

Village of Marcellus, New York 2025 Municipal Greenhouse Gas Inventory

Prepared by: Meghan Virginia, Lydia Morgan, Mitchell Romig, Ben Hutcheson, Tyler Ossen

Table of Contents

Acknowledgements	3
Introduction	4
Methods	6
Emission Sectors	8
Vehicle Fleet	
Streetlights	
Building and Facilities	
Water and Wastewater	
Results	9
Discussion	12
Conclusions	12
Citations	13

Acknowledgements

Our team would like to extend our sincere gratitude to the following individuals and organizations for their invaluable contributions to this project

Village of Marcellus, New York

The Village of Marcellus Board

Mallory Zabinski

Central New York Regional Planning and Development Board

Michael Boccuzzi

SUNY College of Environmental Science and Forestry

Dr. Joshua Cousins

Introduction

Greenhouse gases (GHGs) are gases that absorb heat energy emitted from the Earth's surface and remain in the atmosphere for extended periods. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases.¹ These gases absorb significant amounts of heat energy and re-radiate some of it back toward the surface. By increasing the concentration of GHGs in the atmosphere, humans are accelerating the rise in global temperatures at an unprecedented rate. For example, since 1850, the Earth's average temperature has increased by 0.11°F per decade.² Global warming impacts communities worldwide, including small towns, through extreme weather events, food security issues, and vulnerabilities in infrastructure.

The Village of Marcellus is a 0.6-square-mile community located in Onondaga County, New York, about 12 miles southwest of Syracuse. As of 2019, the village had a population of approximately 1,745 people. One crucial way communities like Marcellus can reduce their GHG emissions is by establishing a baseline to determine how much is currently being emitted. A GHG inventory is an effective way to accomplish this. These inventories account for the level of emissions released by the municipality and community, providing a clearer understanding of energy use and associated costs. Additionally, GHG inventories form the foundation for climate action planning and can help prioritize funding for mitigation projects.³

The process of developing a GHG inventory involves four key steps: reviewing accounting standards and methods, determining organizational and operational boundaries, and selecting a base year. The next steps include collecting data, quantifying GHG emissions, developing a GHG Inventory Management Plan to formalize data collection procedures, and setting GHG emission reduction targets, followed by tracking and reporting progress.⁴ The purpose of this inventory is to establish a baseline year in which future inventories can use as a measure of progress over time.

The Climate Leadership and Community Protection Act (CLCPA), enacted in 2019, is a New York State law aimed at addressing climate change and achieving net-zero emissions. The law sets ambitious goals, including an 85% reduction in GHG emissions by 2050, 100% zero-emission electricity by 2040, 70% renewable energy by 2030, and the reduction of 22 million tons of carbon through energy efficiency and electrification. Additionally, the Central New York Regional Planning and Development Board (CNY RPDB), a public agency serving the counties of Cayuga, Cortland, Madison, Onondaga, and Oswego, provides a broad range of

¹ Overview of greenhouse gases | US EPA. (2025c, January 16). US EPA.

² What are greenhouse gases and why do they matter. (n.d.-b). NOAA Climate.gov.

³ Class_GHG_Inv_Presentation_2025.pptx. (n.d.-d). Google Docs.

⁴ Scopes 1, 2 and 3 Emissions Inventorying and Guidance | US EPA. (2025b, February 18). US EPA.

services aimed at community sustainability and development.⁵ These initiatives help the Village of Marcellus align with state-level climate goals while addressing its unique local needs.

Through the CLCPA, Marcellus can access statewide programs that promote clean energy, reduce GHG emissions, and enhance community resilience. Meanwhile, the CNY RPDB supports the village by offering technical assistance, securing grant funding, and implementing region-specific sustainability projects. This coordinated effort enables Marcellus to take meaningful climate action, improve energy efficiency in municipal buildings, expand renewable energy use, and engage residents in creating a greener, more resilient future.

Another key initiative available to the Village of Marcellus is the Climate Smart Communities (CSC) program, a New York State initiative that helps local governments take action to reduce GHG emissions and adapt to a changing climate.⁶ Marcellus is currently registered as a CSC community but does not yet hold any certifications.⁷ One step toward obtaining certification is conducting a GHG inventory. This report will include the results of the GHG inventory for energy use and emissions from municipal buildings and facilities, streetlights, the vehicle fleet, and the water and wastewater sectors for the year 2024. Additionally, the report will offer recommendations to help the village reduce these emissions.

