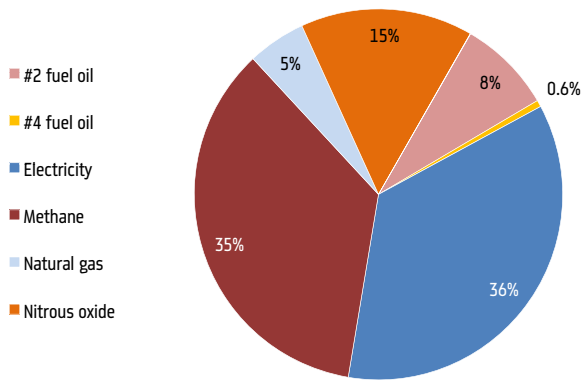
Total = 0.04 million metric tons



Emissions from biofuel are less than 0.1% of total

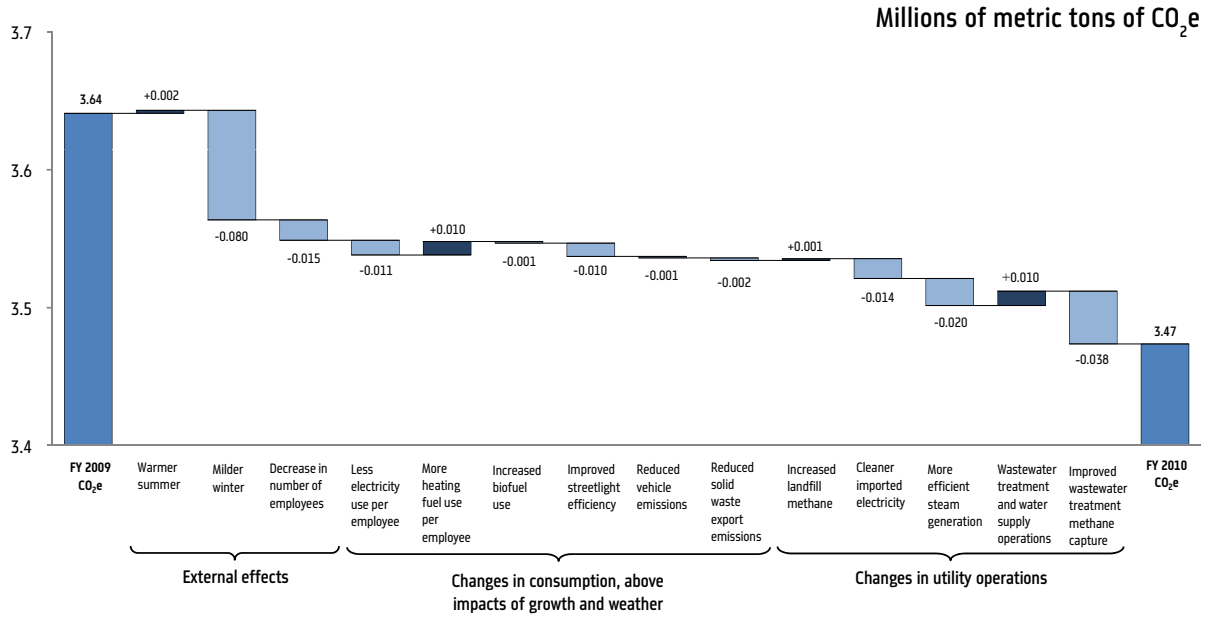
FY 2010 Government CO_2e Wastewater Emissions by Source

Total = 0.60 million metric tons



Emissions from propane and steam are less than 0.1% of total

From FY 2009 to FY 2010, the City government's carbon footprint decreased 4.6%. In addition to a milder winter and an overall reduction in the number of City employees, this decrease can be attributed to improved methane capture at wastewater treatment plants, cleaner imported electricity, more efficient steam generation, less electricity use per employee, and improved streetlight efficiency



supply emissions are reported separately by source. Electricity comprised a large component of both (36 percent of wastewater treatment and 54 percent of water supply emissions), and methane constituted an additional 35 percent of emissions from wastewater treatment plants.

Changes to City government emissions

As with citywide emissions, all changes in City government GHG emissions were analyzed to determine changes between the base year and most current year (FY 2006 to FY 2010) as well as the previous year and most current year (FY 2009 to FY 2010) to understand reasons for changes beyond those governed by external effects such as weather.

City government FY 2006 to FY 2010 changes

From FY 2006 to FY 2010, City government GHG emissions decreased by 0.91 percent, from 3.51 to 3.47 $MgCO_2e$. The principal drivers of this decrease include a reduction in the carbon intensity of the city's electricity supply, less heating fuel used per employee, more efficient streetlights and traffic signals, and improved efficiency in solid waste export transportation from truck to rail as part of the City's Solid Waste Management Plan (SWMP). Increases in the number of City employees, electricity used per employee, wastewater treatment and water supply operations, and wastewater treatment plant methane leaks between FY 06 and FY 09 (due to flare equipment undergoing repair) all contributed to temper emissions reductions. When weather, the number of City employees, and the carbon intensity of the city's power supply are excluded, emissions are shown to have increased by 3.2 percent over this period. However, without the impact of the aforementioned actions taken by the City, this increase would have been greater. Details of these changes are reported in the Executive Summary.

City government FY 2009 to FY 2010 changes

From FY 2009 to FY 2010, City government GHG emissions decreased 4.6 percent, from 3.64 to 3.47 $MgCO_2e$. This is primarily due to increased methane capture at wastewater treatment plants, milder weather, a reduction in the carbon intensity of the city's power supply, improved streetlight efficiency, a reduction in per employee electricity use in buildings, and an overall decrease in the number of City employees. When weather, the number of City employees, and the carbon intensity of the city's power supply are excluded, City government carbon emissions are shown to have decreased by 1.1 percent over this period. City government emissions are below the FY 2006 base year level and current annual reductions are at the level necessary to achieve a 30 percent reduction by 2017. Details of these changes are reported in the figure above.

FY 2010 City Government Emissions by Scope and GHG

SCOPE	GREENHOUSE GAS (METRIC TONS)				
	CO_2	CH_4	N_2O	HFCs	CO_2e
Scope 1	1,498,056	15,234	312	9	1,926,097
Scope 2	1,544,585	29	7		1,547,449
Scopes 1 and 2	**3,042,642**	**15,263**	**319**	**9**	**3,473,546**

City government inventory methodology

The impact of factors resulting in changes to City government GHG emissions were calculated in the same manner as in the citywide inventory. To determine the per capita trend for each energy source by sector, changes due to the following factors were subtracted from the change in total emissions: population (number of City employees); weather (correlated to energy use); and carbon intensity of electricity and steam.

All data used to complete the 2010 City government GHG inventory were acquired from City agencies or fuel vendors. Electricity, natural gas, and steam usage for the City's buildings, facilities, and streetlights was provided by DCAS, which maintains metered data from each utility. Fuel vendors and DEP supplied heating and vehicle fuel usage. Calculation of GHG emissions from fuel uses the volume of fuel delivered to estimate the volume of fuel consumed.

Data used to calculate fugitive and process emissions were provided by several agencies. Those for fugitive and process CH_4 and N_2O emissions from wastewater treatment were provided by DEP; fugitive CH_4 from landfills by DEP and DSNY; fugitive HFCs from municipal vehicle fleet cooling and refrigeration systems by DCAS; and emissions from the long-haul export of solid waste by DSNY. All calculations were made as described in the citywide inventory methodology section.

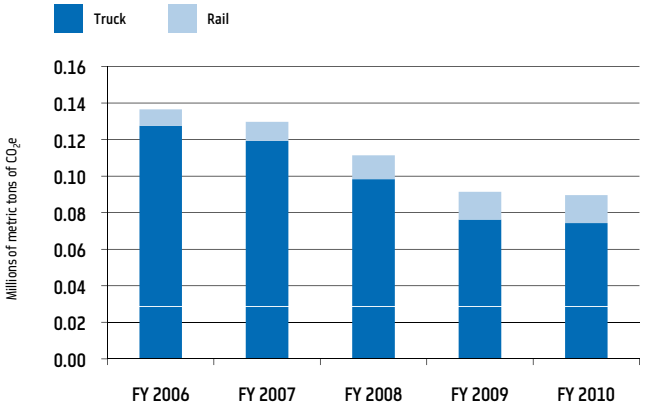
The City government inventory also reports emissions associated with employee commuting as a Scope 3 source. These were estimated using the U.S. Census Bureau's Public-Use Microdata Sample dataset, which reports the means of transportation to work for City employees. The methodology used for the 2010 inventory is the same as that outlined in past New York City inventories.[9]

Emissions from the decomposition of solid waste generated by City employees are also considered a Scope 3 source. These emissions were calculated by multiplying the number of employees by the estimated annual volume of solid waste generated by each employee, as calculated by DSNY.

City Government GHG Reduction Efforts

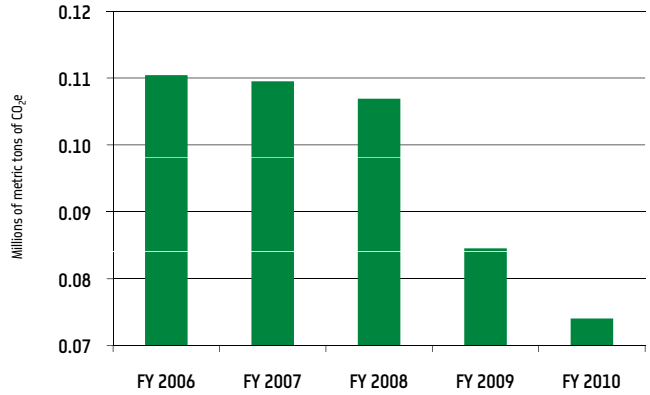
As detailed in this inventory, the City is pursuing GHG emissions reductions in many areas. Below are several examples of initiatives that have yielded significant results.

