



The Village of Bronxville Westchester County, NY

2018 Inventory of Government Operations Greenhouse Gas Emissions

April 2022

**Produced by
the Village of Bronxville
Climate Smart Communities Task Force**

With Technical Assistance from ICLEI Local Governments for Sustainability USA

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Executive Summary

Introduction

The world stands at a crossroads. Climate change has been firmly established by an ever-growing body of scientific evidence to be real, manmade, and already catastrophic for large numbers of people around the globe. Even in the U.S., which contributes most to climate change per capita, our citizens have suffered storms, wildfires, and flooding that are exacerbated by climate change. Numerous reports, most recently the Intergovernmental Panel on Climate Change produced by the United Nations in February and April of 2022, tell us that the world must drastically reduce its release of greenhouse gases produced by the burning of fossil fuels by 2030 to have any chance of restricting a global rise in temperature to 1.5 degrees Celsius, reiterating the goal set in the 195 nation Paris Climate Agreement of 2015. Beyond that point, global climate systems are expected to be so disrupted that they cannot be repaired with any existing technologies, and great sections of the globe are expected to become uninhabitable for humans and many other species.

New York State became a leader on this issue when, in 2019, it passed the Climate Leadership and Community Protection Act (CLCPA). This legislation sets into law ambitious targets that scientists tell us we must meet to avoid the worst effects of climate change. Those include 70% electricity from renewable sources by 2030 and an 85% reduction of fossil fuel emissions along with carbon neutrality by 2050. (Carbon neutrality means that although we will still emit greenhouse gases, they will all be offset by technologies and natural systems that capture and retain 100% of those emissions.)

Although federal action is needed to address the biggest contributors to greenhouse gas emissions (GHG), local governments, which seek to build healthy communities for their residents, have a huge role to play.

In this context, recognizing the urgent need to act both to mitigate climate change and to strengthen our ability to adapt to its impacts, in February 2021, the Bronxville trustees passed a resolution to join New York State's Climate Smart Communities (CSC) program. ([CSCFactSheetModelRes2020_v2.pdf \(ny.gov\)](#)). The Village of Bronxville's Climate Smart Communities Task Force, formed to implement CSC activities, has undertaken various steps to document climate impacts, mitigation, and planning for future sustainability. This report, which is one of the CSC high priority action steps, provides estimates of greenhouse gas emissions resulting from activities within the Village's government operations for a baseline year of 2018. Data will be updated periodically to measure the Village's progress in reducing greenhouse gas emissions.

Methodology

Data for this report were collected from Village records by examining utility bills for each month of 2018 for electricity, heating oil, natural gas, and water usage. Where there were missing data, information was imputed from recent months or adjacent years. The Village also undertook a complete inventory of all vehicles owned and operated by the Village, including vehicles used by administration, the police department, and the Department of Public Works (DPW). Data on miles driven per year, miles per gallon (MPG) and weight/size classification were used to estimate total gasoline or diesel consumption for 2018. Records for operation of the Midland Avenue Firehouse were provided by the Eastchester Fire District. In addition, Village of Bronxville employees were surveyed for their

distance and mode of commuting to work in calendar year 2018. Based on the portion of employees who responded, these estimates were then projected to estimate emissions for the full workforce commute. We used software and data conventions provided by the ICLEI-Local Governments for Sustainability USA organization to conduct our work, and results use standard international units which are expressed in the metric system.

Key Findings

Figure 1 shows the Village of Bronxville local government operations emissions for 2018. The data provided here are the operations for which the village has jurisdictional or contracted authority (such as buildings like Village Hall, the Library, and the Firehouse, and operations like trash collection and policing and fire protection). As such, they do not reflect all emissions produced by municipal operations since we could not disaggregate some functions like solid waste volume or energy used in wastewater treatment by municipal operations from total population data, or account for all process and fugitive emissions (e.g. emissions arising from production or transport of energy used in Village operations). The figure represents carbon dioxide (CO₂) equivalents of three types of emissions (carbon dioxide, methane, and nitrous oxide) from combustion of fossil fuels or production of electricity. A total of 765.3 MT (metric tons) of CO₂e greenhouse gas emissions are reflected in the sectors included in our data set (this is equivalent to 857.1 US tons, or 1,714,272 pounds). The buildings and facilities sector accounts for a majority (38.0%) of these emissions. The next largest contributor is street & outdoor lighting and traffic signals (23.6%), followed by employee commuting (21.2%) and vehicles owned by the Village for administration, police, and Department of Public works activities (17.1%). Fugitive emissions from use of natural gas were estimated at 0.13%.

Actions to reduce emissions from these sectors will be a key part of any future climate action plan developed by the Village of Bronxville. The remainder of this report provides a detailed profile of emissions sources, information that is key to guiding local reduction efforts. These data will also provide a baseline against which the Village will be able to compare future performance and demonstrate progress in reducing emissions.

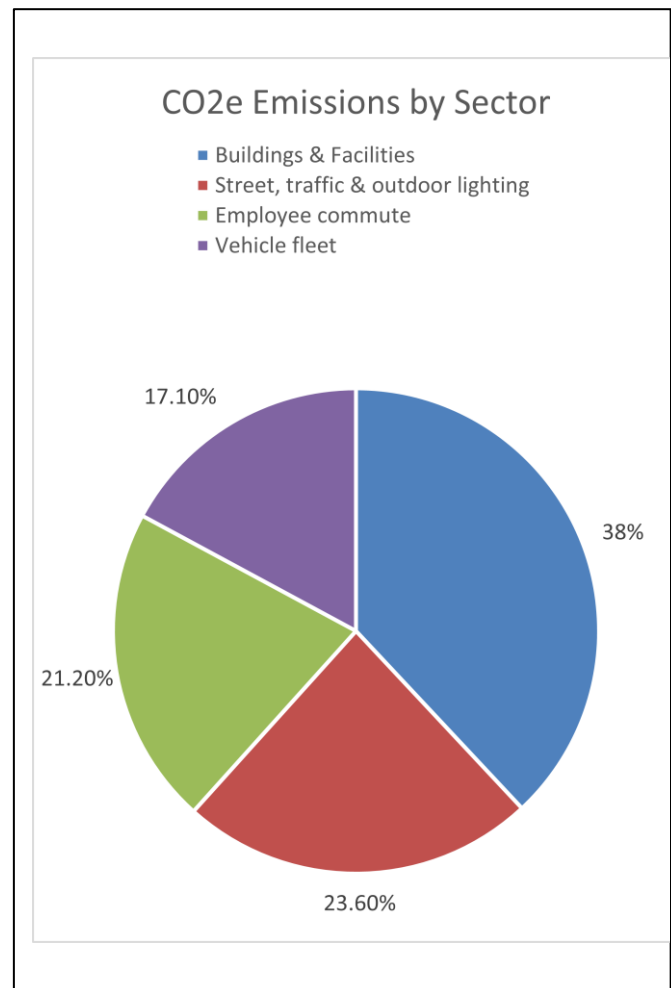


Figure 1: Village Operations Emissions by Sector- Estimated total CO₂

The Village of Bronxville 2018 Greenhouse Gas Inventory Report

The Village of Bronxville 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. While over the last decade the Village has taken steps to become more energy efficient, by installing a geothermal heating and cooling system in Village Hall, transitioning traffic signals to LED bulbs, promoting recycling, and inaugurating a residential food scrap recycling program, these efforts have taken place without an understanding of the overall climate impacts of Bronxville’s municipal operations and ways they might be lessened.

In order to take steps both to mitigate climate change and to strengthen the Village’s ability to adapt to its impacts, in February 2021, the Bronxville trustees passed a resolution to join New York State’s Climate Smart Communities (CSC) program. ([CSCFactSheetModelRes2020 v2.pdf \(ny.gov\)](#)) The CSC program supports local government efforts to reduce greenhouse gas emissions, adapt to the increasing threats of climate change, and develop a productive green economy for its residents and businesses. The CSC program seeks to improve the livability, health, resilience, and equity of all communities.

