City of Beacon, NY

Inventory of 2019 Municipal Operations Greenhouse Gas Emissions

Produced for City of Beacon

By Eleanor Peck, City of Beacon Climate Smart Coordinator

Based on previous inventories created for Beacon by Eli Yewdall, Senior Climate Program Officer at ICLEI - Local Governments for Sustainability USA

June 2020

ICLEI Local Governments for Sustainability USA

Credits and Acknowledgements

Thanks to the following individuals for their assistance in providing information used in this report:

- City of Beacon Climate Smart Task Force
- Eli Yewdall, Senior Climate Program Officer at ICLEI Local Governments for Sustainability USA
- Anthony Ruggiero, City Administrator, City of Beacon
- Jamie Mesnick, City of Beacon Building Department
- Ed Balicki, Chief Operator, City of Beacon Water and Sewer Department
- Mark Debald, Transportation Program Administrator, Duchess County
- Robin Moore, Central Hudson Gas and Electric
- Mae Patel, Metro North Railroad

Table of Contents

Executive Summary

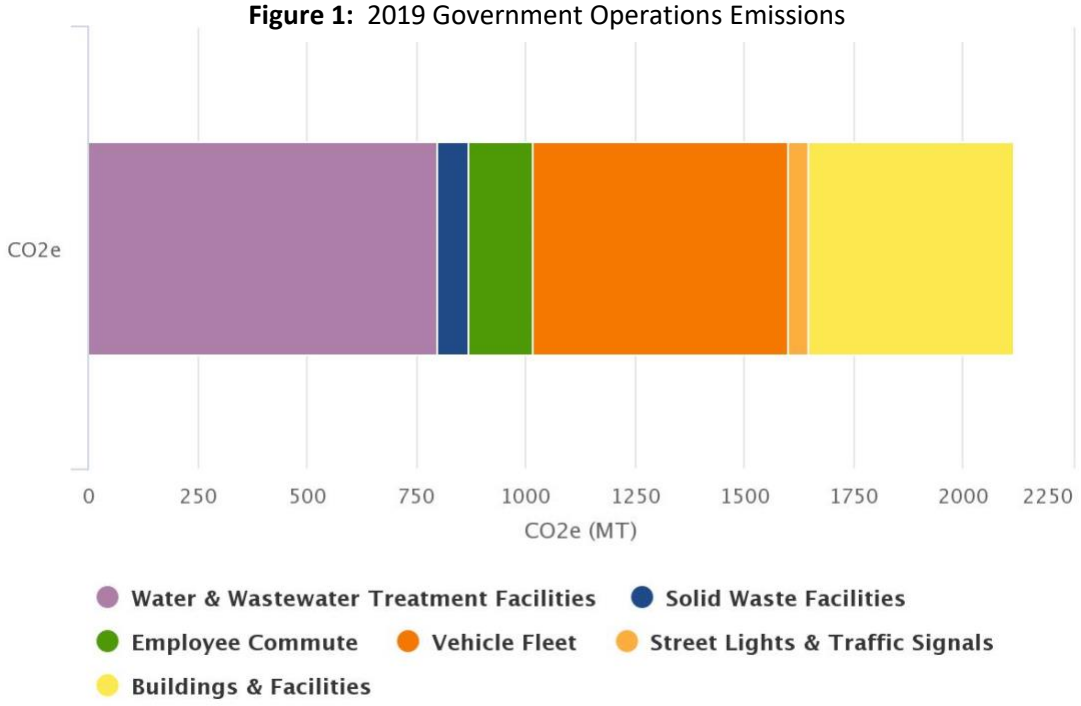
The City of Beacon recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound climate change, the consequences of which pose substantial risks to the future health, wellbeing, and prosperity of our community. Furthermore, the City of Beacon has multiple opportunities to benefit by acting quickly to reduce community GHG emissions.

This GHG inventory is part of ongoing sustainability efforts by the City, and an important step towards fulfilling the City's pledge to become an NY Certified Climate Smart Community[1]. The emissions inventory will inform planning for energy savings and emissions reductions, and sets the baseline from which the city can measure progress towards sustainability goals and targets. This report provides estimates of greenhouse gas emissions resulting from City of Beacon government operations in 2019.

