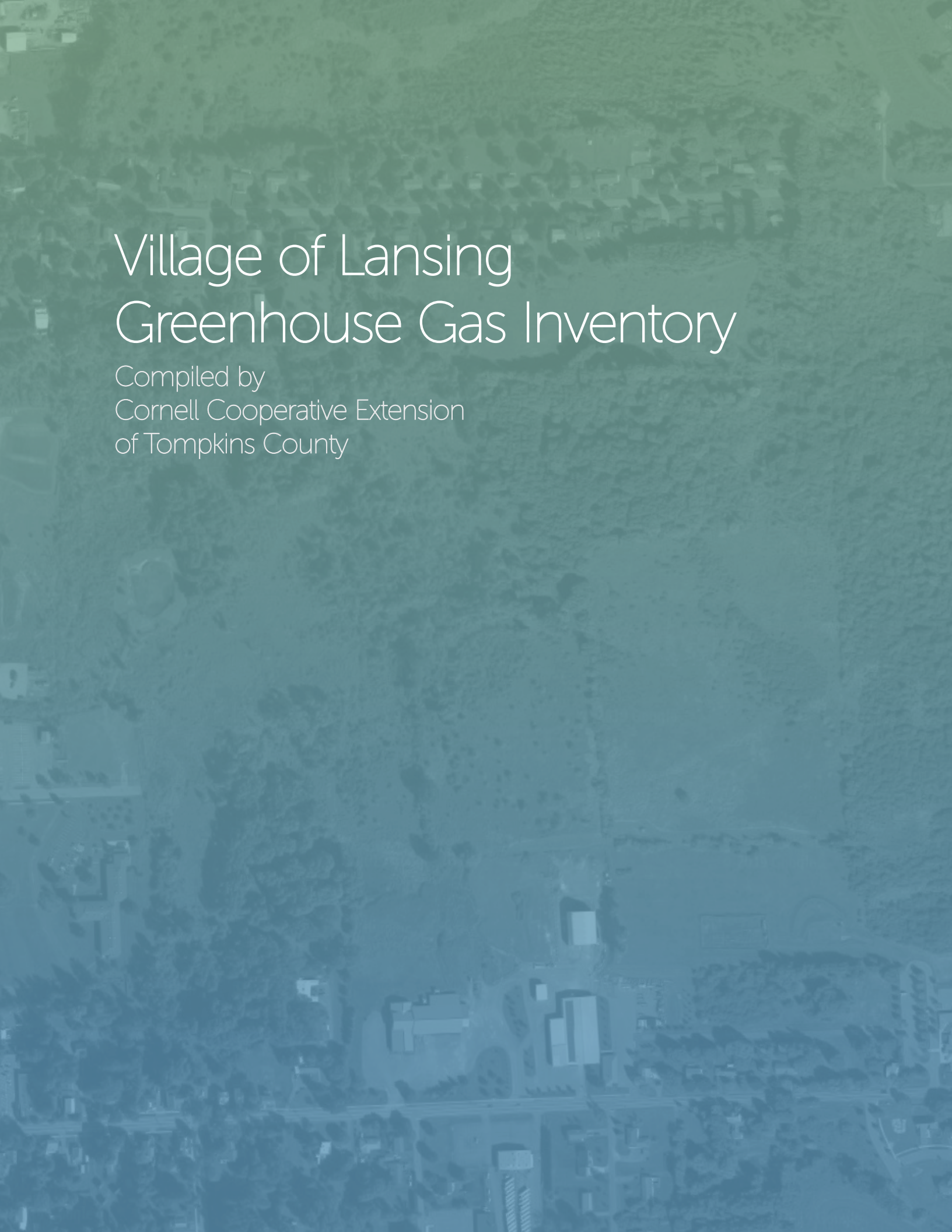

Village of Lansing Greenhouse Gas Inventory

Compiled by
Cornell Cooperative Extension
of Tompkins County

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INTRODUCTION

This comparison of 2019 greenhouse gas (GHG) emissions in the Village of Lansing, New York, from a baseline year of 2013, serves as a preliminary step in creating strategies to reduce GHG emissions. It is important for local government to understand their Village emission levels and their impacts as it allows them to prioritize actions when creating a local Climate Action Plan to mitigate the effect of these emissions.