The Village created a Climate Smart Communities Task Force consisting of a staff coordinator, a Village Trustee, and several members of the Bronxville community to guide the CSC work. The Village of Bronxville’s Climate Smart Communities Task Force identified a number of action steps outlined in the CSC program that address areas of opportunity to address climate mitigation and resiliency within its municipal operations and overall community activities. Undertaking some of these action steps will qualify the Village for technical assistance and grant funding through various state agencies. One high priority step defined by the CSC, was to conduct a data-based Greenhouse Gas (GHG) Inventory for municipal operations. By establishing a baseline or benchmark of greenhouse gas emissions in our municipal operations, the inventory will help us determine the most impactful next steps and monitor our progress in reducing future emissions.

This report provides estimates of greenhouse gas emissions resulting from activities within the Village’s government operations for a baseline year of 2018. This report was facilitated by technical assistance and software programming provided by ICLEI Local Governments for Sustainability USA, which the Village of Bronxville joined in August 2021. The report follows the recommendations of the CSC New York Community and Regional GHG Inventory Guidance, 2015 ([New York Community and Regional GHG Inventory Guidance \(ny.gov\)](#)), the Local Government Operations Protocol for the quantification and reporting of greenhouse gas emissions inventories, Version 1.1, 2010 ([Local Government Operation Protocol](#)), and the US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2, 2019 ([US Community Protocol - \(icleiusa.org\)](#))

Introduction to Climate Change

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. Global climate change influences seasonal patterns and intensifies weather events, threatening the safety, quality of life, and economic prosperity of communities everywhere¹. Many regions are already experiencing the consequences of global climate change, and the Village of Bronxville is no exception.

Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (high confidence estimate). Warming from anthropogenic emissions from the pre-industrial period to the present will persist for centuries to millennia and will continue to cause further long-term changes in the climate system, such as sea level rise, with associated impacts (high confidence estimate), but these emissions alone are unlikely to cause global warming of 1.5°C (medium confidence estimate). Climate-related risks for natural and human systems will be higher than present risks when we reach 1.5°C, but lower than reaching 2°C (high confidence estimate). These risks depend on the magnitude and rate of warming, geographic location, type of land use development and vulnerability, and on the choices and implementation of adaptation and mitigation options (high confidence estimate).²

According to a New York State Energy Resource and Development Authority (NYSERDA) in a 2014 overview of climate change risks to New York ([2014-ClimAid-Report.pdf](#)), overall temperature changes have already risen about 2.4 degrees Fahrenheit (or 1.3 degrees Celsius) in the last 50 years in the state, with warmer winters and more cooling degree days in summers (e.g. days when the temperature exceeds 65 degrees and may require energy use to make living and working environments comfortable). Westchester specific data updated in 2021 ([www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf](#)), shows a 2 degree Fahrenheit average increase (or 1.1 degrees Celsius). Since climate impacts are uneven globally, this suggests New York state overall, as well as Westchester County, may be more at risk than some other geographic areas.

Since the 1950s the amount of moisture in storms in our area increased by 70%, with less winter snow but more rain from December to April. Sea levels have risen over a foot in the last century and may rise two feet by 2050, affecting rivers like the Bronx River which connect to tidal systems. The Hudson River has already risen 1 foot in the

¹ International Panel on Climate Change. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. Retrieved from <https://www.ipcc.ch/report/ar5/syr/>

² IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

last century. Effects of climate change impact agriculture, the ecological health of the natural environment, air pollution, migration of invasive species, and the frequency of new diseases, like Zika or Dengue fever, which result from insect migration to warmer areas. In 2021, the New York State Department of Environmental Conservation (www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf) updated many of the findings from earlier in the decade, noting in particular, increases in heat waves, severe storms with high precipitation, and major winter storms as being major risks.

In a 2021 update of the Westchester County Hazard Mitigation Plan, high risks for the Village of Bronxville are identified as flooding and severe rainstorms, with a medium risk of severe winter storms. About 20 properties in the Village have been exposed to repeated flooding losses, as identified by the National Flood Insurance Program. The most vulnerable areas of the Village are Parkway Road, Stone Place, lower Milburn, and Paxton Avenue. According to a FEMA Storm Events Database involving flooding, wind damage and power outages, from 2001-2021, 48 storm events were recorded in Westchester County. Three of these were widespread, 3 were focused in Bronxville, and an additional 10 occurred in abutting areas such as Fleetwood, Yonkers, Mt Vernon and Tuckahoe. Overall, 31% of storm events in Westchester County in the last 20 years, before Hurricane Ida, had some impact on Bronxville.

Hurricane Ida: Lower Milburn Street & Bronx River Flooding September 2021 *(credit: Village Staff & Bronxville Green Committee)*



Many communities in the United States have started to take 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.

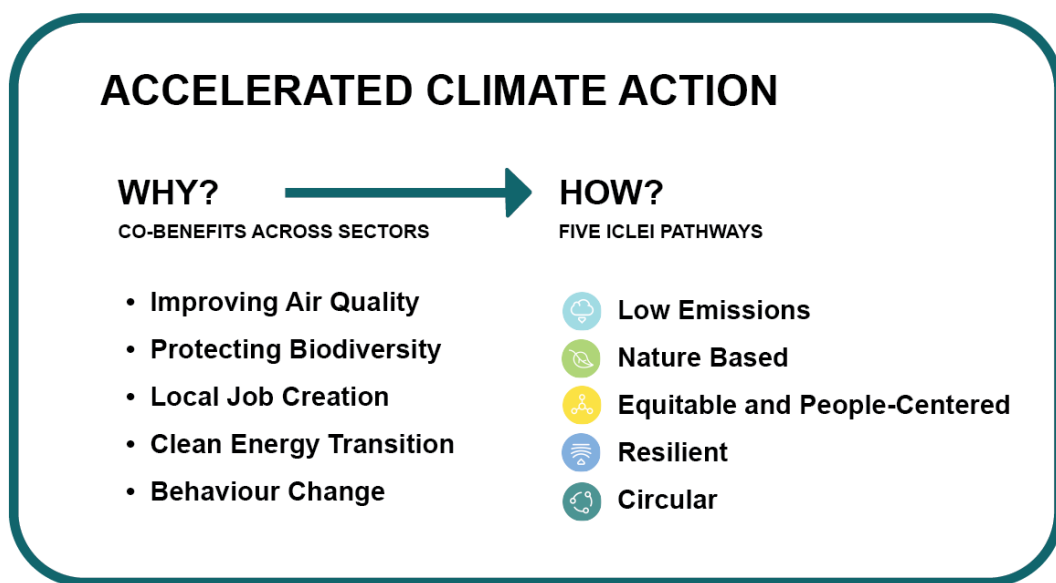
In addition, when residents save on energy costs, they are more likely to spend at local businesses and add to the local economy. Reducing fossil fuel use improves air quality and increasing opportunity for walking and bicycling improves residents' health.

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change.

Cities, towns and counties are well placed to define coherent and inclusive plans that address integrated climate action — climate change adaptation, resilience and mitigation. Existing targets and plans need to be reviewed to bring in the necessary level of ambition and outline how to meet the goal of carbon neutrality, also labelled net-zero emissions, by 2050, goals outlined in the 2015 Paris Climate Agreement and the New York State Climate Leadership Plan of 2019. Creating a roadmap for climate neutrality requires The Village of Bronxville to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and many other impacts that can also deliver on sustainable development.

To complete this inventory, the Bronxville Climate Smart Communities Task Force utilized tools and guidelines from Local Governments for Sustainability USA (ICLEI), which provides authoritative direction for greenhouse gas emissions accounting and defines climate neutrality as follows:



ICLEI stands for a goal of reduction of greenhouse gas (GHG) emissions and GHG avoidance in government operations and across the community in all sectors to an absolute net-zero emission level by 2050 at the latest. In parallel to this, it is critical to adapt to climate change and enhance climate resilience across all sectors, in all systems and processes.