⁵ Class_GHG_Inv_Presentation_2025.pptx. (n.d.-d). Google Docs.

⁶ Home page. (2025, April 4).

⁷ *Municipality detail*. (2012, October 9).

Methods

The Village of Marcellus requested a Greenhouse Gas (GHG) inventory report for their municipal operations in 2024 in order to comply with the Climate Smart Communities (CSC) Certification program. To calculate GHG emissions from municipal operations, this report follows the methodology outlined in the ICLEI Local Government Operations Protocol (LGO Protocol). This protocol provides standardized guidelines for local governments to assess their GHG emissions and categorize them into Scope 1 (direct emissions from owned or controlled sources) and Scope 2 (indirect emissions from the consumption of purchased electricity, steam, heating, and cooling).⁸ The UNFCCC Fifth Assessment Report - AR5 Global Warming Potentials for CO₂, CH₄, and N₂O were used. The environmental attributes for energy transmissions were pulled from the Energy Information Administration's (EIA) Emissions & Generation Resource Integrated Database (eGRID). Emission data from EPA are integrated with generation data from EIA to produce useful values like pounds of emissions per megawatt-hour of electricity generation (lb/MWh). The analysis also incorporates the DEC GHG Inventory Tool, developed by Climate Action Associates, to ensure consistent and accurate data calculations.

The GHG inventory categorizes emissions into four distinct sectors, each representing a major source of emissions within the village's municipal operations. These sectors were analyzed individually to provide a comprehensive assessment of the village's carbon footprint:

1. **Buildings and Facilities:** This sector includes GHG emissions associated with the consumption of electricity, natural gas, and diesel fuel by municipal buildings, facilities, and backup generators.
2. **Water and Wastewater Treatment:** Emissions in this sector stem from electricity and natural gas usage for water pumping and wastewater treatment facilities. Additionally, process emissions from wastewater treatment were also quantified.
3. **Streetlights:** This sector accounts for electricity consumption associated with municipal streetlighting infrastructure.
4. **Vehicle Fleet:** This sector covers the emissions resulting from both gasoline and diesel vehicles owned by the Village of Marcellus, including off-road vehicles and lawn equipment.

There are a multitude of tabs to use on the GHG inventory sheet. For this inventory, the tabs that were required were as follows:

1. **GHG inventory** - summarizes the overall GHG emissions data collected for the Village of Marcellus.
2. **Facility and group master list** - lists all municipal facilities and groups included in the GHG inventory.

⁸ ICLEI USA. (2020, December 11). ICLEI USA | Local Governments for Sustainability. <https://icleiusa.org/>

3. Energy provider accounts - details the utility accounts for electricity and gas services tied to municipal operations
4. Electric data, annual - contains annual electricity consumption data for each facility or account.
5. Electric data, monthly bills - tracks monthly electricity usage and costs from utility bills.
6. Natural gas data, annual - contains annual natural gas consumption figures for municipal facilities.
7. Natural gas, monthly bills - tracks monthly natural gas usage and billing information.
8. Vehicle fleet fuel - captures fuel consumption data for the municipal vehicle fleet.
9. Landfills - the Village of Marcellus doesn't have a landfill
10. Wastewater treatment - tracks greenhouse gas emissions from wastewater treatment operations.

Once data was collected using the documents provided, emissions for each sector were quantified using appropriate emission factors for each fuel type. The DEC GHG Inventory Tool was used to calculate the associated GHG emissions from electricity, natural gas, and fuel consumption.

