Village of Tarrytown

2019 Inventory of Government Operations Greenhouse Gas Emissions

AUGUST 2023

Produced by the Village of Tarrytown with Assistance from ICLEI – Local Governments for Sustainability USA and the Hudson Valley Regional Council

Credits and Acknowledgements

Westchester County Climate Action Planning Institute

Westchester County

George Latimer, Westchester County Executive
Peter McCartt, Director of Sustainability

Hudson Valley Regional Council

Mary Lambert, Climate Action Planning Institute Coordinator

ICLEI – Local Governments for Sustainability

Kale Roberts, Senior Program Officer, ICLEI USA
Caroline Dickey, Program Officer, ICLEI USA

Village of Tarrytown

Climate Action Planning Institute Committee

Dean Gallea, Co-Chair, Tarrytown Environmental Advisory Council
Meghan McLane, Member, Tarrytown Environmental Advisory Council
Alissa Fasman, Deputy Clerk, Village of Tarrytown

Village Administrator's Office

Richard Slingerland, Village Administrator

Department of Public Works

Lou Martirano, Superintendent
William McGuire, General Foreman
Reggie Waters, Foreman, Mechanic
Taft Smith, Foreman, Sanitation
Max Lopez, Foreman, Highway
Thornton Curry, DPW Office

Engineering Department

Donato Pennella, Village Engineer
Mariana Reis, Junior Civil Engineer

Treasurer's Department

Antoinette Morales, Treasurer
Ben McCoy, Office Assistant – Financial Support

Climate Action Planning Institute

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Executive Summary

The Village of Tarrytown 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. Everyone in the Village has a role to play to reduce the impact of climate change. The Village government is committed to leading in these efforts by reducing greenhouse gas emissions of government operations and taking steps to mitigate the potential impacts of climate change through policy and planning. This 2019 GHG inventory offers a data-based justification for climate-action planning, and helps prioritize emissions-reducing actions based on the best return on investment.

Tarrytown has taken some key actions over the past fifteen years to reduce emissions from government operations:

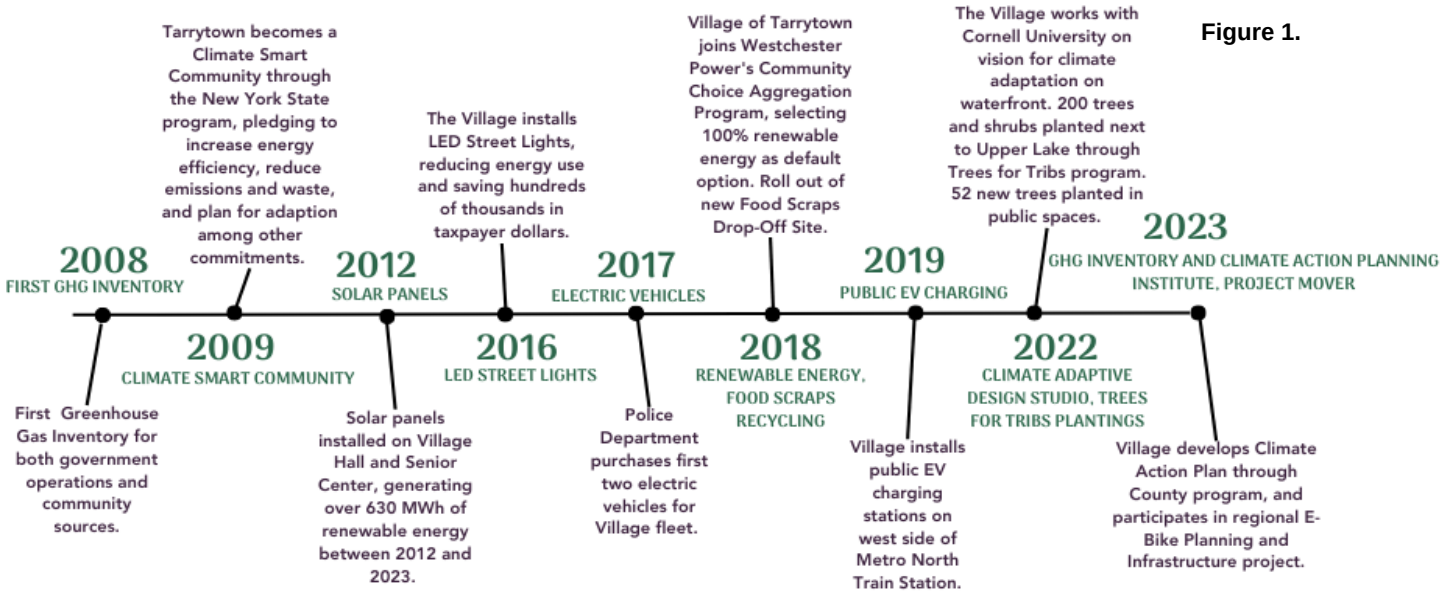


Figure 1.

In 2007/08, the Village conducted a greenhouse gas emissions inventory for government operations as well as community sources. The Village measured emissions from the following sectors: 1) buildings and facilities, 2) municipal vehicle fleet, 3) employee commute, 4) streetlights, 5) water system, and 6) waste. At that time, the total carbon emissions for government operations was calculated in pounds and totaled 4,847,449 or **2199 metric tons ($MTCO_2e$)**[1].