To achieve ambitious emissions reduction, and move toward climate neutrality, the Village of Bronxville will need to set clear goals and act with thoughtful but deliberate speed. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, addressing inequality, and improving the health of people and nature.

ICLEI Climate Mitigation Milestones

In response to the climate emergency, 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, as well as influencing regional emissions through partnerships and advocacy. 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.

ICLEI provides a framework and methodology for local government organizations (LGO) to identify and reduce LGO greenhouse gas emissions, organized along Five Milestones, also shown in Figure 2:

1. Conduct a LGO inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions target;
3. Develop a LGO 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 LGO Mitigation Milestone One, and provides a foundation for future work to reduce LGO greenhouse gas emissions in the Village of Bronxville.



Figure 2: ICLEI LGO Mitigation Milestones

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible LGO greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in government operations. This report presents emissions from operations of the Village of Bronxville government. The government operations inventory is a subset of the community inventory, as shown in Figure 3. For example, data available from utilities on community-wide, county or state data on total commercial energy use includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates (VMT) include miles driven by municipal fleet vehicles.

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 Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol), which is described below.



Figure 3: Relationship of Community and Government Operations Inventories

Three greenhouse gases are included in this inventory: carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). They are calculated from inputs in units easily derived from utility billing and municipal records such as kilowatt hours (kwh), gallons and fuel type, vehicle miles traveled (VMT), and therms (a therm is equal to 100 cubic feet of natural gas and is equivalent to 100,000 British thermal units of heat). The ICLEI ClearPath inventory calculator converts input data to emissions in “carbon dioxide equivalent” (CO₂e) values, calculated using the Global Warming Potentials (GWP) for methane and nitrous oxide from the IPCC 5th Assessment Report:

Table 1: Global Warming Potential Values (IPCC, 2014)

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	28
Nitrous Oxide (N ₂ O)	265

Local Government Operations Protocol

In 2010, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released Version 1.1 of the LGO Protocol.³ The LGO Protocol serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory.

The focus of the LGO inventory is on emissions activities that are under operational and jurisdictional control of the local government entity. In contrast, a community-wide GHG inventory aims to estimate community wide sources of GHG (physical processes within jurisdictional boundaries that release GHG into the atmosphere) and activities (use of energy, material, or services by members of the community that may originate elsewhere but also create GHG). The Village of Bronxville is undertaking a separate community GHG inventory that will provide a broader picture of the community's GHG footprint.

The LGO protocol for collecting and quantifying data includes three Scopes (identifying source of GHG emissions) and 9 Factors or Sectors (identifying the types of operations that produce GHG). For purposes of reporting accuracy, the LGO Protocol specifies information about Scope 1 and 2 emissions are mandatory, while Scope 3 is optional.

Scope 1 consists of **direct** GHG emissions such as burning of natural gas or heating oil in a municipal building and use of fuel in government owned vehicles.

Scope 2 consists of use of **indirect** GHG emissions, primarily from use of purchased electricity generated outside of the jurisdiction.

Scope 3 consists of other **indirect** GHG emissions not included under Scope 2, for which there is not direct operational control, such as our Midland Avenue Firehouse; outsourced solid waste, potable water and wastewater treatment not within the community, employee commute emissions, and what are called process and fugitive emissions, e.g. emissions released due to producing and transporting the energy sources used by local government. Many of these activities will be estimated when the Village undertakes the community wide GHG inventory.

The following activities are included in this Village of Bronxville LGO inventory:

- Scope 1: Heating oil, natural gas, and propane consumption by Village of Bronxville buildings, and facilities; and use of gasoline and diesel by vehicles for administration, the Police Department, and the Department of Public Works.
- Scope 2: Purchased electricity for the operation of buildings, traffic signals, streetlights and other outdoor lighting.
- Scope 3: Estimates of employee commuting GHG emissions based on an employee survey and extrapolated to the full workforce, including the Firehouse staff; energy use by the Midland Avenue Firehouse operated by the Town of Eastchester Fire District; and fugitive emissions estimates for the use of natural gas by the Village of Bronxville municipal buildings.

³ ICLEI. 2008. Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved from <http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol>

Base Year

The inventory process requires the selection of a base year with which to compare current and future emissions. The Village of Bronxville 's LGO greenhouse gas emissions inventory utilizes the 2018 calendar year as its baseline year, because ICLEI software utilizes 2018 emissions factors derived from other research data (such as the proportion of electricity in NYS in 2018 that is generated from solar, wind or hydro vs burning of fossil fuels) to calculate emissions. In addition, we found relatively complete information on municipal operations for 2018 before the major disruptions and changes of the COVID-19 pandemic, and 2018 provides a reasonable benchmark for a 5-year follow-up reassessment, taking into account ongoing changes the Village is making to improve sustainability.

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:

$$\text{Activity Data} \times \text{Emission Factor} = \text{Emissions}$$

The 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. Specifications for how this report made calculations are provided when detailing the results for each Scope and Factor set included in the report. 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 CO₂/kWh of electricity). For this inventory, calculations were made using ICLEI's ClearPath tool.



Government Operations

Emissions Inventory Results

The data for this report will be reported by Scope and Factor (or Sector) and illustrated with data for various municipal buildings and municipal operations. A summary of all emissions included can be found in Table 2 and Figure 18.

Scope 1 & 3 emissions:

Buildings and facilities sector:

Information for direct burning of fossil fuels was collected by obtaining bills for the calendar year 2018 for heating oil gallons delivered and for ConEd natural gas for each municipal building: Village Hall, the Library, the old DPW building (note this building was replaced by a new structure in 2020-2021), and the Firehouse (because operated by the Town of Eastchester, heating oil used by the Firehouse is considered a Scope 3 emission). The Village also provides propane heat for the paddle court area. If a specific monthly bill was missing, the amount of fuel used was estimated from 2019 bills. For the paddle court propane use, 2018 bills were not available, so 2019 data were used.

Heating oil/propane use in buildings & facilities

A total of 11,265 gallons of heating oil was used by the Village operations: 3192 by the Library, 4005 by Village Hall, 4068 by the Firehouse. A total of 935 gallons of propane were used for the paddle court. Comparing efficiency across the buildings is difficult however, because, for example, Village Hall (Police Department) and the Firehouse operate 24 hours every day (168 hours weekly), while the library operates a total of about 52 hours a week. However, calculating total gallons used per square foot results in Village Hall use of 0.195 gallons per sq ft, the Library 0.165 gallons per sq ft, and the Firehouse 0.624 gallons per sq ft.

