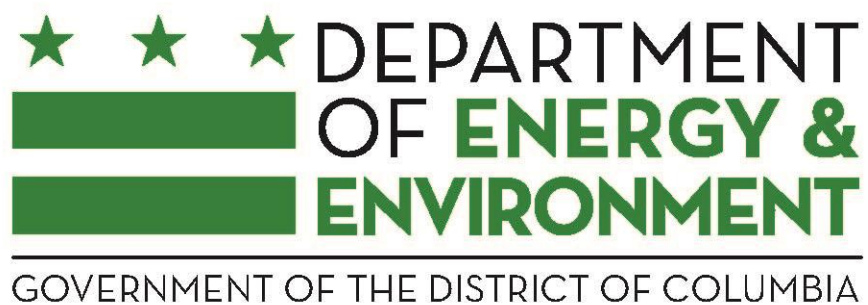


DISTRICT OF COLUMBIA GREENHOUSE GAS INVENTORY UPDATE
2012-2013



ACKNOWLEDGEMENTS

The Department of Energy & Environment (DOEE) would like to thank the following partners for their assistance in providing data and compiling this report: The Metropolitan Washington Council of Governments, ICLEI – Local Governments for Sustainability, the Washington Metropolitan Area Transit Authority (WMATA), Events DC, the University of the District of Columbia, the DC Housing Authority, and DC Water. DOEE would also like to thank the following District of Columbia agencies: the District Department of Transportation, the Department of Public Works, and the Department of General Services.

INTRODUCTION

The District of Columbia is committed to addressing climate change by cutting greenhouse gas (GHG) emissions while also increasing our resilience to the impacts of a changing climate. Sustainable DC, the District's comprehensive sustainability plan, established goals to cut greenhouse gas emissions by 50% by 2032 and 80% below 2006 levels by 2050. Interim targets to reduce emissions 20% by 2015 and 35% by 2020 provide milestones for measuring progress towards these longer-term goals.

In order to evaluate progress, the District regularly measures and reports its emissions. In addition to measuring greenhouse gasses from the city as a whole, the District also measures the emissions from its own government operations to ensure that the District Government is leading by example. The citywide inventory includes all of the energy used for buildings and transportation within the District as well as emissions from the disposal of solid waste. The government operations inventory includes government operated buildings and facilities, streetlights, vehicle fleets, waste generated by District agencies, as well as water and wastewater treatment systems.

The District conducted its first greenhouse gas inventory for 2006. This inventory established the baseline from which the District's goals for cutting emissions were established. In 2012, an updated inventory reported annual emissions through 2011. This report, the District's third inventory, provides an update for emissions in 2012 and 2013. Better data and more accurate accounting procedures have become available; therefore, previous emission estimates have been revised in order to more accurately calculate and compare emissions from year to year.

Emissions are measured and reported according to leading national and international greenhouse gas reporting protocols. The District Government operations inventory is calculated per the Local Government Operations Protocol (LGOP), and the citywide emissions inventory follows guidance from ICLEI – Local Governments for Sustainability, C40 Cities Climate Leadership, and the World Resources Institute. The District also reports annually to CDP its greenhouse gas emissions as well as actions taken to reduce emissions and make the District more resilient.

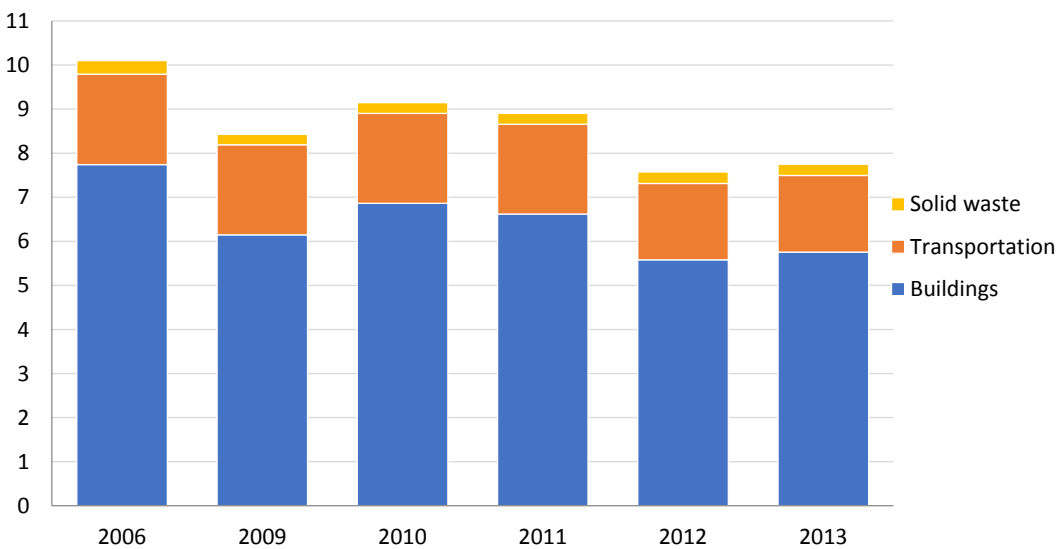
CITYWIDE EMISSIONS INVENTORY

Greenhouse gas emissions in the District of Columbia fell 23.3% from 10.10 million metric tons of carbon in 2006 to 7.75 million tons in 2013. Emissions fell despite significant increases in population and employment in the District during this period. As a result, per capita emissions dropped 30.8% since 2006. Emissions rose slightly (2.3%) from 2012 to 2013 due in part to colder weather driving greater building energy use for heating. The District has surpassed its interim goal of reducing emissions 20% by 2015.

2012 AND 2013 CITYWIDE EMISSIONS BY SECTOR, SOURCE AND SCOPE

In 2012, total citywide emissions were 7.58 million metric tons of carbon dioxide equivalent (MtCO₂e), 25% below 2006 baseline emissions of 10.10 MtCO₂e. In 2013, emissions rose slightly to 7.75 MtCO₂e, 23.3% below 2006 levels, and 2.3% above 2012. Figure 1 shows emissions by sector from 2006 through 2013, and Figure 2 shows emissions by source. A full summary of the data by sector for each inventory year is provided in Appendix B.

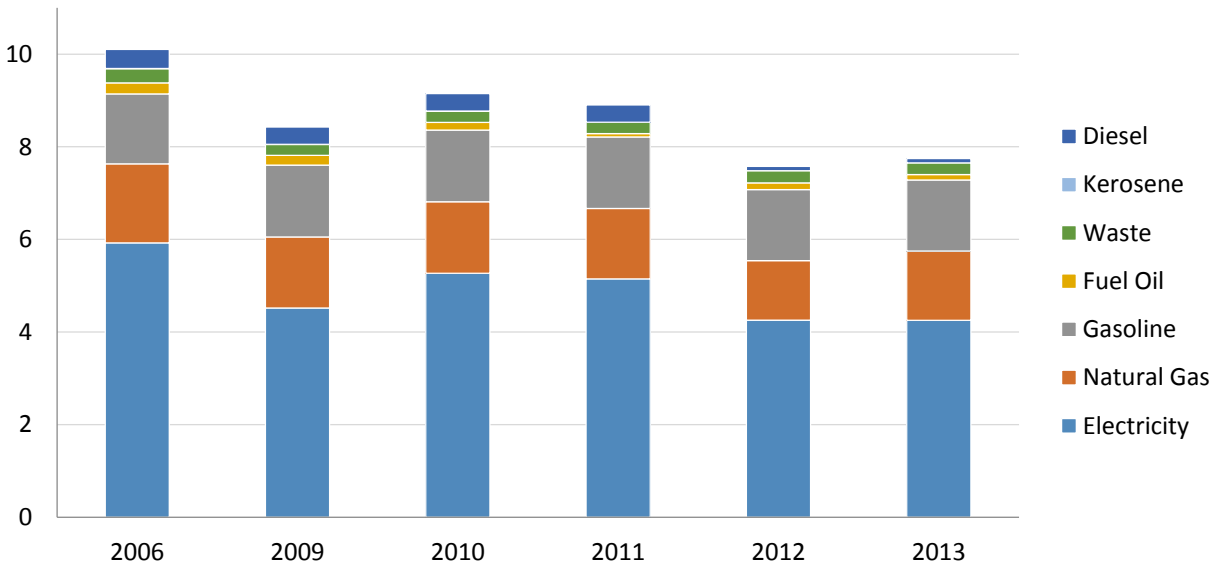
Figure 1: Citywide Emissions by Sector, 2006-2013 (Million Metric Tons CO₂e)¹



The energy used to power, heat and cool buildings remains by far the largest contributor to the District's citywide greenhouse gas emissions, accounting for 74% of total emissions in 2013. On-road transportation and Metrorail accounted for 23% of emissions. Emissions associated with the combustion and disposal of solid waste in landfills accounted for the remaining 3% of emissions.