This information was compiled per the Local Government Operations Protocol (LGOP), version 1.1. The LGOP is a policy framework that provides guiding methodologies to help local governments calculate and understand the GHG emissions of their operations. The LGOP was developed by the International Council for Local Environmental Initiatives and the Climate Registry in collaboration with the California Climate Action Registry and the California Air Resources Board.

This Greenhouse Gas Inventory was prepared as a component of the Village of Lansing's participation in the Climate Smart Communities program of the New York State Department of Environmental Conservation. The inventory was prepared by Brian Toy, Climate Smart Communities Outreach Specialist, on behalf of the Village of Lansing and under the guidance of Terrance Carroll, Clean Energy Communities Coordinator for Tompkins County. Additional assistance was provided by the Village of Lansing CSC Task Force and Village staff members who provided the data necessary to complete this inventory.

Communities that have been certified as Climate Smart Communities are committed to reducing GHG emissions and improving climate resilience, which allows them to reduce long-term costs and adapt to a changing climate.

Greenhouse Gas Emission and Energy Use in New York State

Greenhouse gases are gases that trap heat in the Earth's atmosphere when they accumulate in high concentrations. Common greenhouse gases include carbon dioxide, methane, nitrous oxide, and fluorinated gases, which are synthetic gases produced by industrial processes. These gases are released into the atmosphere in a number of ways: everyday activities of all kinds can have a direct impact on greenhouse gas emissions and climate change.

Some gases have a greater impact on the atmosphere than others, but together, these gases combine to "thicken the Earth's blanket" and change climatic conditions. For example, methane gas has a higher warming effect on the atmosphere than carbon dioxide but dissipates more quickly. Some of these gases, such as water vapor, carbon dioxide, and methane, occur naturally in small percentages, and help the atmosphere retain enough heat to sustain life. This balance is disrupted, however, by greenhouse gas emissions from human activity, which cause the atmosphere to retain more energy from the sun than it normally would. This seemingly small change in the atmosphere's composition has already led to big changes in temperature and weather all over the world.

Greenhouse gas emissions in New York State come mostly from transportation (34%). This includes all travel of people and goods by cars, trucks, ships, airplanes, trains, and other

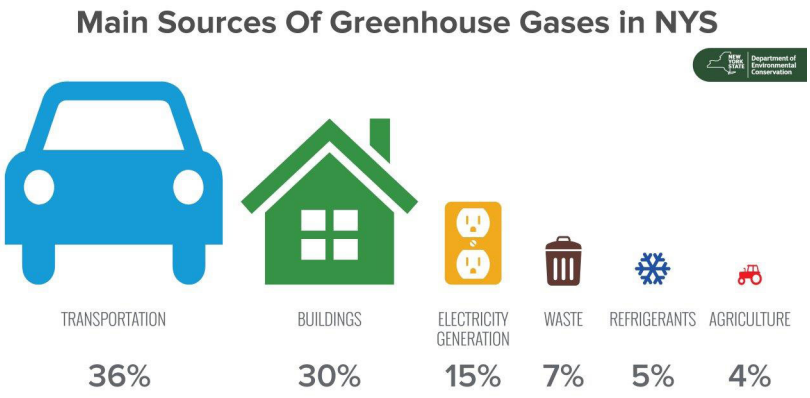


Image source: New York Department of Environmental Conservation http://www.dec.ny.gov/images/administration_images/ghgsrcsm.jpg

vehicles. Greenhouse gases in the state are also largely produced by the industrial sector from the manufacturing processes that create the goods and raw materials that we use every day. Residential and commercial activity contributes as well, mostly resulting from heating, cooking, wastewater management, and refrigerant leaks. GHG emissions in rural areas of New York State also come from soil management of agricultural land that releases nitrous oxide into the atmosphere. These activities include the use of synthetic and organic fertilizers, growing nitrogen-fixing crops, and various irrigation processes. Livestock also contribute to GHG emissions, as their natural digestive processes produce methane. This can be exacerbated or mitigated by proper management of livestock waste.

A variety of research, including New York's Climate Aid report (2011, 2014) and the National Climate Assessment (2014), has shown that impacts of climate change have already begun to occur in New York State. Climate change manifests as changes in temperature, precipitation, sea levels, seasonal changes, and severe weather events. These changes have direct effects on the health of humans, animals and plants in New York State.