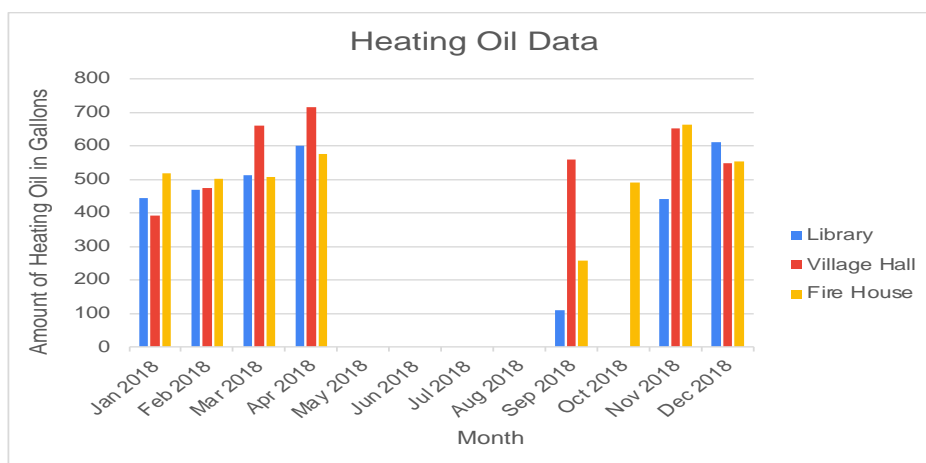


Figure 4. Monthly Heating Oil Use by Building

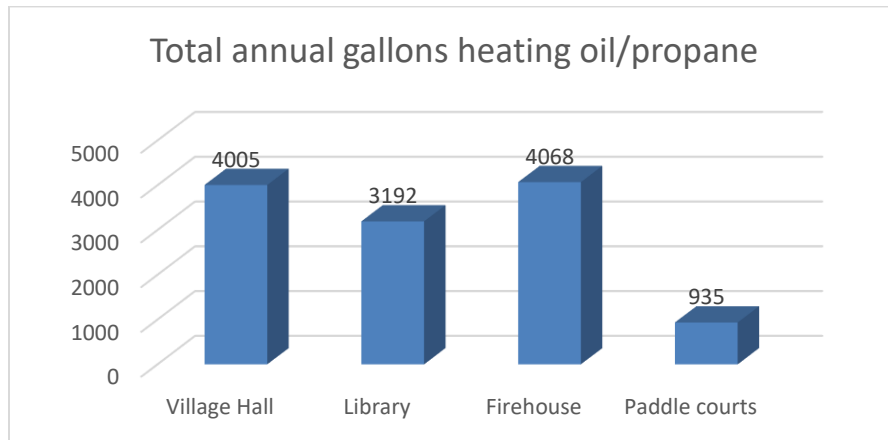


Figure 5. Annual Heating Oil & Propane Use



Village of Bronxville Library (credit Bronxville Green Committee)

Natural gas use in buildings:

Only two Village buildings used natural gas, with the old DPW building consuming 7808 therms, while the Library used only 421 therms.

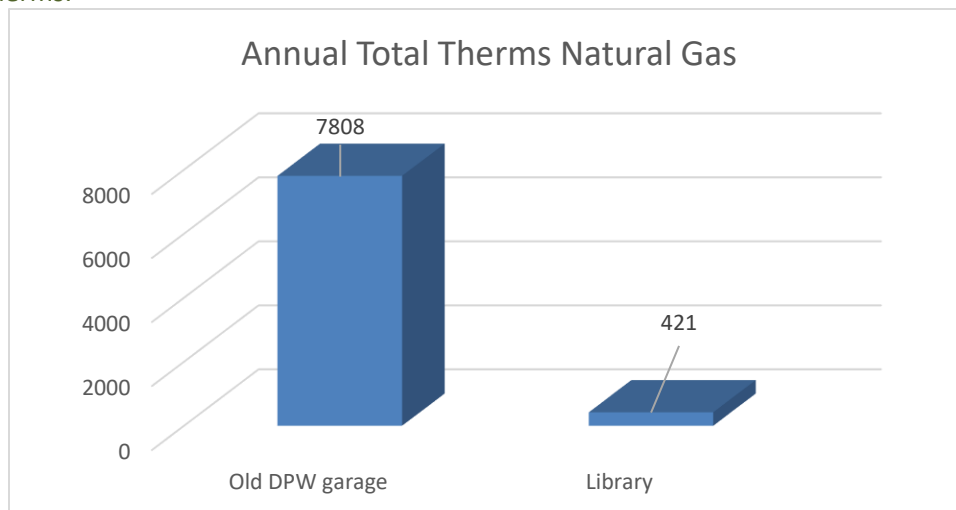


Figure 6. Total Therms Natural Gas Use by Building

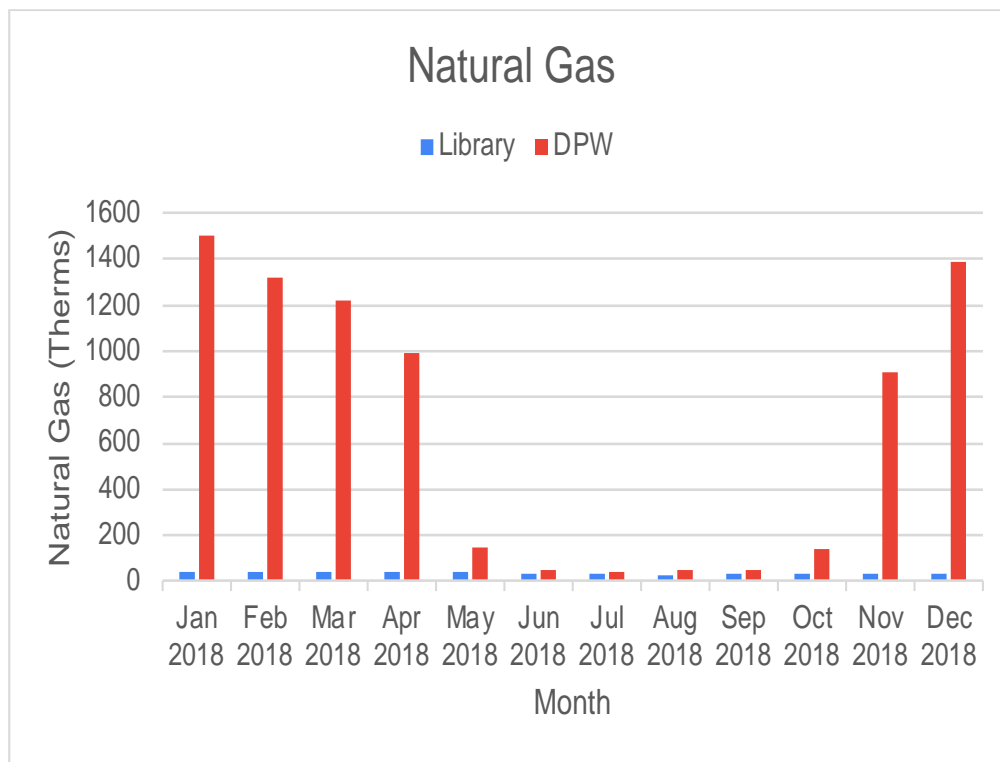


Figure 7. Natural Gas Use by Month

Vehicle fleet sector:

The Village of Bronxville conducted a fleet inventory of its vehicles in fall 2021. All vehicles then in operation were tallied and information about assigned department, model year, type of vehicle, type of fuel, Gross Vehicle Weight, MPG, and odometer readings were provided. Verification was cross checked with Village insurance records. This inventory included both passenger vehicles (administrative and police department) and maintenance/construction and waste collection vehicles (DPW). Information was extracted for a total of 31 vehicles, 2 administrative, 9 police department, and 20 DPW. Vehicles that were purchased after 2018 (n= 7) were excluded from the totals. In addition, 5 DPW vehicles indicated as trailers, leaf vacuums etc. which do not have their own power or for which odometer or MPG data were missing were deleted. Calculations for total annual gasoline or diesel consumption across the 31 vehicles by department were made by dividing the total odometer readings by estimated years in service based on model year to obtain estimated annual miles and that was divided by recorded MPG. Total gasoline consumption for Village operations was 6548 gallons and 107,625 vehicle miles travelled (VMT), with an average MPG of 16.4 gallons. Total diesel consumption for Village operations was 5894 gallons by the DPW department, and 52,153 VMT, with an average MPG of 8.8 MPG.

For the Firehouse (considered Scope 3 emissions), the Eastchester Fire District provided diesel pump deliveries for the main and secondary fire engines used at the Midland Avenue firehouse as well as VMT for 2018. The fire engines consumed 1291 gallons of diesel fuel and travelled a total of 3696 miles, for an average 3.1 MPG. The charts below show total fuel consumption and VMT by department.

