Village of Montour Falls, New York: Greenhouse Gas Emissions Inventory: A comparison of 2013 and 2018

Compiled by:
Cornell Cooperative Extension of Tompkins County
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Introduction

This comparison of 2018 greenhouse gas (GHG) emissions in Montour Falls, 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's 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 guidance and assistance of the NYS Climate Smart Communities Greenhouse Gas Inventory Guide for Government Operations. This guide was developed to provide detailed guidance on procedures on how to collect the municipal energy usage and emissions data. It also advises on what specific data is needed to calculate the government operations total greenhouse gas emissions. This guide was used in conjunction with the EPA Government Operations GHG calculation tool which provides the specific requirements to calculate total emissions.

This Greenhouse Gas Inventory was prepared as a component of the Village of Montour Falls' participation in the Climate Smart Communities program of the New York State Department of Environmental Conservation. The inventory was prepared by Osamu Tsuda (CCE Tompkins) and Chris Skawski (CCE Schuyler), Clean Energy Community Program Staff on behalf of the Village of Montour Falls and under the guidance of Katherine Herleman (CCE Schuyler) and Terrance Carroll (CCE Tompkins), both of whom are Clean Energy Communities coordinators in their designated counties.

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.

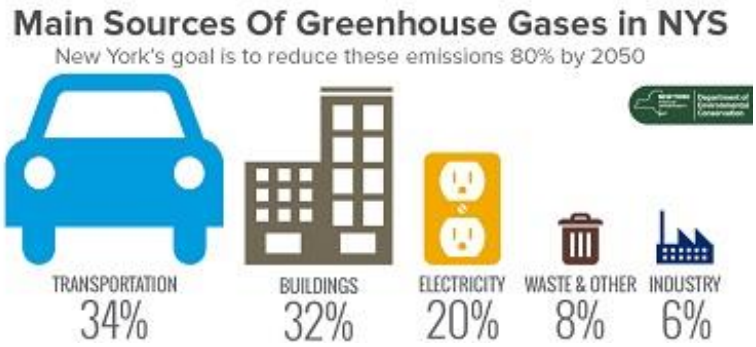


Image source: New York Department of Environmental Conservation
http://www.dec.ny.gov/images/administration_images/ghgsrcsm.jpg

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 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. The chart below from Climate Smart Farming depicts county specific yearly temperature projections.

