



CITY OF SCHENECTADY LOCAL GOVERNMENT OPERATIONS GREENHOUSE GAS INVENTORY

A Preliminary Report for Baseline Year 2016



A report developed by the City of Schenectady's Sustainability Advisory Committee (SAC) for the Climate Smart Communities Certification program through the New York State Department of Environmental Conservation.

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Acknowledgements

The City of Schenectady, with support from local municipal staff and guidance from the Department of Environmental Conservation's Climate Smart Communities Coordinator, Climate Action Associates, LLC and the Capital District Regional Planning Commission, conducted a greenhouse gas (GHG) inventory for the time period between January of 2016 and December of 2018.

Overview

The GHG inventory and report is part of phase one of the City's Climate Smart Work Plan. A vulnerability assessment and climate adaptation strategies comprise the second phase of the Work Plan. To prepare this inventory, Schenectady followed the official Local Government Operations Protocol (LGOP), a protocol established by ICLEI- Local Governments for Sustainability and the Climate Registry that governs how to make calculations and report this information.

Presentation of this information is intended to assist city officials and policy-makers in making informed decisions to reduce energy usage, save taxpayer dollars and cut GHG emissions associated with City operations. Energy and greenhouse gas baseline information can be used to develop the strategies and measures in the (Climate Action Plan or Climate Adaptation Strategies report) that can be employed to meet energy and GHG emissions reduction goals set by the City.

This report provides an overview of the municipal energy assessment and greenhouse gas (GHG) emissions inventory for the City of Schenectady. The inventory assesses energy usage and GHG emissions resulting from municipal operation within the City. The energy usage and GHG emissions in this report does not include information pertaining to residential or non-municipal operations.

Key Findings:

- The City spent approximately \$2,431,000 on energy in 2016 and created a total of 5,850 GHG emissions (measured in metric tons of carbon dioxide equivalent or MTCO_{2e}).
- The largest source of GHG emissions by sector from the baseline year 2016 was Vehicle Fleet, which accounted for 44% of all emissions. Schenectady spent roughly \$397,000 on gasoline and diesel in 2016. Total cost for fleet fuels rose to \$503,400 in 2018, however, overall fleet fuel consumption and GHG emissions decreased over the same time period.
- Code Enforcement reduced GHG emissions by 15.7 metric tons from 2016 to 2018 by transferring a majority of the fleet over to electric vehicles.
- Wastewater Facilities accounted for 31% of GHG emissions, making it the second largest contributor to overall emissions.
- Wastewater Facilities were the largest user, accounting for 66% of all electricity usage.
- City streetlights and cameras only account for 7% of GHG emissions but account for 18% of all electricity usage. Implementing new LED lighting would lower overall electricity usage.

Sources of GHG Emissions

This municipal assessment considers most GHG sources that could be accurately accounted for as noted below:

- **Electricity consumption** - Consumption of electricity creates indirect emissions as the actual emissions occur at the power plants. They are included in this analysis as the City has the capacity to lessen its impact by reducing its use of electricity.
- **Stationary fossil fuels** - This includes natural gas, primarily used for heating of municipal buildings.
- **Transportation fuels** - These include gasoline, diesel and electricity (for plug in vehicles).

Emissions and Costs by Sector

The City of Schenectady divided greenhouse gas (GHG) emissions into four broad sectors: Wastewater Facilities, Administration Facilities, Vehicle Fleet, and Streetlights and Traffic Signals. Of the total average \$2.4 million the City spends on energy, including vehicle fleet totals, most money is spent on keeping our wastewater facilities running - over \$1 million on average - followed by maintaining our streetlights and traffic signals, which cost about \$800,000 annually on average. The City spends the least on powering our administration facilities, which include City Hall, Bureau of Services, the Fire and Police Department buildings, and our park facilities (Table 1). Between 2016 and 2018, the City emitted an average of 5,700 MTCO_{2e}, which according to the U.S. Environmental Protection Agency (EPA), would require the planting of 6,700 acres of forest to sequester. The majority of the City's GHG emissions come from our vehicle fleet, followed by our wastewater facilities (Table 1). These two sectors combined account for approximately 75% of our total GHG emissions (Figure 1).