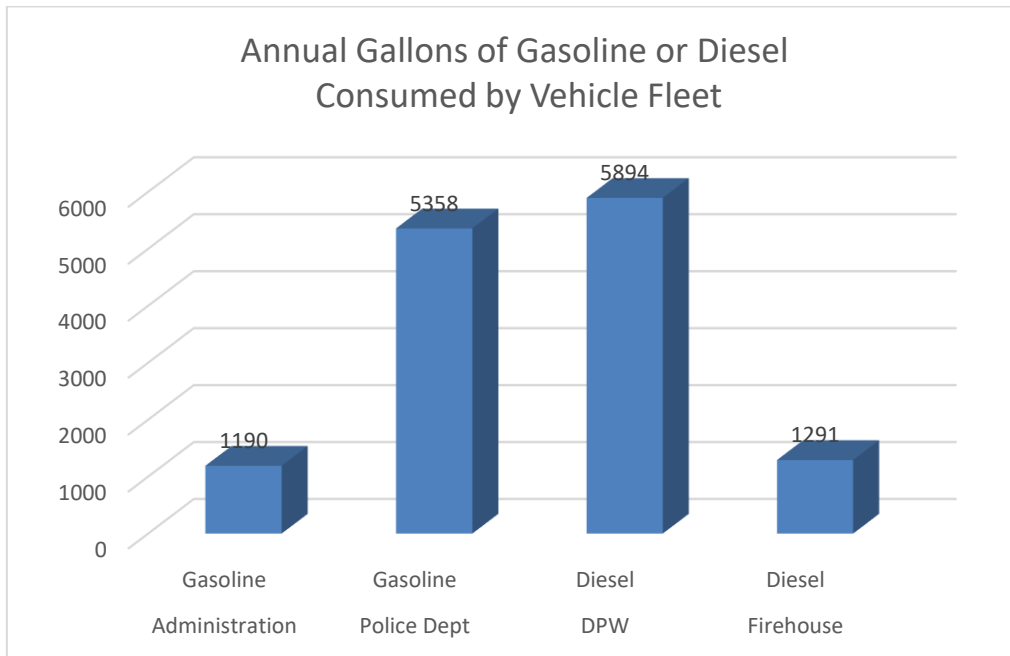


Figure 8. Gasoline & Diesel Annual Fleet Consumption

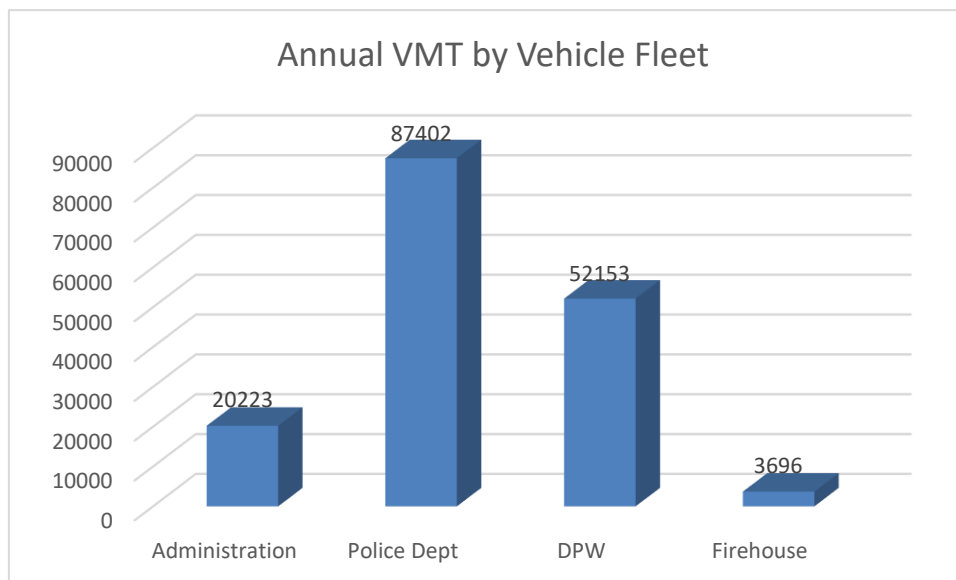


Figure 9. Total Annual Vehicle Miles Travelled by Fleet

Midland Avenue Firehouse-operated by Eastchester Fire District
(credit Bronxville Green Committee)

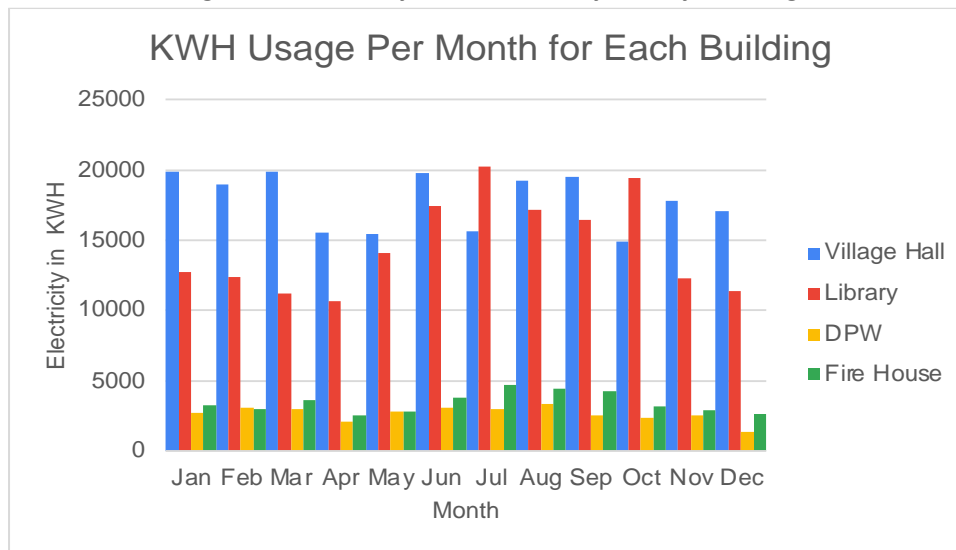


Scope 2 emissions:

Purchased electricity buildings sector:

Electricity consumption for buildings was extracted from New York Power Authority (NYPA) bills collected for 2018. NYPA bills were also provided for the Midland Avenue Firehouse from the Town of Eastchester Fire District. Bills for January 2018 were missing from both town’s records so January 2018 electric use had to be estimated from 2019 data. The charts below show kwh usage per month by building as well as annual totals per building. The most kwh consumed was for Village Hall (213,640 kwh), followed by the Library (175,520 kwh), with the old DPW garage (32,172 kwh) and the Firehouse (41,392 kwh) consuming considerably less electricity. Total annual building kwh of electricity consumption was 462,724 kwh.

Figure 10. Monthly KWH Electricity Use by Building



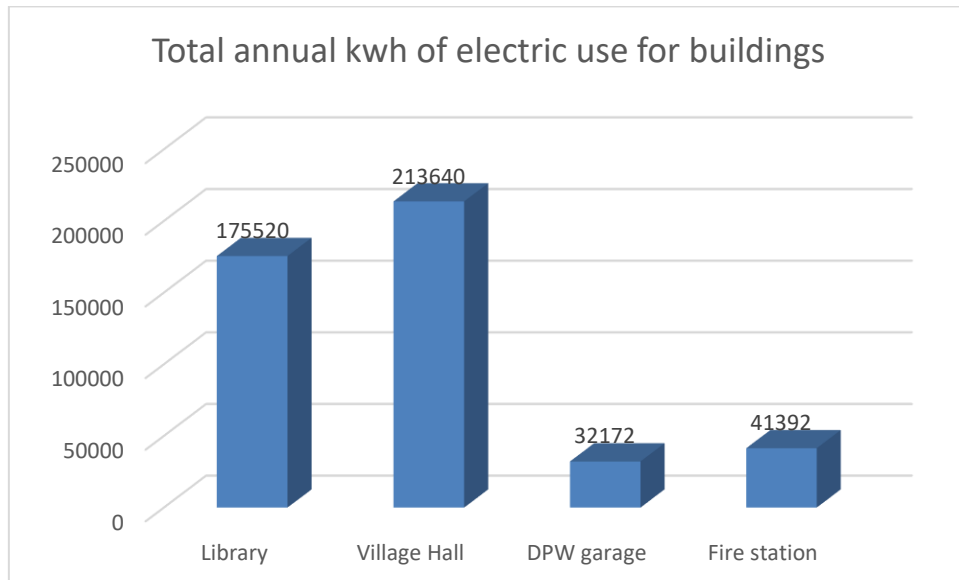


Figure 11. Total Annual KWH Electricity Use by Building

Purchased electricity traffic signals, streetlights and other outdoor lighting sector:

Electricity used for traffic signals, streetlights, and other outdoor lighting was estimated from NYPA bills for 2018. NYPA provided totals for traffic and street lighting, and separately indicated a total of individual metered kwh that included buildings as well as other outdoor lighting such as for parking lots around the train station. Total electricity for buildings was calculated from the monthly NPYA bills and then subtracted from the monthly NYPA total metered kwh in order to separate building operations (reflected above) from other metered outdoor electricity uses and traffic signals and streetlighting. A total of 603,661 kwh was used by traffic signals and streetlights, while 62,725 kwh were used by other outdoor metered lighting.

