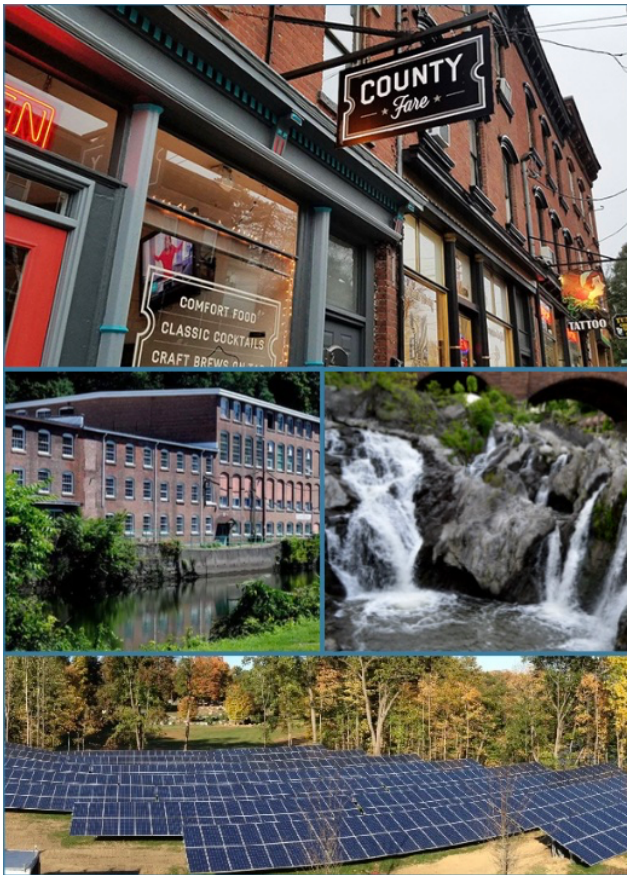
Village of Wappingers Falls



Baseline Year 2019

Inventory of Government Operations Greenhouse Gas Emissions

SEPTEMBER 15, 2023

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

Credits and Acknowledgements

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ICLEI-Local Governments for Sustainability USA

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Executive Summary

The Village of Wappingers Falls (to be called “Village”) recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing climate change, the consequences of which pose risks to the future health, wellbeing, and prosperity of our community.

The Village has a solar field located on the northern edge of the Water Plant property to help offset the electrical power required from Central Hudson. The Village streetlights have been transitioned to LED to reduce electricity demands.

This report provides estimates of greenhouse gas emissions resulting from activities within the Village’s government operations. This inventory accounts for Scopes 1, 2 and some scope 3 emissions (employee commuting).

Key Findings

Figure 1 shows local government operations emissions. Water and Wastewater Treatment Facilities accounts for a vast majority (40.2%) of these emissions. The next largest contributor is the Vehicle Fleet (27.6%), followed by Buildings and Facilities (20.2%). Actions to reduce emissions from these sectors will be a key part of any future climate action plan developed by The Village. Employee Commute (10.0%) and Street Lights and Traffic Signals (2.0%) were responsible for the remainder of local government operations emissions. Unfortunately, Solid Waste information was not available as the hauler does not breakout the Village from the surrounding towns.

The Inventory Results section of this report provides a detailed profile of emissions sources within the Village; information that is key to guiding local reduction efforts. This data will also provide a baseline against which the Village will be able to compare future performance and demonstrate progress in reducing emissions.