Since the first inventory, the Village implemented a number of carbon-reducing initiatives including the replacement of streetlights with LED equivalents, the purchase of two electric vehicles and one hybrid

[1] CO_2e stands for carbon dioxide equivalent," the standard unit for measuring the global warming impact of different types of greenhouse gases (such as carbon dioxide, methane, and nitrous oxide).

between 2007 and 2019, and the installation of solar panels on two of its facilities. A new Village Hall was also constructed, eliminating the fuel-oil powered heating system in the old Village Hall. At the same time, three new buildings were added to the inventory of facilities operated by the Village: Washington Engine Fire House and Consolidated Engine Fire House in 2008, and a new Recreation Center in 2015. New goals with an eye toward climate change mitigation and adaptation were incorporated into the Comprehensive Plan, "Tarrytown Connected" in 2018, a plan that serves as a foundational document for the new Climate Action Plan for government operations to be developed with this GHG inventory as its base.

Key Findings

The 2023 update of the GHG inventory for government operations using a base year of 2019 will serve as a basis for analysis in the development of a robust Climate Action Plan for Village operations. The base year 2019 was chosen to account for the dramatic change in human activity that occurred during the COVID-19 pandemic. 2019 was identified as the closest measurable year we currently have under "normal" operations. In 2019, the Village of Tarrytown's government operations emissions **totaled 1,247 metric tons of carbon $MTCO_2e$**.

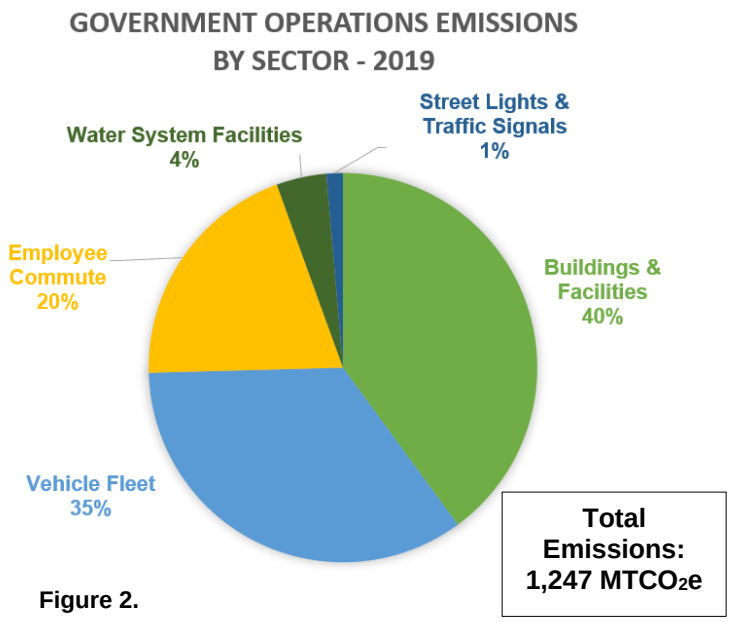


Figure 2.

The greatest source (41%) of carbon emissions from government operations in 2019 was from Buildings and Facilities [Figure 2]. Vehicle Fleet contributed 35% of the total emissions from government operations, followed by Employee Commute (20%), and Water System Facilities (4%) and Lighting (1%).

Sector	2019 Greenhouse Gas Emissions (MTCO2e)
Buildings & Facilities	498
Vehicle Fleet	432
Employee Commute	248
Water System Facilities	52
Street Lights & Traffic Signals	17

Table 1.

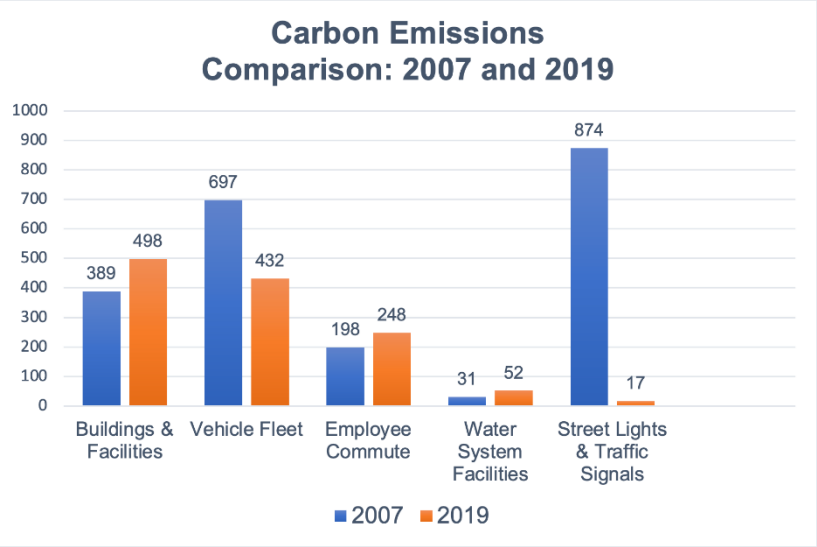


Figure 3.

Between 2007 and 2019, government operations reduced carbon emissions from 2,199 $MTCO_2e$ to 1,247 $MTCO_2e$, a reduction of 957 $MTCO_2e$ or 43%.[2] The significant reduction of greenhouse gas emissions is due to a number of factors, but primary among them is a change in the factor set used to calculate carbon emissions generated by electricity usage in New York. As New York's electric grid has become cleaner, with an increased supply of renewable energy sources, the use of electricity results in significantly fewer greenhouse gas emissions. To illustrate this, using a prior factor set, the electricity usage in buildings and facilities as well as streetlights resulted in carbon emissions totaling 382 $MTCO_2e$ and 85 $MTCO_2e$. After accounting for the cleaner grid, the carbon emissions from electricity usage in buildings and streetlights totals 62 $MTCO_2e$ and 17 $MTCO_2e$ respectively.