Since 1970, the average annual temperature has risen by 2.4°F in New York State. Average winter temperatures have increased by over 4.4°F. Climate change has also resulted in increased precipitation in the winter, and less in the summer. Climate change also includes climactic events beyond global warming, namely an increase in severe weather events, such as superstorms and hurricanes. Between 1958 and 2010, the number of very heavy precipitation events increased by over 70% in the United States. New York's coastal areas have seen a sea level rise of over a foot since 1900. Sea level rise is a result of climate change, which causes warmer temperatures that melt polar caps, glaciers, and land-based ice. Sea level rise is especially imminent in New York State, where the rate of rise (1.2 inches per decade) is nearly twice as high as the global rate (0.7 inches per decade). Climate change has also resulted in variation in seasonal patterns. In New York State, for example, spring begins a week earlier than it once did. The first leaf date in autumn is, correspondingly, over a week late.

Once greenhouse gases are emitted into the atmosphere, they can linger for decades or even centuries, even if emissions are reduced in the future. It is important to understand how

greenhouse gas emission are affecting our region in order to create strategies for reducing future greenhouse gas emissions. Modelling has projected that climate change will continue in New York State. The region will experience more precipitation, more variability in precipitation, and warmer temperatures. Specifically, the 2014 Climate Aid report projections for the region state that by the 2050s there will be an increase of 4.4 to 6.3 degrees in temperature and 4 to 10 percent more precipitation as compared to the 1971-2000 period.

Climate change also negatively impacts the availability of clean air, water, and food supplies. Changing environmental conditions in New York State also help insects, such as mosquitoes and ticks, spread infectious diseases such as West Nile virus and Lyme disease. Human health is also affected directly by the changing climate, especially those, like the elderly and children, who are already vulnerable. This can be caused by things such as increased pollen production, ground-level ozone formation, or the presence of other forms of air pollution. All of these factors exacerbate asthma, allergies, and other respiratory conditions.

In summary, greenhouse gas emissions and the climate change that they cause have already begun to affect the health and sustainability of communities in New York State. These negative effects can be partially mitigated, however, by reducing greenhouse gas emissions and the activities that create them. This Greenhouse Gas Inventory for the Village of Lansing, New York, serves as a first step in taking action to plan for a healthier and more environmentally responsible village that may be enjoyed for generations to come.

METHODOLOGY

The calculations in this report were performed using the EPA Local Greenhouse Gas Inventory Tool: Government Operations Module provided by the United States Environmental Protection Agency. The tool is based on the Local Government Operations Protocol, which serves as a national standard for municipal greenhouse gas inventories across the country. Buildings emission data for the Village of Lansing was collected from the New York State Electric and Gas Corporation (NYSEG) over a 12-month period. Vehicle emissions data was gathered through the municipal gas log compiled by the Village Clerk.

At this point in time, the Village was unable to collect information about emissions from the Village of Cayuga Heights Wastewater Treatment Plant (VCHWWTP). The Village intends to include emissions from the VCHWWTP in any future iterations of the Greenhouse Gas Inventory.

RESULTS

Stationary Combustion of Fossil Fuels

For the calendar year consisting of January 2013 – December 2013 the Village of Lansing had two buildings using natural gas, which are the Village Garage and the old Village Hall. These buildings used 215 million British thermal units (MMBtu) of energy over the course of the year. In 2014, the Village moved into a new administrative building, resulting in an increase in their natural gas usage for the calendar year consisting of January 2019 – December 2019. Additionally, one of the water delivery facilities, Brown Road, used 18 MMBtu of natural gas in 2013 and 14 MMbtu of natural gas in 2019. Overall natural gas usage for the Village increased by 81.5% (208 MMBtu) from 233 MMBtu in 2013 to 423 MMBtu in 2019.