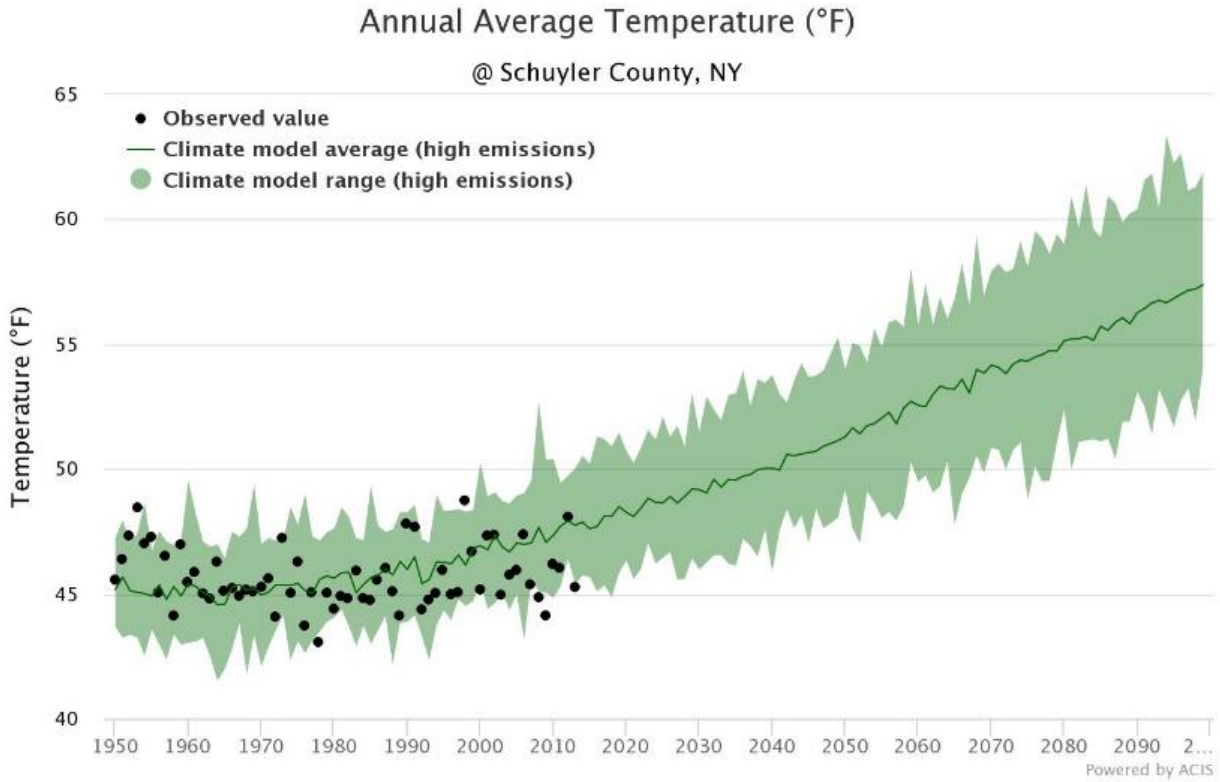


Chart 1 Temperature Projections- Cornell Climate Smart Farming

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). The chart on the following page from Climate Smart Farming depicts county-specific projections. 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.

While coastal flooding and sea level rise is a major problem, for most of New York State, inland flooding due to extreme weather poses an even greater threat to communities. According to the DEC, a large portion of Upstate NY will experience increased precipitation. This not only includes rainfall, but snow as well, as the Finger Lakes' regional weather can be significantly influenced by the major lakes (i.e. Lake Ontario). As a result of this increased precipitation, runoff will continue to increase, which will not only lead to flooding, but potential contamination of existing waterbodies. According to the US

EPA, runoff is a major factor to the contamination of large waterbodies, eventually leading to algal bloom, which is a green-colored cyanobacteria that creates a toxic environment to aquatic organisms as well as humans, thus posing a threat to the entire community. This phenomenon is a major issue throughout fresh-water waterbodies in New York State and many findings have shown that while there are many factors that lead to increased algal bloom, increased runoffs which contain contaminants and fertilizers from developed lands and surfaces have significantly contributed to this problem. While this might seem like an indirect link to climate change, it is important to make the connection that all of this can be linked back to greenhouse gas emissions.