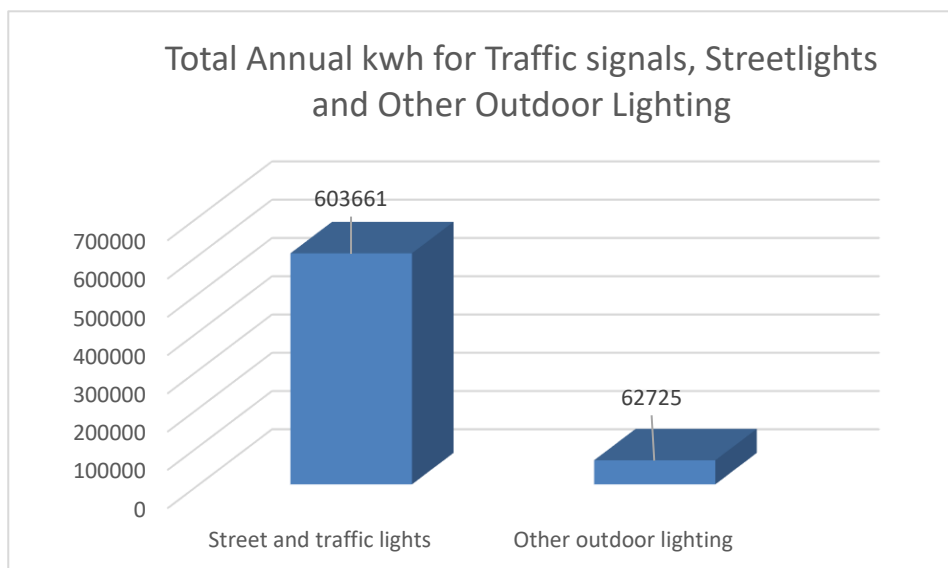


Figure 12. Total Annual KWH Electricity for Outdoor Uses

Street lighting example (credit Bronxville Green Committee)



Scope 3 emissions:

Scope 3 emissions not already reflected above in the reporting on Buildings and Facilities and Vehicle Fleet included employee commute estimates from the Village of Bronxville employee survey and extrapolated to the Firehouse staff. In addition, we had the ClearPath software calculate the fugitive emissions (e.g. leakage) attributed to natural gas use in Village buildings.

Employee commute sector:

A large portion of Scope 3 emissions and total municipal emissions (21.2%) are reflected in the employee commute data. An employee commute survey was conducted in February 2022. An employee-wide email was distributed asking for anonymous data from employees who were employed by the Village in 2018 to provide information about their commuting during that year. To be as accurate as possible, employees were asked how many weeks of the year they typically worked (eliminating vacations, holidays, sick time etc.), and how many days a week they typically commuted to work. We then asked the miles of their one-way commute and how many days they used different modes of commuting (e.g. driving a car, a motorcycle, walking or biking, taking the bus, Metro North, or taking a cab/uber). If driving a passenger vehicle was indicated, we asked the type of fuel used (e.g., gasoline, diesel, electric) and the MPG for the vehicle. If they did not know the MPG they were asked to write in the make/model/year of the vehicle so average MPG could be located online. Additional questions were asked to estimate if they commuted from different locations in that year (none reported) or used different vehicles on different days (one response).

A total of 27 out of approximately 60 full-time and 40 part-time Village of Bronxville employees responded to the survey, 20 full-time (33.3% of total) and 7 part-time (17.5% of total) employees. According to the Town Manager, there is turnover of only 1-2 employees a year, so we anticipate the collected data reflect fairly accurately the commute patterns of the total Village workforce. Of the 20 full-time respondents, one survey was not complete enough to indicate miles driven, yielding 19 analyzable responses. All reported some days driving a vehicle. No vehicles used diesel fuel and only two were reported to be gasoline-electric hybrid vehicles. Of the 7 part-time respondents, 2 respondents reported never using a vehicle (one walked and one used Metro North). We therefore extrapolated the fuel use data for the 19 full-time employees to the total full-time workforce of 60 employees, and

the 5 part-time employees commuting by car to the remaining 38 part-time employees. The average miles traveled daily for full time employees and average MPG were used to also estimate the employee commute for the Firehouse employees. According to the Eastchester Fire District, the Midland Avenue Firehouse is routinely staffed by 2 persons per 24-hour shift. This means that once a day for 365 days a year, a different crew commutes to the Firehouse. We multiplied the full time Village employee commute estimates for miles and gasoline consumption x 730 days to estimate the Firehouse staff commute. Data on the employee commute estimates are shown below.

Village employees were estimated to have used 16,576 gallons of gasoline per year, travelling 429,193 miles. The Firehouse staff were estimated to have used 814 gallons of gasoline, travelling 21,243 miles. While 60% of Village employees travelled less than 10 miles one way to work, a fairly large percentage travelled more than 30 miles one way. In addition, while a few employees walked, biked or used Metro North, the vast majority drove a passenger car most days they commuted to work.