There has also been a significant change in the primary sources of emissions as a result of actions taken by the Village. In 2007, the largest source of emissions from government operations was due to Street Lights and Traffic Signals, followed by Vehicle Fleet, and then Buildings and Facilities.

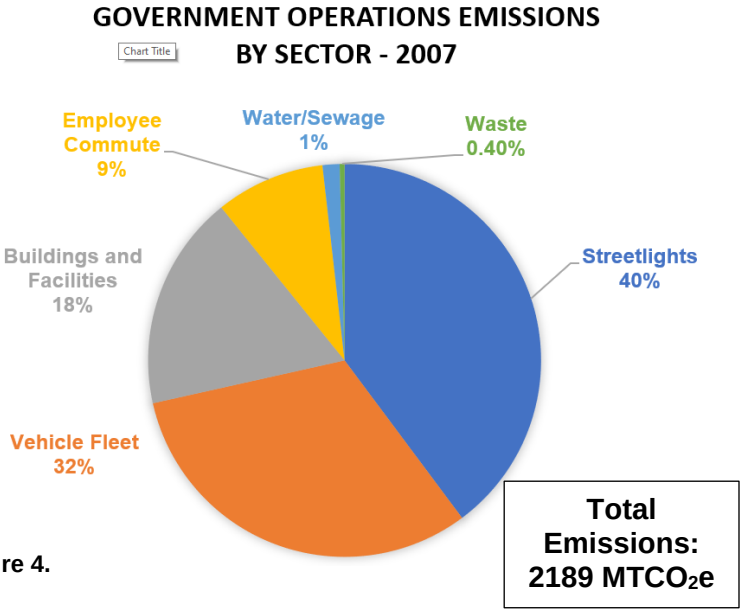


Figure 4.

[2] This reduction accounts for the fact that the 2019 inventory did not include measurement of waste in government operations because the sector was challenging to measure and it was assumed to be likely a very small contributor to GHG emissions. In 2007, the waste sector contributed less than .5% to overall emissions.

The reduction of emissions from lighting was due to the 2015 change to LED street lighting, reducing emissions from 874 (MTCO2e) to 17, the equivalent of removing 186 passenger cars from Village roads.

Vehicle Fleet emissions also reduced significantly. On the one hand, fuel efficiency has improved as vehicles have been replaced. In 2016, the Village undertook a re-structuring of the sanitation schedule to improve labor efficiency, but it had the unintended consequence of reducing greenhouse gas emissions. Garbage collection was reduced to one day per week instead of two. That means for two days in the week since 2016, two garbage vehicles are on the road instead of three. With two electric vehicles and a single hybrid vehicle in the fleet by 2019, improvement in fuel efficiency standards in vehicles overall, plus this change in sanitation operations, fleet emissions reduced from 697 (CO2e) to 432.

By 2019, the largest contributing sector to greenhouse gas emissions in the Village changed from street lighting to buildings and facilities. The second contributing sector remains the vehicle fleet, and the employee commute increased in significance as street lighting became less of a factor.

The measurement and monitoring of greenhouse gas emissions enables the Village to prioritize its actions. Projects to increase energy efficiency in facilities and vehicle fleets, utilize renewable energy sources, make procurement practices more sustainable, reduce waste, and support alternative modes of transportation for employees will all contribute to a healthier, more sustainable community. The co-benefits of these measures may include lower energy bills, improved air quality, and more efficient government operations.

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, threatening the safety, quality of life, and economic prosperity of global communities. Although the natural greenhouse effect is needed to keep the earth warm, a human enhanced greenhouse effect with the rapid accumulation of GHG in the atmosphere leads to too much heat and radiation being trapped. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms that human activities have unequivocally caused an increase in carbon emissions[3]. Many regions are already experiencing the consequences of global climate change, and the Village of Tarrytown 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) 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), but these emissions alone are unlikely to cause global warming of 1.5°C (medium confidence). Climate-related risks for natural and human systems are higher for global warming of 1.5°C than at present, but lower than at 2°C (high confidence). These risks depend on the magnitude and rate of warming, geographic location, levels of development and vulnerability, and on the choices and implementation of adaptation and mitigation options (high confidence)[4].

According to the 2018 National Climate Assessment, "by 2035, the Northeast is projected to be more than 3.6°F (2°C) warmer on average than during the preindustrial era. This would be the largest increase in the

[3]IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

[4]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.

contiguous United States and would occur as much as two decades before global average temperatures reach a similar milestone." [5] The consequences of a changing climate are already observable, including in Tarrytown, with increased incidents of extreme temperatures, episodes of poor air quality, recurrent waterfront and coastal flooding, and intense precipitation events. In a dense, historic suburban community such as Tarrytown, such hazards threaten aging infrastructure, impact human health, and have economic consequences, particularly to vulnerable populations including the elderly, the impoverished, and recent immigrant communities with fewer resources to adapt and respond to extreme weather events.

Already, the Northeast has experienced the highest levels of sea level rise in the country. The New York State Department of Environmental Conservation predicts that sea levels will rise as much as 60 inches by 2080. According to a predictive tool developed by Columbia University,[6] this level of sea level rise would have a profound impact on the Tarrytown waterfront, with parts of Losee and Pierson Parks predicted to be permanently under water by 2080.[7]

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 be spend 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.