Table 1. GHG emissions (MTCO_{2e}) and costs (\$) by sector by year (2016-2018).

	2016		2017		2018		Average	
	Cost (\$)	Emissions (MTCO _{2e})	Cost (\$)	Emissions (MTCO _{2e})	Cost (\$)	Emissions (MTCO _{2e})	Cost (\$)	Emissions (MTCO _{2e})
Admin. Facilities	\$139,652.57	1062.74	\$114,860.44	959.83	\$131,586.78	1072.54	\$128,699.93	1031.70
Streetlights & Traffic Signals	\$892,551.66	404.10	\$743,420.74	408.37	\$873,520.06	408.73	\$836,497.49	407.07
Vehicle fleet	\$397,140.45	2597.7	\$475,164.86	2615.3	\$504,826.92	2330.4	\$459,044.08	2514.5
Wastewater facilities	\$1,001,919.13	1785.73	\$981,471.66	1831.31	\$938,300.42	1885.17	\$973,897.07	1834.07
All Municipal Operations	\$2,431,263.81	5850.27	2,314,917.7	5814.81	2,448,234.2	5696.84	2,398,138.5	5787.34

The energy emissions and costs by sector are broken down by percentage in Figures 1 and 2 below. Almost half of the City’s emissions come from our vehicle fleet, although that sector only accounts for about 19% of our total energy costs. Streetlights and traffic signals, despite contributing the least to our carbon footprint, represent nearly 35% of the City’s overall energy spending.

AVERAGE GHG EMISSIONS BY SECTOR (2016-2018)

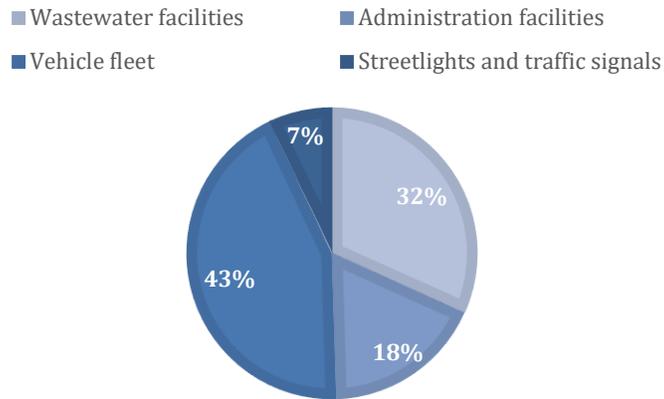


Figure 1. Average percentage of GHG Emissions (MTCO₂e) for each sector between 2016 and 2018 in the City of Schenectady.

AVERAGE COST BY SECTOR (2016-2018)

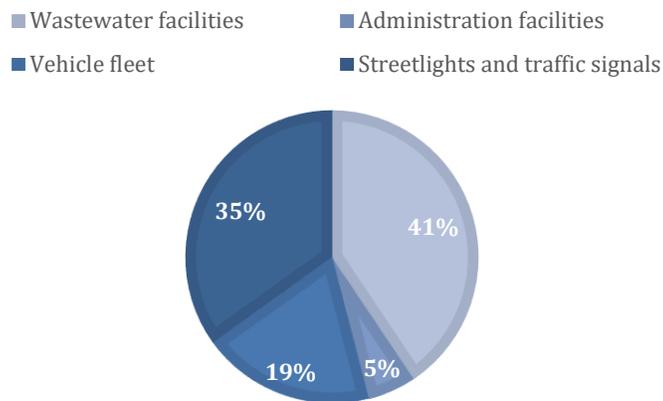


Figure 2. Average cost (USD) for each sector between 2016 and 2018 in the City of Schenectady.