Key Findings

Emissions from City of Beacon operations for 2019 are shown in Figure 1. Energy use in water and wastewater facilities, followed by fleet vehicle fuel use are the largest contributors to city operations emissions, followed closely by buildings and facilities.

Figure 1: 2019 Government Operations Emissions



1 https://climatesmart.ny.gov/

Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

Climate change is already beginning to impact the people and communities of New York State. New York's ClimAID Report describes what can be expected in New York specifically[2]. Increases in summer and winter temperatures are a primary driver of change throughout the state, and temperatures have already risen about 2.4 degrees Fahrenheit over the past 50 years, with winters even warmer. Heat waves are becoming more frequent and longer-lasting, increasing heat-related illness and death and posing new challenges to heat-stressed electricity infrastructure, air quality, and agriculture (by the end of the century, our growing season could be a month longer) (NYSERDA, 2011). Shifts in year-to-year precipitation patterns that reduce snowpack and increase flooding are among the most acutely felt impacts across the state. For instance, since the late 1950s, the amount of precipitation falling in downpours increased by more than 70%, and although more precipitation is falling during winter, the amount falling as snow has decreased. Moreover, for coastal communities, sea levels have risen more than a foot over the past 100 years and we could see sea levels rising another two or more feet by 2050, increasing the chances of coastal flooding. Our human community is not the only one climate change impacts: Pollinating bees arrive about 19 days earlier than they did during the 1800s and bird and fish populations have shifted their ranges northward, each migration affecting agriculture, hunting and fishing, and recreation.

To respond to the climate emergency, New York State passed the Climate Leadership and Community Protection Act (The Climate Act) in June 2019. Hailed as the most ambitious state climate legislation in the United States, The Climate Act calls for 100 percent carbon-free electricity by 2040 and a net-zero carbon economy by 2050, with 85 percent of reductions coming from reduced GHG emissions and the remaining 15 percent coming from carbon offsets (from projects primarily occurring within the state). Moreover, strong statewide local climate initiatives—the Climate Smart Communities and Clean Energy Communities Programs—offer the potential capacity to address many climate-related risks at the local level.

2 NYSERDA 2014, Responding to Climate Change in New York State (ClimAID): 2014 Supplement - Updated Climate Projections Report

Many communities in the United States have taken responsibility for addressing climate change at the local level. Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. In addition, money not spent on energy is more likely to be spent at local businesses and add to the local economy. Reducing fossil fuel use improves air quality, and increasing opportunities for walking and bicycling improves residents' health.

ICLEI Climate Mitigation Program

In response to the problem of climate change, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

Figure 2: ICLEI Climate Mitigation Milestones

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones, also shown in Figure 3:

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions reduction target;
3. Develop a climate action plan for achieving the emissions reduction target;
4. Implement the climate action plan; and,
5. Monitor and report on progress.

This report represents the completion of ICLEI's Climate Mitigation Milestone One, and provides a foundation for future work to reduce greenhouse gas emissions in City of Beacon.

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from government operations of the City of Beacon government. The government operations inventory is a subset of the community inventory (see Figure 4); for example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

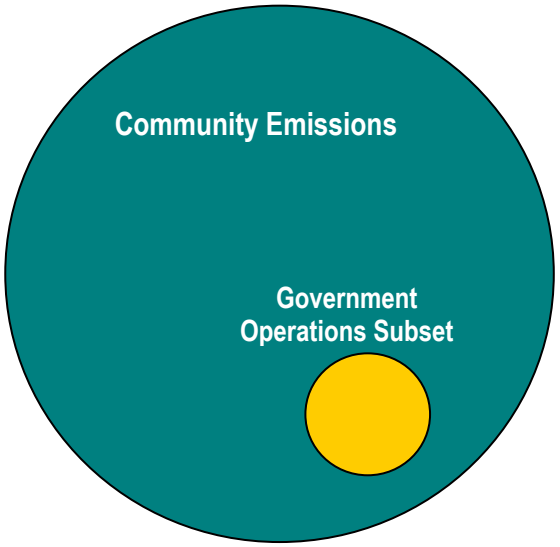


Figure 3: Relationship of Community and Government Operations Inventories

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the Community Greenhouse Gas Emissions Protocol (Community Protocol)[3].