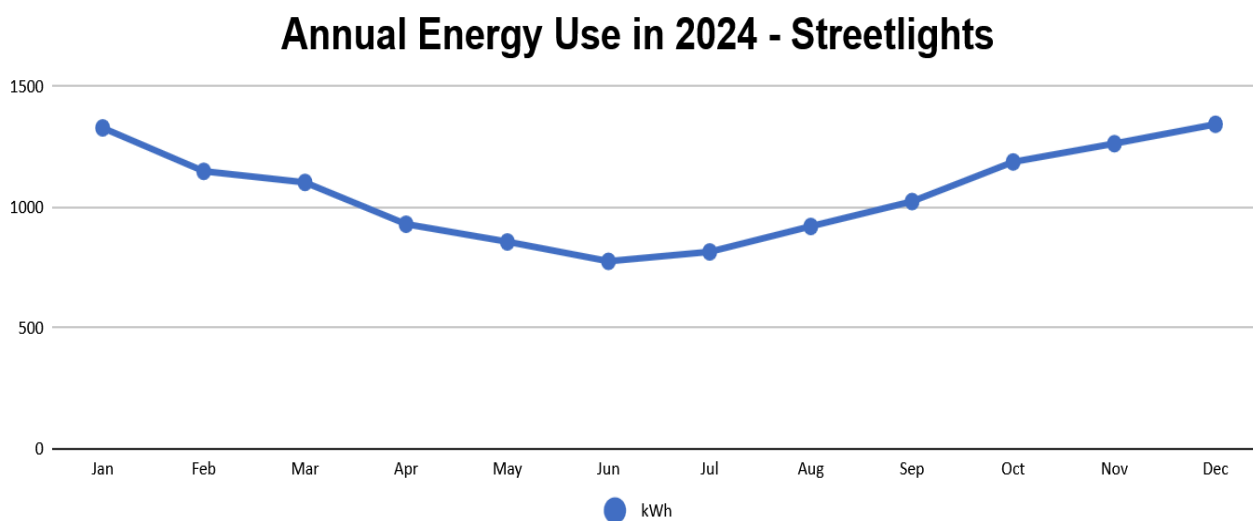
Emissions Sector

Vehicle Fleet

The Villages vehicle fleet is made up of 9 cars that use gasoline and 1 lawnmower. And they have two skid steers that use diesel. The village of Marcellus provided a county fuel invoice which included their fuel purchases and activity details. The GHG Inventory Tool calculated the total gas and diesel consumption and total amount in 2024. The total gas and diesel consumption and total amount in 2024 was calculated by the tool. The vehicle fleet used 5192.6 gallons of gas and spent \$14,225.27, and they also used 47.2 gallons of diesel and spent \$115.94 in the year of 2024. And the wastewater treatment facility (WPCP) part of the vehicle fleet used 387.8 gallons of diesel which cost them \$2,413.08 in 2024. It is worth noting that due to limitations of the inventory tool and local data, the diesel consumption of the WPCP includes onsite generators. This is because the fuel tank provides diesel to both the skid steer and generators. The fuel usage for the skid steer and generator is not tracked separately. Overall, the Vehicle Fleet Sector emitted 46 MTCO_{2e}.

Streetlights

There are 76 LED streetlights in the Village of Marcellus. And 100% of their streetlights were converted to LEDs in 2019, but this might not include decorative lighting. Energy consumption for the year of 2024 in the Streetlight sector was provided by the Village of Marcellus. During the months of January, February, October, November, and December of 2024 were the months with the highest electricity consumption. This is because the days in these months have more darker hours which keeps the streetlight on longer. The annual electric usage for the Streetlight sector in 2024 was 12,688 kWh which created 1.4 MTCO_{2e}.