City Government CO_2e Emissions from Long-Haul Export of Solid Waste



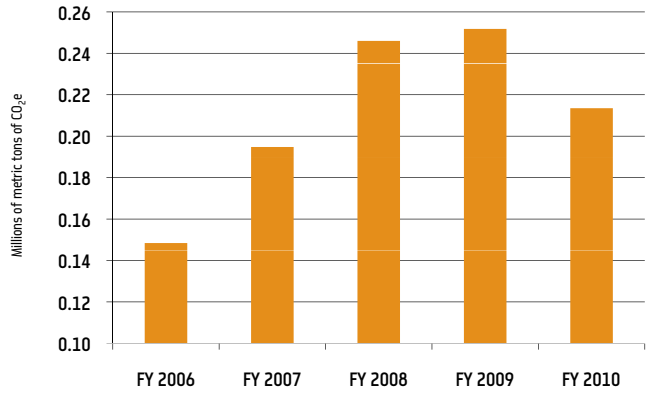
All solid waste generated by residents and certain institutions is collected by the Department of Sanitation and disposed of in landfills or at waste-to-energy facilities outside of the city. The City's Solid Waste Management Plan (SWMP) requires the City to shift the transportation of this waste from a truck-based system to a system composed of marine barges and rail-based transport. Because trains are significantly more efficient than trucks, the City has already avoided more than 40,000 $MgCO_2e$ since FY 2006, a 31 percent reduction. As the City fully implements SWMP and nearly all solid waste collected by the City is transported by barge and rail, significant additional GHG reductions will be achieved.

City Government CO_2e Emissions from Streetlights



The City has achieved significant energy reductions from streetlights by installing 250,000 lower watt fixtures throughout the five boroughs. As a result, streetlight energy consumption has decreased by more than 25 percent since FY 2006, while still providing the level of lighting necessary to ensure safety and security. In turn, these reductions have led to the total avoidance of more than 40,000 MgCO2e since 2007. Over $65 million has been invested in this project, and the City is expecting full payback in less than five years.

City Government CH_4 Emissions from Wastewater Treatment Plants



Since FY 2006, CH_4 emissions from the City's wastewater treatment plants have increased 44 percent as critical emissions control equipment underwent emergency repair. However, recent investments by the City to repair system leaks and upgrade CH_4 emissions control equipment have resulted in a reduction of CH_4 emissions by 15 percent in the last year. Going forward, the City expects to reduce CH_4 emissions even further through additional system upgrades and the increased use of CH_4 to heat anaerobic digesters and wastewater treatment plant facilities, offsetting the use of pipeline natural gas.

Credit: New York City Economic Development Corporation

APPENDICES

Appendix A

Updates and Revisions

Base and interim year results were revised due to updated emissions coefficients, refined methodology, and improved data availability

The calculation of City government GHG emissions is a dynamic process, requiring updates to past years' reported results as new techniques and methods are adopted, accounting and analysis methodologies are developed, and improved data become available. To accommodate these changes, the City revised its citywide 2005 and City government FY 2006 base years as well as interim year GHG emissions levels to reflect changes since the September 2010 *Inventory of New York City Greenhouse Gas Emissions* report was published.

Electricity emissions coefficient

As in past years, the City has elected to develop its own electricity emissions coefficient, rather than using the U.S. Environmental Protection Agency's (EPA) eGRID coefficient. The City does this for several reasons. The eGRID coefficient is regionally based on all Westchester County and New York City electricity generation. The eGRID coefficient also reflects data that are several years old—the most recent eGRID coefficient is based on 2007 generation data—which does not allow the City to measure the impact of changes to the power supply that occurred during the year of analysis. Also, the eGRID coefficient does not include imported power—New York City imports a significant volume of electricity from upstate New York, the amount of which increased in 2010, resulting in an increase in the volume of imported electricity generated by cleaner sources.

The City used power plant data from EPA's Continuous Emissions Monitoring System (CEMS) database and the U.S. Energy Information Administration's (EIA) EIA-923 database (previously titled EIA-906) to calculate the CO_2e emissions coefficient for electricity. Data from these sources were acquired from a data warehouse (Ventyx, Velocity Suite) and were organized to develop specific emissions coefficients for each plant in the New York Independent System Operator's (NYISO) territory. From these data, New York City's electricity emissions coefficients were calculated by taking the following steps:

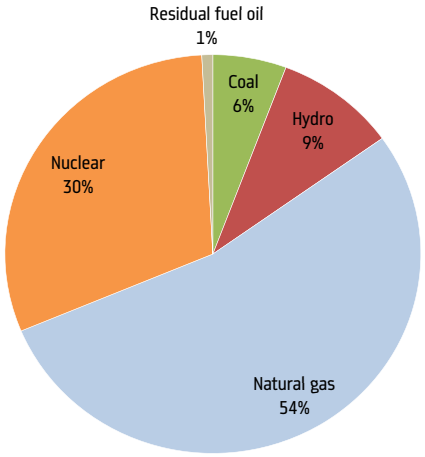
1. All electricity generated within New York City (NYISO Zone J) and all electricity imported to New York City through bilateral contracts between power generators and the New York Power Authority (NYPA) and Consolidated Edison of New York (ConEd) was added to determine the known quantity of consumption.
2. Emissions coefficients for both in-city generation and bilateral contracts were generated for CO_2, CH_4, N_2O, and CO_2e based on each plant's heat rate (efficiency) and primary fuel used for generation.
3. Imported electricity was calculated by subtracting the combined in-city generation plus bilateral contracts from New York City's required energy, as listed in NYISO's *2011 Load & Capacity Data "Gold Book"*.[10]
4. Energy use attributed to steam generation at in-city co-generation plants was deducted from the energy input used to calculate each plant's emissions coefficients, using ConEd's steam system data, to avoid double counting emissions resulting from this generation.
5. The emissions coefficient for imported power was calculated by assigning 600 megawatts (MW) from NYISO Zones A and D and 42 MW of upstate hydropower to New York City per NYPA agreement, with the balance of imported power assumed to be generated in NYISO Zones G, H, and I, as recommended by NYPA.
6. Emissions coefficients for imported power were derived for CO_2, CH_4, N_2O, and CO_2e based on the heat rate of each plant in each zone from which imported power was being generated to develop a single coefficient for each of NYISO Zone A and D, and for NYISO Zone G, H, and I combined.
7. A weighted average coefficient was developed for each GHG, based on the generation of the supplying sector.
8. A transmission and distribution loss factor, calculated by subtracting ConEd and the Long Island Power Authority's (LIPA) reported electricity deliveries from the NYISO energy requirement, was applied to each coefficient. The electricity coefficient is presented in detail in Appendix H.

While New York City's electricity emissions coefficient has not been officially verified by a third party, the methodology has been reviewed and endorsed by the EPA, ConEd, and NYPA. As such, the City encourages all entities in New York City, public and private, to use this coefficient to complete GHG inventories. Revised electricity emissions coefficients were applied to past years' inventories.

Breakdown of Citywide CO_2e Emissions Changes 2005 Base to 2005 Adjusted

	METRIC TONS CO_2e	CHANGE AS % OF BASE
2005 reported total (*Inventory of 2009 Emissions*)	56,632,297	
Reason for change		
Revised heating fuel coefficients	453	0.00%
Revised transportation fuel coefficients	-26,707	-0.05%
Revised electricity data	3,254	0.01%
Revised fuel oil data	2,409,826	4.26%
Revised fugitive natural gas data	248,733	0.44%
Revised on-road vehicle miles traveled data	1,257,578	2.22%
Revised WPCP process N_2O data	186	0.00%
Revised solid waste export fuel economy factors	9,362	0.02%
Inclusion of exported solid waste landfill gas	1,452,645	2.57%
Revised electricity emissions coefficient	-419,651	-0.74%
2005 adjusted total CO_2e	**61,567,977**	**8.72%**

2010 Fuel Mix for Electricity Consumed in New York City



Steam emissions coefficient

As in past inventories, the City developed its own steam emissions coefficient in cooperation with ConEd. An increase in the percentage of steam generated by co-generation resulted in a reduction in the amount of energy required to generate each unit of steam (measured in units of metric tons). The revised steam coefficient is applied to citywide and government 2010 inventories. The steam emissions coefficient is presented in detail in Appendix G.

It should be noted that the steam emissions coefficient used by New York City takes into account the impact of generating steam by means of co-generation. This coefficient is intended to be used for macro, city-scale analyses, as the accounting methodology used by ConEd (as recommended by the EPA and approved by the New York State Public Service Commission (PSC)) allocates much of the fuel used for co-generated steam to electricity generation, which is accounted for in the City's electricity coefficient. As such, applying this steam coefficient to more granular, project-specific analyses may not yield appropriate results. The City is actively working to develop a steam coefficient more appropriate for project-scale analysis.

Fuel oil consumption calculation for citywide inventory

Citywide fuel oil use was modeled using DEP's oil boiler permit data. DEP maintains a database of all permits for fuel oil boilers with capacity equal to or greater than 350,000 British Thermal Units (Btu) per hour. These data were processed using the City's property database to determine the building square footage each fuel oil boiler was responsible for heating. Fuel intensity (amount of oil required to heat each square foot of building floor area) was calculated by analyzing records of fuel oil deliveries from suppliers and from buildings reporting fuel oil use under the City's benchmarking law, Local Law 84 of 2009. #2 fuel oil use was adjusted to reflect use in boilers less than 350,000 Btu/hour using the U.S. Census Bureau's *2008 New York City Housing and Vacancy Survey*, which estimates that 29 percent of residences using fuel oil for heat are in buildings consisting of less than 15 units, the threshold below which boilers are assumed to have a capacity of less than 350,000 Btu/hour.[11] This additional percentage was added to DEP's reported #2 fuel oil consumption. 2010 fuel oil consumption is assumed to be a baseline—estimated fuel oil consumption for past years was calculated based on changes in heating degree days.[12]

Exported solid waste—transportation

Previous years' inventories had used fuel efficiency factors from a U.S. Department of Transportation study that estimates that one gallon of diesel fuel moves one (short) ton of solid waste 59 miles by truck and 202 miles by rail.[13] For this year's inventory, a new methodology was adopted. It calculates emissions from DSNY-managed solid waste transported by truck based on the number of trucks required to haul the mass of solid waste disposed each year (20 metric tons per truck), the weighted average roundtrip distance to disposal landfills (1015 km), and the fuel consumed to haul this waste based on the average fuel economy for tractor trailer trucks (2.3 km per liter). Emissions from DSNY-managed solid waste transported by rail were modeled by calculating fuel consumption based on the number of trains required to haul the mass of waste disposed. This was based on the train hauling capacity (5,505 metric tons) and the fuel required for each train to travel to the principal landfill used by train-hauled solid waste (28,051 liters).