¹ Data was not collected in 2007 and 2008 due to availability when the last inventory update was completed in 2012.

Figure 2: Citywide Emissions by Source, 2006 and 2013 (Million Metric Tons CO₂e)



When measured by source, electricity used in buildings and transportation (Metrorail) accounts for the majority of emissions (55%). Gasoline used by vehicles is the second largest source (20%), followed by natural gas (19%), which is primarily used for heating buildings and providing hot water.

Emissions are also classified by scope in order to distinguish between emissions that occur within the District’s boundaries, and those that occur outside the District but are attributed to District activities. Table 1 lists the District’s emissions by scope.

- **Scope 1** includes all those emissions from sources within the District;
- **Scope 2** includes emissions occurring as a result of the use of grid-supplied electricity within in the District;
- **Scope 3** includes all other emissions that occur outside the city boundary as a result of activities taking place within the city boundary.

Table 1: Citywide Emissions by Scope, 2012 and 2013 (Metric Tons CO₂e)

	Scope 1	Scope 2	Scope 3 ²
2012	3,057,006	4,256,621	261,691
2013	3,240,148	4,253,582	253,055

² Emissions associated with solid waste disposal are the only scope 3 emissions currently tracked by the District. All emissions associated with the disposal of solid waste are classified as scope 3. There are currently no landfills or waste combustion facilities located within the District.

CHANGES IN CITYWIDE EMISSIONS

As shown in Table 2, emissions fell across each of three major end-use sectors: buildings, transportation, and solid waste. As buildings account for almost three-quarters of emissions citywide, changes in building emissions have contributed the most to reductions overall. In general, emissions decline as a result of a reduction in use, e.g. driving less, or a reduction in the amount of greenhouse gases associated with a given activity, e.g. switching to cleaner fuels. Factors outside the direct control of the District can also significantly influence emissions including weather, population changes, the fuel efficiency of vehicles, and changes to the mix of fuels used to generate electricity that is imported. Below is a summary of the changes in citywide emissions by end-use sector. A detailed discussion of the changes by sector follows.

Table 2: Changes in Citywide Emissions by End-Use Sector

Sector	2006 (MtCO ₂ e)	2012 (MtCO ₂ e)	2013 (MtCO ₂ e)	% Change 2006-2013	% of Total Reduction 2006-2013
Transportation	2,051,029	1,731,870	1,737,512	-15.3%	13%
Solid Waste	308,340	261,691	253,055	-17.9%	2%
Buildings	7,742,526	5,581,757	5,756,218	-25.7%	84%
Total	10,101,895	7,575,318	7,746,785	-23.3%	100%

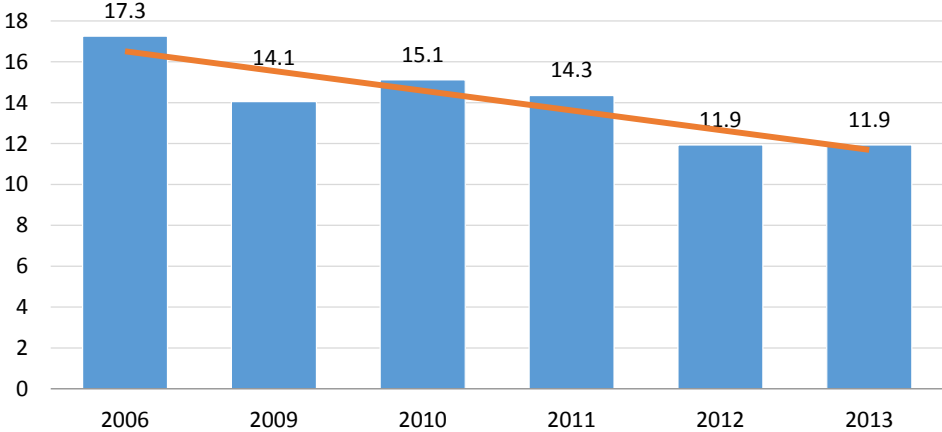
From 2006 to 2013, both the District population and the size of the District workforce increased significantly, rising 10.9% and 7.9% respectively. Yet, overall emissions fell as Washingtonians used less energy (and the energy they did use grew cleaner), drove less, and generated less waste per capita. As a result, emissions per capita fell 30.8% from 17.26 tons CO₂e in 2006 to 11.93 tons in 2013 (see Figure 3).

A shift toward cleaner electricity generation in the region has contributed significantly to cutting the District's emissions. From 2006 to 2013, a greater share of the fuel used by power plants which supply the District's electricity has come from natural gas and a small but increasing share of renewable energy, and less from coal. As a result, the amount of carbon per unit of electricity has declined by 25%.³ As electricity accounts for the majority of emissions, this decline in carbon intensity is responsible for 59% of the total reduction in emissions from 2006-2013.

Due in part to colder weather driving greater demand for energy for heating purposes, citywide emissions increased slightly (2.3%) from 2012 to 2013. Natural gas consumption, which is primarily used for heating purposes, jumped 16.5% from 2012 to 2013.

³ The District relies on the U.S. Environmental Protection Agency's Emissions & Generation Resource Integrated Database (eGRID) for the RFC East region to estimate the carbon intensity of its electricity supply. The baseline inventory (2006) uses the 6th edition (eGRID2007 Version 1.1) with data from 2005. Inventory years 2012-2013 use the 10th edition (eGRID2012 Version 1) with 2012 data, the latest available.

Figure 3: Citywide Emissions per Capita, 2006-2013 (Metric Tons CO₂e)



CITYWIDE EMISSIONS BY SECTOR

BUILDINGS & ENERGY USE

Nearly three quarters of the District's emissions come from the energy used to heat, cool, and power buildings. Non-residential buildings, which includes commercial, government (federal and local), and institutional buildings are the largest energy users and are responsible for 57% of the District's total emissions, while residential buildings account for a much smaller share (17%).⁴ As a result, small changes in energy use in non-residential buildings can have a big impact on the District's overall emissions.