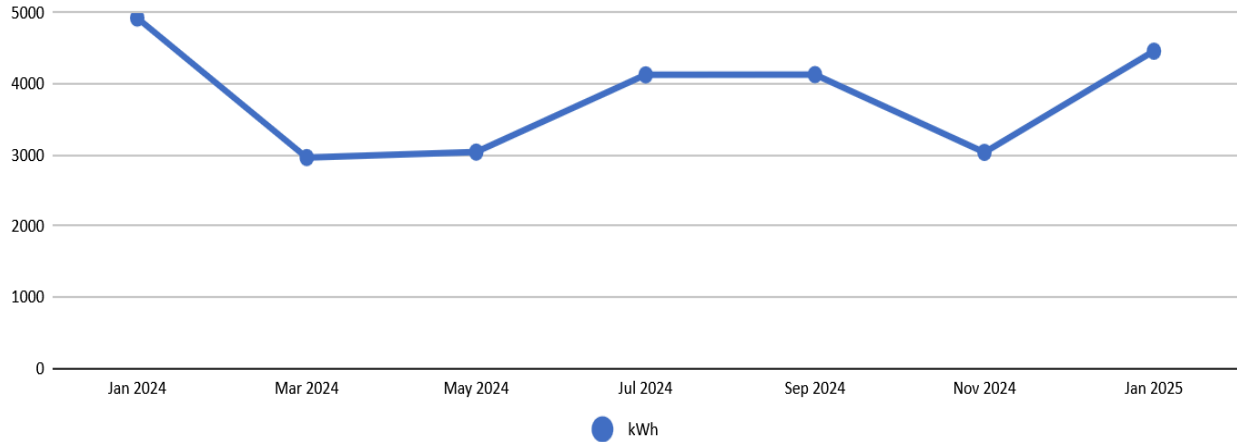


Buildings and Facilities

The emissions from the Buildings and Facilities sector consists of electricity and natural gas for Village Hall, Orange Street Pump, and Platt Road Pump. Stationary combustion of natural gas for the Buildings and Facilities sector produced 19.62 MTCO_{2e}. And the electricity use for the

Building and Facilities sector produced 2.6 MTCO₂e for the year of 2024. In total the Buildings and Facilities sector emitted 22.1 MTCO₂e or 17% of emissions.

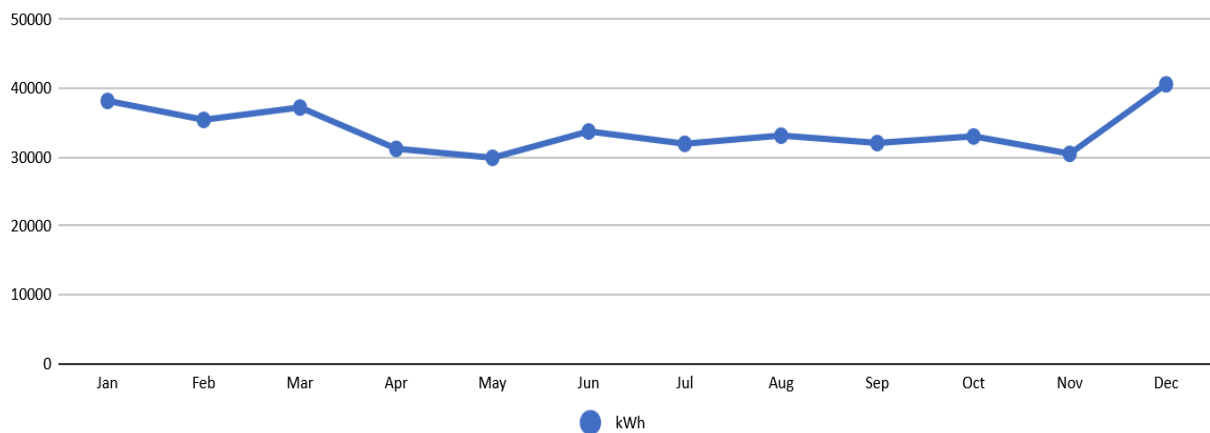
Annual Energy Use in 2024 - Village Hall



Wastewater

The WPCP is the wastewater treatment plant found in the village of Marcellus. It is the largest emitter of GHGs within the village and it makes up 44% of GHG emissions (MTCO₂e) in 2024. This sector consumed 406,680 kWh of electricity and 2,627 therms of natural gas. Stationary combustion of natural gas in this sector emitted 13.90 MTCO₂e, and electricity use emitted 44.5 MTCO₂e. In total the Wastewater sector emitted a total of 58.39 MTCO₂e.