Breakdown of City Government CO_2e Emissions Changes CY 2008 Base to CY 2008 Adjusted

	METRIC TONS CO_2e	CHANGE AS % OF BASE
CY 2008 reported total CO_2e (*Inventory of 2009 Emissions*)	3,647,759	
Reason for change		
Revised electricity coefficient	12,969	0.36%
Revised electricity data	115,143	3.16%
Revised natural gas data	39,369	1.08%
Revised steam data	-1,102	-0.03%
Revised solid waste export calculation methodology	-10,109	-0.28%
Revised calculations	-466	-0.01%
CY 2008 adjusted total CO_2e	**3,803,563**	**4.27%**

Breakdown of City Government CO_2e Emissions Changes FY 2006 Base to FY 2006 Adjusted

	METRIC TONS CO_2e	CHANGE AS % OF BASE
FY 2006 reported total CO_2e (*Inventory of 2009 Emissions*)	3,570,021	
Reason for change		
Revised electricity coefficient	-71,247	-2.00%
Revised solid waste export calculation methodology	7,502	0.21%
Revised calculations	-768	-0.02%
FY 2006 adjusted total CO_2e	**3,505,508**	**-1.81%**

Exported solid waste—disposal

For the first time, the citywide inventory includes emissions resulting from the disposal of New York City's solid waste exported out of the city. All non-recycled and non-composted solid waste generated in New York City is exported out of the city to landfills or waste-to-energy facilities. Emissions from residential, commercial, and construction and demolition waste were calculated by applying emissions factors in EPA's WARM model to the mass of waste disposed, which was categorized by waste type. All emissions generated by solid waste deposited in landfills were attributed to 2010, the year of disposal. Negative emissions factors in WARM used to estimate carbon sequestration from organic waste were excluded, following standard inventory practice. Emissions from the disposal of exported solid waste were also added to the base year and interim years' inventories.

Ethanol content in gasoline

The LGOP requires that greenhouse gas emissions from biogenic sources be classified as Scope 3 emissions. CO_2 emissions from ethanol are considered biogenic and are therefore counted separately from gasoline, which is a Scope 1 direct emissions source. The State of New York requires that all gasoline contain up to 10 percent ethanol, though the actual percentage varies from about 4 percent to 13 percent.[14] The City obtained inspection records from the New York State Department of Agriculture and Markets for gas stations throughout New York State. The average ethanol content was applied to both citywide and government gasoline consumption data for each year of analysis, thereby allowing for the differentiation of Scope 1 and Scope 3 emissions.

Biodiesel

The City uses biodiesel in both vehicles and as building heating fuel, and has been increasing the use of both. Consumption of fuel containing various percentages of biodiesel was reported by DCAS. As CO_2 from biodiesel is considered to be biogenic, it was separated out and reported as a Scope 3 emissions source.

International System of Units

The September 2011 *Inventory of New York City Greenhouse Gas Emissions* report is the first to convert all units of measure to the International System of Units (SI). This aligns the report with standard international GHG reporting practice.

Appendix B

City Government CY 2010 Results

City government CY 2010 results

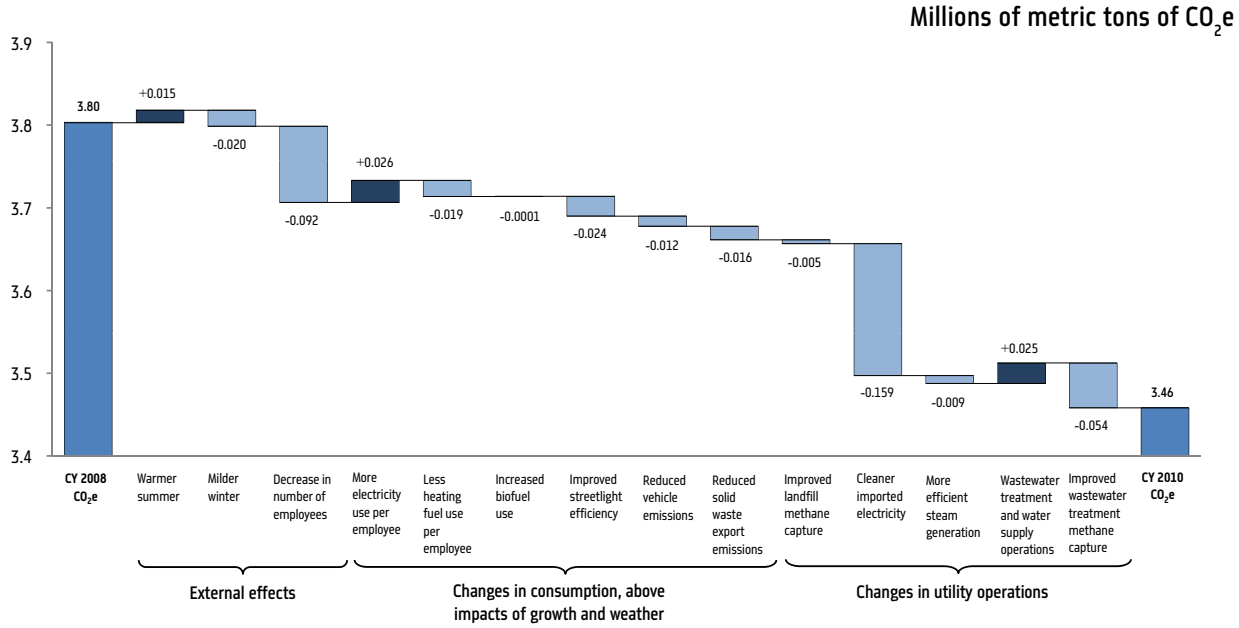
Carbon emissions for City government in CY 2010 were just below that of FY 2010, at 3.46 million $MgCO_2e$. This corresponds to a 3.2 percent decrease from CY 2009 and a 9.1 percent decrease from CY 2008, when calendar year emissions were first reported. Scope 1 GHG emissions were 1.88 million $MgCO_2e$ and Scope 2 emissions were 1.57 million $MgCO_2e$; these are displayed by GHG in the table on page 24. Scope 3 GHG emissions were 0.39 million $MgCO_2e$.

City government CY 2008 to CY 2010 changes

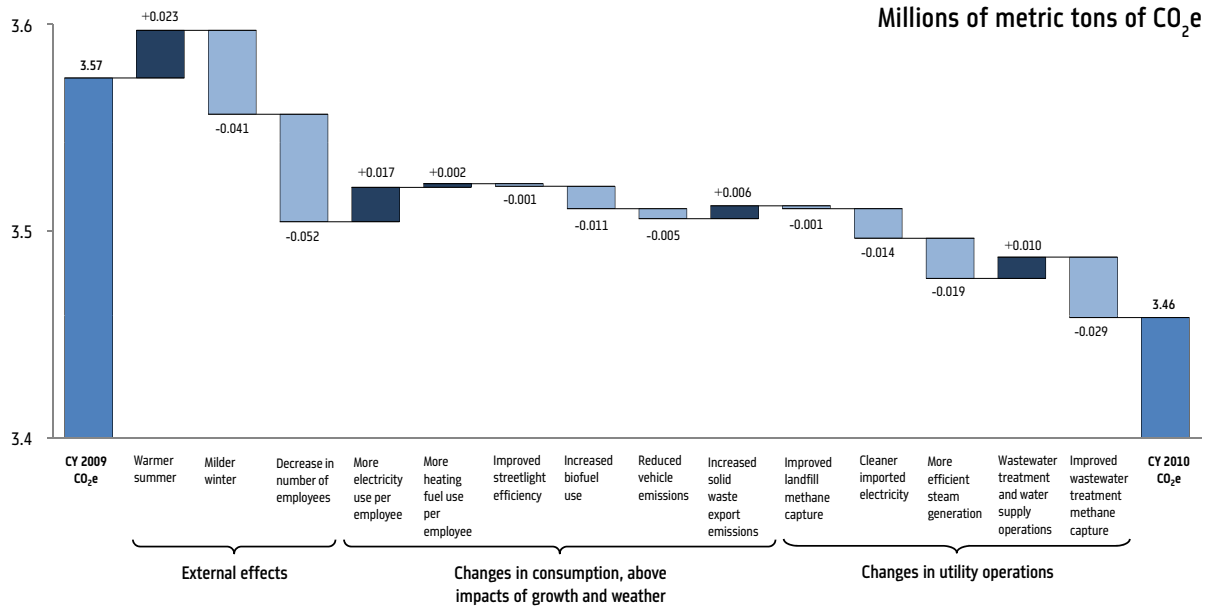
From CY 2008 to CY 2010, City government GHG emissions decreased 9.1 percent, from 3.80 to 3.46 $MgCO_2e$. In addition to a milder winter and a decrease in the overall number of City employees, the main factors of this change were a reduction in the carbon intensity of the city's power supply, increased methane capture at wastewater treatment plants, more efficient streetlights, a reduction in heating fuel use per employee, and improved efficiency in solid waste export transportation from truck to rail as part of the City's Solid Waste Management Plan (SWMP). When weather, the number of City employees, and the carbon intensity of the city's power supply are excluded, emissions are shown to have decreased by 2.1 percent. Changes to government greenhouse gas emissions from CY 2008 to CY 2010 are detailed below.