2013 v. 2019 Municipal Fuel and Energy Consumption by Sector (million BTU)				
Sector	2013 Natural Gas Energy Use	2019 Natural Gas Energy Use	2013 v. 2019 Natural Gas Use Difference	2013 v. 2019 Natural Gas Use Percent Change
Buildings	215	409	↑194	↑90.2%
Water Delivery Facilities	18	14	↓ 4	↓22.2%
Total Stationary Combustion Energy Use	**233**	**423**	**↑190**	**↑81.5%**

The result of the increase in natural gas usage is a corresponding increase in CO_2 emissions. In 2013, the Village emitted 12.3 MT CO_2e from natural gas, compared to 22.5 MT CO_2e in 2019. This is an increase of 10.2 MT CO_2e, or an 82.9% increase in emissions.

2013 v. 2019 GHG Emissions from Natural Gas by Sector (MT CO_2e)				
Building	2013 CO_2 Emissions	2019 CO_2 Emissions	2013 v. 2019 Emission Difference	2013 v. 2019 Emission Percent Change
Buildings	11.4	21.7	↑10.3	↑90%
Water Delivery Facilities	0.9	0.8	↓0.1	↓11.1%
Total Stationary Combustion Emissions	**12.3**	**22.5**	**↑10.2**	**↑82.9%**

Electricity Consumption

Electricity consumption in buildings increased from 29,520 kilowatt-hours (kwh) in 2013 to 31,775 kwh in 2019. Conversely, electricity consumption in streetlights and traffic signals decreased from 150,608 kwh in 2013 to 112,813 kwh in 2019. For water delivery facilities, electricity usage decreased from 13,857 kwh in 2013 to 9,214 kwh in 2019. Finally, energy usage from wastewater facilities, which only include Village pump stations as VCHWWTP information is not included in this inventory, increased from 2,248 kwh in 2013 to 3,140 kwh in 2019.

2013 v. 2019 Electrical Consumption by Sector (kwh)				
Sector	2013 Electrical Use	2019 Electrical Use	2013 v. 2019 Electrical Use Difference	2013 v. 2019 Electrical Use Percent Change
Buildings	29,520	31,775	↑2,255	↑7.6%
Streetlights and Traffic Signals	150,608	112,813	↓37,795	↓25.1%
Water Delivery Facilities	13,857	9,214	↓4,643	↓33.5%
Wastewater Facilities	2,248	3,140	↑892	↑40%
Total Electrical Consumption	**196,233**	**156,942**	**↓39,291**	**↓20%**

The small increase in building electricity usage somewhat counterintuitively corresponds with a decrease in buildings emissions from 5.21 $MTCO_2e$ in 2013 to 3.66 $MTCO_2e$ in 2019. Although there was the addition of a new Village Hall in 2014, this Village Hall was built to higher energy efficiency standards than the previous building, resulting in only a slight increase in electricity usage. One possible explanation for the corresponding decrease in emissions is the "greening" of the grid (see Appendix A).

An increased mix of renewables in the upstate NY energy grid results in a lower emissions factor attributed to emissions from electricity in 2019 than in 2013. Emissions from streetlights and traffic signals decreased significantly from 26.58 $MTCO_2e$ to 13.01 $MTCO_2e$. This decrease is likely due to efforts by the Village to convert many of its streetlights to LED in the years between 2013 and 2019 in combination with the greening grid, vastly reducing electricity usage and emissions. Water delivery facilities' electricity emissions decreased from 2.45 $MTCO_2e$ in 2013 to 1.05 $MTCO_2e$ in 2019. Like electricity emissions from buildings, the increased mix of renewables in the grid likely caused this decrease in emissions. Emissions from wastewater facilities electricity usage decreased from 0.4 $MTCO_2e$ to 0.36 $MTCO_2e$, which is a negligible difference.

2013 v. 2019 GHG Emissions from Electricity by Sector (MT CO_2e)				
Sector	2013 CO_2 Emissions	2019 CO_2 Emissions	2013 v. 2019 Emission Differ-ence	2013 v. 2019 Emission Percent Change
Buildings	5.21	3.66	↓1.55	↓29.8%
Streetlights and Traffic Signals	26.58	13.01	↓13.57	↓51.1%
Water Delivery Facilities	2.45	1.06	↓1.39	↓56.7%
Wastewater Facilities	0.40	0.36	↓0.04	↓10%
Total Emissions from Electricity	**34.63**	**18.09**	**↓16.54**	**↓47.7%**