[5] U.S. Global Change Research Program. 2018. National Climate Assessment – Ch 18: Northeast. Retrieved from https://nca2018.globalchange.gov/chapter/18/

[6] http://www.ciesin.columbia.edu/hudson-river-flood-map/

[7] Climate Adaptive Design Studio

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

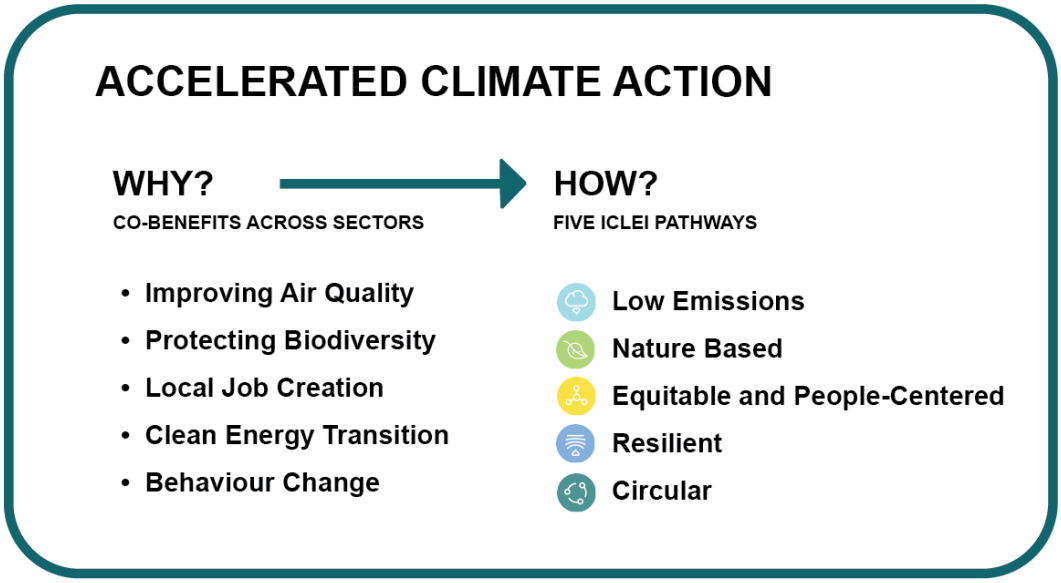
Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change.

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 achieve net-zero emissions by 2050 at the latest. Creating a roadmap for climate neutrality requires the Village of Tarrytown to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development.

To complete this inventory, the Village of Tarrytown utilized tools and guidelines from ICLEI - Local Governments for Sustainability (ICLEI), which provides authoritative direction for greenhouse gas emissions accounting and defines climate neutrality as follows:

> The targeted 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 at the latest by 2050. 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 Tarrytown will need to set a clear goal and act rapidly following a holistic and integrated approach. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, reducing poverty and 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 governments to identify and reduce greenhouse gas emissions, organized along Five Milestones, also shown in Figure 2:

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

Figure 5: ICLEI Climate Mitigation Milestones

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 operations of the of the Village of Tarrytown government. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 3. 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 6: Relationship of Community and Government Operations Inventories

As local governments continue 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 U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) and the Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol), both of which are described below.

Three greenhouse gases are included in this inventory: carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Many of the charts in this report represent 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 2: Global Warming Potential Values (IPCC, 2014)

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO2)	1
Methane (CH4)	28
Nitrous Oxide (N2O)	265

Local Government Operations (LGO) 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.8 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 following activities are included in the LGO inventory:

- Energy and natural gas consumption from buildings & facilities
- On-road transportation from employee commute and vehicle fleet
- Water System Facility processes
- Street Lights and Traffic Signals

Quantifying Greenhouse Gas Emissions

Sources and Activities

Governments contribute to greenhouse gas emissions in many ways. Two central categorizations of emissions are used in the local government inventory: 1) GHG emissions that are produced by "sources" that are within the Village government's control (e.g. heating units and vehicles), and 2) GHG emissions produced as a consequence of government "activities" (e.g. the use of fossil fuel-generated grid electricity).

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 employees and officials of the Village government 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. The division of emissions into sources and activities replaces the scopes framework that is used in government operations inventories, but that does not have a clear definition for application to community inventories.

[8] 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 emissions. The Village of Tarrytown's LGO greenhouse gas emissions inventory utilizes 2019 as its baseline year, for which the necessary data are available. 2019 was selected due to the profound impact that the COVID-19 pandemic had on human activity. 2019 was deemed the closest year for which we have data when government operations qualified as "normal," and therefore useful for forecasting and policy assessment going forward.

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

Most 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 appendices for a detailed listing of the activity data used in composing this inventory.

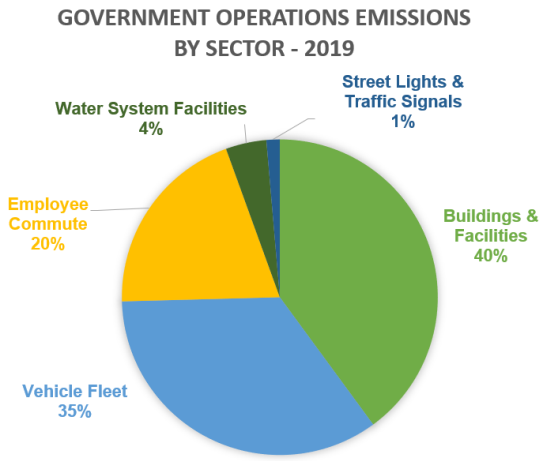
Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO2/kWh of electricity). For this inventory, calculations were made using ICLEI's ClearPath tool.