Annual Energy Use in 2024 - WPCP

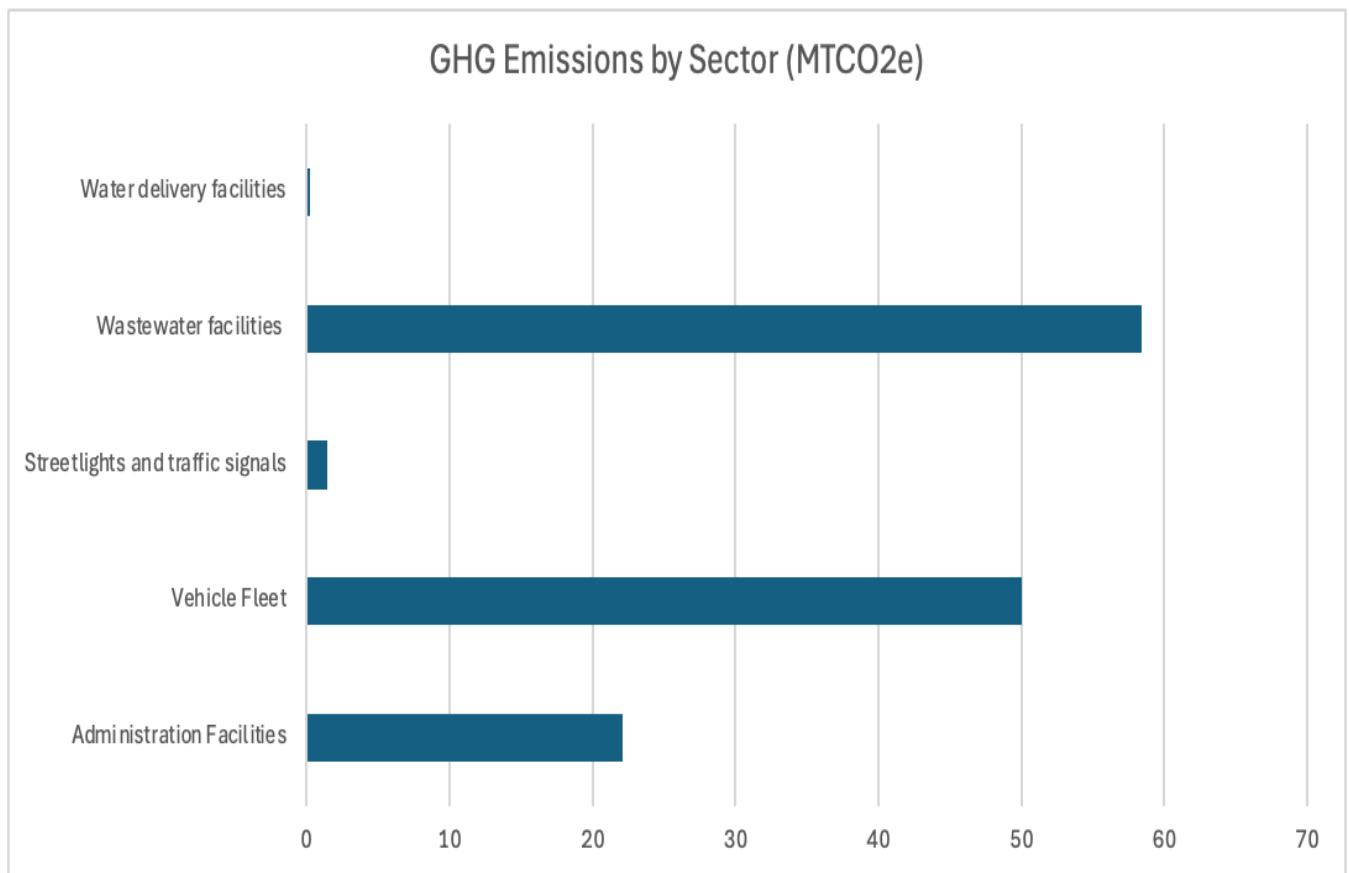


Results

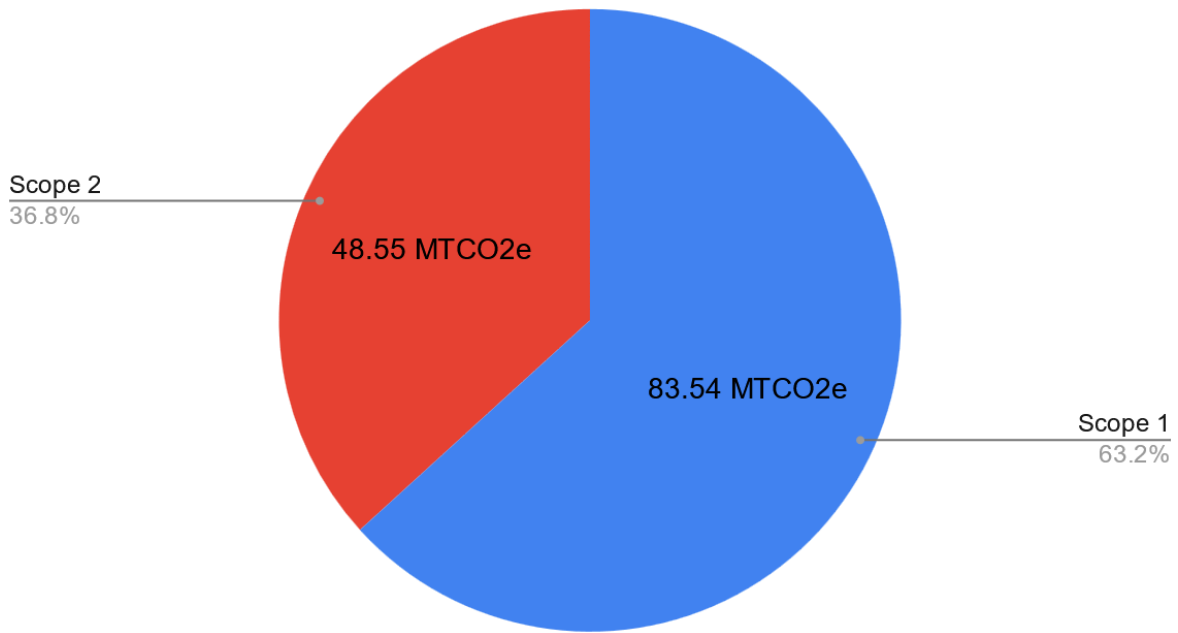
The total emissions for the village of Marcellus municipal operations for 2024 equaled 132.08 MTCO₂e. Scope 1 emissions totaled 63.2% (83.54 MTCO₂e) of emissions, whereas Scope 2 emissions accounted for 36.8% of emissions (48.55 MTCO₂e). The most significant emitting sector was the Wastewater sector with a total of 58.4 MTCO₂e or 44% of gross emissions in the

Village of Marcellus in 2024. The Vehicle Fleet sector emitted a total of 50.0 MTCO₂e which is also 38% of gross emissions for the year of 2024. The