CY 2008 to CY 2010 Changes in New York City Government Greenhouse Gas Footprint

From CY 2008 to CY 2010, the City government's carbon footprint decreased 9.1%. In addition to an overall reduction in the number of City employees and a milder winter, this is due to cleaner imported electricity, more efficient steam generation, improved methane capture at wastewater treatment plants, and improved streetlight efficiency



From CY 2009 to CY 2010, the City government's carbon footprint decreased 3.2%. In addition to a milder winter and an overall reduction in the number of City employees, this decrease is the result of cleaner imported electricity, more efficient steam generation, improved methane capture at wastewater treatment plants, increased biofuel use, and reduced vehicle emissions



City government CY 2009 to CY 2010 changes

From CY 2009 to CY 2010, City government GHG emissions decreased 3.2 percent, from 3.57 to 3.46 $MgCO_2e$. In addition to a milder winter and a decrease in the overall number of City employees, the main factors of this change were a reduction in the carbon intensity of the city's power supply, increased methane capture at wastewater treatment plants, more biofuel use, and reduced vehicle emissions. When weather, the number of City employees, and the carbon intensity of the city's power supply are excluded, emissions are shown to have decreased by 0.35 percent. Changes to government greenhouse gas emissions from CY 2009 to CY 2010 are detailed above.

CY 2010 City Government Emissions by Scope and GHG

SCOPE	GREENHOUSE GAS (METRIC TONS)				
	CO_2	CH_4	N_2O	HFCs	CO_2e
Scope 1	1,478,685	14,347	302	9	1,884,871
Scope 2	1,570,298	29	7		1,573,209
Scopes 1 and 2	**3,048,983**	**14,377**	**310**	**9**	**3,458,081**

Appendix C

Acronym Definitions

New York City Agencies:

ACS – New York City Administration for Children's Services
DCAS – New York City Department of Citywide Administrative Services
DEP – New York City Department of Environmental Protection
DHS – New York City Department of Homeless Services
DOC – New York City Department of Correction
DOE – New York City Department of Education
DOT – New York City Department of Transportation
DPR – New York City Department of Parks and Recreation
DSNY – New York City Department of Sanitation
FDNY – New York City Fire Department
HRA – New York City Human Resources Administration
NYPD – New York City Police Department

Other Entities:

ConEd – Consolidated Edison of New York
Cultural – Cultural institutions
CUNY – City University of New York
EPA – United States Environmental Protection Agency
HHC – New York City Health and Hospitals Corporation
ICLEI – ICLEI-Local Governments for Sustainability
LIPA – Long Island Power Authority
LIRR – Long Island Railroad
MTA – Metropolitan Transportation Authority
MNR – Metro North Rail Road
NJT – New Jersey Transit
NYCT – New York City Transit
NYISO – New York Independent System Operator
NYMTC – New York Metropolitan Transportation Council
NYPA – New York Power Authority
NYPL – New York Public Libraries
PANYNJ – Port Authority of New York and New Jersey
PATH – Port Authority Trans-Hudson Corporation
SIR – Staten Island Railway

The following acronyms are used throughout this report:

Btu – British Thermal Unit
CDD - cooling degree day
CH_4 – methane
CO_2 – carbon dioxide
CO_2e – carbon dioxide equivalent
GHG – greenhouse gas
GIS – geographic information system
GJ – gigajoule
GWh – gigawatt hour
HDD – heating degree day
HFCs – hydrofluorocarbons
kg – kilogram
kWh – kilowatt hour
LGOP – Local Government Operations Protocol
Mg – Megagram (metric ton)
$MgCO_2e$ – metric ton of carbon dioxide equivalent
MMBtu – million British thermal units
MW – megawatt
MWh – megawatt hour
N_2O – nitrous oxide
SF_6 – sulfur hexafluoride
VMT – vehicle miles traveled
WARM – EPA's Waste Reduction Model

Appendix D

Endnotes

1. City of New York, *Long Term Plan to Reduce Energy Use and Greenhouse Gas Emissions of Municipal Buildings and Operations*, available online at http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/ecse_long_term_plan.pdf.
2. City of New York, *Inventory of New York City Greenhouse Gas Emissions* (April 2007), available online at http://www.nyc.gov/html/planyc2030/downloads/pdf/emissions_inventory.pdf. The City is amending the convention to which these documents refer to avoid confusion. All past inventory documents will now be referred to by the year of citywide emissions analysis—e.g. the inventory released in April 2007 reporting citywide 2005 emissions will be the *2005 Inventory*.
3. City of New York, *Inventory of New York City Greenhouse Gas Emissions* (September 2008), available online at http://www.nyc.gov/html/planyc2030/downloads/pdf/inventory_nyc_ghg_emissions_2008_-_feb09update_web.pdf.
4. City of New York, *Inventory of New York City Greenhouse Gas Emissions* (September 2009), available online at http://www.nyc.gov/html/planyc2030/downloads/pdf/greenhousegas_2009.pdf.
5. City of New York, *Inventory of New York City Greenhouse Gas Emissions* (September 2010), available online at http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/greenhousegas_2010.pdf.
6. California Air Resources Board (CARB), The California Climate Action Registry (CCAR), ICLEI – Local Governments for Sustainability (ICLEI), and The Climate Registry (TCR), *Local Government Operations Protocol*, Version 1.1 (2010), available online at http://www.theclimateregistry.org/downloads/2010/05/2010-05-06-LGO-1.1.pdf.
7. The WARM model is not intended to be used to calculate carbon footprints—rather, it is used to assess the impact of certain waste reduction scenarios. However, the emissions coefficients used by WARM are considered to be the standard for assessing impacts from solid waste disposal. Standard carbon accounting practice does not include the sequestered carbon values for organic materials contained in the WARM model. Accordingly, these values are not applied to the City's calculation of GHG emissions from disposed solid waste.
8. LGOP Version 1.1 (May 2010), pp 14.
9. U.S. Census Bureau, available online at http://www.census.gov/main/www/pums.html.
10. New York Independent System Operator (April 2011), Table I-4a: Historic Energy Requirements and Coincident Peaks, available online at http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2011_GoldBook_Public_Final.pdf.
11. U.S. Census Bureau, *2008 New York City Housing and Vacancy Survey*, available online at http://www.census.gov/hhes/www/housing/nychvs/2008/nychvs08.html.
12. U.S. National Oceanographic and Atmospheric Administration (NOAA), available online at http://cdo.ncdc.noaa.gov/pls/plclimprod/somdmain.somdwrapper?datasetabbv=DS3220&countryabbv=&georegionabbv=NAMER.
13. U.S. Department of Transportation Maritime Administration, *Environmental Advantages of Inland Barge Transportation*, August 1994, available at http://ntl.bts.gov/lib/6000/6300/6301/837.pdf.
14. New York State Department of Agriculture and Markets.

Appendix E

City Comparison Data Sources

Greenhouse Gas Emissions and Electricity Consumption Data Per Capita Comparisons

Arup
Austin: http://www.coolaustin.org/downloads/ACPP_Annual_Report_5.20.09_FINAL.pdf
Baltimore: http://cleanergreenerbaltimore.org/uploads/files/Full%20GHG%20Inventory%20Report%202007%2010.7.09.pdf
Boston: http://www.cityofboston.gov/climate/pdfs/Report2005GHGinventory.pdf
Carbon Disclosure Project: http://www.cdproject.net
Copenhagen: http://www.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage/CitizenInformation/~/media/4FAFC7144E3141D8984401D494CC5021.ashx
Chicago: http://www.chicagoclimateaction.org/filebin/pdf/finalreport/CCAPREPORTFINALv2.pdf
Dallas: http://www.greendallas.net/pdfs/GHG_Emissions_Summary.pdf
Denver: http://www.greenprintdenver.org/docs/Denver_GHG_Inventory_Report.pdf
Hong Kong: http://www.epd.gov.hk/epd/english/climate_change/files/GHG_Inventory_Table_1990_2007.pdf
Houston: http://www.greenhoustontx.gov/index.html
London: http://legacy.london.gov.uk/mayor/priorities/docs/delivering_london_energy_future_assembly_and_functional_body_draft_february_2010.pdf
Los Angeles: http://www.ci.la.ca.us/ead/index.htm
Madrid: http://www.munimadrid.es
Miami: http://www.miamigov.com/msi/pages/climate%20Action/MiPlan%20Final%20062608.pdf
Philadelphia: http://www.phila.gov/green/
Portland: http://www.portlandonline.com/bps/index.cfm?c=49989&a=268612
San Diego: http://www.sandiego.gov/environmental-services/sustainable/
San Francisco: http://www.sfenvironment.org/downloads/library/climateactionplan.pdf
Seattle: http://www.seattle.gov/climate/docs/2008-community-inventory-fullreport.pdf
Singapore: http://app.mewr.gov.sg/web/Contents/Contents.aspx?ContId=1233
Stockholm: http://international.stockholm.se/-/News-from-the-City-of-Stockholm/News/Action-plan-for-climate-and-energy/
Sydney: http://www.cityofsydney.nsw.gov.au/Environment/GreenhouseAndAirQuality/WhattheCityisdoing/CarbonNeutral.asp
Tokyo: http://www2.kankyo.metro.tokyo.jp/pdf/B/tokyo_strategy_full.pdf
Toronto: http://www.toronto.ca/teo/pdf/ghg-aq-inventory-june2007.pdf
USA: http://www.epa.gov/climatechange/emissions/usinventoryreport.html
Vancouver: http://vancouver.ca/sustainability/documents/2008GHGInventoryMethodologiesDocument20091210.pdf
Washington D.C.: http://green.dc.gov/green/lib/green/2010_1_12__ghgemissionsinventoryreport.pdf

Transportation Comparisons

U.S. Census Bureau, 2008 American Community Survey

Appendix F

Weather Impacts on Emissions

In PlaNYC, the City estimated that more than 40 percent of all energy consumed within the city's buildings was used to heat or cool building spaces. As 75 percent of the city's GHG emissions are related to buildings, heating and cooling directly affects over 30 percent of the city's carbon footprint.