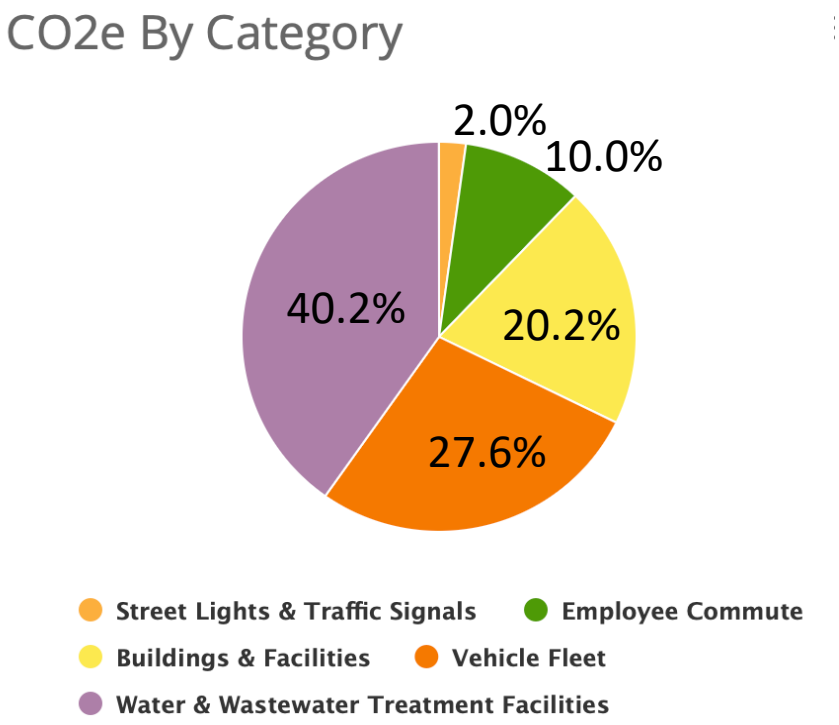


Figure 1: Government Operations Emissions by Sector

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 an enhanced 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 caused an increase in carbon emissions[1]. Many regions are already experiencing the consequences of global climate change, and the Village 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. Carbon dioxide concentrations have increased substantially since the beginning of the industrial era, rising from an annual average of 280 ppm in the late 1700s to 414 ppm in 2021 (a 48 percent increase)[2].

Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. 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, but these emissions alone are unlikely to cause global warming of 1.5°C. 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. These risks depend on the magnitude and rate of warming, geographic

[1]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.

[2]United States Environmental Protection Agency WebSite (www.epa.gov), Climate Change Indicators: Atmospheric Concentrations of Greenhouse Gases, https://www.epa.gov/climate-indicators/climate-change-indicators-atmospheric-concentrations-greenhouse-gases

location, levels of development and vulnerability, and on the choices and implementation of adaptation and mitigation options[3].

According to the 2019 National Climate Assessment, Heat waves, heavy downpours, and sea level rise pose growing challenges to many aspects of life in the Northeast. Infrastructure, agriculture, fisheries, and ecosystems will be increasingly compromised. Many states and cities are beginning to incorporate climate change into their planning.

The Northeast is characterized by a diverse climate. Average temperatures in the Northeast generally decrease to the north, with distance from the coast, and at higher elevations. Average annual precipitation varies by about 20 inches throughout the Northeast with the highest amounts observed in coastal and select mountainous regions. During winter, frequent storms bring bitter cold and frozen precipitation, especially to the north. Summers are warm and humid, especially to the south. The Northeast is often affected by extreme events such as ice storms, floods, droughts, heat waves, hurricanes, and major storms in the Atlantic Ocean off the northeast coast, referred to as nor'easters. However, variability is large in both space and time. For example, parts of southern New England that experienced heavy snows in the cold season of 2010-2011 experienced little snow during the cold season of 2011-2012. Of course, even a season with low totals can feature costly extreme events; snowfall during a 2011 pre-Halloween storm that hit most of the Northeast, when many trees were still in leaf, knocked out power for up to 10 days for thousands of households.[4]

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.

[3]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.
[4]U.S. Global Change Research Program. 2014. National Climate Assessment – Ch 19: Southeast. Retrieved from https://nca2014.globalchange.gov/chapter/19/

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

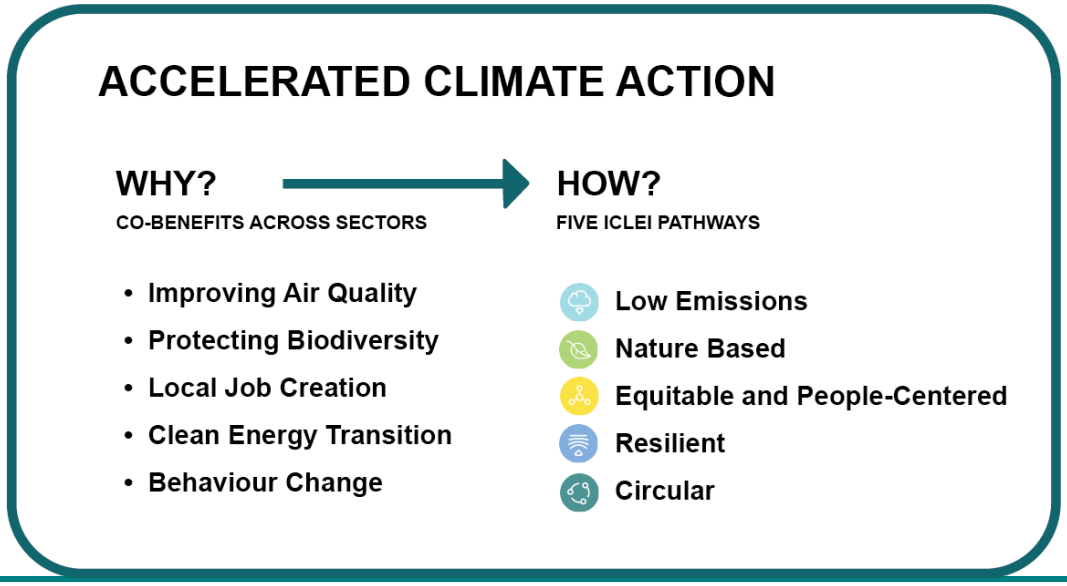
Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change.