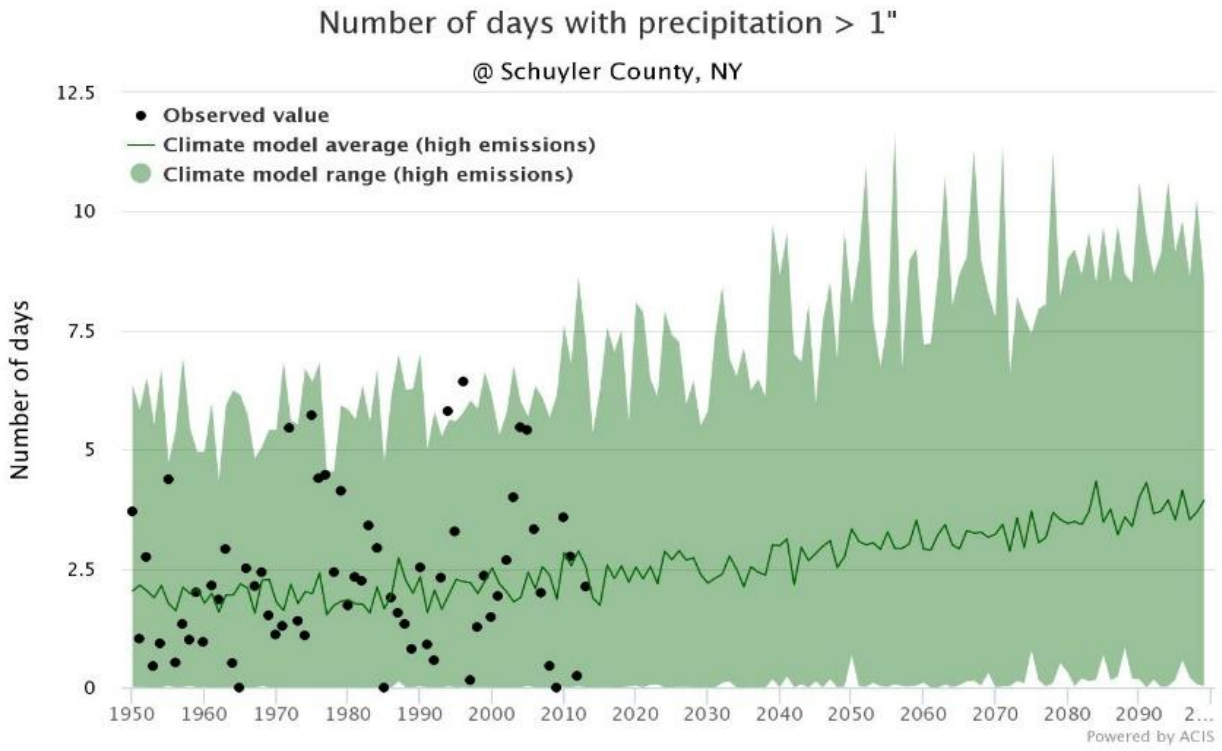


Chart 2Extreme Weather Projections - Cornell Climate Smart Farming

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. By 2020, average precipitation will increase by up to 8%, compared to the 1971-2000 period, and annual average temperatures will increase by 3°F.

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 Montour Falls, New York, serves as a first step in taking action to plan for a healthier and more environmentally responsible town that may be enjoyed for generations to come.

Methodology

The calculations in this report were performed using the Climate Smart Communities Local Government Greenhouse Gas Accounting Tool, provided by the New York State Department of Environmental Conservation. 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 emissions data for the Village of Montour Falls was collected from the New York State Electric and Gas Corporation (NYSEG) over a 12-month period. Vehicle emissions data was gathered through municipal gas logs and the village vehicle inventory. And finally, all other information such as waste water treatment facility data was provided by the public works department of the Village.

Stationary Combustion of Fossil Fuels: Natural Consumption in Municipal Buildings

The use of natural gas in the Village Hall and municipal facilities has increased in the period between 2013 and 2018. In the Village Fire Station, yearly natural gas usage increased from 259 million BTUs to 570 million BTUs, an approximately 100% increase. In the village Library, natural gas usage increased from 198 million BTUs to 209 million BTUs, an increase of 5.56%. In total, natural gas use in these municipal buildings increased by 14.4%, or a total of 195 million BTUs of natural gas used per year. A note on units: A BTU, or British Thermal Unit, measures thermal energy, and is a standard measure of natural gas usage.

2013 v. 2018 Municipal Building Fuel and Energy Consumption (million BTU)				
Building	2013 Natural Gas Energy Use	2018 Natural Gas Energy Use	2013 v. 2018 Use Difference	2013 v. 2018 Use Percent Change
Village Hall	259	287	28	10.8%
Fire Station	328	570	242	73.8%
Public Works	572	537	-35	-6.1%
Library	198	209	11	5.6%
Total Stationary Combustion Energy Use	**1357**	**1552**	**↑246**	**↑14.4%**

The combustion and use of natural gas results in the release of carbon dioxide into the atmosphere. The Village of Montour Falls' emissions from municipal buildings have been calculated below in metric tons of CO_2 equivalent (MT CO_2E). This unit converts other greenhouse gases into the amount of CO2 that would have the same impact on global climate change in order to standardize and measure harmful emissions. The yearly carbon dioxide equivalent emissions of these buildings have increased in the period between 2013 and 2018, corresponding with the increase in the amount of natural gas used.

2013 v. 2018 GHG Emissions from Natural Gas by Municipal Building (MT CO_2E)				
Building	2013 CO_2 Emissions	2018 CO_2 Emissions	2013 v. 2018 Emission Difference	2013 v. 2018 Emission Percent Change
Village Hall	14	13	-1	-7.1%
Fire Station	17	30	13	76.5%
Public Works	30	28	-2	6.7%
Library	11	11	0	0%
Total Stationary Combustion Emissions	**72**	**82**	**↑7**	**↑76.1%**

In general, as there is an overall increase in consumption of natural gas, it is important to note that the winter of 2018 was significantly colder than 2013. For example, in 2013 between January and May, the average temperature was approximately 37 F whereas in 2018 the temperature was approximately 35 F. While this might not sound too significant, these lower temperatures likely contributed to the increase in fuel consumption. Other factors to consider are reinstallation of new HVAC systems and changing hours of operation for the different facilities.