Figure 4: 2013 Building Energy Use Emissions by Source and Building Type

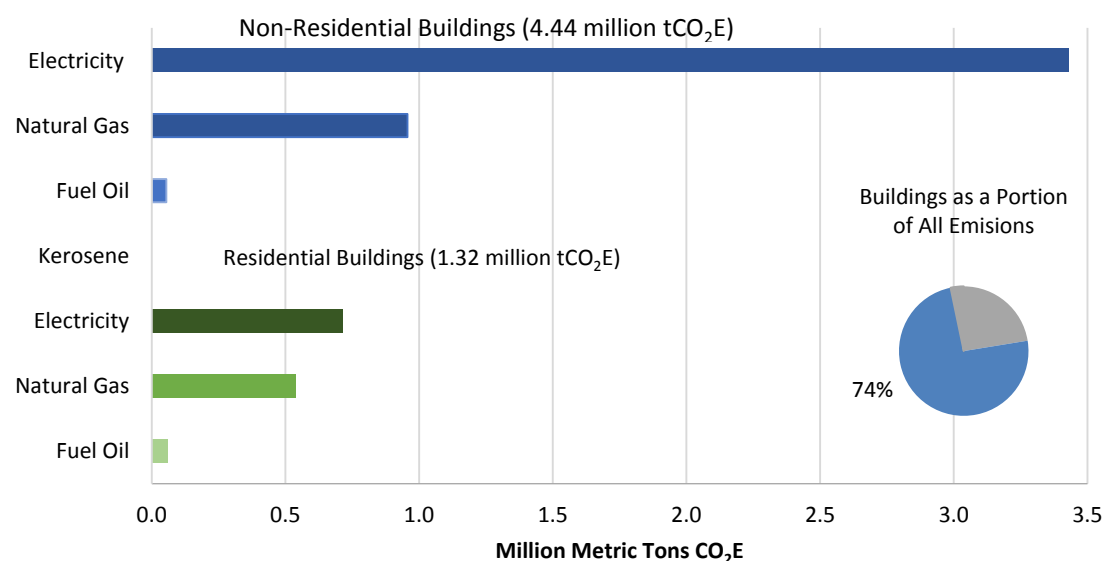


Figure 4 shows emissions from building energy use by source and building type. Electricity use accounts for the significant majority (77%) of emissions from non-residential buildings; while residential buildings emissions are more evenly split between electricity (54%) and natural gas (41%). Fuel oil accounts for a small share of energy use and emissions in both building types.

Since 2006, emissions from the building sector have fallen 26% as result of cleaner electricity sources and improvements in energy efficiency. Non-residential building emissions have fallen further (29%) than residential buildings (13%). This is due to the larger share of electricity consumption in non-residential buildings. While changes in the carbon intensity of electricity supply driven by regional policies and other factors has contributed the most to cutting emissions from buildings, District initiatives are also contributing by driving buildings to use energy more efficiently. In 2006, the District enacted the Green Building Act which required large private commercial and public and publicly financed commercial and multifamily residential buildings to attain green building certification. More recently, the Clean and Affordable Energy Act of 2008

⁴ Residential buildings include all single-family homes and multifamily buildings with units that are separately metered. Master-metered multifamily buildings are included with other non-residential buildings.

required all private residential and commercial buildings 50,000 square feet and larger and all public buildings 10,000 square feet and larger to annually track and report energy and water consumption. DOEE began publicly disclosing this data in 2014. The same legislation also created the DC Sustainable Energy Utility (DCSEU) to provide energy efficiency and renewable energy programs and incentives to businesses and homeowners. In 2013, DCSEU programs delivered electricity and natural gas savings equivalent to 45,000 tons of carbon dioxide equivalent. While that represents a small fraction of emissions today (0.6% of total 2013 emissions), the savings are cumulative. A building that is made more efficient today will continue to save energy and avoid emissions for the lifetime of the energy efficiency measures that are installed.

Thanks to these policies and programs, the District is a national leader in green and energy-efficient buildings. The number of LEED certified buildings in the District has increased significantly since the first inventory was completed in 2006. In 2014, the District surpassed 100 million square feet of LEED certified building space. According to data collected through the benchmarking program, the median reported ENERGY STAR® score for private commercial buildings in the District was 72 out of 100—well above the national median score of 50. Furthermore, buildings that benchmarked their energy use became more efficient from 2012 to 2013, decreasing their weather-normalized energy use by 3%.

Solar energy in the District has also steadily increased since the baseline inventory was completed, contributing to the decline in building sector emissions. The District’s renewable energy portfolio standard (RPS) requires that 20% of the electricity provided by District suppliers come from renewable energy by 2020. It further requires that 2.5% of electricity supply come from locally sited solar photovoltaics or solar thermal by 2023. As of the end of 2013, there were 991 solar photovoltaic systems and 66 solar thermal systems with a capacity of 10.4 MW approved by the District of Columbia Public Service Commission (PSC) to receive renewable energy certificates RPS,⁵ displacing 9,800 tons of carbon.⁶ While this represents a small fraction of the District’s overall emissions today, distributed solar will continue to grow as required by the RPS, displacing an increasing amount of energy use and carbon emissions in the future. Furthermore, as the District’s RPS along with similar policies in states in our region, continue to increase, the electric grid will continue to grow less carbon intensive, further reducing building sector emissions.

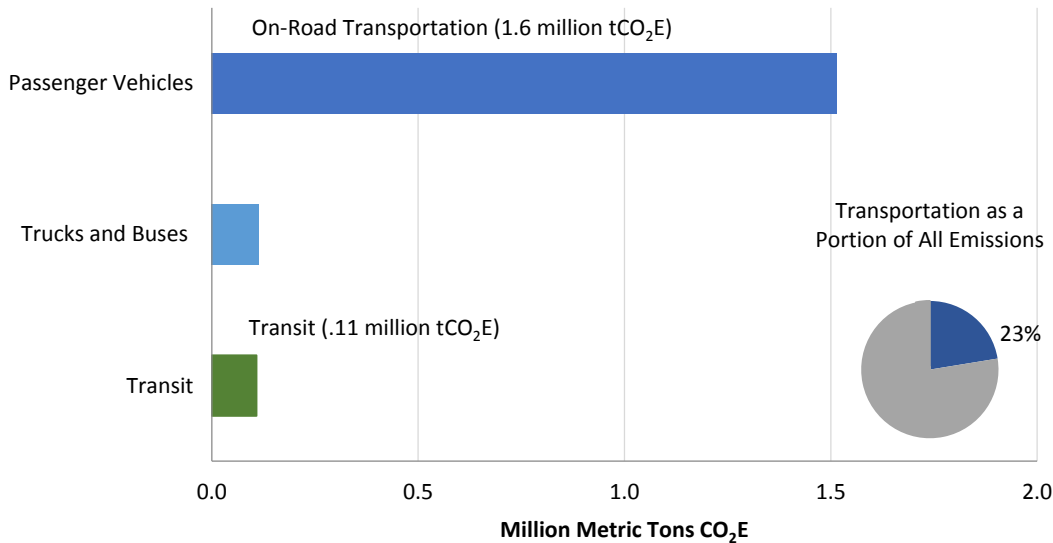
TRANSPORTATION

Fuel used for vehicle travel and transit is the second largest source of emissions, accounting for 23% of the total. As shown in Figure 5, on-road transportation, which includes passenger vehicles, trucks and busses, is the largest contributor of emissions from the transportation sector (94%), followed by electricity used by Metrorail (6%).

⁵ District of Columbia Public Service Commission, *2014 Report on the Renewable Energy Portfolio Standard*, available at http://www.dcpsc.org/pdf_files/reports/renewable_2014.pdf

⁶ Displaced emissions estimated using the U.S. EPA’s AVERT tool.

Figure 5: 2013 Transportation Emissions by Mode



From 2006 to 2013, transportation sector emissions fell 15%. On-road transportation emissions fell 15%, while transit emissions fell by 17%. On-road transportation emissions have fallen despite an increase in vehicle miles traveled (VMT) as vehicles have become more fuel efficient nationally and the share of travel by smaller more efficient vehicles and trucks locally has increased.⁷

As the District population grew from 2006 to 2013, per capita VMT fell 5%. This is evident in the increased use of transit, biking and walking for commuting in the District. As of 2013, 37% of city households did not own a car, and the share of District residents who drove to work fell 4% from 2006 to 2013. During the same period, the share of workers biking more than doubled from 2% to 5%, while the share walking increased from 12% to 14%.⁸ The rise of biking has been supported by the expansion of bicycling infrastructure in the District including the installation of the now more than 60 miles of bicycle lanes, and the launch and continued expansion of the Capital Bikeshare program. Capital Bikeshare contributes to reducing emissions by replacing vehicle trips and helping to expand access to transit as members use bike share to and from Metrorail stations and bus stops.