Government Operations Emissions Inventory Results

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions ($MTCO_2e$)
Buildings & Facilities	Electricity	1166.59	MWh	58
	Natural Gas	82,813	MMBtu	440
Buildings & Facilities total				**498**
Street Lights & Traffic Signals	Electricity	338.47	MWh	17
Street Lights & Traffic Signals total				**17**
Vehicle Fleet (includes Transit Fleet)	Gasoline (on-road)	28,845	gallons	253
	Diesel (on-road)	17,399	gallons	179
Vehicle Fleet total				**433**
Employee Commute	Gasoline	27,092.88	gallons	240
	Diesel	875.63	gallons	8
Employee Commute Total				**248**
Water System	Usage of Grid Electricity			52
Water System total				**52**
Total government emissions				**1247**

Table 3: Local Government Operations Inventory

Figure 7. Local Government Operations Emissions by Sector Buildings and Facilities (41%) represents the majority of emissions, followed by Vehicle Fleet (35%) and Employee Commute (20%). Water System Facilities (4%) and Lighting (1%) account for a small portion of emissions.



Buildings and Facilities: 498 MTCO2e

The Buildings and Facilities Sector is the largest source of government operations emissions for Base Year 2019, measuring 498 MTCO2e. This sector includes 14 facilities administered by the Village including administrative buildings, recreational facilities, the Public Works Department, the Fire Department, and the Library. The Water Pump Station and related facilities are included in the Water System sector.

The Public Works Department garage and office space is the largest single source of emissions, measuring 142 MTCO2e in 2019. The most efficient large facility administered by the Village is the Recreation Center, built in 2015, with emissions measuring just 19 MTCO2e in 2019. The much smaller Senior Center facility is open to the public for far fewer hours than the Recreation Center, yet emissions measured twice as much as the Recreation Center at 43 MTCO2e. Village Hall, also a relatively new facility, is the second single largest source of emissions in the Village, measuring 66 MTCO2e.

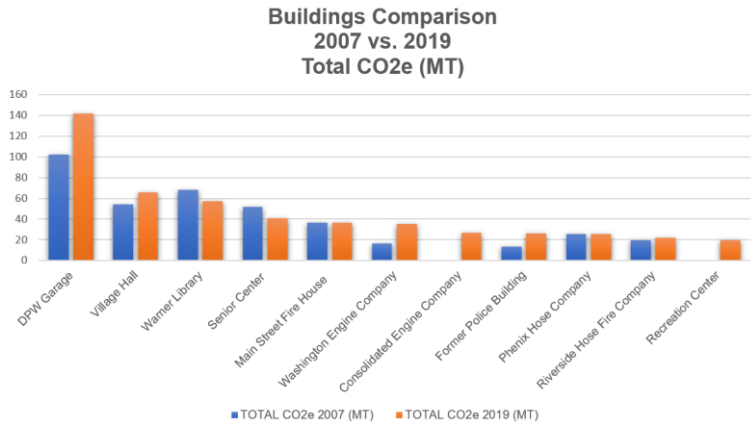


Figure 8.

When making comparisons between the 2007 GHG inventory and the inventory with a base year of 2019, emissions increased overall for buildings and facilities, with the addition of three new facilities under Village administration: the Recreation Center and two new fire houses – Washington Engine and Consolidated Engine. Warner Library reduced emissions substantially between 2007 and 2019. The most significant upgrade to impact the building's efficiency would have been the roof replacement in 2015. The heating system was also upgraded in 2007. For Village Hall, while fuel oil was eliminated as a heat source when the new building was constructed, greenhouse gas emissions have nevertheless increased in the larger facility.

Buildings	Total MTCO2e 2007	Total MTCO2e 2019	MTCO2e from Gas 2007	MTCO2e from Gas 2019	MTCO2e from Electricity 2007	MTCO2e from Electricity 2019
DPW Garage	102.17	142.24	100.91	136.83	1.26	5.42
Village Hall	54.36	66.15	12.04	50.54	2.2	15.61
Warner Library	68.04	57.72	67.31	48.08	0.72	9.64
Senior Center	51.89	42.96	50.86	38.20	1.02	4.76
Main Street Fire House	36.42	36.94	35.32	33.79	1.1	3.15
Washington Engine Company	16.67	35.22	15.92	31.97	0.75	3.25
Consolidated Engine Company		27.10		24.37		2.80
Phenix Hose Company	25.83	25.74	24.81	24.16	1.02	1.58
Riverside Hose Fire Company	19.66	22.30	18.46	20.27	1.2	2.03
Recreation Center		19.31		12.66		6.69
Former Police Building	13.73	26.32	12.62	19.57	1.1	6.75
Skate Shack		0.75				0.75
Patriots Park Stone Shed		0.02				0.02
EV Charging Station		0.37				0.37
Total:	**388.77**	**498.9**	**338.25**	**440.45**	**10.37**	**58.44**
Total Building Emissions 2007		**389**	**Total Building Emissions 2019**			**499**

Table 4.

Vehicle Fleet: 433 MTCO2e

The Municipal Vehicle fleet in 2019 consisted of 99 vehicles including heavy trucks, light trucks and passenger vehicles. In 2019, the municipal vehicle fleet used a total of 17,399 gallons of diesel fuel, and 28,845 gallons of gasoline. This compares with 21,578 gallons of diesel fuel and 49,393 gallons of gasoline used by the fleet in 2007.