Electricity Consumption in Municipal Buildings

Electricity consumption in municipal buildings in the Village of Montour Falls has decreased considerably in the period between 2013 and 2018. Between 2013 and 2018, while annual electricity uses in the Village Hall increased by 1,267 kWh, or 13.1%, the

rest of the municipal facilities have managed to significantly decrease energy use. In the same period, electricity uses in the Fire Station decreased by 12,360 kWh or 22.2% , Public Works by 9,320 kWh or 25.8%, and Library by 4200 kWh or 21.7%. In total, municipal buildings in the Town of Ulysses consumed 24,613 fewer kilowatt hours of electricity in 2018, compared to 2013. This was a total reduction of 20.4%.

2013 v. 2018 Electrical Consumption by Municipal Building (kWh)				
Building	2013 Electrical Use	2018 Electrical Use	2013 v. 2018 Electrical Use Difference	2013 v. 2018 Electrical Use Percent Change
Village Hall	9,664	10,931	1267	13.1%
Fire Station	55,680	43,320	-12360	-22.2%
Public Works	36,080	26,760	-9320	-25.8%
Library	19,346	15,146	-4200	-21.7%
Total Electrical Consumption	**120,770**	**96,157**	**↓24613**	**↓20.4%**

The reduction of electrical consumption in this period resulted in a reduction of greenhouse gas emissions from electricity. Between 2013 and 2018, greenhouse gas emissions from electricity use in the Village Hall decreased by 0.24 metric tons of CO_2 equivalent, or 14%. As for the fire station, yearly electricity consumption was reduced by 4.01 metric tons of CO_2 equivalent between 2013 and 2018, a decrease of 40.8%.Similarily for Public Works a decrease of 2.78 metric tons or 43.6% and 1.38 metric tons or 40.5% for the library. In total, electricity uses in municipal buildings produced 8.41 fewer metric tons of CO_2 equivalent in 2018, compared to 2013.

2013 v. 2018 GHG Emissions from Electricity by Municipal Building (MT CO_2E)				
Building	2013 CO_2 Emissions	2018 CO_2 Emissions	2013 v. 2018 Emission Difference	2013 v. 2018 Emission Percent Change
Village Hall	1.71	1.47	-0.24	-14%
Fire Station	9.83	5.82	-4.01	-40.8%
Public Works	6.37	3.59	-2.78	-43.6%
Library	3.41	2.03	-1.38	-40.5%
Total Emissions from Electricity	**21.31**	**12.91**	**↓8.41**	**↓39.4%**

The significant decrease in electricity consumption across the different departments can be attributed to the installation of LED lighting throughout all municipal buildings. According to Energy Star, LED lighting uses up to 75% less energy than a regular incandescent light. Over time, this can add up to a significant energy savings, especially for those buildings that use lights throughout the entire day/ night. In addition to lighting, other factors to consider are changing HVAC systems (from electric to gas) and changes in building operation hours (which can determine whether lights are used or not).

Mobile Combustion of Fossil Fuels: Municipal Vehicle Fleet Consumption

As of 2018, the mobile fleet in the Village of Montour Falls consists of 23 vehicles: eight of which consume diesel, and the rest of which consume gasoline. In 2013, the municipal vehicle fleet in the Village of Montour Falls used a total of 1150 million British Thermal Units (MMBtu) of energy, from 8,935 gallons of fossil fuel. By 2018, with the replacement of some old vehicles with new vehicles, fossil fuel use decreased by approximately 5%. In 2018, the fleet's fossil fuel consumption increased by 60 MMBtu to 1090 MMbtu. The fleet used 8478 gallons of fossil fuel.

2013 v. 2018 Vehicle Fossil Fuel Use by Type (MMBtu)			
Year	Gasoline	Diesel	**Total**
2013	799	351	1150
2018	769	321	1090

The vehicle upgrade and fleet efficiently naturally led to a decrease in greenhouse gas emissions from fossil fuel use in the fleet. Between 2013 and 2018, carbon dioxide emissions decreased by 4 MT CO_2E, from 82 MT CO_2E to 78 MT CO_2E, a 4.9% overall decrease in emissions.