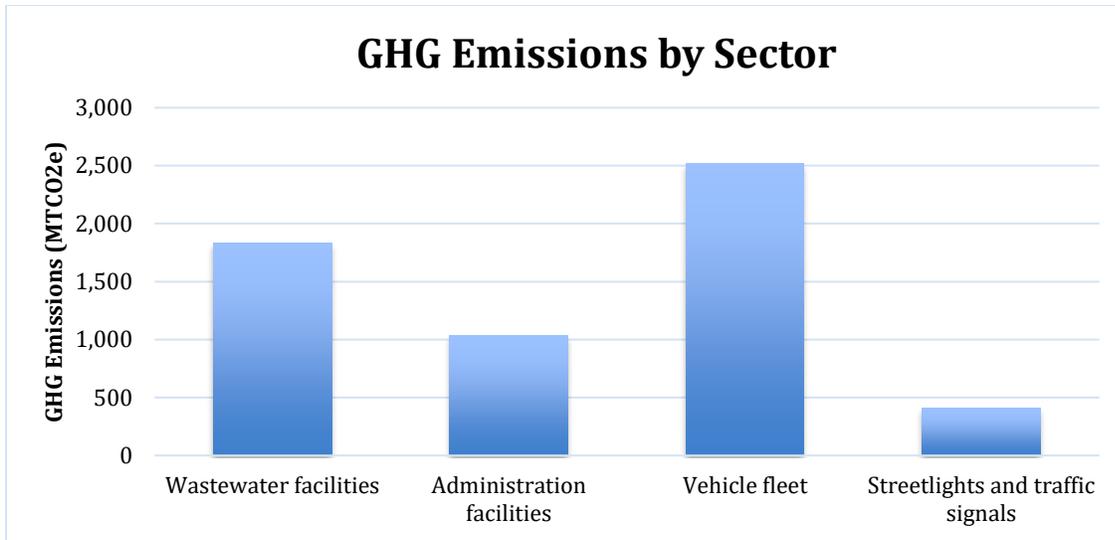


Figure 3. Average GHG Emissions for each of the four sectors between 2016 and 2018.

Sector Breakdown

Further breakdowns of individual sectors are crucial in the City’s ability to understand how we may be able to make future sustainability improvements. Each section below provides a more in-depth look at a few key sectors the City assessed in this report.

I.) Vehicle Fleet (43% of GHG Emissions, 19% of Energy Costs)

The City of Schenectady’s vehicle fleet consists of 24 cars (8 electric vehicles), 13 vans, 35 trucks, 4 street sweepers, 21 plows/spreaders, 17 dump trucks, as well as 79 other vehicles. The departments that contribute the majority of GHG emissions are the Police, Waste, Fire, and Streets departments (Table 2; Figure 4), which is to be expected because these departments not only have the largest fleets, but they also utilize the most fuel-intensive vehicles. The least emissions are contributed by the Assessment, Development, and Engineering Departments (Table 2; Figure 4). Since these departments use City vehicles relatively rarely, this result is also expected. Costs follow a similar pattern to GHG emissions, as the Police Department spends the most on fuel, and Assessment spends the least (Table 2; Figure 5).

Table 2. Total costs and emissions from Vehicle Fleets by City Department between 2016 and 2018.

Department	Cost (\$)	GHG Emissions (MTCO2e)	Department	Cost (\$)	GHG Emissions (MTCO2e)
Assessment	401.33	2.0	Parks	45559.04	244
Codes	12057.92	59.2	Police	444,267.36	2323
Development	957.16	4.8	Sewer	95,713.58	532.1
Engineering	1,782.61	8.9	SNAP	41,884.28	225.3
Fire	143,084.36	800.6	Streets	125,573.47	704.3
Mechanical	6531.38	37.1	Utilities & Facilities	37,501.46	208.8
Waste	350,367.27	2005.5	Water	71,451.01	387.8