The amount of total emissions from the Municipal Vehicle Fleet in 2019 was 433 MTCO2e. This number, however, is likely to be slightly underestimated, as the gallons of fuel used by the Parks and Public Works Department's maintenance equipment were not included in the calculations.

Vehicles by Department	Fuel or source	2019 Usage (gallons)	2019 Emissions ($MTCO_2e$)
DPW	Diesel	14,237.00	145.36
	Gas	10,612.00	93.17
Fire Department	Diesel	3,162.00	32.28
	Gas	1,788.00	15.70
Parks Department	Diesel		1.83
	Gas	1,459.00	12.81
Police Department	Gas	12,210.00	107.20
Ambulance Corps	Gas	1,499.00	13.16
Senior Van (Transit)	Gas	1,277.00	11.21
Total Usage		**46,244.00**	
Total fleet vehicle emissions			**432.73**

Table 5.

By comparison, Vehicle Fleet Emissions reduced substantially since the last inventory in 2007 from 697 to 433, MTCO2e, or 38%. Three factors likely contributed to this reduction: improvement in fuel efficiency standards, a reduction in trash collection days in the Village, and the introduction of one hybrid vehicle and two electric vehicles into the fleet. Further investigation into the reasons for the emissions reduction is warranted as part of the Climate Action Plan for government operations.

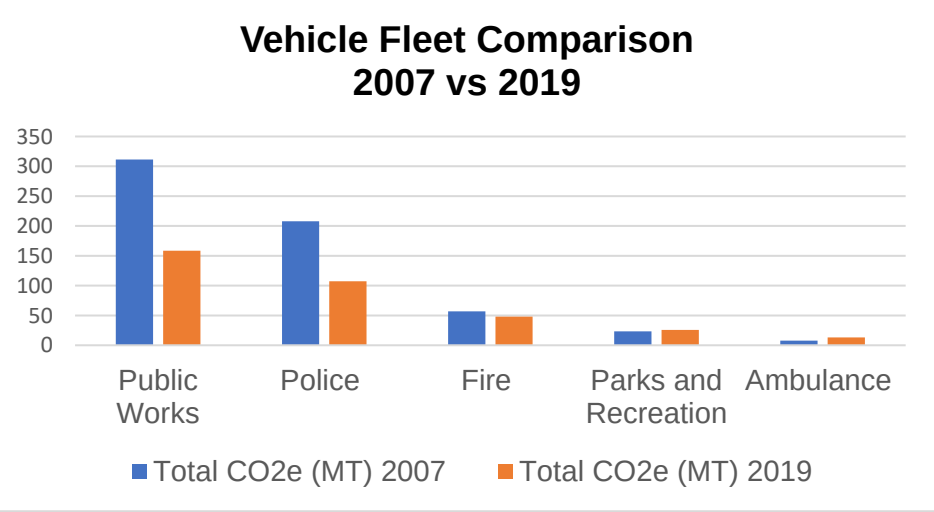


Figure 9.

Employee Commute: 248 MTCO2e

The Village administered an Employee Commute Survey to all full-time employees regarding their commute patterns and preferences. Of 93 full-time employees, 47 responded to the survey. Using ICLEI parameters, the results were extrapolated to represent emissions from all employees. See Appendix C for a detailed description of the survey and methods used to calculate emissions.

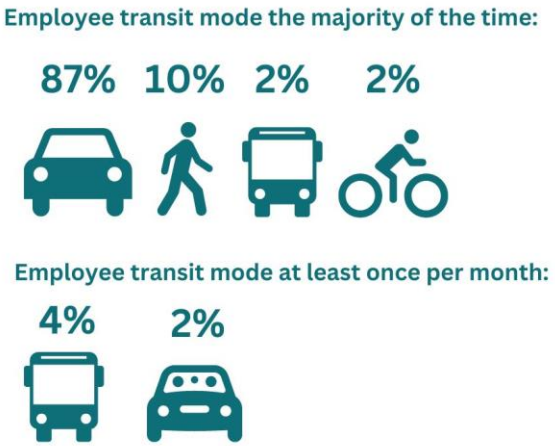


Figure 10.

Emissions resulting from employees commuting to work account for the third largest source of emissions from government operations in the Village, and have increased from 198 MTCO2e to 248 MTCO2e between 2007 and 2019. The increase occurred despite the fact that the Village had 99 employees in 2007 versus 93 employees in 2019. The number of Light Trucks and SUVs used for commuting increased, but more significantly, annual vehicle miles traveled more than tripled, increasing from 164,964 miles traveled annually to 556,477.

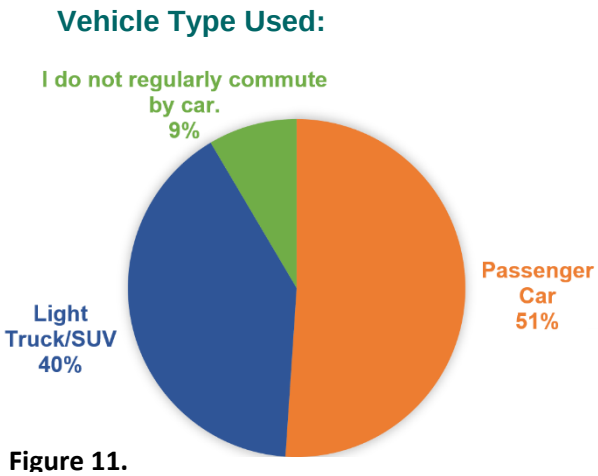


Figure 11.