Three greenhouse gases are included in this inventory: carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Carbon dioxide represents the vast majority of the community emissions and is produced from burning fossil fuels such as coal, gasoline, diesel, and natural gas. Methane accounts for about two percent of community-wide emissions, and comes primarily from waste decomposition in landfills and from local natural gas distribution system leakage, as well as small amounts as a byproduct of fuel combustion. Nitrous oxide is the smallest contributor to the inventory and comes from wastewater treatment process emissions, as well as small amounts as a byproduct of fuel combustion.

Quantifying Greenhouse Gas Emissions

Sources and Activities

Communities contribute to greenhouse gas emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by “sources” located within the community boundary, and 2) GHG emissions produced as a consequence of community “activities”.

3 http://www.icleiusa.org/tools/ghg-protocol/community-protocol

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary.

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

  Activity Data x Emission Factor = Emissions

All emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see Methodology Details section for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs. CO_2/kWh of electricity).

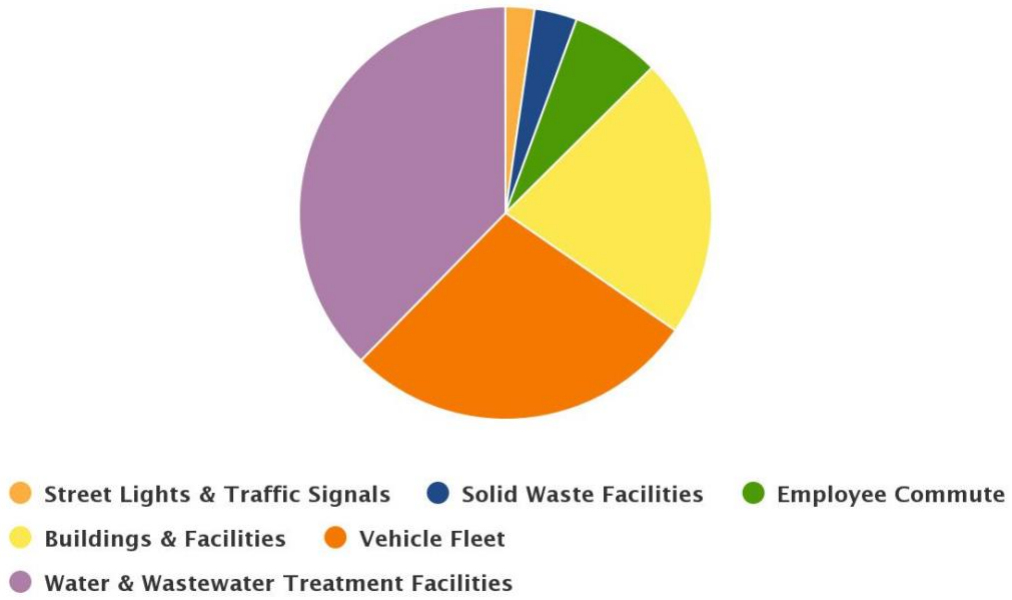
Government Operations Inventory Results

Government operations emissions for 2019 are shown in Table 1 and Figure 4. Water and wastewater treatment facilities are the largest contributors to government operations emissions, followed by the vehicle fleet.

Table 1: Government Operations Inventory Results

Sector	Fuel or source	2019 Usage	Usage unit	2019Emissions ($MTCO_2e$)
Buildings	Electricity	845,825	kWh	113
Buildings	Natural gas	66,666	therms	355
Buildings total				**468**
Street lights & Signals	Electricity	356,580	kWh	48
Street light total				**48**
Vehicle fleet	Gasoline	35,320	gallons	310
Vehicle fleet	Diesel	27,070	gallons	276
Vehicle fleet total				**586**
Employee commute*	Gasoline	13,770	gallons	122
	Diesel	808	gallons	8
Employee commute total				**130**
Solid waste*	Government generated waste	253	tons	71
Solid waste total				**71**
Water & wastewater treatment	Electricity	4,212,043	kWh	566
	Natural gas	13,017	therms	69
	Process emissions*		N/A	162
Water & wastewater treatment total				**797**
Government operations total emissions				**2,100**
Sunlight Beacon production**		3,318,305	kWh	-446
Emissions net of solar production				**1,654**

Figure 4: 2019 City Operations GHG Emissions by Sector



The electricity usage for the highest usage facilities in 2019 were the wastewater treatment and water supply facilities. This is typical for cities that operate water and wastewater treatment, as many energy intensive processes are needed to safely and effectively treat the water and wastewater. Nevertheless, the water and wastewater facilities should be a high priority for evaluating energy efficiency and onsite renewable energy opportunities.