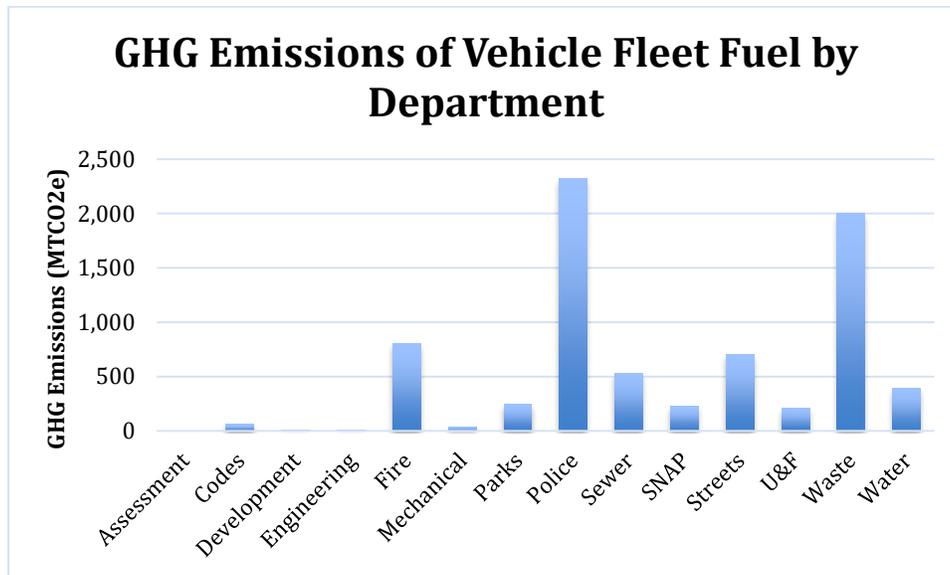


Figure 4. Total GHG Emissions from vehicles within each City department. Totals include all emissions from gasoline and diesel between 2016 and 2018.

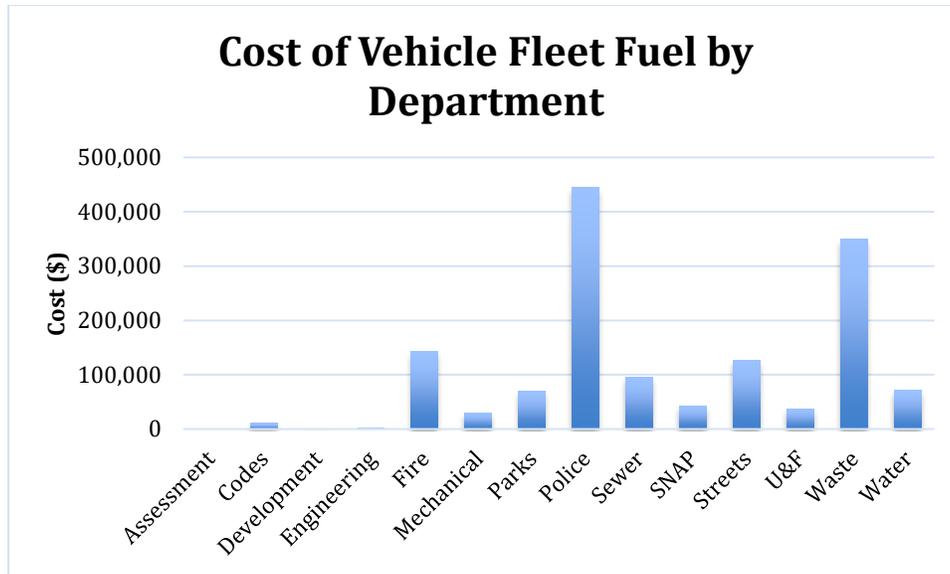


Figure 5. Total fuel expenditures for vehicles within each City department. Totals include costs of both gasoline and diesel between 2016 and 2018.

The City’s EVs, purchased in 2017, are also used only by the Assessment and Codes departments, and has greatly reduced the costs and emissions associated with fueling those departments. The overall cost of fuel for the Assessment Department decreased by nearly 10% between 2016 and 2018, while the Codes Department spent 41% less. GHG emissions were also reduced by 86% and 41% in the Assessment and Codes departments, respectively (Table 3). These cost and emissions decreases suggest that the City may be able to reduce our total carbon footprint and save money over time by replacing aging vehicles in other departments’ fleets with electric ones.

Table 3. Decrease in costs and emissions in the Assessment and Code Enforcement departments after the City purchased electric vehicles in 2017.