Streetlights sector emitted 1.4 MTCO₂e or 1% of total emissions. Buildings and Facilities emitted 22.1 MTCO₂e which is 17% of the village's emissions. The figure below shows gross emissions by reporting sector.

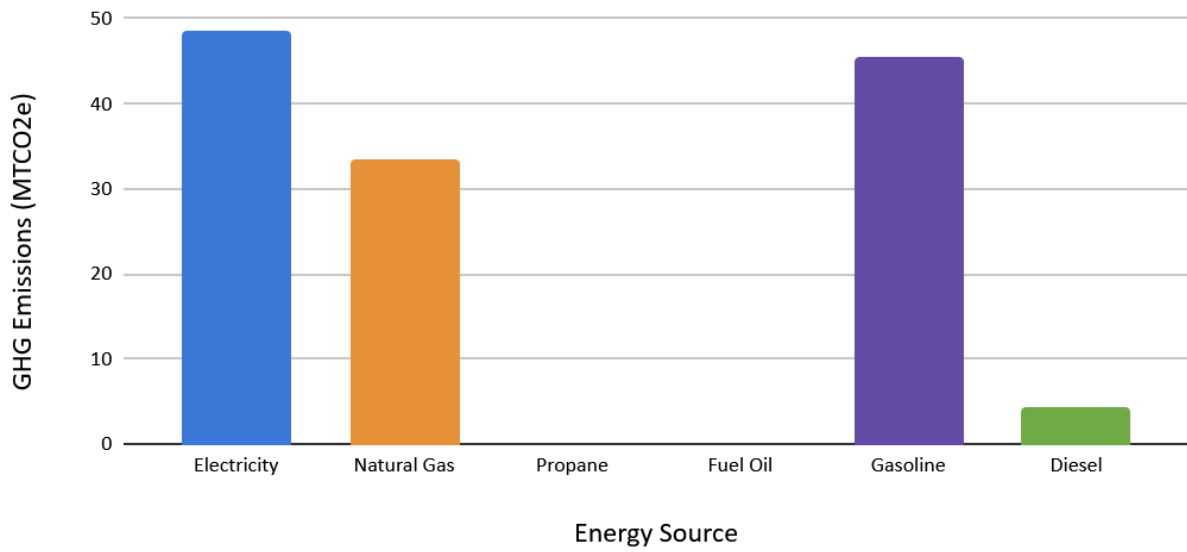
When looking at the GHG emissions by energy type, electricity use is the largest contributor to greenhouse gas emissions (48.55 MTCO₂e), with gasoline use at a close 2nd (45.59 MTCO₂e). Natural gas is the 3rd largest contributor (33.52 MTCO₂e). It is worth noting that only two municipal buildings utilize natural gas for heating, that is the wastewater treatment facility and Village Hall.