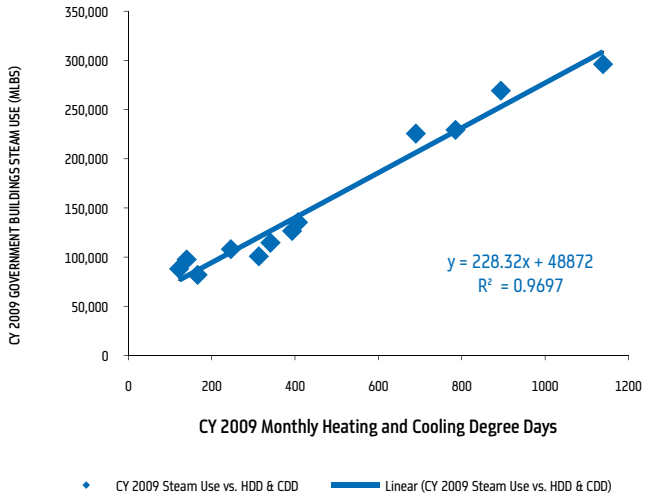
To fully understand the impact of year-on-year changes in GHG emissions, the extent of weather's impact on energy consumption must be accounted for and is a key component in determining causes for interannual changes in the GHG carbon footprint. Steam (used for both heating and cooling), electricity (used for cooling via air-conditioners), natural gas (used for heating), and building oil (used for heating) consumption figures are correlated with monthly heating degree days (HDDs) and cooling degree days (CDDs).

The resulting correlation graphs show the relationship of each type of energy consumption and its corresponding weather statistics, and the strength of this relationship.

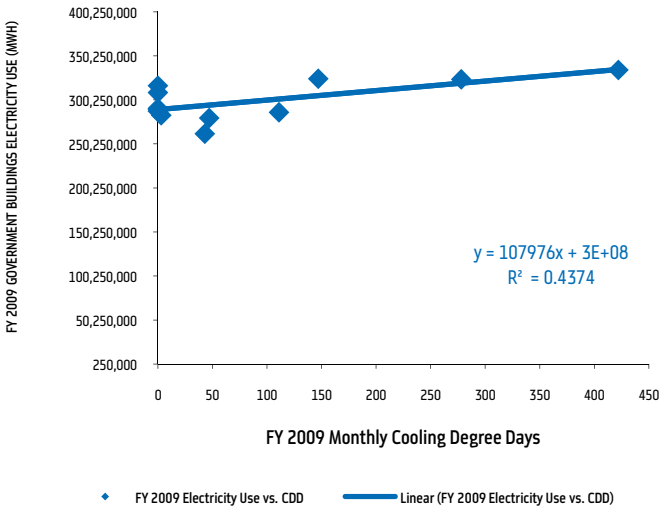
The exclusion of weather from year-on-year changes is based on these results; it is presented as an estimate rather than a detailed analysis, and further refinement of these methods will be necessary to make precise claims of exactly how weather affects GHG emissions.

The weather fluctuations are measured in degree days, in which 65° represents the temperature at which no heating or cooling is required. Therefore, one day at 66° would be one cooling degree day, and one day at 75° would be ten cooling degree days. (Conversely, one day at 55° would be ten heating degree days.)

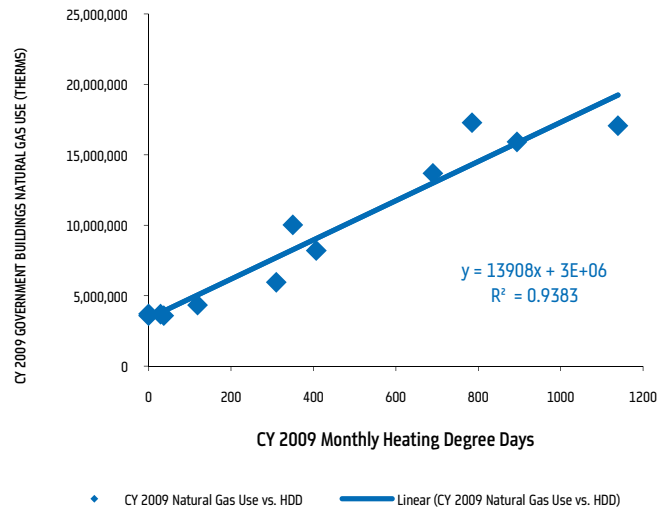
Correlation of Cooling & Heating Degree Days to Steam Use



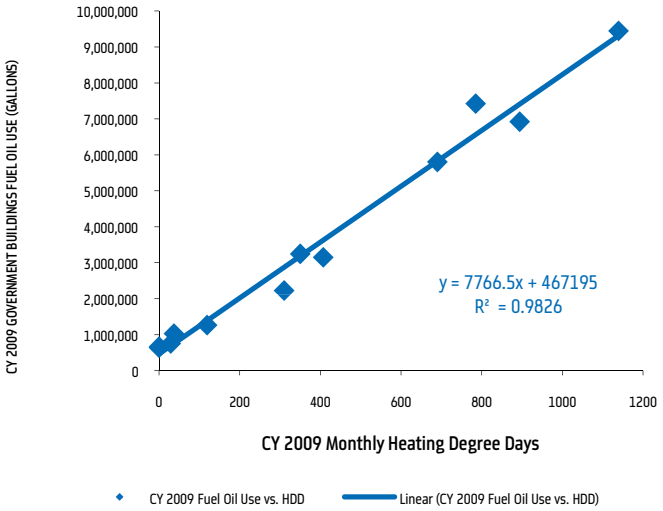
Correlation of Cooling Degree Days to Electricity Use



Correlation of Heating Degree Days to Natural Gas Use



Correlation of Heating Degree Days to Fuel Oil Use



Source: NOAA (CDD and HDD), City government natural gas, fuel oil, steam, and electricity consumption

Appendix G

Steam Emissions Coefficients

2005 Steam Emissions Coefficient					
To convert metered kg of steam to GJ		Steam coefficient - kg per metric ton delivered to buildings			
Steam Generation Efficiency	Total GJ input per metric ton steam	CO_2	CH_4	N_2O	CO_2e
104%	3.0939	190.5204767	0.00611	0.00109	190.9856

2006 Steam Emissions Coefficient					
To convert metered kg of steam to GJ		Steam coefficient - kg per metric ton delivered to buildings			
Steam Generation Efficiency	Total GJ input per metric ton steam	CO_2	CH_4	N_2O	CO_2e
129%	2.4615	155.6952942	0.00484	0.00084	156.0589

2007 Steam Emissions Coefficient					
To convert metered kg of steam to GJ		Steam coefficient - kg per metric ton delivered to buildings			
Steam Generation Efficiency	Total GJ input per metric ton steam	CO_2	CH_4	N_2O	CO_2e
120%	2.6615	161.5285496	0.00504	0.00088	161.9076

2008 Steam Emissions Coefficient					
To convert metered kg of steam to GJ		Steam coefficient - kg per metric ton delivered to buildings			
Steam Generation Efficiency	Total GJ input per metric ton steam	CO_2	CH_4	N_2O	CO_2e
123%	2.5986	153.9608137	0.00458	0.00078	154.2974

2009 Steam Emissions Coefficient					
To convert metered kg of steam to GJ		Steam coefficient - kg per metric ton delivered to buildings			
Steam Generation Efficiency	Total GJ input per metric ton steam	CO_2	CH_4	N_2O	CO_2e
115%	2.770	165.4976878	0.00501	0.00086	165.8690

2010 Steam Emissions Coefficient					
To convert metered kg of steam to GJ		Steam coefficient - kg per metric ton delivered to buildings			
Steam Generation Efficiency	Total GJ input per metric ton steam	CO_2	CH_4	N_2O	CO_2e
129%	2.4615	142.6908	0.00405	0.00066	142.9816

Appendix H

Electricity Emissions Coefficients

2005 ELECTRICITY EMISSIONS COEFFICENT											
	Generation (GJ)	CO_2 (Mg)	CO_2/GJ (kg)	CH_4 (Mg)	CH_4/GJ (kg)	N_2O (Mg)	N_2O/GJ (kg)	CO_2e (Mg)	CO_2e/GJ (kg)	Source energy (GJ)	Source GJ/GJ
In-city	88,618,432	13,939,008	157.292	274.78	0.00310	29.72	0.00034	13,953,992	157.462	233,463,499	2.634
Contract	63,154,249	2,045,234	32.385	38.57	0.00061	3.86	0.00006	2,047,240	32.417	221,522,697	3.508
NYISO Zone A	13,308,192	1,358,448	102.076	15.04	0.00113	21.85	0.00164	1,365,536	77.907	16,451,345	1.236
NYISO Zone D	5,613,408	170,458	30.366	3.22	0.00057	0.32	0.00006	170,625	102.609	3,849,636	0.686
Market procurement (Zone G, H, I)	23,730,919	3,753,034	158.150	84.58	0.00356	44.94	0.00189	3,768,740	30.396	68,670,819	2.894
Total	194,425,200	21,266,182	109.380	416.20	0.00214	100.68	0.00052	21,306,134	109.585	543,957,994	**2.798**
Total 2005 NYC consumption	185,030,541		Coefficient with transmission and distribution losses								
Transmission and distribution loss rate	-4.83%		114.665		0.00224		0.00054		115.149		

2006 ELECTRICITY EMISSIONS COEFFICENT											
	Generation (GJ)	CO_2 (Mg)	CO_2/GJ (kg)	CH_4 (Mg)	CH_4/GJ (kg)	N_2O (Mg)	N_2O/GJ (kg)	CO_2e (Mg)	CO_2e/GJ (kg)	Source energy (GJ)	Source GJ/GJ
Total	191,145,600	16,238,006	84.951	328.16	0.00172	84.47	0.00044	18,207,698	95.256	581,737,144	**3.043**
Total 2006 NYC consumption	181,779,844		Coefficient with transmission and distribution losses								
Transmission and distribution loss rate	-4.90%		89.113		0.00180		0.00046		100.163		