Employee Commute Survey

A survey of employee how employees get to work was conducted in order to obtain data needed to calculate employee commute emissions. The survey also asked questions about willingness to consider different transportation options, and what would encourage them to use a different option. Currently, 97% of Beacon employees normally drive alone to work. However, many employees are willing to consider different modes, as shown in figure 5. Eighteen percent would consider bicycling, and sixteen percent would consider carpooling. Employees reported that safe bike lanes are the number one thing that would encourage them to bike to work, as shown in Figure 6. Employees who already bike to work, either daily or occasionally, would be a good starting point

for additional engagement to identify priorities for improved bike infrastructure. Improved bike infrastructure would support reductions in community-wide transportation emission as well as those from employee commute.

Figure 5: Percent of employees who would consider alternate commute modes

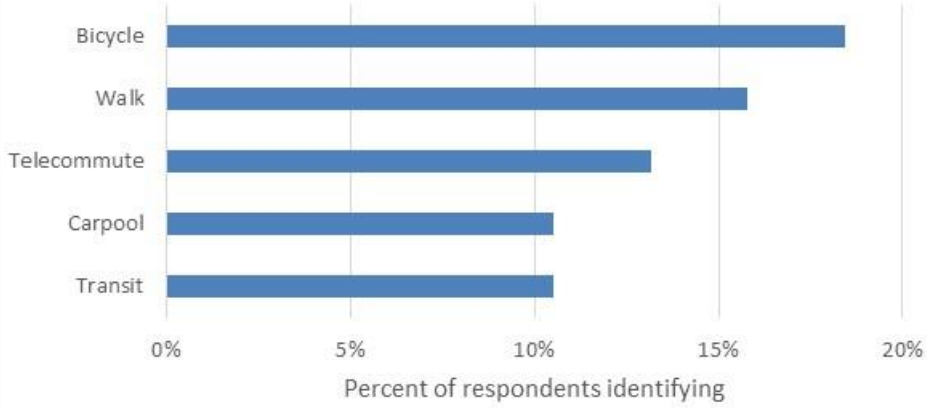
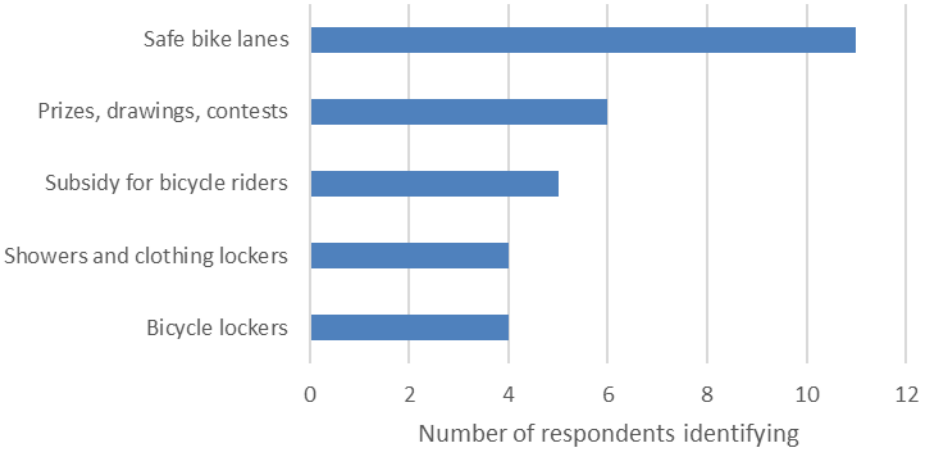


Figure 6: Top five ways to encourage bicycling to work



Government Operations Next Steps

The inventory results should be used to focus and prioritize actions to reduce emissions. Based on the inventory results, the following areas have the greatest potential for emissions reduction:

- Continued energy efficiency improvements to water and wastewater facilities, as well as other facilities.
- Where feasible, replacing fleet vehicles with electric vehicles, or with more efficient vehicles.