Scope 1 vs Scope 2 Emissions (MTCO₂e)



GHG Emissions by Energy Type (MTCO₂e)



Discussion

The effects of global warming are becoming increasingly more destructive as time goes on. Rising global temperatures have resulted in frequent and more intense weather patterns throughout the whole world. New York State has combated this with setting in place very ambitious climate goals. Key targets include reducing greenhouse gas emissions by 85% by 2050, transitioning to 100% zero emission electricity by 2040, and reaching 70% renewable energy generation by 2030.

For the Village of Marcellus, this report can serve as a starting point for developing their local climate action plan to reduce greenhouse gas emissions and reach New York State's climate action goals. Using this report Marcellus can identify actionable steps to reduce emissions and improve efficiency. In doing so the village will align with New York State's climate plan and receive various incentives such as grants, rebates, and low interest loans, as well as become a model for other small communities to develop their own climate action plan.

Conclusion

The 2024 Greenhouse Gas Inventory for the Village of Marcellus reveals total municipal emissions of approximately 108 metric tons of carbon dioxide equivalent (MTCO₂e). Using the Environmental Protection Agency's Local Greenhouse Gas Inventory Tool emissions from four key municipal sectors were analyzed which includes Vehicle Fleet, Streetlights, Buildings and Facilities, and Water Pollution Control. The results indicate that the Water Pollution Control sector is the largest contributor to municipal GHG emissions. This was followed by emissions from the Vehicle Fleet, Buildings and Facilities, and Streetlights. This inventory provides a clear baseline from which the Village can track progress and plan targeted emission reduction strategies. Reducing greenhouse gas emissions is essential to securing a sustainable future for Marcellus. Taking action now will not only help mitigate the impacts of climate change but also contribute to long-term economic and environmental benefits. Investments in energy efficiency, cleaner transportation, and infrastructure upgrades can lead to significant cost savings through reduced energy use. Which will also improve public health by decreasing air pollution. Furthermore, building climate resilience will help protect local ecosystems, infrastructure, and quality of life for current and future generations. Prioritizing emissions reductions and continuing to engage with New York State's Climate Smart Communities (CSC) program, the Village of Marcellus is positioning itself as a leader in environmental responsibility and sustainable development.

Citations

Class_GHG_Inv_Presentation_2025.pptx. (n.d.-a). Google Docs.

<https://docs.google.com/presentation/d/1JMnfUibcuZUs01U0w8gD2m7U04f4qmee/edit?slide=id.p1#slide=id.p1>

Home page. (2025, April 4). <https://climatesmart.ny.gov/>

ICLEI USA. (2020, December 11). *ICLEI USA | Local Governments for Sustainability*.

<https://icleiusa.org/>

Municipality detail. (2012, October 9).

https://climatesmart.ny.gov/actions-certification/participating-communities/municipality-detail/?tx_sjcert_applicant%5Bapplicant%5D%5B__identity%5D=884&tx_sjcert_applicant%5Baction%5D=show&tx_sjcert_applicant%5Bcontroller%5D=Applicant&cHash=0f305cb4ec57d1623052d7df16a93e48

Overview of greenhouse gases | US EPA. (2025c, January 16). US EPA.

<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

Scopes 1, 2 and 3 Emissions Inventorying and Guidance | US EPA. (2025b, February 18). US EPA.

<https://www.epa.gov/climateleadership/scopes-1-2-and-3-emissions-inventorying-and-guidance>

What are greenhouse gases and why do they matter. (n.d.-c). NOAA Climate.gov.

<https://www.climate.gov/ghg/what-are-greenhouse-gases-and-why-do-they-matter>