	Assessment Costs (\$)	Assessment Emissions (MTCO _{2e})	Codes Costs (\$)	Codes Emissions (MTCO _{2e})
2016	115.32	0.70	4,347.35	26.80
2017	181.72	0.90	4,193.32	21.40
2018	104.29	0.10	3,517.24	11.00
Total Decrease	11.03	0.60	830.11	15.80
Percent Decrease	9.6%	86%	19%	41%

II.) Wastewater Facilities (30% of GHG Emissions, 18% of Energy Costs)

The wastewater sector includes the facilities used for wastewater treatment, which are powered by both gas and electricity, as well as the City’s water pumps and truck wash station. There are twelve pumps, one truck wash station, and one wastewater treatment plant in the City. Together these pumps, the truck wash, and the plant averaged about 1,834 MTCO_{2e} and \$328,576 annually in the past three years (Table 1). The pumps account for about half of both the emissions and costs of the wastewater sector, followed closely by wastewater buildings, which contribute 34% of the total emissions and 44% of the total costs (Table 4).

Table 4. GHG emissions and cost breakdowns for subgroups of the Wastewater sector between 2016 and 2018.

	Electricity (kWh)	Gas (Therms)	GHG Emissions (MTCO _{2e})	Cost (\$)
Water Pumps	21,487,001	1800	15,205	536,629.08
Truck Wash	19,003	0	13.4	11,486.19
Wastewater Buildings	10,994,731	163158	8,640	436,775.62

III.) City Buildings (17% of GHG Emissions, 7% of Energy Costs)

City-owned buildings contribute a relatively small proportion of the City’s overall emissions and costs; however, there are likely a significant number of opportunities for GHG emission reductions in this sector because of the sheer number of facilities the sector includes, in addition to the large amount of electrical equipment housed in these buildings. The largest percentage of GHG emissions in the City Buildings sector can be attributed to the Police Department facility (51%), with the rest of total emissions more equally divided between City Hall (23%), Fire Department stations (18%), and City parks and recreation facilities (12%) (Figure 7). Energy costs in this sector are relatively evenly distributed between the City Buildings subgroup; however, the Police Department makes up the largest percentage of the total cost, at 34% (Figure 8).

Table 5. GHG emissions and cost breakdowns for subgroups of the City Buildings sector between 2016 and 2018.

	Electricity (kWh)	Gas (Therms)	GHG Emissions (MTCO ₂ e)	Cost (\$)
City Hall	941,336	123,542	1,331	82,626.81
Fire Dept	1,057,184	5,4728	1,038	73,577.26
Police Dept	3,216,800	7,6375	2,680	129,355.7
Parks	961,405	3,358	697.8	92,828.64
Bevis Hill	-1,021,785	6,222	-690	-132,893.37

GHG EMISSIONS FROM CITY BUILDING SUBGROUPS

■ City Hall ■ Fire Dept ■ Police Dept ■ Parks

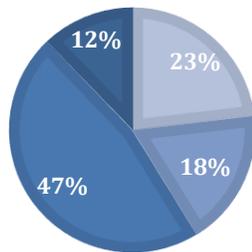


Figure 7. Total GHG emissions (MTCO₂e) for the City Buildings sector between 2016 and 2018.

COST OF ENERGY FOR CITY BUILDING SUBGROUPS

■ City Hall ■ Fire Dept ■ Police Dept ■ Parks

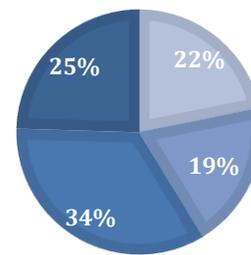


Figure 8. Total energy costs (\$) for the City Buildings sector between 2016 and 2018.

The City also owns a solar array at Bevis Hill, which decreased our overall carbon footprint by almost 700 MTCO₂e between 2016 and 2018. The City also received energy credits totaling over \$130,000 during the same timeframe (Table 4). These emission reductions and cost savings indicate that further investments in solar projects may improve the City’s performance in future GHG assessment reports.

IV.) Lighting (7% of GHG Emissions, 46% of Energy Costs)

Although lighting contributes only a small proportion of the overall GHG emissions in the City, this sector costs the City over \$800,000 annually - more than any other sector examined in this report. Any government agency that uses lights owned by a utility company is required to back “facility charges.” Because the majority of the City’s streetlights are owned by Nation Grid, our local utility company, we must pay these facility charges.