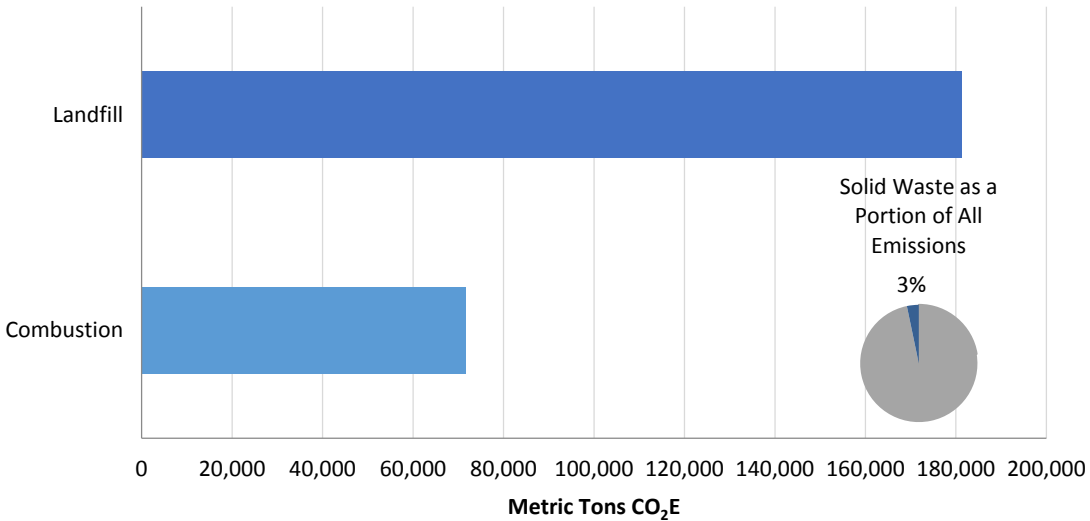
⁷ Vehicle miles traveled (VMT) within the District is provided by the Metropolitan Washington Council of Governments based on the results of regional transportation modeling. Changes to modeling methodologies and the granularity of VMT by vehicle type do not allow for direct comparisons between 2006 and 2013 by vehicle and fuel type.

⁸ United States Census American Community Survey 1-year estimates for 2006 and 2013.

SOLID WASTE

The collection, transportation, and disposal of solid waste contribute 3% of the District's greenhouse gas emissions. Figure 6 shows emissions resulting from landfilling and combustion of waste, the two methods used to dispose of waste that is not recycled, composted, or reused.

Figure 6: 2013 Waste Sector Emissions by Disposal Method



Emissions from the waste sector have fallen 18% despite a 3% increase in total waste disposed due to the shift of landfilling to combustion, which began in 2010. The amount of waste generated per capita has fallen 8% from 2006 to 2013.

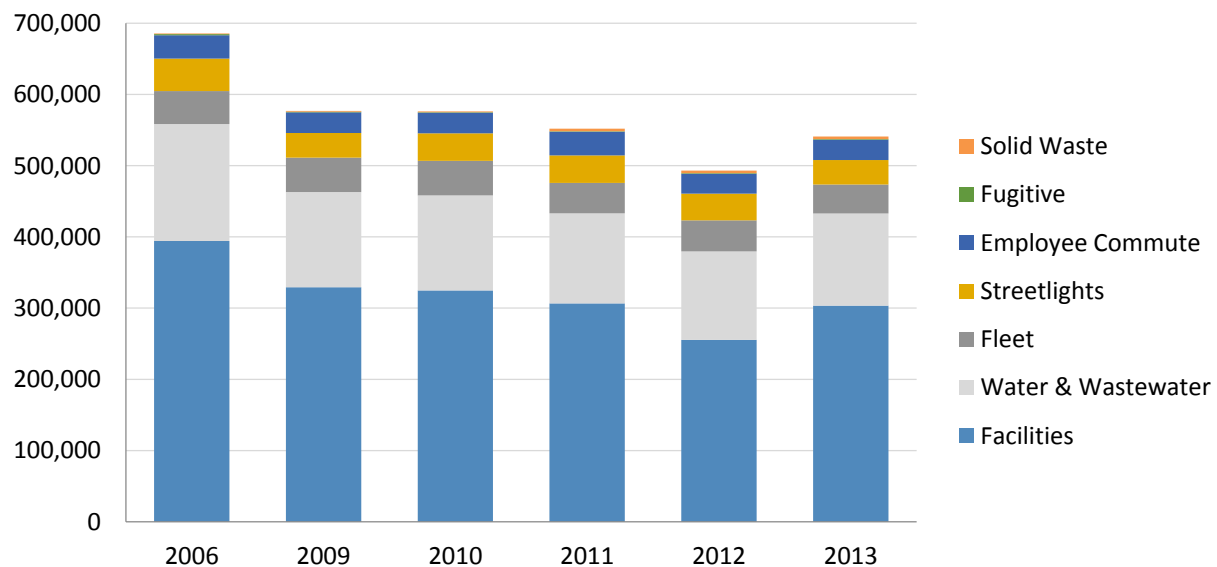
GOVERNMENT OPERATIONS INVENTORY

Greenhouse gas emissions from government operations represent about 7% of emissions citywide. Government emissions fell 21.1% from 685,582 metric tons of carbon in 2006 to 540,892 tons in 2013. Cleaner electricity, more efficient buildings, and a more efficient vehicle fleet all contributed to the decline in emissions. Emissions increased 9.7% from 2012 to 2013 due to an expanding portfolio of public buildings and colder weather driving greater building energy use. Significant reductions are expected in the 2014-2016 period as large renewable energy projects come online.

2012 AND 2013 GOVERNMENT EMISSIONS BY SECTOR, SOURCE AND SCOPE

In 2012, government emissions were 493,023 metric tons of carbon dioxide equivalent (MtCO_{2e}), 28.1% below 2006 baseline emissions of 685,582 MtCO_{2e}. In 2013, emissions increased to 540,892 MtCO_{2e}, 21.1% below 2006 levels, and 9.7% above 2012. Figure 7 shows emissions by sector from 2006 through 2013, and Figure 8 shows emissions by source. A full summary of the data by sector for each inventory year is provided in Appendix D.

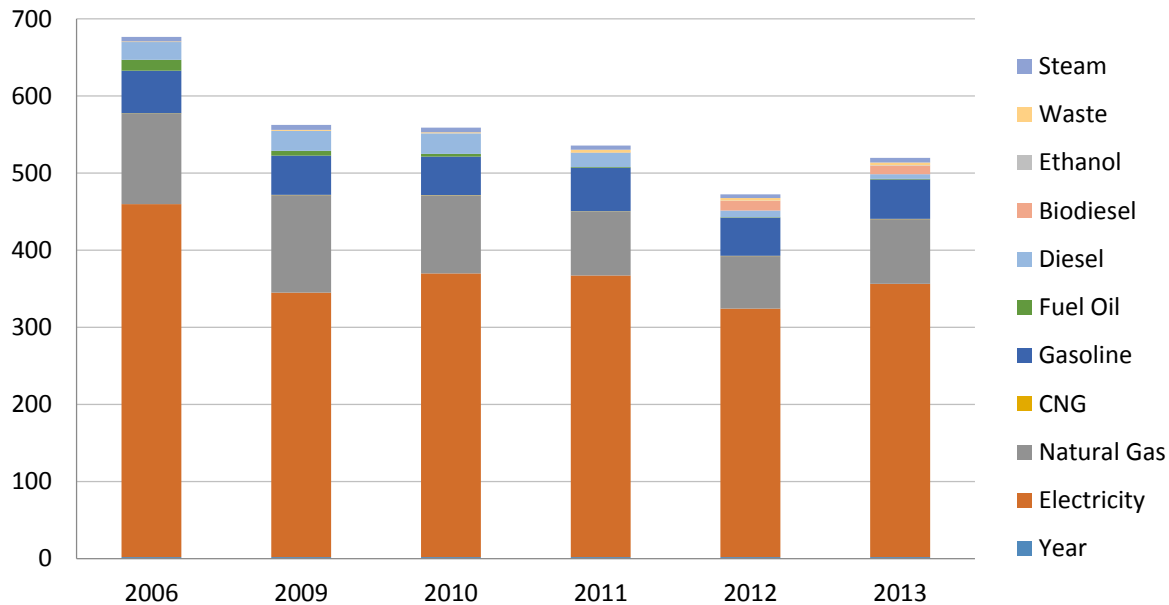
Figure 7: Government Emissions by Sector, 2006-2013 (Metric Tons CO_{2e})⁹



The energy used to power government buildings including offices, schools, public housing, fire and police stations accounts for just over half of the District Government’s emissions (56.1%). The next largest source is water and wastewater treatment services (23.9%), driven in large part by DC Water’s Blue Plains Advanced Wastewater Treatment Plan which treats wastewater for the District and surrounding counties. The District’s fleet of vehicles account for 7.5% of emissions and streetlights account for 6.4%, followed by a small share of emissions from solid waste disposal and other fugitive emissions.