The majority of employees (87%) drive alone to work every day. 12% walk or bike to work regularly. The majority of vehicles driven to work operated on gasoline with only 2 employees reporting use of a hybrid vehicle, and no employees used electric vehicles.

36% of respondents demonstrated openness to considering alternative forms of transportation.

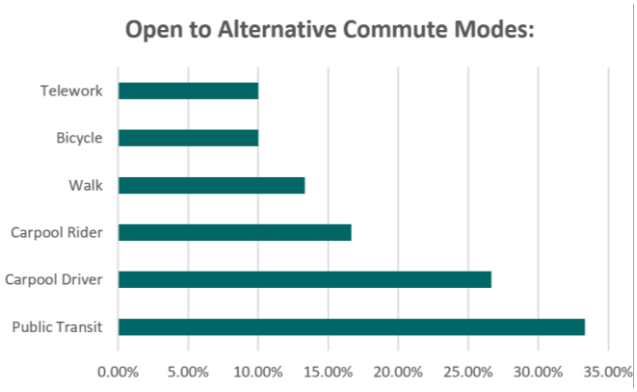


Figure 12.

Water System Facilities: 52 MTCO2e

The Water Distribution System in Tarrytown relies on three facilities that use electricity – the Shaft 10 Pump Station on Neperan Road, a High Water Tank to support households at higher elevations in Tarrytown, and a pump station on Executive Boulevard to transport water from the New York City Catskill Aqueduct System. The Shaft 10 Pump Station also uses fuel oil for its heating system and its emergency generator.

Emissions for the water distribution system increased from 31 MTCO2e in 2007 to 52 MTCO2e in 2019, an increase of 40%. Both the heating system as well as the roof on the Shaft 10 Pump Station are in need of replacement, but further investigation is required to determine what other factors might be causing the increase in energy usage.

Street Lighting: 17 MTCO2e

The great success story of the 2019 greenhouse gas inventory update for the Village of Tarrytown is the demonstration of the profound impact that the transfer to LED lighting had on energy use and greenhouse gas emissions. Between 2007 and 2019, the emissions from street lighting decreased from 874 MTCO2e, causing this sector to be the heaviest emitter in 2007, to 17 MTCO2e, and now the least impactful of all the sectors on greenhouse emissions. This 98% reduction in MTCO2e is both due to the greening of the electric grid in the State of New York which has altered the factor set used by the ICLEI Clear Path tool, as well as the decrease in energy usage required for LED lights.

In 2007, the total energy usage for streetlights in Tarrytown was 2,564,990 kWh. In 2019, the total energy usage for streetlights in Tarrytown was 338,469 kWh. The average cost of energy per kWh in 2019 was $0.169 per kWh which means that without the conversion to LED streetlights, if using 2007 energy usage as the factor, the Village would have paid $433,483.31 in 2019 for energy consumption of streetlights instead of $57,201.26, a savings of $376,282.05 in a single year, or an 86% cost savings. Seeking out remaining locations for LED replacement of standard lighting is an obvious, cost-effective priority action to consider in the Climate Action Plan for government operations.

Sectors Not Included in the 2019 Greenhouse Gas Inventory

Solid Waste

Solid waste production by government operations is both challenging to measure and also estimated to be such a small percentage of emissions from government operations, that this report does not include it as a sector. The Village might consider establishing a system for measurement of waste production by Village departments for inclusion in future inventories.

Wastewater Treatment

While there is a pump located at the end of Depot Plaza to transport wastewater from Tarrytown to a treatment facility in Yonkers, the pump is operated by the County, and therefore not considered in the local government operations inventory for Tarrytown.

Refrigerants

There are no substantial refrigerant facilities administered by the Village, but for future inventories, it is worth further investigation given the substantial impact refrigerants have on greenhouse gas emissions.

Next Steps:

The local government operations emissions inventory highlights a number of areas that merit further investigation to determine ways to improve energy efficiency, reduce energy usage, and contribute to efforts to reduce greenhouse gas emissions in the Village of Tarrytown.

The next steps for the Village of Tarrytown will be to:

1) Establish a target for emissions reduction. Developing a GHG emissions forecast to estimate how emissions are likely to grow is an important next step. As part of the Climate Acton Planning Institute (CAPI) cohort, we will be creating a municipal business-as-usual emissions projection. The village will use that forecast to establish a target for reduction.
2) Investigate opportunities for improving energy efficiency in buildings and facilities, reducing the use of fossil fuels for heating and cooling as well as transportation, and identifying processes and procedures that contribute to reducing emissions.
3) Develop a Climate Action Plan that prioritizes actions based on information learned in the GHG inventory.
4) Establish a plan for future monitoring of energy usage and greenhouse gas emissions.

Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. The next steps are to forecast emissions, set an emissions-reduction target, and build upon the sustainability elements in the 2018 Tarrytown Connected Comprehensive Plan with a more robust climate action plan that identifies specific quantified strategies that can cumulatively meet that target.

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. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%. 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.

Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent a community's fair share of the global ambition necessary to meet the Paris Agreement commitment. To achieve a science-based target, community education, involvement, and partnerships will be instrumental.

In addition, the Village of Tarrytown will continue to track key energy use and emissions indicators on an on-going basis. It is recommended that communities update their inventories on a regular basis, especially as plans are implemented to ensure measurement and verification of impacts.