Annual tracking of energy use in City buildings and facilities, with completion of another complete GHG inventory in two to five years, is recommended in order to assess progress resulting from any actions implemented. The

detailed methodology section of this report, as well as notes and attached data files in the ClearPath tool and a master data Excel file provided to the City of Beacon, will be helpful to complete a future inventory consistent with this one.

Methodology Details

Government Operations Inventory Data

Buildings and Facilities

Central Hudson provided a report of electricity and natural gas usage by facility for 2019. Electricity emissions factors were obtained from EPA's eGRID[4], and are shown in Table 3.

Table 3: Electricity Emissions Factors

Year	CO_2 (lbs./MWh)	CH_4 (lbs./GWh)	N_2O (lbs./GWh)
2018	253.1	18	1

*2018 is the most recent data available from eGRID, and was used for both 2019.

Street Lights and Traffic Signals

Electricity usage for street lights and traffic signals was collected as described above for buildings and facilities. Electricity emissions factors from eGRID were used as shown in Table 3.

Vehicle Fleet

Total gallons of diesel and gasoline fuel by department used in city vehicles for 2019 were collected from city records. Emissions were calculated using per gallon emissions factors from Table G.1 of the LGO Protocol.

Employee Commute

A survey of how employees get to work was conducted in November 2019. 39 employees out of a total of 100 responded to the survey, a participation rate of 39%. Survey respondents reported their one-way commute distance, the number of days/year they worked, and the fuel type and miles per gallon (MPG) of their vehicle. In addition, they reported if they used carpooling, transit, bicycling or walking to get to work. This data was used to calculate the annual commute VMT and gallons of fuel for each responding employee. Two of the respondents indicated they bicycle to work every day, while the remaining respondents drive alone to work every day. From these numbers, average MPG was calculated for gasoline and for diesel vehicles. The VMT from respondents was then multiplied by 100/39, to estimate VMT for all employees. The average MPG numbers were used along with the VMT for each fuel type to calculate emissions. These values are shown in Table 7.

4 https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

Table 7: Employee Commute VMT and MPG

Fuel	Employee commute VMT	Average MPG
Gasoline	317,101	23.03
Diesel	12,564	15.56

Water and Wastewater Treatment Facilities

Natural gas and electricity usage data were collected as described above for buildings and facilities. Electricity emissions factors were used as shown in Table 3.

N_2O emissions from effluent discharge were calculated based on data provided by Water and Sewer Department. The department indicated an N load discharge of 370 lbs/day; emissions were calculated from this using factors and equations in the LGO Protocol.[5]

In addition, nitrification/denitrification process emissions from the wastewater treatment facility were calculated based on a population of 15,000 served by the facility[6] and default emissions factors from the Local Government Operations Protocol.[7]

Conclusion

A greenhouse gas inventory is an excellent baseline from which to measure your progress. ICLEI's ClearPath tool allows your community to use the inventory results to conduct a business-as-usual scenario, set targets for reductions, and analyze opportunities to reduce GHG emissions.

Local governments can act directly in areas for which they have judicial authority, operational control or ownership and through advocacy to regional, state, and national bodies with these levels of authority.

Some of these strategies are highlighted on pages 12 and 16 of this report, including:

- Encourage bicycling, walking, and transit use by City employees.
- Promotion of electric vehicles (EVs) to replace gasoline and diesel City vehicles when possible.
- Energy efficiency for City facilities.
- Conversion of heating to heat pumps for both City facilities.

Local actions in each of these areas can make a significant contribution to reducing GHG emissions, and to maintaining cost-effective local government services and a high quality of life for Beacon residents.

5 https://www.theclimateregistry.org/tools-resources/reporting-protocols/local-goverment-operations-protocol/
6 The department indicated that a small population outside the City of Beacon is served by the facility, but the exact population outside the city that is served is not known.
7 https://www.theclimateregistry.org/tools-resources/reporting-protocols/local-goverment-operations-protocol/