2007 ELECTRICITY EMISSIONS COEFFICENT											
	Generation (GJ)	CO_2 (Mg)	CO_2/GJ (kg)	CH_4 (Mg)	CH_4/GJ (kg)	N_2O (Mg)	N_2O/GJ (kg)	CO_2e (Mg)	CO_2e/GJ (kg)	Source energy (GJ)	Source GJ/GJ
Total	197,100,000	17,370,651	94.809	329.64	0.00175	69.212	0.00046	17,399,030	94.989	572,790,221	**2.906**
Total 2007 NYC consumption	188,202,200		Coefficient with transmission and distribution losses								
Transmission and distribution loss rate	-4.51%		99.090		0.00182		0.00048		99.480		

2008 ELECTRICITY EMISSIONS COEFFICENT											
	Generation (GJ)	CO_2 (Mg)	CO_2/GJ (kg)	CH_4 (Mg)	CH_4/GJ (kg)	N_2O (Mg)	N_2O/GJ (kg)	CO_2e (Mg)	CO_2e/GJ (kg)	Source energy (GJ)	Source GJ/GJ
Total	197,406,000	18,097,970	91.679	322.32	0.00163	91.96	0.00047	18,133,245	91.858	566,884,779	**2.872**
Total 2007 NYC consumption	186,150,634		Coefficient with transmission and distribution losses								
Transmission and distribution loss rate	-5.70%		96.906		0.00173		0.00049		97.412		

2009 ELECTRICITY EMISSIONS COEFFICENT											
	Generation (GJ)	CO_2 (Mg)	CO_2/GJ (kg)	CH_4 (Mg)	CH_4/GJ (kg)	N_2O (Mg)	N_2O/GJ (kg)	CO_2e (Mg)	CO_2e/GJ (kg)	Source energy (GJ)	Source GJ/GJ
In-city	83,690,030	10,784,766	128.866	204.98	0.00245	20.79	0.00025	10,795,517	128.994	214,179,004	2.559
Contract	51,125,157	1,630,338	31.889	30.75	0.00060	3.07	0.00006	1,631,937	31.920	215,435,675	4.214
NYISO Zone A	13,308,192	1,035,413	77.803	11.08	0.00083	17.35	0.00130	1,041,025	78.224	11,969,363	0.899
NYISO Zone D	5,613,408	102,679	18.292	1.94	0.00035	0.19	0.00003	102,780	18.310	2,043,149	0.364
Market procurement (Zone G, H, I)	34,899,058	2,481,293	71.099	38.66	0.00111	36.12	0.00104	2,493,303	71.443	97,101,617	2.782
Market procurement (ROS)	2,524,154	133,372	52.838	0.96	0.00038	0.90	0.00036	133,802	53.009	4,440,372	1.759
Total	191,160,000	16,167,861	84.578	288.37	0.00151	78.44	0.00041	16,198,364	84.737	545,169,181	**2.852**
Total 2009 NYC consumption	182,649,671		Coefficient with transmission and distribution losses								
Transmission and distribution loss rate	-4.45%		88.343		0.00158		0.00043		88.685		

2010 ELECTRICITY EMISSIONS COEFFICENT											
	Generation (GJ)	CO_2 (Mg)	CO_2/GJ (kg)	CH_4 (Mg)	CH_4/GJ (kg)	N_2O (Mg)	N_2O/GJ (kg)	CO_2e (Mg)	CO_2e/GJ (kg)	Source energy (GJ)	Source GJ/GJ
In-city	86,233,586	11,021,449	127.809	209.44	0.00243	21.24	0.00025	11,032,431	127.937	218,888,739	2.538
Contract	48,658,118	1,805,308	37.102	34.05	0.00070	3.40	0.00007	1,807,079	37.138	217,473,479	4.469
NYISO Zone A	13,308,192	1,149,229	86.355	12.37	0.00093	19.13	0.00144	1,155,420	86.820	13,169,352	0.990
NYISO Zone D	5,613,408	41,261	7.350	0.78	0.00014	0.08	0.00001	41,302	7.358	820,968	0.146
Market procurement (Zone G, H, I)	38,229,527	2,318,993	60.660	39.13	0.00102	31.53	0.00082	2,329,591	60.937	107,223,986	2.805
Market procurement (ROS)	6,367,569	375,193	58.922	2.35	0.00037	1.90	0.00030	376,333	59.102	11,365,231	1.785
Total	198,410,400	16,711,433	84.227	298.12	0.00150	77.29	0.00039	16,742,155	84.381	568,941,755	**2.867**
Total 2010 NYC consumption	190,667,806		Coefficient with transmission and distribution losses								
Transmission and distribution loss rate	-3.90%		87.647		0.00156		0.00041		87.808		

Appendix I

Fuel Emissions Coefficients

2010 FUEL EMISSIONS COEFFICIENTS							
	UNIT	GREENHOUSE GAS (Kg/UNIT)					FUEL EFFICIENCY (Km/UNIT)
		CO_2	CH_4	N_2O	CO_2e	GJ/UNIT	
Stationary source							
Natural gas (buildings)	GJ	50.25326	0.00474	0.00009	50.38216	0.99995	
Natural gas (industrials)	GJ	50.25326	0.00095	0.00009	50.30254	0.99995	
#2 fuel oil (buildings)	liter	2.69627	0.00040	0.00002	2.71147	0.03846	
#2 fuel oil (industrial)	liter	2.69627	0.00011	0.00002	2.70534	0.03846	
#4 fuel oil (buildings)	liter	2.89423	0.00042	0.00002	2.91031	0.04069	
#4 fuel oil (industrial)	liter	2.89423	0.00012	0.00002	2.90383	0.04069	
#6 residual fuel oil (buildings)	liter	2.97590	0.00044	0.00002	2.99242	0.04181	
#6 residual fuel oil (industrial)	liter	2.97590	0.00012	0.00002	2.98576	0.04181	
100% biodiesel*	liter	2.49683	0.00004	0.00000	2.49876	0.03567	
Propane (industrial)	liter	1.47748	0.00007	0.00001	1.48346	0.02536	
Kerosene (industrial)	liter	2.68187	0.00011	0.00002	2.69075	0.03762	
Mobile source							
On-road							
Diesel - buses	liter	2.69720	0.00002	0.00002	2.70253	0.03849	5.38
Diesel - light trucks	liter	2.69720	0.00000	0.00000	2.69851	0.03849	4.38
Diesel - heavy-duty vehicles	liter	2.69720	0.00001	0.00001	2.70082	0.03849	3.65
Diesel - passenger cars	liter	2.69720	0.00000	0.00000	2.69854	0.03849	6.73
Gasoline - light trucks	liter	2.31968	0.00012	0.00017	2.37403	0.03484	6.21
Gasoline - passenger cars	liter	2.31943	0.00015	0.00016	2.37200	0.03484	8.72
100% biodiesel (B100) - heavy trucks*	liter	2.49710	0.00004	0.00000	2.49903	0.03568	3.65
100% ethanol (E100) - passenger cars*	liter	1.51899	0.00022	0.00027	1.60857	0.02342	6.58
Compressed natural gas - bus	GJ	50.28833	0.10395	0.00925	55.33978	1.00000	0.37
Off-road							
Aviation gasoline	liter	2.19527	0.00186	0.00003	2.24333	0.03350	
Diesel, locomotives	liter	2.52840	0.00007	0.00008	2.55529	0.03763	
Diesel, ships and boats	liter	2.69720	0.00021	0.00007	2.72293	0.03866	
Jet fuel	liter	2.69749	0.00020	0.00007	2.72289	0.03866	

*** Per the LGOP, CO_2 from biofuels is considered biogenic and is reported as a Scope 3 source**
**** Per the LGOP, building usage here is identified as residential, commerical, or institutional**