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 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 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 a 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 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 climate change, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries, 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.

Figure 2: 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 Village 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.

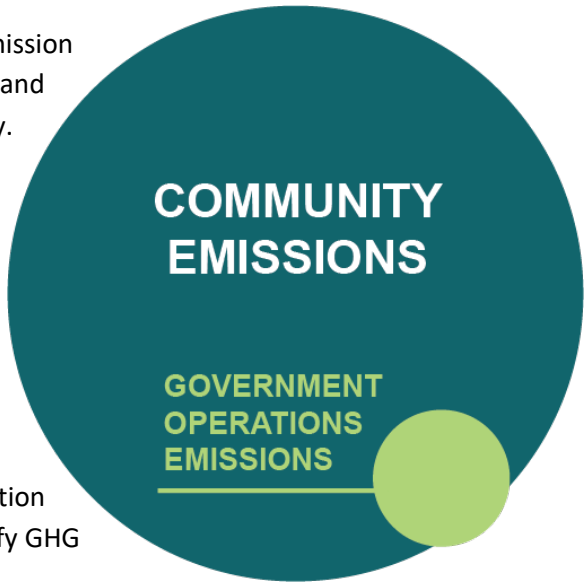


Figure 3: Relationship of Community and Government Operations Inventories

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 1: 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[5]. 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:

- Water & Wastewater treatment processes
- On-road transportation from vehicle fleet
- Electric and natural gas consumption from buildings & facilities
- On-road transportation from employee commute
- Street Lights and Traffic Signals

Quantifying Greenhouse Gas Emissions

Sources and Activities

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

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

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

[5]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

in government operations inventories, but that does not have a clear definition for application to community inventories.

Base Year

The inventory process requires the selection of a base year with which to compare current emissions. The Village's LGO greenhouse gas emissions inventory utilizes 2019 as its baseline year, for which the necessary data are available. Employee Commute data was not available for 2019 so 2020 was used for this sector.

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.

Picture from https://grinnell-library.org/history-of-the-grinnell-library/

Government Operations Emissions Inventory Results

Government operations emissions for 2019 are shown in Table 3 and Figure 6.

Table 2: Local Government Operations Inventory

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions ($MTCO_2e$)
Buildings & Facilities	Electricity	363596	kWh	38
	Natural Gas	15191	Therms	81
Buildings & Facilities total				**119**
Street Lights & Traffic Signals	Electricity	120980	kWh	13
Street Lights & Traffic Signals total				**13**
Vehicle Fleet	Gasoline (on-road)	17087	Gallons	150
	Ethanol (on-road)	779.4	Gallons	7
	Diesel (on-road)	630.6	Gallons	6
Vehicle Fleet total				**163**
Employee Commute	Gasoline	144925	Miles	59
Employee Commute Total				**59**
Water and wastewater	Electricity (Tri-Muni)	2055688	kWh	218
	Electricity (Village Waste Pumps)	17507	kWh	2
	Electricity (Village Water Plant)	77449	kWh	8
	Natural Gas (Village Water Plant)	1892	Therms	10
Water and wastewater total				**238**
			Total government emissions	**592**

Figure 4 shows the distribution of emissions among the four sectors included in the inventory. Water and Wastewater Treatment Facilities represents the majority of emissions (40.2%), followed by Vehicle Fleet (27.6%) and Building and Facilities (20.2). Employee Commute (10.0%) and Street Lights and Traffic Signals (2.0%) account for a small portion of emissions. Solid Waste is not included as records do not break out the Village portions from the surrounding Towns.

Please note that we have not included emissions associated with a water treatment plant, municipal solid waste, because we were not able to obtain this data. We also do not have any large-scale refrigerants. However, in future years, it is recommended that we begin to track and report municipal solid waste and refrigerant data.