⁹ Data was not collected in 2007 and 2008 due to availability when the last inventory update was completed in 2012.

Figure 8: Government Emissions by Source, 2006 and 2013 (Thousand Metric Tons CO₂e)



When measured by source, electricity used by buildings, facilities and streetlights accounts for by far the largest share of emissions (66%) followed by natural gas (16%) and then gasoline used by the District’s vehicle fleet and employee commutes (9%).

CHANGES IN GOVERNMENT EMISSIONS

As shown in Table 3, emissions fell across all sectors except for solid waste. The increase in emissions from solid waste reflects the addition in 2011 of schools to the portfolio of buildings for which the District Government manages waste. As facilities account for the largest share of emissions, the decline in that sector contributed the most to the overall reduction from 2006 to 2013. A detailed discussion of the changes by end-use sector follows.

Table 3: Changes in Government Emissions by Sector, 2006-2013

Sector	2006 (MtCO ₂ e)	2012 (MtCO ₂ e)	2013 (MtCO ₂ e)	% Change 2006-2013	% of Total Reduction 2006-2013
Facilities	394,313	255,303	303,550	-23.0%	63%
Water & Wastewater	164,138	124,438	129,361	-21.2%	24%
Fleet	46,278	43,486	40,710	-12.0%	4%
Streetlights	45,582	37,628	34,407	-24.5%	8%
Employee Commute	32,818	27,855	28,474	-13.2%	3%
Fugitive	1,693	858	858	-49.3%	1%
Solid Waste	760	3,456	3,531	364.6%	-2%
Total	685,582	493,023	540,892	-21.1%	100%

The shift toward cleaner electricity generation contributed significantly to the decline in government emissions. The carbon intensity of electricity sources drives emissions in the facilities, streetlights, and water sectors as they each consume large amounts of electricity. Total electricity emissions fell 22.4% due to cleaner generation, accounting for 71% of the total emissions reductions from 2006-2013. Note that the District Government has purchased 100% renewable power via renewable energy certificates (RECs) since 2012. However, until recently, greenhouse gas accounting protocols did not recognize these purchases, and the emissions in this report are calculated using the average emissions factor for the regional electric grid. Beginning in 2015, new guidance from the Greenhouse Gas Protocol will allow for alternative accounting for electricity purchases.¹⁰ This will include accounting for power purchase agreements (PPAs) such as the 20-year PPA that the District Government signed in 2015 to source approximately 30% of its electricity needs directly from a wind generation facility in Pennsylvania. This new methodology will be reflected in the next inventory update and is expected to result in a significant decline in electricity related emissions.

¹⁰ See the new Scope 2 Guidance for the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard available at http://www.ghgprotocol.org/scope_2_guidance.

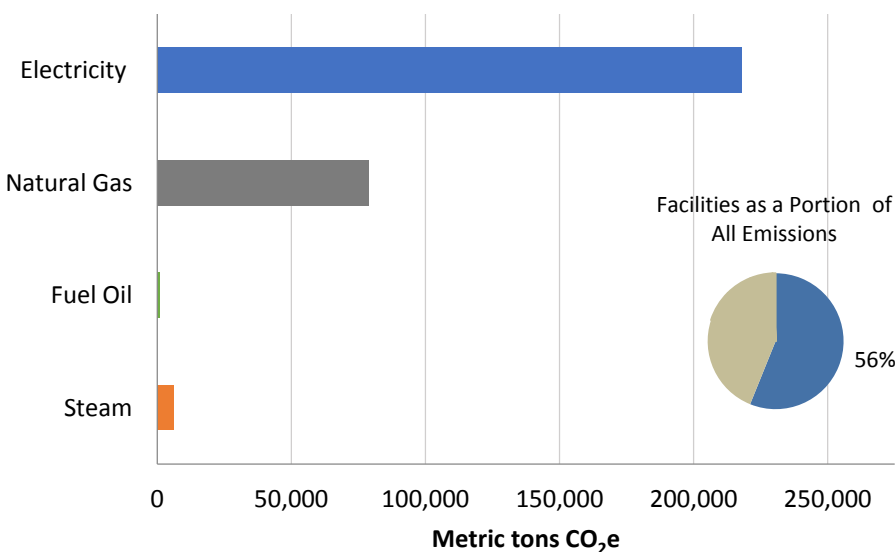
GOVERNMENT OPERATIONS INVENTORY BY SECTOR

BUILDINGS & FACILITIES

Just over half of the District Government's emissions come from the energy used by the more than 600 buildings and facilities owned by the District. These vary widely from office buildings to police stations, recreation centers, schools, and public housing.

Figure 9 shows the breakdown of emissions by fuel source. Electricity is by far the largest source of emissions, followed by natural gas, and small amounts of fuel oil and steam. Several District Government buildings receive steam from the General Service Administration's Central Heating Plant district energy system.

Figure 9: 2013 Building & Facility Energy Use Emissions by Source

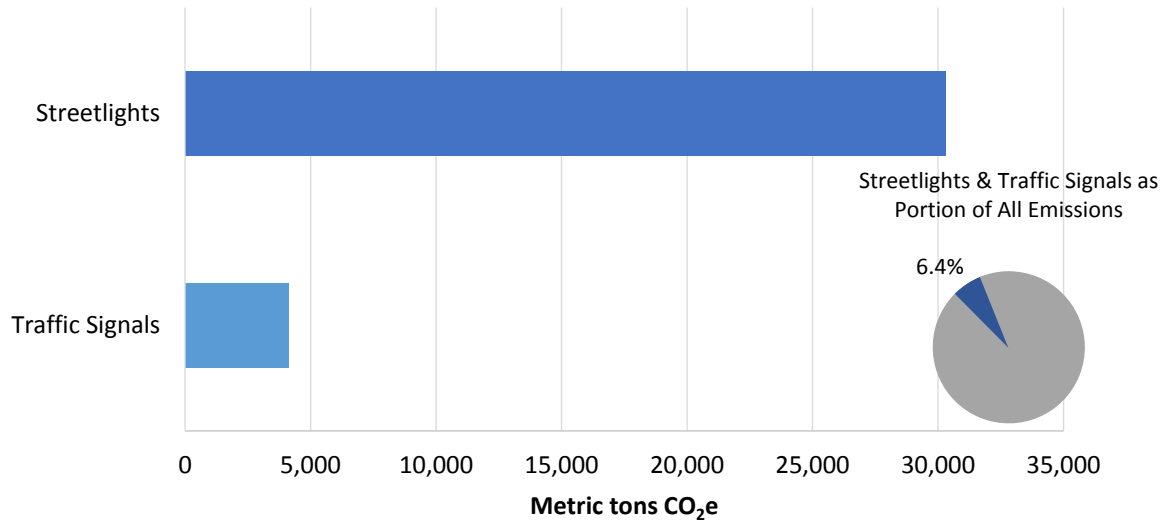


Since 2006, emissions from facilities have fallen 23%. This decline is due largely to cleaner electricity sources. While electricity usage rose 6% across District facilities, overall emissions from electricity use declined 16%. The increase in electricity consumption does not necessarily reflect a decline in energy efficiency. Since emissions are tracked on an absolute basis, the increase in consumption is due in part to an increase in building square footage, as well as the modernization of facilities to utilize more technology. All government facilities 10,000 square feet and larger are subject to the District's benchmarking law, which requires annual reporting of energy and water consumption.