Appendix J

Citywide GHG Emissions Summary

	UNITS	2005			2009			2010		
		CONSUMED	$MgCO_2e$	Source GJ	CONSUMED	$MgCO_2e$	Source GJ	CONSUMED	$MgCO_2e$	Source GJ
Buildings										
#2 fuel oil	liters	2,330,793,867	6,319,001	89,648,959	2,348,382,890	6,366,686	90,325,482	2,196,468,297	5,954,831	84,482,415
#4 fuel oil	liters	362,931,089	1,056,169	14,768,600	365,669,900	1,064,139	14,880,049	342,015,072	995,301	13,917,473
#6 fuel oil	liters	1,008,031,614	3,016,403	42,143,219	1,015,638,589	3,039,166	42,461,247	949,937,922	2,842,565	39,714,471
Electricity	GJ	174,059,153	20,042,787	486,978,377	170,807,731	15,148,157	487,126,553	178,090,456	15,637,764	510,674,325
Natural gas	GJ	258,698,683	13,032,381	258,698,683	270,967,771	13,651,161	270,967,771	271,992,112	13,701,775	271,992,112
Steam	kg	11,694,104,807	2,233,406	28,785,193	10,323,107,015	1,712,283	28,590,570	10,569,902,787	1,511,301	26,017,955
Transportation										
Biodiesel B5 - transit bus	liters				54,877,599	140,898	2,104,485			
CNG - transit bus	GJ	249,113	13,786	249,113	1,536,743	85,043	1,536,743	1,420,989	78,637	1,420,989
Diesel - commuter rail	liters	5,207,217	14,179	201,286	5,165,746	14,066	199,683	5,064,028	13,789	195,751
Diesel - heavy trucks	liters	354,347,537	956,907	13,638,620	317,241,216	856,810	12,210,420	326,200,350	881,007	12,555,252
Diesel - light trucks	liters	29,530,997	79,696	1,136,630	28,976,990	78,195	1,115,307	35,234,181	95,080	1,356,142
Diesel - non-transit bus	liters	68,793,026	185,923	2,647,801	7,238,594	19,563	278,609	7,545,275	20,391	290,413
Diesel - passenger cars	liters	13,842,098	37,354	532,774	14,115,275	38,090	543,288	14,166,357	38,228	545,254
Diesel - solid waste transport - rail	liters	3,029,923	8,250	117,135	5,908,176	16,088	228,407	5,671,501	15,443	219,257
Diesel - solid waste transport - truck	liters	48,753,438	131,674	1,876,694	25,537,933	68,973	983,047	28,064,413	75,797	1,080,300
Diesel - transit bus	liters	182,539,690	493,340	7,025,841	138,163,340	373,392	5,317,822	188,631,878	509,784	7,260,325
Electricity - subway and commuter rail	GJ	9,823,257	1,131,141	27,483,266	10,864,207	963,497	30,983,630	10,118,346	888,472	29,014,354
Gasoline - light trucks	liters	429,097,993	919,214	14,461,233	462,463,871	990,690	15,593,560	440,373,688	946,065	14,846,296
Gasoline - passenger cars	liters	3,545,245,331	7,597,884	119,479,978	3,616,121,296	7,749,779	121,929,967	3,629,210,490	7,790,907	122,351,394
Streetlights and traffic signals										
Electricity	GJ	1,148,131	132,206	3,212,212	977,734	86,711	2,788,398	855,804	75,146	2,454,016
Fugitive and process emissions										
CH_4 - exported solid waste	Mg	69,174	1,452,645		62,095	1,303,991		61,176	1,284,706	
CH_4 - landfills	Mg	5,651	118,667		4,869	102,241		4,802	100,846	
CH_4 - natural gas distribution	GJ	809,581	318,789		847,976	333,908		851,182	335,170	
CH_4 - wastewater treatment plants	Mg	6,545	137,444		10,808	226,975		9,416	197,730	
HFCs - municipal vehicle fleet	Mg	10	12,623		9	11,305		9	11,235	
N_2O - wastewater treatment process	Mg	286	88,547		282	87,423		285	88,435	
SF_6 - electricity distribution	kg	85,254	2,037,561		18,259	436,387		10,813	258,434	
TOTAL Scope 1			38,028,437	566,626,566		37,054,969	580,675,889		36,236,158	572,227,846
TOTAL Scope 2			23,539,540	546,459,048		17,910,648	549,489,151		18,112,683	568,160,651
TOTAL Scope 1 and 2			**61,567,977**	**1,113,085,614**		**54,965,617**	**1,130,165,039**		**54,348,841**	**1,140,388,497**
Scope 3										
Biogenic CO_2 from ethanol and biodiesel			601,928			615,355			610,135	
Aviation emissions			14,345,894			14,179,668			13,710,939	
TOTAL Scope 3			**14,947,822**			**14,795,022**			**14,321,074**	

	UNITS	% CHANGE 2009 - 2010			% CHANGE 2005 - 2010		
		CONSUMED	$MgCO_2e$	Source GJ	CONSUMED	$MgCO_2e$	Source GJ
Buildings							
#2 fuel oil	liters	-6.47%	-6.47%	-6.47%	-5.76%	-5.76%	-5.76%
#4 fuel oil	liters	-6.47%	-6.47%	-6.47%	-5.76%	-5.76%	-5.76%
#6 fuel oil	liters	-6.47%	-6.47%	-6.47%	-5.76%	-5.76%	-5.76%
Electricity	GJ	4.26%	3.23%	4.83%	2.32%	-21.98%	4.87%
Natural gas	GJ	0.38%	0.37%	0.38%	5.14%	5.14%	5.14%
Steam	GJ	2.39%	-11.74%	-9.00%	-9.61%	-32.33%	-9.61%
Transportation							
Biodiesel B5 - transit bus	liters	-100.00%	-100.00%				
CNG - transit bus	GJ	-7.53%	-7.53%	-7.53%	470.42%	470.42%	470.42%
Diesel - commuter rail	liters	-1.97%	-1.97%	-1.97%	-2.75%	-2.75%	-2.75%
Diesel - heavy trucks	liters	2.82%	2.82%	2.82%	-7.94%	-7.93%	-7.94%
Diesel - light trucks	liters	21.59%	21.59%	21.59%	19.31%	19.29%	19.31%
Diesel - non-transit bus	liters	4.24%	4.24%	4.24%	-89.03%	-89.03%	-89.03%
Diesel - passenger cars	liters	0.36%	0.36%	0.36%	2.34%	2.34%	2.34%
Diesel - solid waste transport - rail	liters	-4.01%	-4.01%	-4.01%	87.18%	87.18%	87.18%
Diesel - solid waste transport - truck	liters	9.89%	9.89%	9.89%	-42.44%	-42.44%	-42.44%
Diesel - transit bus	liters	36.53%	36.53%	36.53%	3.34%	3.33%	3.34%
Electricity - subway and commuter rail	GJ	-6.87%	-7.79%	-6.36%	3.00%	-21.45%	5.57%
Gasoline - light trucks	liters	0.38%	-4.50%	-4.79%	2.63%	2.92%	2.66%
Gasoline - passenger cars	liters	0.36%	0.53%	0.35%	2.37%	2.54%	2.40%
Streetlights and traffic signals							
Electricity	GJ	-12.47%	-13.34%	-11.99%	-25.46%	-43.16%	-23.60%
Fugitive and process emissions							
CH_4 - exported solid waste	t	-1.48%	-1.48%		-11.56%	-11.56%	
CH_4 - landfills	t	-1.36%	-1.36%		-15.02%	-15.02%	
CH_4 - natural gas distribution	GJ	0.38%	0.38%		5.14%	5.14%	
CH_4 - wastewater treatment plants	t	-12.88%	-12.88%		43.86%	43.86%	
HFCs - municipal vehicle fleet	t	-0.62%	-0.62%		-11.00%	-10.99%	
N_2O - wastewater treatment process	t	1.16%	1.16%		-0.13%	-0.13%	
SF_6 - electricity distribution	kg	-40.78%	-40.78%		-87.32%	-87.32%	
TOTAL Scope 1			-2.21%	-1.45%		-4.71%	0.99%
TOTAL Scope 2			1.13%	3.40%		-23.05%	3.97%
TOTAL Scope 1 and 2			**-1.12%**	**0.90%**		**-11.73%**	**2.45%**
Scope 3							
Biogenic CO_2 from ethanol and biodiesel			-0.85%			1.36%	
Aviation emissions			-3.31%			-4.43%	
TOTAL Scope 3			**-3.20%**			**-4.19%**	

Appendix K

Government GHG Emissions Summary

	UNITS	FY 2006			FY 2009			FY 2010			CY 2008		
		CONSUMED	$MgCO_2e$	SOURCE GJ	CONSUMED	$MgCO_2e$	SOURCE GJ	CONSUMED	$MgCO_2e$	SOURCE GJ	CONSUMED	$MgCO_2e$	SOURCE GJ
Buildings													
#2 fuel oil	liters	55,406,011	150,232	2,130,960	50,687,968	137,439	1,949,500	42,100,182	114,153	1,619,207	56,362,852	152,826	2,167,760
#4 fuel oil	liters	29,787,480	86,691	1,212,065	33,203,003	96,631	1,351,044	29,700,154	86,437	1,208,512	28,034,021	81,588	1,140,716
#6 fuel oil	liters	76,941,578	230,242	3,216,560	78,313,273	234,346	3,273,904	68,720,191	205,640	2,872,863	78,012,725	233,447	3,261,339
Biodiesel	liters				60,116	0.1163	2,145	464,703	0.8988	16,578	69,631	0.1347	2,484
Electricity	GJ	11,115,083	1,113,325	33,826,116	12,904,200	1,144,414	36,799,533	12,725,673	1,117,416	36,488,928	13,006,665	1,267,001	37,348,859
Natural gas	GJ	10,948,014	551,585	10,948,014	11,564,423	582,641	11,564,423	11,287,206	568,674	11,287,206	11,608,809	584,877	11,608,809
Steam	kg	822,764,601	128,400	2,114,254	857,812,486	142,284	2,375,646	841,110,934	120,263	2,070,296	838,807,553	129,426	2,179,579
Transportation													
Diesel - trucks	liters	57,595,425	155,558	2,216,937	58,384,095	157,690	2,247,049	59,954,846	161,927	2,307,503	63,597,015	171,782	2,447,947
Biodiesel - trucks	liters				2,362,666	4.5698	84,285	2,425,744	4.6918	86,535			
Diesel - marine vessels	liters	16,143,025	43,951	623,980	19,371,210	52,740	748,760	19,353,969	52,693	748,094	16,402,763	44,658	634,020
Diesel - solid waste transport - rail	liters	3,286,291	8,949	127,040	5,575,008	15,182	215,516	5,623,564	15,314	217,393	4,807,000	13,091	185,826
Diesel - solid waste transport - truck	liters	47,229,856	127,573	1,817,950	28,216,896	76,217	1,086,112	27,513,045	74,316	1,059,019	35,029,146	94,618	1,348,326
Ethanol	liters	465,555	281	12,102	303,330	176	7,848	95,901	56	2,484	357,262	216	9,580
Gasoline	liters	57,421,357	123,483	1,936,907	59,754,424	128,342	2,014,719	57,246,657	122,893	1,929,851	57,900,883	125,170	1,955,424
Jet fuel	liters	859,672	2,196	32,345	823,565	2,104	30,986	881,688	2,253	33,173	864,548	2,209	32,528
Streetlights and traffic signals													
Electricity	GJ	1,102,486	110,429	3,355,153	953,283	84,542	2,718,522	843,407	74,058	2,418,341	1,099,907	107,144	3,158,403
Wastewater Treatment													
#1 and #2 fuel oil	liters	16,245,155	43,949	624,802	17,690,138	47,858	680,377	18,331,050	49,556	705,414	16,408,962	44,392	631,102
#4 fuel oil	liters	590,232	1,714	24,017	752,920	2,186	30,637	1,196,601	3,475	48,690	596,183	1,731	24,259
Electricity	GJ	2,116,390	211,985	6,440,730	2,286,663	202,794	6,520,989	2,434,906	213,804	6,981,723	2,254,193	219,585	6,472,955
Methane	Mg		148,426			251,785			213,485			252,035	
Natural gas	GJ	387,927	19,514	387,927	778,857	39,178	778,857	611,317	30,751	611,317	748,723	37,663	748,723
Nitrous oxide	Mg		83,134			89,138			91,160			85,983	-
Propane	liters										1,784	3	45
Steam	kg	1,280,059	200	3,289	1,444,716	240	4,001	1,173,917	168	2,889	2,243,052	346	5,828
Water Supply													
#1 and #2 fuel oil	liters	527,506	1,427	20,288	2,284,118	6,179	87,849	885,211	2,394	34,051	738,904	1,999	28,419
Biodiesel	liters				37,029	0.0716	1,321	23,489	0.0454	838	17,247	0.0334	615
Electricity	GJ	223,677	22,404	680,709	236,066	20,936	673,201	242,659	21,307	695,788	241,098	23,486	692,317
Kerosene	liters				64,860	175	2,440	37,593	101	1,414	92,301	248	3,473
Natural gas	GJ	52,997	2,666	52,997	77,148	3,881	77,148	94,913	4,774	94,913	79,525	4,000	79,525
Propane	liters	4,086,926	6,063	103,652	5,162,907	7,659	130,941	7,273,174	10,789	184,461	4,460,711	6,617	113,132
Steam	kg	1,687,392	263	4,336	1,979,510	328	5,482	3,024,151	432	7,444	1,917,367	296	4,982
Solid waste facilities													
Methane	Mg		119,499			102,548			103,844			105,548	
Other fugitive and process emissions													
HFCs - municipal fleet	Mg		11,370			11,354			11,407			11,580	
Scope 1	Mg		**1,918,502**	**25,488,542**		**2,045,454**	**26,365,859**		**1,926,097**	**25,069,516**		**2,056,279**	**26,424,054**
Scope 2	Mg		**1,587,006**	**46,424,587**		**1,595,539**	**49,097,374**		**1,547,449**	**48,665,408**		**1,747,283**	**49,862,924**
TOTAL Scope 1 and 2	Mg		**3,505,508**	**71,913,129**		**3,640,993**	**75,463,233**		**3,473,546**	**73,734,924**		**3,803,563**	**76,286,977**
Scope 3													
Employee commute	Mg		224,207			228,868			197,411			234,365	
Biogenic CO_2e from fuel	Mg		13,625			15,464			15,974			22,445	
Employee solid waste	Mg		174,178			177,192			176,993			176,856	
TOTAL Scope 3	Mg		**412,010**			**421,524**			**390,378**			**433,666**	