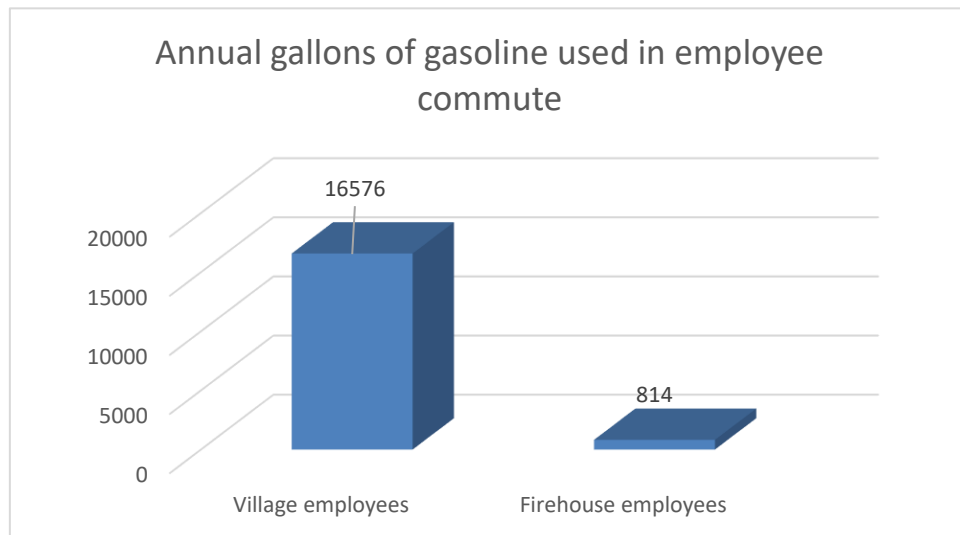


Figure 13. Total Annual Gallons Gasoline Used in Employee Commuting

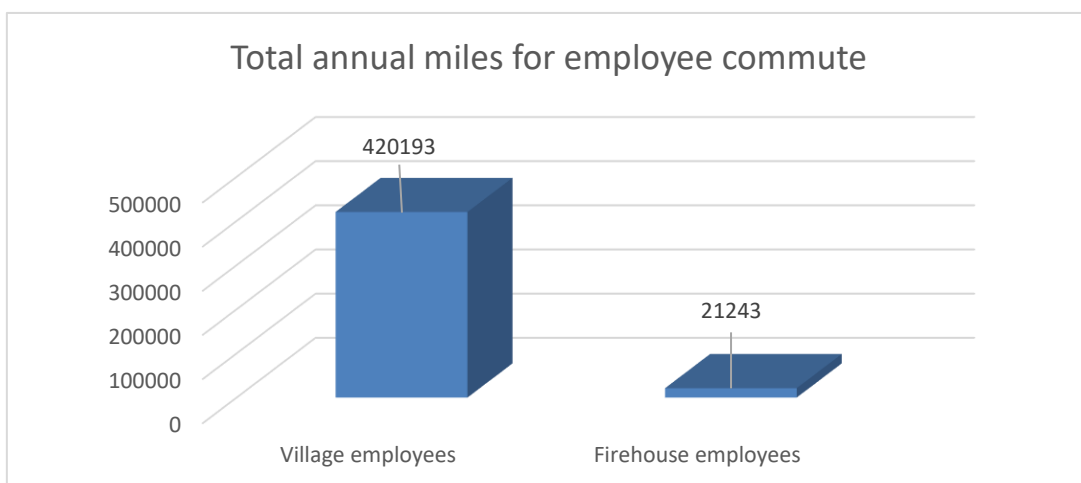


Figure 14. Total Annual VMT for Employee Commuting

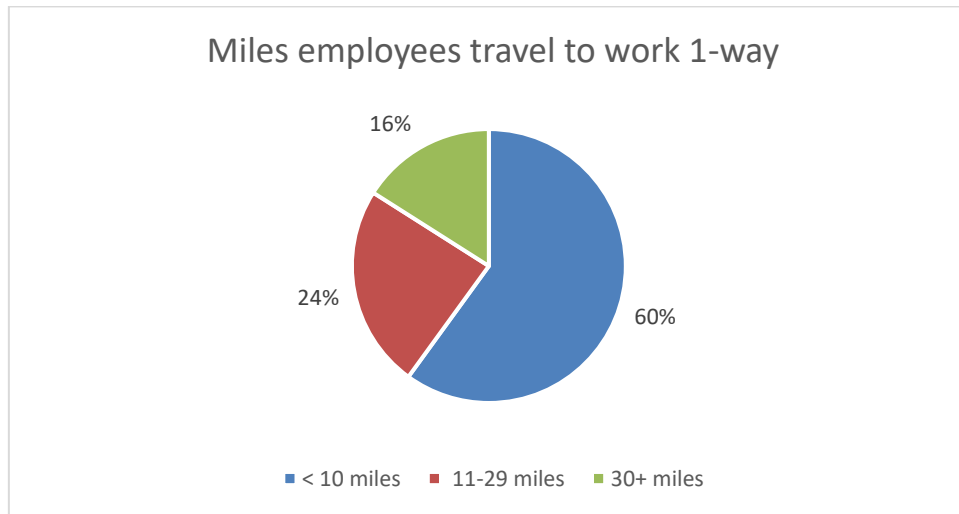


Figure 15. Percent of Employees Commuting Distance by Miles One Way

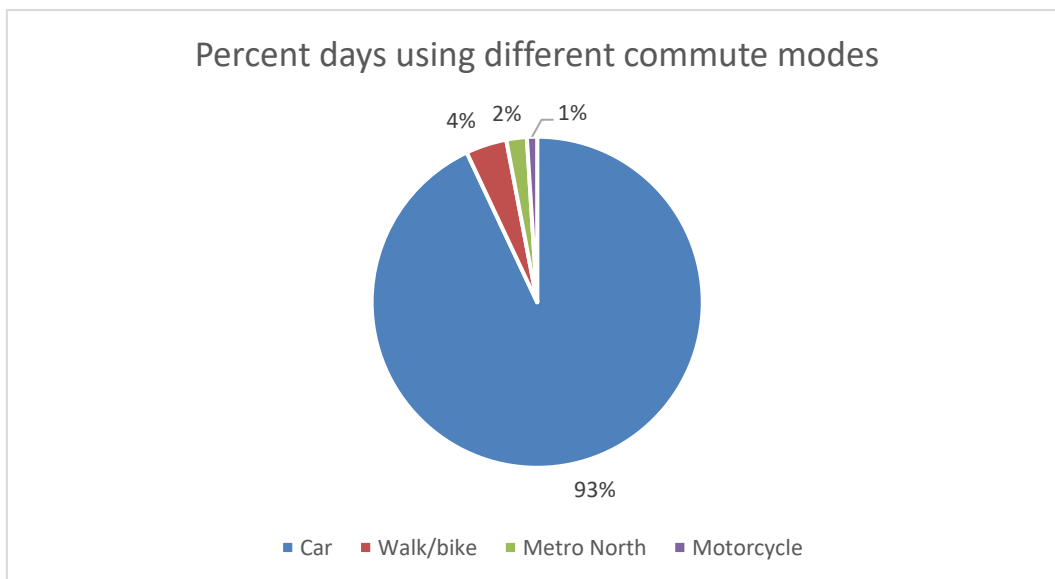


Figure 16. Percent of Commuting Days Using Different Modes of Transportation

Fugitive emissions sector:

We were only able to calculate fugitive emissions (leakage through transport or production of fossil fuels fuel) for natural gas used in village operations. Natural gas use was a total of 8229 therms (see Figures 6 & 7). This is equivalent to 1.43 metric tons of emissions, or 0.13% of total emissions accounted for in this report.

Potable water data:

In anticipation of estimating community-wide consumption of potable water and the related energy expended in processing and delivery of potable water, we additionally collected water use data for the Village of Bronxville municipal operations, including water use at the Midland Avenue Firehouse. These data are not used directly in

government operations inventories unless there is a treatment plant within municipal boundaries; however we will be able to use these data to better understand community-wide water usage.

Water bills were collected for all Village of Bronxville uses, including outdoor park, recreation, and landscape water use reflected by Suez water bills. In addition, water use was collected for the Firehouse. Missing months for winter shutoffs were noted as zero consumption, but other missing months had to be estimated from prior bills and prior monthly data charts provided on some of the billing statements. While emissions due to potable water treatment and transport are likely to be a small portion of total GHG emissions in Village operations, nevertheless, low coast water saving devices and sustainable management of the Village’s green areas can reduce such emissions and can be part of future planning for reducing GHG emissions. See below for a summary of total water use by 100 cubic feet units. The total annual consumption was 4100 CCF. (Note, 1 cubic foot of water is 7.48 gallons, or 748 gallons per CCF for a total water consumption of 3,066,800 gallons of water.

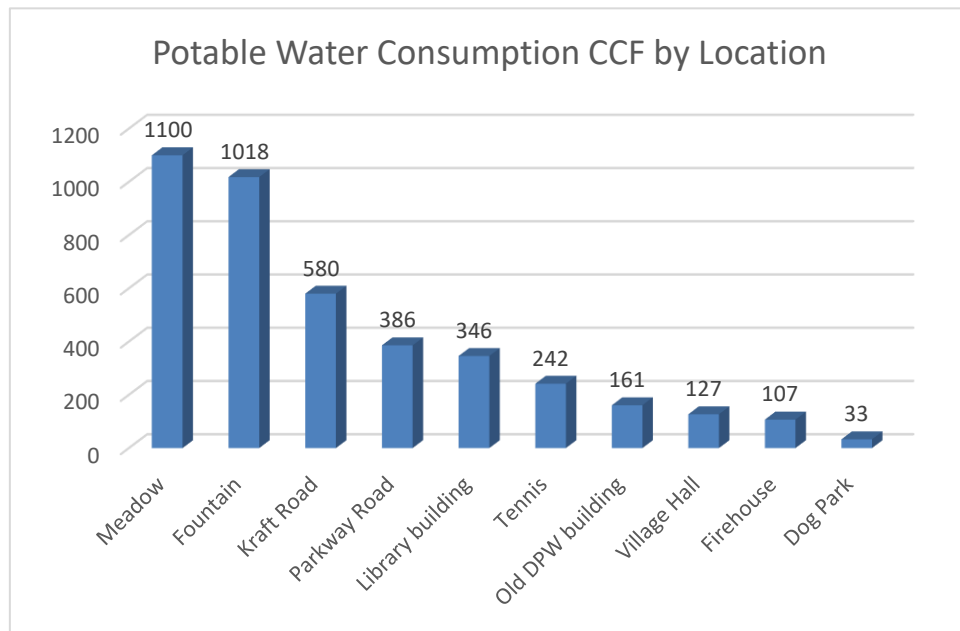


Figure 17. Total Annual Water Consumption by Village Operations in CCF



Green area near train station (credit Bronxville Green Committee)