STREETLIGHTS & TRAFFIC SIGNALS

The electricity used to power the District's more than 70,000 streetlights and traffic signals contributes 6.4% of the government's total emissions. Since 2006, emissions from streetlights and traffic signals have fallen 24.5% due to the shift toward cleaner electricity generation. The amount of electricity used has remained essentially flat, increasing just .2% from 2006 to 2013.

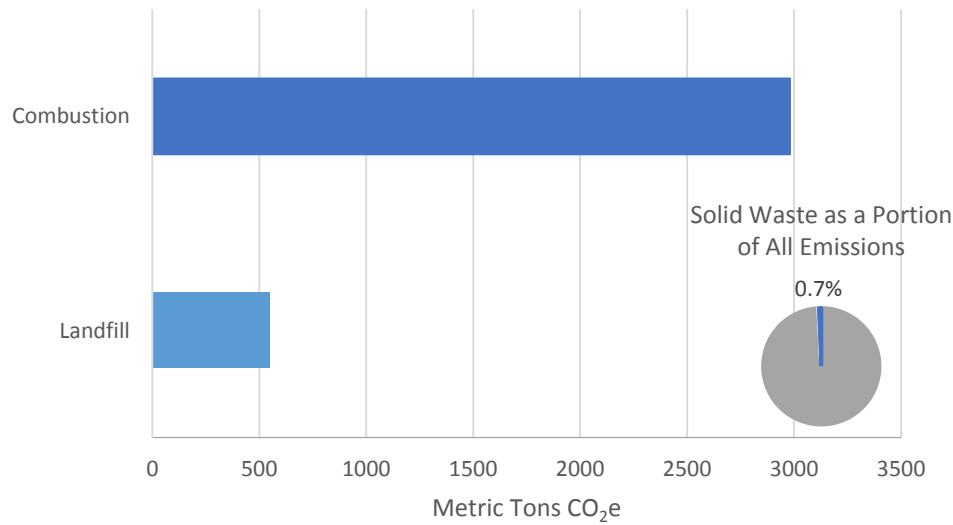
Figure 10: 2013 Streetlight & Traffic Signal Emissions by Source



SOLID WASTE

The disposal of solid waste generated by District Government operations including agencies and schools accounts for less than 1% of the government’s overall emissions. Emissions have increased since 2006 as the Department of General Services began managing trash collection for the DC Public Schools in 2011, significantly increasing the amount of waste attributed to the District Government.

Figure 11: 2013 Solid Waste Emissions by Source

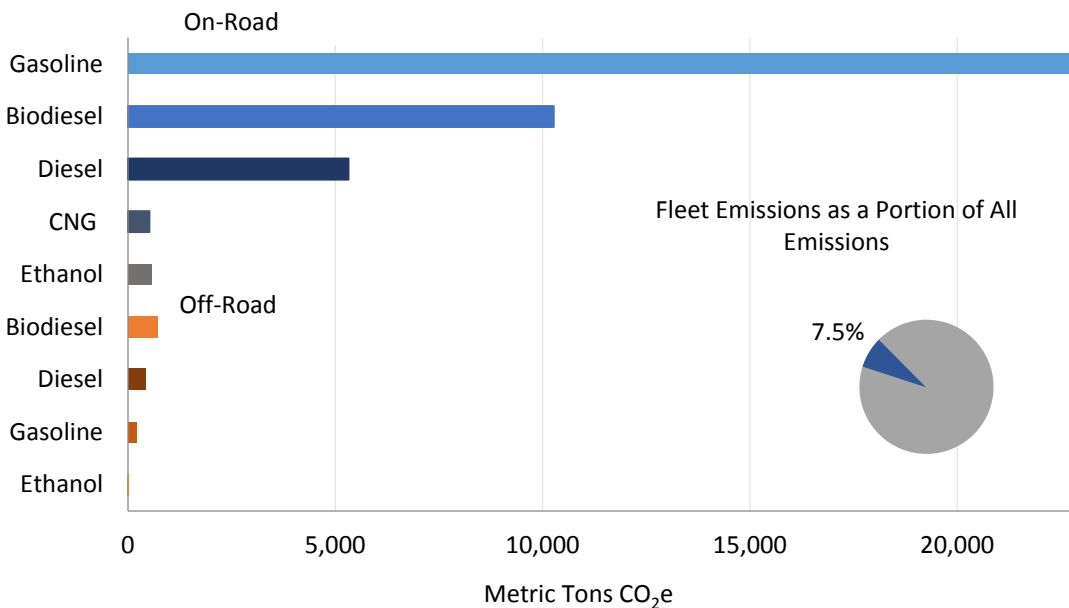


Nearly all, 90%, of the trash collected from District Government operations is combusted. The remainder is landfilled. Emissions from trash collection and transport are not included. The Department of General Services, as required by the Healthy Schools Act of 2010, supports a variety of programs to reduce waste generated by schools including recycling at all schools and organics composting at 39 schools as of the end of 2015.

VEHICLE FLEET

The District’s large and diverse fleet includes more than 7,000 vehicles and pieces of equipment ranging from on-road vehicles like police motorcycles, fire trucks, and garbage and recycling trucks to off-road construction and landscaping equipment. As shown in Figure 12, these vehicles run on gasoline, diesel, compressed natural gas, and a growing amount of ethanol and biodiesel. The fuel used by the District’s fleet accounts for 7.5% of total emissions.

Figure 12: 2013 Vehicle Fleet Emissions by Source



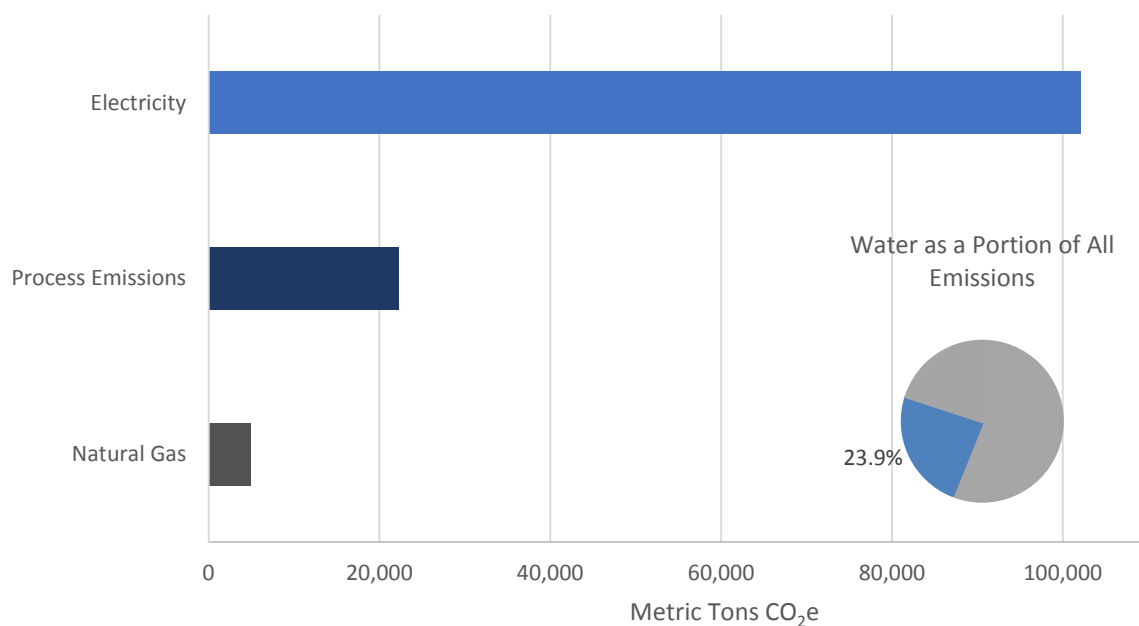
The District’s fleet emissions have fallen 12% since 2006 due to shifts to more efficient vehicles, efforts to reduce vehicle trips, and the use of cleaner fuels. In order to maximize fuel efficiency and reduce vehicle miles traveled, the Department of Public Works (DPW), which manages the District vehicle fleet, utilizes right-sizing, i.e. requiring compact, passenger vehicles unless there is a specific programmatic need for a larger vehicle, and one-for-one replacement, i.e. one vehicle must be removed from the fleet for each new vehicle purchased, to improve fuel efficiency and reduce vehicle trips. To further reduce fleet size and improve efficiency, the District was the first jurisdiction in the nation to introduce an innovative motor pool operation based on car sharing services like Zipcar. DC Fleet Share has allowed the District to downsize its fleet by 360 vehicles, and introduce more fuel-efficient hybrid vehicles. DPW also introduced bio-diesel (B5, B10, and B20) in 2011, and as a result emissions from diesel have fallen 27%.