Mobile Combustion of Fossil Fuels: Municipal Vehicle Fleet

In the budget year encompassing June 2013 – May 2014 the mobile fleet in the Village of Lansing consisted of 11 vehicles and pieces of equipment: 6 which consumed gasoline, and 5 of which consumed diesel. In budget year 2013, the municipal vehicle fleet in the Village of Lansing used

a total of 4,085 gallons of fossil fuel. By budget year 2019 (encompassing June 2019 – May 2020), with 2 more vehicles and 5 more pieces of equipment in the fleet, and some older vehicles replaced, fossil fuel use increased. In budget year 2019, the fleet consisted of 18 vehicles and pieces of equipment: 6 of which consumed gasoline, and 11 of which consumed diesel. In 2019, the fleet's fossil fuel consumption increased by 1,458 gallons from 2013 levels to 5,543 gallons of fossil fuel.

2013 v. 2019 Vehicle Fossil Fuel Use by Type (gallons)			
Year	Gasoline	Diesel	**Total**
2013	2,485	1,600	**4,085**
2019	1,748	3,795	**5,543**
2013 v. 2019 Fossil Fuel Use Difference	↓737	↑2,195	**↑1,458**
2013 v. 2019 Fossil Fuel Use Percent Change	↓29.7%	↑137.2%	**↑35.7%**

Another way of interpreting this data is to measure energy use in MMBtu. MMBtu is a scientific unit used to measure energy. The exact percent change in energy usage is slightly different due to the conversion between gallons and MMBtu.

2013 v. 2019 Vehicle Fossil Fuel Use by Type (MMBtu)			
Year	Gasoline	Diesel	**Total**
2013	311	221	**532**
2019	218	524	**743**
2013 v. 2019 Fossil Fuel Use Difference	↓93	↑303	**↑211**
2013 v. 2019 Fossil Fuel Use Percent Change	↓29.9%	↑135.3%	**↑39.7%**

The increase of fossil fuel use for the municipal vehicle fleet naturally led to an increase in greenhouse gas emissions from fossil fuel use in the fleet. Between 2013 and 2019, carbon dioxide emissions increased from 39 MT CO_2e to 55 MT CO_2e, a growth of 41.0%. A possible reason for this increase in fossil fuel usage, apart from the addition of vehicles and equipment to the fleet, is the winter weather conditions in 2013 versus 2019. A bad winter weather season results in the Village having to plow roads more frequently and therefore use more fuel, resulting in increased emissions from the vehicle fleet. A mild winter weather season results in the opposite. Other possible reasons for the increase include an expanded park system which results in more lawnmowing and additions to the sidewalk system which the Village is responsible for plowing in the winter.

2013 v. 2019 GHG Emissions from Municipal Vehicle Fleet (MT CO_2e)			
2013 CO_2 Emissions	2019 CO_2 Emissions	2013 v. 2019 Emission Difference	2013 v. 2019 Emission Percent Change
39	55	↑16	↑41.0%