Summary

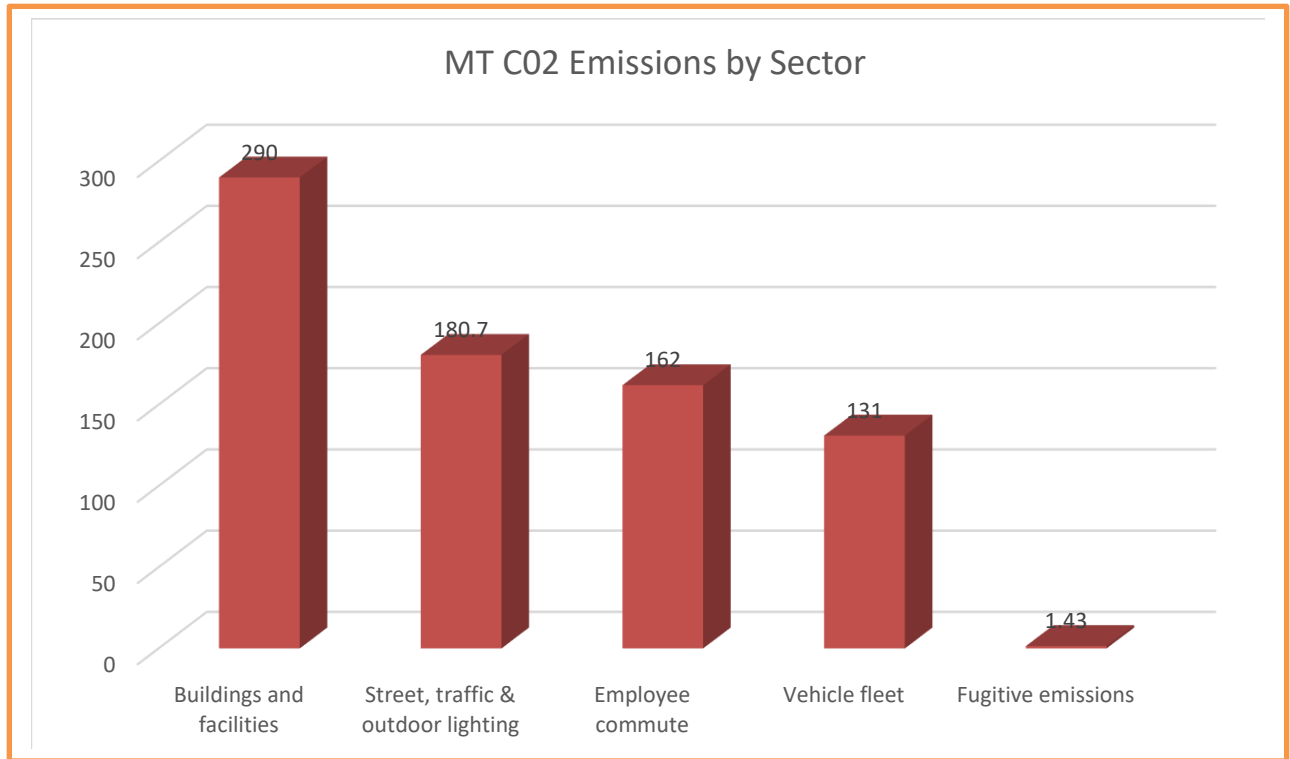
Total estimated Village of Bronxville government operations emissions for 2018 are shown in Table 2 and Figure 18, expressed as metric tons of CO₂ equivalents for the three greenhouse gases included in the software calculations (carbon dioxide, methane, and nitrous oxide- see Table 1 for global warming equivalents).

Table 2: Local Government Operations Inventory

Sector	Fuel or source	2018 Usage	Usage unit	2018 Emissions (MTCO ₂ e)
Buildings & Facilities	Electricity	462724	kWh	125.5
	Natural gas	8229	Therms	43.8
	Heating oil	11266	Gallons	115.7
	Propane	935	Gallons	5.3
Buildings & Facilities total				290.3
Street Lights, Traffic Signals & Other Outdoor Lighting	Electricity	666385	kWh	180.7
Street Lights, Traffic Signals & Other Outdoor Lighting Total				180.7
Vehicle fleet	Gasoline (on-road)	6548	Gallons	58.0
	Diesel (on-road)	7185	Gallons	73.5
Vehicle Fleet total				131.5
Employee Commute	Gasoline	17390	Gallons	161.4
Employee Commute Total				161.4
Process & Fugitive Emissions	Natural gas usage	8229	Therms	1.43
Total government emissions				765.3 MT CO₂e

Figure 18 shows the distribution of emissions among the sectors included in the inventory. Buildings and Facilities represent the majority of emissions (38%), followed by Streetlights, Traffic and Other Outdoor Lighting (23.6%), followed by Employee Commute (21.2%) and Vehicle Fleet (17.1%). Fugitive emissions from natural gas use account for less than 0.13% of emissions.

Figure 18: Local Government Operation Emissions by Sector in MTCO2e



Next Steps

The local government operations emissions inventory points to opportunities for reduction in GHG emissions across several areas of operation. Using ClearPath modeling tools and other information, the Village of Bronxville will explore cost-effective and practical solutions to improving the sustainability of Village operations. Many action steps are already underway in terms of building energy audits, instituting greener composting programs, traffic calming, safe streets planning, and continuing the changeover of street lighting to LED bulbs. The Village is also considering purchasing electric vehicles as replacements are needed for the existing Village fleet.

Over the next 6-9 months the Village administration and Trustees will carefully examine activities that can have impact on municipal emissions and will undertake planning to implement such activities, including investigating grant opportunities and other sources of financing. A data driven model for implementing GHG reductions will show return on investment time frames and compare cost-benefits resulting from mitigation strategies vis a vis the risks, losses, and increasing costs associated with inaction. Such an approach will assist the Village in making cost-effective decisions that will not only be fiscally responsible, but will also improve the sustainability of our community and contribute to state, national and international climate mitigation goals.



New Department of Public Works Building with newly instituted Food Scrap Recycling Drop-Off Site
(credit Bronxville Green Committee)

Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Local Government Operations (LGO) Emissions Mitigation Milestones and one of the high priority actions steps for the New York State Climate Smart Communities Program. To achieve the second, third, and fourth LGO Mitigation Milestones we will: forecast future emissions, set an emissions-reduction target, and build upon the existing Village of Bronxville sustainability programs with a robust climate action plan.

The Village of Bronxville will continue to track key energy use and emissions indicators on an on-going basis. We anticipate completing an updated report in about 2 years in order to track emissions from 2018-2022. This five-year time period will reflect changes from many green initiatives already in progress in the Village and assist in us in further planning to meet 2030 targets.

The Village of Bronxville will also complete a community emissions inventory in the next few months to further plan for broader GHG reductions that cannot be achieved by adapting Village operations alone. To achieve a science-based target, community education, involvement, and partnerships will be instrumental.

The Intergovernmental Panel on Climate Change (IPCC) states that to meet the Paris Agreement commitment of keeping warming below 1.5°C we must reduce global emissions by 50% by 2030 and reach climate neutrality by 2050. These goals are also enacted in the New York State 2019 Climate Leadership and Community Protection Act. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations act aggressively. More than ever, it is imperative that countries, regions, and local governments set targets that are ambitious enough to slash carbon emissions between now and mid-century.