Tarrytown has already implemented a number of emissions-reducing measures over the past fifteen years, many of which have had measurable benefit including the installation of LED street lights, improvements to building insulation at the Warner Library, the reduction of trash pickups which reduces heavy truck use, and the installation of solar panels on Village Hall and the Senior Center. By setting a target and developing a robust action plan based on the data-based GHG inventory, the Village has the opportunity to reduce energy usage and operational costs while mitigating the climate impacts of governmental operations. All involved stakeholders – Village leadership and staff, elected officials, community members and taxpayers – have the opportunity to contribute to this necessary effort, and to ensure follow-through in the years to come.

Appendix: Methodology Details

Energy

The following tables shows each activity, related data sources, and notes on data gaps.

Table 6: Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Electricity consumption	New York Power Authority (NYPA) and Con Edison - 2019	For each building or facility, we generated the names of the facilities by identifying them from the account addresses For each building or facility, we took the Col W sum "Energy Qty (KWH)", representing the full year, entered that into the Master Workbook, and later into the ClearPath tool.
Natural gas consumption	Con Edison - 2019	Data source: Con Ed (supplier) data for 2019, by account and address (Con Ed 2019_Gas Village of Tarrytown.xlsx) We generated the name of each building or facility by identifying it from the account address. For each building or facility we calculated the sum of the 12 monthly rows in the "THERMS" column, representing the full year, entered that into the Master Workbook, and later into the ClearPath tool.

Table 7: Emissions Factors for Electricity Consumption in Westchester County (NYPA)

Year	CO_2 (lbs./MWh)	CH_4 (lbs./GWh)	N_2O (lbs./GWh)
2019	110.010538	21	2

Transportation

Table 8: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Government Vehicle fleet	Monthly and Annual Village Fuel Reports organized by pump key. Each user assigned a pump key code.	We assumed ALL fuel consumed by Village-owned vehicles was represented by records received Departments for which data was received: DPW, Police, Fire/EMS and Parks & Rec Some pump key records include multiple vehicles, and some vehicles are on multiple keys, so accurate mileage per vehicle was not available. We consolidated each key's fuel delivery data for the year, indexed by vehicle, into a workbook ("2019 Fleet Fuel Data - Tarrytown.xls"), with each Department on a separate worksheet. We summed total gallons for each department by fuel type, which was entered into the Master Workbook, and copied into ClearPath. Note: We got a separate listing of the Village's vehicle inventory, and attempted to match each vehicle to its fuel record, but we were unable due to disparate naming convention. This should be improved going forward, so we can get more accurate data for the next GHG Survey.
Employee commute	Self-reported survey data	We received 45 responses, 42 from vehicle commuters; There were 93 Village employees in 2019, so we received responses from about half (similar to that in the 2007 survey) We assumed that, since 3 commuters reported not using a car, that there were about 6 of the total 93 staff that used a car to commute, so the total drivers in 2019 were assumed to be 87 For each respondent, we did the following: • Calculated the number of trips by multiplying the days worked per week by 52, and

		subtracting 12 holidays and reported vacation days. • Calculated the total miles driven by multiplying the number of trips by the reported commuting distance. • We adjusted for the number of reporting employees by multiplying each driver's total miles driven by (total 2019 drivers)/(reporting 2023 drivers), or 87/42. • For each reported Village Department, we summed each of the above calculated total adjusted miles values across the fuel type and vehicle type. • We also adjusted the total employees reported for each Dept. and Fuel/Vehicle type to approximately 87/42, rounding to the nearest integer. • We entered the data into the Master Data Workbook and later into the ClearPath Tool.

For vehicle transportation, it is necessary to apply average miles per gallon and emissions factors for CH4 and N2O to each vehicle type. The factors used are shown in Table 6.

Table 9: MPG and Emissions Factors by Vehicle Type for Westchester County
2019 US National Defaults (updated 2021)

Fuel	Vehicle type	MPG	CH_4 g/mile	N_2O g/mile
Gasoline	Passenger car	24.1	0.0183	0.0083
Gasoline	Light truck	17.6	0.0193	0.0148
Gasoline	Heavy truck	5.371652	0.0785	0.0633
Gasoline	Motorcycle	24.1	0.0183	0.0083
Diesel	Passenger car	24.1	0.0005	0.001
Diesel	Light truck	17.6	0.001	0.0015
Diesel	Heavy truck	6.392468	0.0051	0.0048

Water System Facilities

Table 10: Potable Water System Data Sources

Activity	Data Source	Data Gaps/Assumptions

Local Government Operations		
Electricity consumption	New York Power Authority (NYPA)	The emissions of four Village-operated facilities were accounted for in the Water Treatment section of the report: Two entries for the Shaft 10 Pump Station on Neperan Road which includes the pump facilities and the Heat and Generator operations for that facility, the High Service Water Tank, and the pump station on Executive Boulevard. For each building or facility, we took the Col W sum "Energy Qty (KWH)", representing the full year, entered that into the Master Workbook, and later into the ClearPath tool.
Natural gas consumption	Con Edison	For each building or facility we calculated the sum of the 12 monthly rows in the "THERMS" column, representing the full year, entered that into the Master Workbook, and later into the ClearPath tool.
Fuel Oil Consumption	Sprague Operating Resources – Bi-annual Invoices	The Fuel Oil is used to heat the Shaft 10 Pump Station.

Inventory Calculations

The 2019 inventory was calculated following the US Community Protocol and ICLEI's ClearPath software. As discussed in Inventory Methodology, the [IPCC 5th Assessment] was used for global warming potential (GWP) values to convert methane and nitrous oxide to CO2 equivalent units. ClearPath's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final CO2e emissions.