Fuel Sources Breakdown

The City uses four different fuel types to power its operations: electricity, natural gas, gasoline, and diesel. The majority of GHG emissions from fuel in the City come from electricity, followed by diesel (Figure 9). The City also spends the most money on these two energy sources. Of the total energy costs for the City between 2016 and 2018, \$2.4 million, electricity expenditures account for 77% and diesel accounts for 10% (Figure 10).

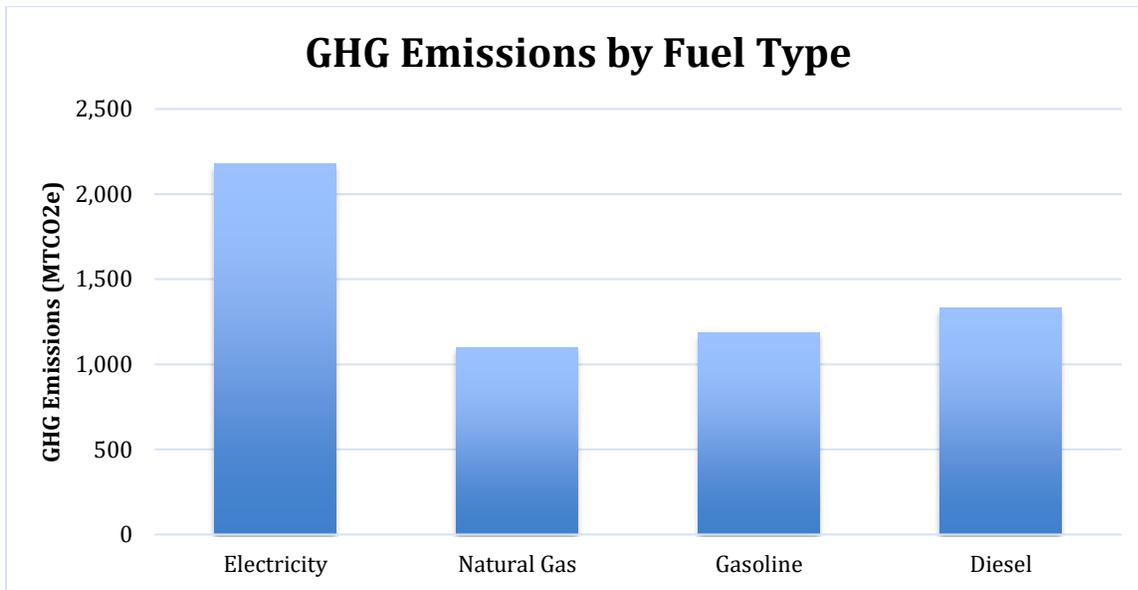


Figure 9. Average GHG Emissions (MTCO2e) for each fuel type used by the City between 2016 and 2018.

AVERAGE ENERGY COST BY FUEL TYPE

■ Electricity ■ Natural Gas ■ Gasoline ■ Diesel

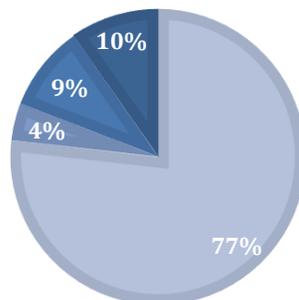


Figure 10. Average energy costs (\$) for each fuel type used by the City between 2016 and 2018.

Next Steps & Recommendations

The City of Schenectady has many promising options that could help reduce our carbon footprint. Although the City is already improving streetlights with new LED lighting and “Smart” technology fixtures, there is plenty of room for improvement in the sustainability of our facilities and operations. This GHG emissions assessment report is just one of several initiatives in the City’s climate and sustainability planning process. With this in mind, we outline several key recommendations and next steps based on the findings contained in this report below.

Next steps:

- Ensure all propane, fuel oil and refrigerants if any are accounted for.
- Calculate the indirect emissions from solid waste collection.
- Assess the impact generated from employee commutes.
- Conduct a more in-depth analysis of municipal vehicle fleet data.

Recommendations and Potential Options:

- EV purchasing - phase out gasoline vehicles in our fleet.
- Carbon credit (or REC) purchasing.
- Investment in solar projects.
- Tree inventory and green infrastructure audit.
- Analysis of City employees’ modes of transportation for improvement.
- Conduct building energy audits to determine where the City can reduce energy use and increase efficiency.