In addition to fuel usage, vehicles contribute emissions through the leakage of small amounts of hydrofluorocarbons (HFCs) used in air conditioning and refrigeration systems. HFCs are a highly potent greenhouse gas. These fugitive emissions are responsible for a small share however, just 0.2%, of overall emissions.

WATER & WASTEWATER

The energy used by DC Water, the District’s water utility, to distribute, collect, and treat drinking water and wastewater is the second largest source of emissions from government operations, accounting for nearly a quarter of total emissions. Figure 13 shows the emissions from water and wastewater operations by source.

Figure 13: 2013 Water & Wastewater Emissions by Source



Electricity used to operate pumping and treatment equipment is by far the largest source of water sector emissions. DC Water’s Blue Plains Advanced Wastewater Treatment Plant is the largest plant of its kind in the world, and the single largest energy user in the District. DC Water provides wastewater collection and treatment services to more than two million Washington metro area customers, not just District residents. However, as the plant is located within the District, all emissions associated with its operations are accounted for here. The second largest source of water related emissions are process emissions which result from the release of greenhouse gas emissions during the wastewater treatment process, followed by natural gas used for facilities’ operations.

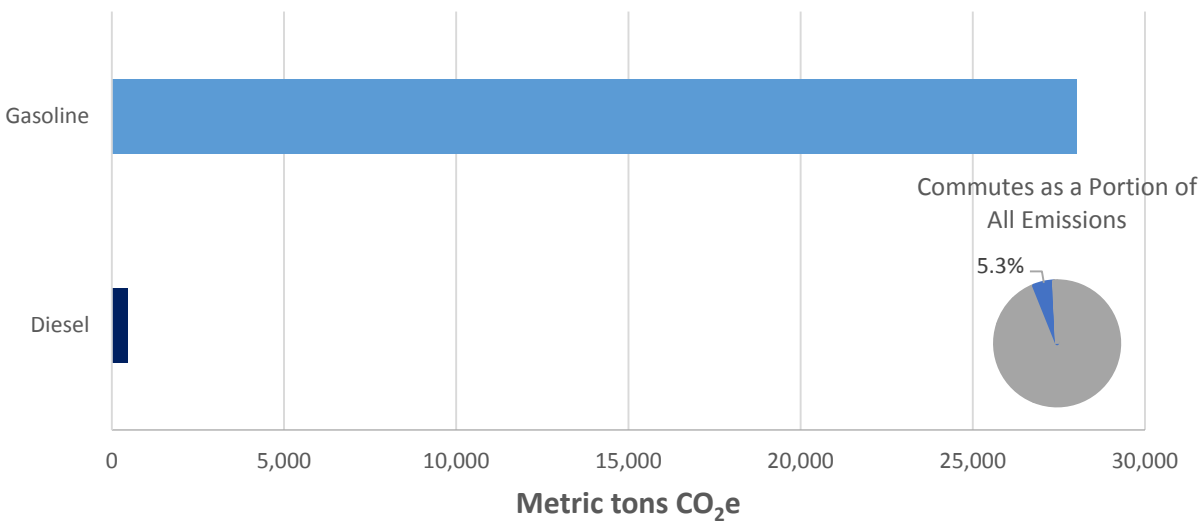
DC Water’s emissions have fallen 21% as a result of the regional shift to cleaner electricity as well as investments in more energy-efficient pumping and treatment equipment that have contributed to an 11% drop in electricity usage. In 2015, DC Water began operating an anaerobic digester that

will allow them to generate enough renewable energy from wastewater to provide one third of Blue Plains' power needs, which will significantly reduce emissions in the future.

EMPLOYEE COMMUTES

The District employed more than 32,000 staff in 2013. Based on employee surveys, it is estimated that approximately 40% of District employees drive to work either alone or in carpools. The fuel used by employees who drive to work accounted for 5.3% of the District Government's emissions in 2013.

Figure 14: Employee Commute Emissions by Source



Emissions from employee commutes have fallen 11% since 2006 despite an increase in the number of employees because of the rising fuel efficiency of passenger vehicles. The last time employees were surveyed about their commuting habits was in 2009. Updating the survey would allow for an analysis of shifts in commuting behavior, for example, an increase in the share of employees taking public transit or bicycling.

APPENDICES

A. CITYWIDE INVENTORY METHODOLOGY AND DATA SOURCES

The District follows guidance from leading international organizations including ICLEI – Local Governments for Sustainability, C40 Cities Climate Leadership Group, and the World Resources Institute to complete the citywide inventory. For the first time, the 2012 and 2013 inventories were calculated using Clear Path, ICLEI’s online emissions accounting software. Data sources and the methodology used to calculate emissions for each sector are described below. CO₂e for all years is calculated using the global warming potentials for CH₄ and N₂O determined by the IPCC 4th Assessment as recommended by the U.S. EPA. Previous inventories (2006-2011) used the IPCC 2nd assessment values and were revised accordingly.

BUILDINGS & ENERGY USE

Electricity and natural gas usage by sector was provided by Pepco and Washington Gas respectively to the Metropolitan Washington Council of Governments (MwCOG) per their annual energy survey. Fuel oil and kerosene sales are from the U.S. Department of Energy, Energy Information Administration. Emissions from grid-supplied electricity were calculated using emission factors from the U.S. EPA Emissions & Generation Resource Integrated Database (eGRID) RFC East subregion.

TRANSPORTATION

On-road emissions are calculated using modeling of vehicle miles traveled (VMT) by vehicle type completed by MwCOG. Fuel consumption by passenger vehicles and light-duty trucks is calculated using average fuel economy by vehicle type for each year as reported by the U.S. Department of Transportation, Bureau of Transportation Statistics (*National Transportation Statistics, Tables 4-11 and 4-12*). Medium and heavy-duty truck fuel efficiency is as reported by the EIA Annual Energy Outlook (Transportation, Table 67). Average fuel economy was updated for all years to reflect the most recent data available from the Bureau of Transportation Statistics (passenger cars and light duty trucks) and the EIA Annual Energy Outlook (medium and heavy duty trucks). VMT by vehicle and fuel type is not directly comparable between 2012-2013 and previous years because of changes to the methodology used by MwCOG for more recent years. For 2012 and 2013 MwCOG provided a more detailed breakdown of VMT by vehicle type (e.g. medium and heavy duty trucks). This level of detail is not available for previous years, and it was determined that backcasting the data would have less than a 2% impact on emissions overall.

Emissions from Metrorail are calculated using electricity consumption provided by WMATA for the entire Metrorail system. The District’s share of this consumption is estimated using the District’s cost allocation as determined by WMATA’s annual budget (32.3%).

SOLID WASTE

Total waste generated within the District is estimated based on total waste collected at the District’s solid waste transfer stations, which are managed by the Department of Public Works (DPW) and estimated by DPW to be approximately half of the total waste generated in the District. Estimates for the share of waste that is landfilled and combusted were provided by DPW. Emissions

were calculated using ICLEI's Clear Path tool based on a breakdown of waste by material provided by DPW's *2011 Solid Waste Characterization Study for the District of Columbia*.