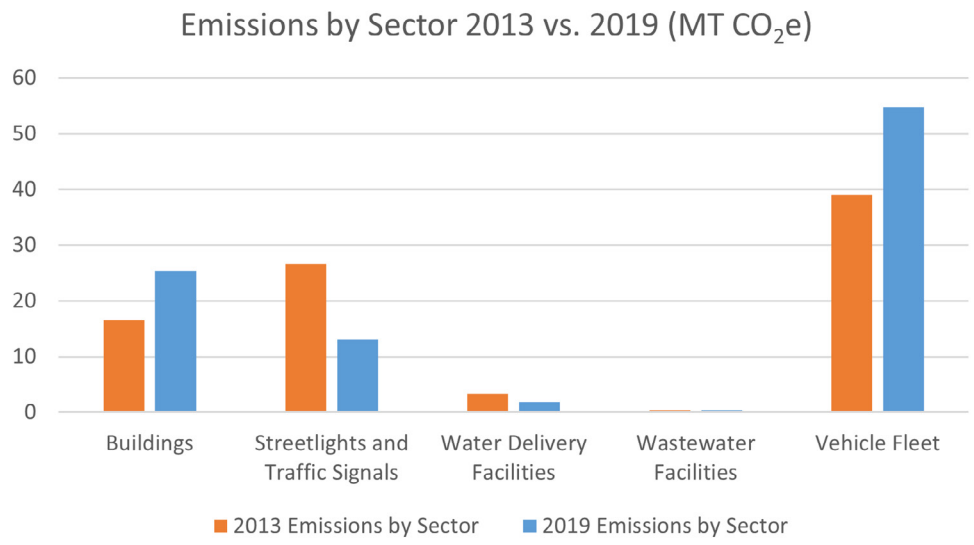
SUMMARY & CONCLUSION

Summary: Greenhouse Gas Emissions in the Village of Lansing, New York

2013 v. 2019 GHG Emission Source (MT CO_2e)				
Year	Stationary Combustion	Electricity	Mobile Combustion	**Total**
2013	12.3	34.63	39	**85.93**
2019	22.5	18.09	55	**95.28**
% Change in Emissions	↑82.9%	↓47.7%	↑41%	**↑10.9%**

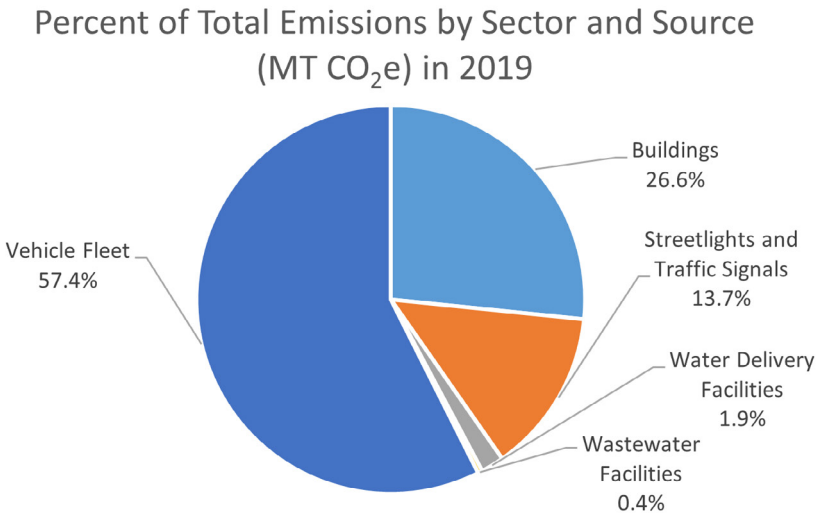
Overall, greenhouse gas emissions from Village of Lansing government operations increased by 10.9%, or 9.35 $MTCO_2e$, from 2013 to 2019. Ultimately, the significant decrease in electricity emissions from the increased mix of renewables in the grid and converting streetlights to LED was not enough to offset emissions increases in the vehicle fleet and natural gas consumption with the addition of the new Village Hall building. Building emissions from natural gas and the vehicle fleet are the two areas that are the culprits of this increase in emissions. Emissions from buildings increased from 16.61 $MTCO_2e$ in 2013 to 25.37 $MTCO_2e$ in 2019, and vehicle fleet emissions increased from 39 $MTCO_2e$ in 2013 to 55 $MTCO_2e$ in 2019. The net increase in emissions when only incorporating the increase in building and vehicle emissions and decrease in streetlight emissions is 11.19 $MTCO_2e$, nearly equating the increase in overall Village emissions from 2013 to 2019.

The Village of Lansing currently plans to perform actions to achieve Climate Smart Communities certification which will hopefully decrease emissions in the future. These actions include, but are not limited to, energy benchmarking for municipal buildings, conducting a municipal fleet inventory, and upgrade outdoor lighting. The implementation of emissions reduction measures will help the Village set an example for the broader community and lower emissions on a community-wide level as municipal government emissions contribute to emissions of the entire Village of Lansing.



Conclusions: Impacts and Further Action

In 2019, the Village of Lansing created 95 metric tons of carbon dioxide equivalent. This is approximately equivalent to 864,351 miles driving in an average passenger car, 40 homes' energy use for one year, or the amount of carbon sequestered by 455 acres of U.S. forests in one year.



The Village of Lansing has already taken many steps to reduce emissions from government operations. In addition to converting streetlights to LED, the Village built its new Village Offices buildings to higher energy-efficiency standards. The Village also updated its Greenway Plan in 2018 and has a standing Greenway Committee to maintain natural areas. In terms of intermunicipal cooperation, the Village has participated in the Cayuga Lake Watershed Intermunicipal Organization for at least 10 years to monitor and protect the local watershed. The Village also participates in an intermunicipal committee to address inflow and infiltration issues within shared sewer systems to address unnecessary water usage and sewer treatment issues.