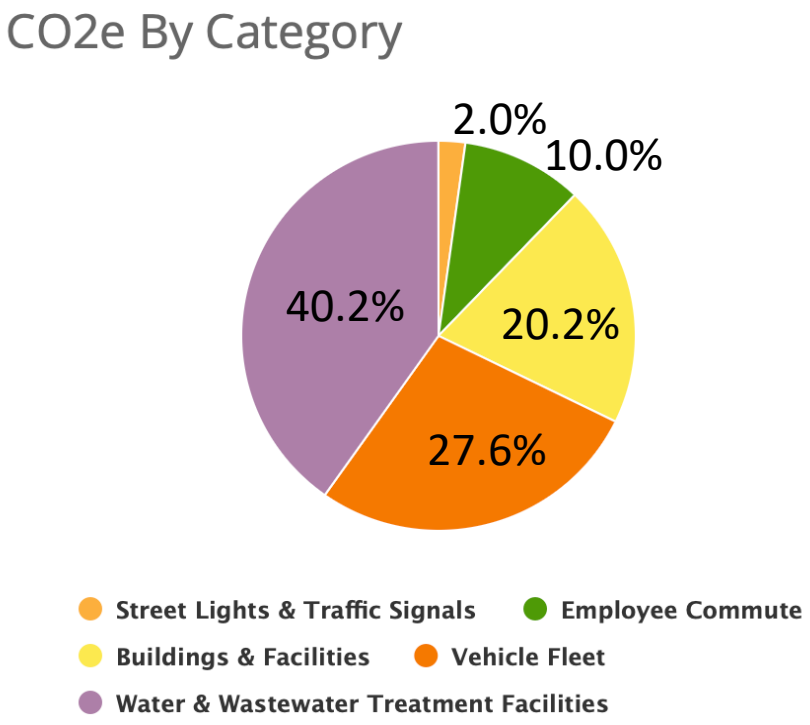


Figure 4: Local Government Operations Emissions by Sector

Next Steps:

The local government operations emissions inventory highlights a need to focus on the top three contributors. Areas of focus and potential actions are described below.

Tri-Municipal Wastewater Treatment

The electric energy used to move and process wastewater is a major contributor to the Village GHGs (40.2%). Focus needs to be on more efficient processes, lower electric demand pumps, and, if possible, lower effluent to process.

Vehicle Fleet

Fleet Vehicles use of Gasoline, Ethanol, and Diesel accounts for over a quarter of the Village GHGs (27.6%). Focus needs to be put on moving to Electric and Hybrid Vehicles.

Buildings and Facilities

The Village Buildings and Facilities account for 20.2% of all GHGs. Focus needs to be on assessing the current building heating and cooling equipment with an eye toward more efficient methods.

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 existing Village of Wappingers Falls Climate Initiative 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, 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 reduce 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.

The Village has recently adopted a new Comprehensive Plan that specifically calls out energy efficient actions, such as recommending renewable energy in development plans, implementing green building standards, amending the zoning code to require new buildings conform to EPA Energy Star standards and establish criteria for electric vehicle charging stations (EVCS) in larger new developments and Municipal lots.

In addition, the Village 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. Regular inventories also allow for "rolling averages" to provide insight into sustained changes and can help reduce the change of an anomalous year being incorrectly interpreted. This inventory shows that Water and Wastewater Treatment Facilities, Vehicle Fleet, and Buildings and Facilities as well as communitywide transportation patterns will be particularly important to focus on. Through these efforts and others, the Village can achieve environmental, economic, and social benefits beyond reducing emissions.

The next step is to forecast how emissions are projected to change over time, set an emissions-reduction target, and build upon the municipality's existing Climate Smart efforts with a climate action plan that identifies specific, targeted strategies that can realistically meet that reduction target.

Appendix: Methodology Details

Energy

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

Table 3: Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Electricity consumption	Central Hudson and Tri-Muni	The Village assumed the records from Central Hudson and Tri-Municipal were accurate and complete
Natural gas consumption	Central Hudson	

Table 4: Emissions Factors for Electricity Consumption

NPCC Upstate NY (NYUP) eGRID 2019

Year	CO_2 (lbs./MWh)	CH_4 (lbs./GWh)	N_2O (lbs./GWh)
2019	232.305	17	2

Transportation

Table 5: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Government vehicle fleet	Village Administration	Medium Duty vehicles were captured in the Heavy Duty category
Employee commute	Employee Survey	Used database of employee addresses and work departments supplied by Village administration in conjunction with milage calculations

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 6: MPG and Emissions Factors by Vehicle Type

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

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.