CY 2009			CY 2010			% CHANGE FY 2006 - 2010			% CHANGE FY 2009 - 2010		
CONSUMED	$MgCO_2e$	SOURCE GJ	CONSUMED	$MgCO_2e$	SOURCE GJ	CONSUMED	$MgCO_2e$	SOURCE GJ	CONSUMED	$MgCO_2e$	SOURCE GJ
49,271,446	133,598	1,895,019	41,216,173	111,756	1,585,207	-24.02%	-24.02%	-24.02%	-16.94%	-16.94%	-16.94%
32,368,906	94,204	1,317,104	28,811,003	83,849	1,172,332	-0.29%	-0.29%	-0.29%	-10.55%	-10.55%	-10.55%
79,482,148	237,844	3,322,769	66,302,027	198,404	2,771,771	-10.69%	-10.69%	-10.69%	-12.25%	-12.25%	-12.25%
23,335	0.0451	832	497,216	0.9617	17,738				673.01%	673.01%	673.01%
12,769,285	1,132,450	36,414,791	12,931,805	1,135,516	37,079,980	14.49%	0.37%	7.87%	-1.38%	-2.36%	-0.84%
11,292,569	568,944	11,292,569	11,356,001	572,140	11,356,001	3.10%	3.10%	3.10%	-2.40%	-2.40%	-2.40%
849,708,468	140,940	2,353,202	862,110,346	123,266	2,121,983	2.23%	-6.34%	-2.08%	-1.95%	-15.48%	-12.85%
61,212,720	165,330	2,355,915	58,949,875	159,213	2,268,824	4.10%	4.09%	4.09%	2.69%	2.69%	2.69%
2,361,920	4.5683	84,259	2,408,099	4.6577	85,906				2.67%	2.67%	2.67%
16,480,764	44,870	637,035	18,848,725	51,317	728,564	19.89%	19.89%	19.89%	-0.09%	-0.09%	-0.09%
5,907,532	16,088	228,370	5,670,883	15,443	219,222	71.12%	71.12%	71.12%	0.87%	0.87%	0.87%
25,535,150	68,973	982,887	28,061,355	75,797	1,080,125	-41.75%	-41.75%	-41.75%	-2.49%	-2.49%	-2.49%
182,206	114	4,755	39,992	26	1,047	-79.40%	-80.07%	-79.48%	-68.38%	-68.12%	-68.35%
57,873,638	124,302	1,951,305	55,552,097	119,255	1,872,726	-0.30%	-0.48%	-0.36%	-4.20%	-4.25%	-4.21%
812,614	2,076	30,574	856,591	2,189	32,229	2.56%	2.56%	2.56%	7.06%	7.06%	7.06%
953,305	84,544	2,718,585	831,001	72,968	2,382,768	-23.50%	-32.94%	-27.92%	-11.53%	-12.40%	-11.04%
17,923,912	48,490	689,368	18,439,583	49,834	709,758	12.84%	12.76%	12.90%	3.62%	3.55%	3.68%
1,045,341	3,035	42,535	1,085,273	3,151	44,160	102.73%	102.73%	102.73%	58.93%	58.93%	58.93%
2,364,860	209,729	6,743,987	2,501,331	219,637	7,172,186	15.05%	0.86%	8.40%	6.48%	5.43%	7.07%
	227,121			197,917			43.83%			-15.21%	
694,261	34,923	694,261	588,086	29,582	588,086	57.59%	57.59%	57.59%	-21.51%	-21.51%	-21.51%
	87,276			88,248			9.65%			2.27%	
1,350,367	224	3,740	1,312,718	188	3,231	-8.29%	-15.98%	-12.16%	-18.74%	-29.96%	-27.78%
813,628	2,201	31,293	781,573	2,114	30,065	67.81%	67.78%	67.84%	-61.24%	-61.25%	-61.24%
13,084	0.0253	467	17,073	0.0330	609				-36.57%	-36.57%	-36.57%
240,066	21,290	684,607	240,960	21,158	690,917	8.49%	-4.90%	2.22%	2.79%	1.78%	3.36%
48,497	130	1,825	16,518	44	622				-42.04%	-42.04%	-42.04%
78,717	3,960	78,717	106,910	5,378	106,910	79.09%	79.09%	79.09%	23.03%	23.03%	23.03%
4,929,898	7,313	125,031	4,804,886	7,128	121,861	77.96%	77.96%	77.96%	40.87%	40.87%	40.87%
2,282,515	379	6,321	3,330,331	476	8,197	79.22%	64.20%	71.67%	52.77%	31.69%	35.78%
	102,241			100,846			-13.10%			1.26%	
	11,354			11,235			0.33%			0.46%	
	1,984,395	**25,766,891**		**1,884,871**	**24,793,762**		**0.40%**	**-1.64%**		**-5.84%**	**-4.92%**
	1,589,556	**48,925,233**		**1,573,209**	**49,459,261**		**-2.49%**	**4.83%**		**-3.01%**	**-0.88%**
	3,573,950	**74,692,124**		**3,458,081**	**74,253,023**		**-0.91%**	**2.53%**		**-4.60%**	**-2.29%**
	230,774			195,027			-11.95%			-13.74%	
	14,879			15,673			17.24%			3.30%	
	178,741			174,959			1.62%			-0.11%	
	424,394			**385,659**			**-5.25%**			**-7.39%**	

Appendix L

Heating and Cooling Degree Days

Heating and Cooling Degree Days, Central Park 2005-2010 Using 65 Degrees (°F) Base Temperature

	YEAR	ANNUAL TOTAL	% CHANGE FROM PREVIOUS YEAR
Calendar years			
Heating degree days	2005	4733	
Heating degree days	2006	3987	-15.76%
Heating degree days	2007	4705	18.01%
Heating degree days	2008	4598	-2.27%
Heating degree days	2009	4760	3.52%
Heating degree days	2010	4447	-6.58%
Cooling degree days	2005	1472	
Cooling degree days	2006	1130	-23.23%
Cooling degree days	2007	1212	7.26%
Cooling degree days	2008	1163	-4.04%
Cooling degree days	2009	876	-24.68%
Cooling degree days	2010	1549	76.83%
Fiscal years			
Heating degree days	2006	4261	
Heating degree days	2007	4460	4.67%
Heating degree days	2008	4470	0.22%
Heating degree days	2009	4835	8.17%
Heating degree days	2010	4377	-9.47%
Cooling degree days	2006	1435	
Cooling degree days	2007	1177	-17.98%
Cooling degree days	2008	1202	2.12%
Cooling degree days	2009	1051	-12.56%
Cooling degree days	2010	1112	5.80%

Source: http://cdo.ncdc.noaa.gov/pls/plclimprod/somdmain.somdwrapper?datasetabbv=DS3220&countryabbv=&georegionabbv=NAMER

All calculations presented in this report are based on data submitted to the New York City Mayor's Office. While every effort has been made to ensure these data's accuracy, the possibility for errors exists. This report is not intended to be a flawless accounting of New York City's carbon emissions, but is rather intended to provide guidance from which policy decisions may be based. The City of New York does not accept responsibility for the completeness or accuracy of this report, and it shall not be held liable for any damage or loss that may result, either directly or indirectly, as a result of its use.