While the Village has already implemented actions to reduce emissions, it will continue to work towards further emissions reductions. Some of the actions the Village is currently pursuing for the Climate Smart Communities Certification, such as a fleet inventory and energy benchmarking, provide a baseline for future actions that the Village can complete. Furthermore, while the new Village Offices building is more energy efficient, the Village can install HVAC upgrades on the old Department of Public Works (DPW) building. With the Greenway Committee already in place, the Village is also well-positioned to expand the existing Complete Streets policy partially addressed in the 2018 Greenway Plan and the improvement of bicycling and pedestrian infrastructure. Complete streets designs can include green infrastructure to help with stormwater management and bicycle and pedestrian infrastructure can promote alternative modes of travel to vehicles on an individual level for Village residents.

Although emissions increased in the Village of Lansing from 2013 to 2019, the Village has already begun to implement measures to mitigate future greenhouse gas emissions. Many streetlights have already been converted to LED, and the Village has created a task force to pursue Climate Smart Communities certification. In combination with other initiatives the Village has such as the Greenway Committee, the Village is well-positioned to implement further actions to reduce greenhouse gas emissions into the future.

SOURCES

For Questions Regarding this Greenhouse Gas Inventory

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Sources and Further Information

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

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APPENDIX

Appendix A: Further Information About the "Greening" of the Grid

The Upstate New York Electric Grid (NYUP) generates power using a mixture of combustion-based generation and non-combustion-based generation. Combustion-based generation is primarily derived from fossil fuels, including coal, natural gas, and oil. Non-combustion-based generation includes hydropower, nuclear, and other renewables such as solar and wind. Since 2013, the mixture of combustion-based generation and non-combustion-based generation powering the Upstate New York Electric Grid has shifted towards increased non-combustion-based generation. The cause of this shift has been the closure of coal power plants in combination with the growth of renewable generators in the grid from 2013 to 2019.

The shift towards renewable energy has decreased the greenhouse gas emissions factor, a value related to the quantity of a pollutant released into the atmosphere from an activity, for electricity usage in the region between 2013 and 2019. This emissions factor is multiplied by electricity consumed as part of the equation to calculate greenhouse gas emissions in metric tons of CO_2e. A lower emissions factor will result in a lower amount of greenhouse gas emissions for the same amount of electricity used. The "greening" of the NYUP grid from 2013 to 2019 means that major sources of electricity consumption, such as Village buildings, streetlights, and traffic signals, saw decreased emissions from electricity usage beyond what would be expected from normal efficiency improvements. The exact composition of resources used to power the New York Upstate Electric Grid and the change in the emissions factor are displayed in the tables below.

New York Upstate Electric Grid Resource Generation Mix (percent of total)[1]

	Coal	Oil	Gas	Nuclear	Biomass	Wind	Solar	Hydro	Other Fossil Fuel
2012	5.5%	0.2%	30.4%	28.9%	1.8%	3.6%	0%	29.2%	0.4%
2018	0.8%	0.6%	25.9%	31.3%	2.0%	4.7%	0.2%	34.6%	0%

New York Upstate Electric Grid Nonrenewables vs. Renewables[2]

	Nonrenewables Generation	Renewables Generation
2012	65.4%	34.6%
2018	58.6%	41.4%

New York Upstate Electric Grid Combustion vs. Non-combustion

	Combustion Generation	Non-Combustion Generation
2012	38.3%	61.7%
2018	29.2%	70.8%

1 Resource mix calculations only occur every other year. Since this inventory compared the years 2013 and 2019, 2012 and 2018 numbers are presented here in the appendix as the closest approximation.

2 Nuclear power is included in nonrenewables generation NOT renewables generation.

New York Upstate Electric Grid Emissions Factors

	Electricity Emissions Factor[3]
2012	387.3
2018	253.1

3 Note the emissions factor is calculated using megawatt-hours instead of kilowatt-hours. There are different emissions factors for CO_2, CH_4, and N_2O. The emissions factor provided here is for CO_2 emissions.