B. CITYWIDE EMISSIONS SUMMARY 2006-2013

Sector	Units	2006		2011		2012		2013	
		Consumed	Co ₂ e	Consumed	Co ₂ e	Consumed	Co ₂ e	Consumed	Co ₂ e
Buildings									
Residential									
Gas	Therms	91,552,500	486,829	99,866,041	531,036	83,814,342	445,681	101,293,397	538,626
Electricity	MWh	1,836,663	954,231	1,844,709	842,575	1,799,282	704,040	1,830,232	835,962
Fuel Oil	Gallons	7,453,000	76,535	1,430,000	14,692	6,997,000	78,625	5,927,000	60,893
Non-Residential									
Gas	Therms	199,807,771	1,062,474	154,350,551	820,756	132,554,278	704,855	179,909,300	956,664
Electricity	MWh	8,868,544	4,607,620	8,788,055	4,013,964	8,429,128	3,298,231	8,763,938	4,002,948
Fuel Oil	Gallons	15,913,000	163,487	5,607,000	57,605	6,243,000	64,139	5,319,000	54,646
Kerosene	Gallons	115,000	1,175	3,000	31	-	-	-	-
Federal									
Gas	Therms	29,928,048	159,142	31,321,848	166,553	24,999,981	132,937	NA	NA
Electricity	MWh	444,682	231,033	378,699	172,971	391,652	153,249	NA	NA
Subtotal			7,742,526		6,620,183		5,581,757		6,449,739
Transportation									
Transit	MWh	252,649	131,263	259,744	118,648	258,379	101,101	276,503	108,193
On-Road	VMT (million)	3,416		3,363		3,573		3,584	
Gasoline	Gallons	170,152,509	1,507,374	173,309,963	1,545,175	171,849,971	1,537,228	171,504,358	1,535,510
Diesel	Gallons	40,423,618	412,392	36,530,624	373,283	9,148,851	93,541	9,172,709	93,809
Subtotal			2,051,029		2,037,106		1,743,535		1,737,398
Waste									
Landfill	Tons	800,000	308,340	538,523	166,621	636,513	188,060	613,920	181,385
Incineration	Tons	-		226,732	78,684	212,171	73,631	206,521	71,670
Subtotal		800,000	308,340	765,255	245,305	848,684	261,691	820,441	253,055
TOTAL			10,101,895		8,902,594		7,575,318		7,746,785

C. GOVERNMENT OPERATIONS INVENTORY METHODOLOGY AND DATA SOURCES

The government operations inventory is conducted in accordance with ICLEI's Local Government Operations Protocol (LGOP). For the first time, the 2012 and 2013 inventories were calculated using Clear Path, ICLEI's online emissions accounting software. Data sources and the methodology used to calculate emissions for each sector are described below. CO₂e for all years is calculated using the global warming potentials for CH₄ and N₂O determined by the IPCC 4th Assessment as recommended by the U.S. EPA. Previous inventories (2006-2011) used the IPCC 2nd assessment values and were revised accordingly.

BUILDINGS & FACILITIES

Building energy usage data for electricity, natural gas, fuel oil, and steam was provided by the Department of General Services, which manages most of the District's buildings and facilities including DC Public Schools. For buildings not managed by DGS, data was provided by the DC Housing Authority, DC Superior Court System, Events DC, and the University of the District of Columbia. Fuel oil data for 2012 and 2013 was not available from DGS, so usage was estimated based on the share of fuel oil compared to overall building energy usage in previous years. Emissions from grid-supplied electricity were calculated using emission factors from the U.S. EPA Emissions & Generation Resource Integrated Database (eGRID) RFC East subregion.

STREETLIGHTS & TRAFFIC SIGNALS

Electricity usage for streetlights and traffic signals was provided by the District Department of Transportation. Emissions from grid-supplied electricity were calculated using emission factors from the U.S. EPA Emissions & Generation Resource Integrated Database (eGRID) RFC East subregion.

SOLID WASTE

Solid waste generation totals were not available for 2012 and 2013. Therefore waste generation was estimated based on per employee generation from previous years provided by the Department of General Services, which manages contracts for waste collection from District agencies and DC Public Schools. The share of the District Government's waste that is combusted and landfilled was assumed to be consistent with previous years. Emissions were calculated using ICLEI's Clear Path tool based on a breakdown of waste by material provided by DPW's *2011 Solid Waste Characterization Study for the District of Columbia*.

WATER & WASTEWATER

DC Water conducts regular greenhouse gas inventories of their operations, which they provide to DOEE. This inventory includes electricity and natural gas used to operate the drinking water, sewer, and wastewater treatment systems. It also includes emissions resulting from the wastewater treatment process including N₂O emissions resulting from the denitrification process, effluent discharge, and the use of methanol.

VEHICLE FLEETS

Vehicle emissions are calculated based on fuel consumption and mileage data provided by the Department of Public Works Fleet Management Administration for all vehicles and equipment used by all District agencies including DC Water, Fire & Emergency Management Services, the Metropolitan Police Department, and DC Public Schools. Fugitive emissions from the use of refrigerants are based on average leakage rates by vehicle as provided by the ICLEI LGOP.

EMPLOYEE COMMUTES

Emissions associated with employee commutes are estimated based on a 2009 survey of District employee commuting habits. The share of employees driving to work is assumed to be constant and is used to estimate fuel usage based on the current number of employees and national average vehicle fuel economy.

D. GOVERNMENT OPERATIONS EMISSIONS SUMMARY 2006-2013

Sector	Units	2006		2011		2012		2013	
		Consumption	CO ₂ e	Consumption	CO ₂ e	Consumption	CO ₂ e	Consumption	CO ₂ e
Buildings & Facilities									
Gas	Therms	21,460,213	114,114	11,947,783	78,918	11,880,036	65,074	14,525,990	78,906
Electricity	KWh	500,858,748	260,219	485,021,842	221,535	522,951,172	184,965	529,539,419	217,833
Fuel Oil	Gallons	1,384,554	14,225	77,536	797	60,344	618	75,240	773
Steam	thousand lbs	80,020	5,755	75,785	5,385	65,352	4,646	84,316	6,038
Subtotal			394,313		306,635		255,303		303,550
Streetlights & Traffic Signals									
Electricity	KWh	87,734,545	45,582	84,180,622	38,450	83,884,151	37,628	87,933,183	34,407
Subtotal			45,582		38,450		37,628		34,407
Solid Waste									
Landfill	Tons	2685	760	962	556	932	539	952	550
Incineration	Tons	0	0	8,659	3,010	8,386	2,917	8,572	2,981
Subtotal		2,685	760	9,621	3,566	9,318	3,456	9,525	3,531
Fleet									
CNG	GGE	94,725	661	62,395	410	62,172	452	67,568	518
Diesel	Gallons	2,252,290	22,907	1,778,109	18,175	817,938	8,359	562,256	5,747
Biodiesel	Gallons	0	0	56,855	1	1,371,704	12,408	1,235,128	10,985
Ethanol	Gallons	97,171	144	72,232	130	235,240	372	364,117	573
Gasoline	Gallons	2,521,172	22,566	2,640,943	23,945	2,475,940	21,895	2,588,178	22,887
Subtotal			46,278		42,661		43,486		40,710
Fugitive Refrigerant Emissions	metric tons	1.18	1,693	0.6	780	0.6	858	0.6	858
Water & Wastewater									
Electricity	KWh	292,514,082	151,975	230,471,425	105,268	254,559,977	99,607	261,075,795	102,156
Natural Gas	Therms	526,485	2,800	709,589	3,773	572,791	3,046	930,668	4,949
Process Emissions			9,363		17,542		21,785		22,256
Subtotal			164,138		126,583		124,438		129,361
Employee Commute									
Gasoline	Gallons	3,639,221	32,818	3,142,800	32,698	3,074,453	27,402	3,142,757	28,011
Diesel	Gallons				558	44,333	453	45,318	463
Subtotal		3,639,221	32,818		33,256		27,855		28,474
TOTAL			685,582		551,931		493,023		540,892