2013 v. 2018 GHG Emissions from Municipal Vehicle Fleet (MT CO_2E)			
2013 CO_2 Emissions	2018 CO_2 Emissions	2013 v. 2018 Emission Difference	2013 v. 2018 Emission Percent Change
82	78	-4	-4.9%

Montour Falls Waste Water Treatment Facility

As of 2018, the village of Montour Falls has been actively using their own wastewater treatment plant. However, the village has collaborated with the neighboring municipality, Watkins Glen, to develop an inter-municipal wastewater treatment facility which is expected to reduce overall emissions as well as costs. Currently, the village operates using an anaerobic treatment facility which, due to its age, tends to have high emissions. As for the year of 2018, the facility produced an average of 220,000 gallons of flow per day. This accounted for 43.43 Metric tons of CO2E for the year of 208. This is based on the number of municipal staff within the village, not the total number of residents.

When comparing the emissions of the wastewater treatment facility, there is an overall 1.8% decrease in overall emissions. This overall steady emission makes sense since

there has not been any change to the treatment facility between these years and also since there has not been major fluctuation between the number of municipal employees.

2013 v. 2018 GHG Emissions from Wastewater Treatment Facility (MT CO2E)			
2013 CO_2 Emissions	2018 CO_2 Emissions	2013 v. 2018 Emission Difference	2013 v. 2018 Emission Percent Change
44.22	43.43	-0.79	-1.8%

Summary: Greenhouse Gas Emission in Montour Falls, New York

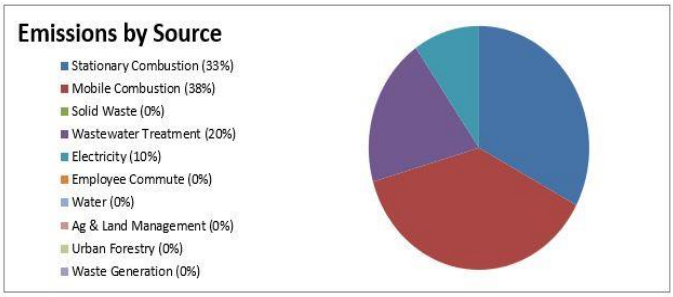
2013 v. 2018 GHG Emission Source (MT CO_2E)					
Year	Stationary Combustion	Electricity	Mobile Combustion	Wastewater Treatment	**Total**
2013	71.96	21.31	82.86	44.22	220.35
2018	82.31	12.91	78.52	43.43	217.17
% Change in Emissions	↑14.82%	↓39.4%	↓5.2%	↓1.8%	↓1.4%

In total, the greenhouse gas emissions generated by municipal government in the Village of Montour Falls seem to have decreased by 1.4%. This number should be considered as an estimate, however, since not every source of greenhouse gas emission involved in village government operations was considered in this inventory, as not all of this data was available. Some of the emissions sources excluded include, electric streetlights and employee commutes. Furthermore, government-based source emissions not connected to energy, such as waste, were also excluded from this analysis. It is also important to note that this inventory only estimates emissions created by the village government and does not take into account the greenhouse gas emissions generated by residents and businesses in Ulysses.

As the village is currently on track to implement sustainability measures such as EV charging stations in the village and developing a more efficient wastewater treatment plant this will cut the overall MT CO_2E. By the village being proactive and slowly implementing additional sustainability measures over time, the municipality will continue to see an overall decline in overall emissions, not just for municipal operations, but also for the entire community.

Conclusions: Impacts and Further Action

In 2018, the Village of Montour Falls created 217.17 metric tons of carbon dioxide equivalent. This is approximately equivalent to driving 46 average passenger cars for an entire year. Alternatively, it is 46 average fuel consuming vehicles that travel 11,543 miles each.



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The Village of Montour Falls has taken a number of concrete steps to help reduce their greenhouse gas emissions since 2013. These have included upgrading the existing vehicle fleet, beginning to switch to more efficient light fixtures on the interior and exterior of buildings, and newer HVAC system technology.

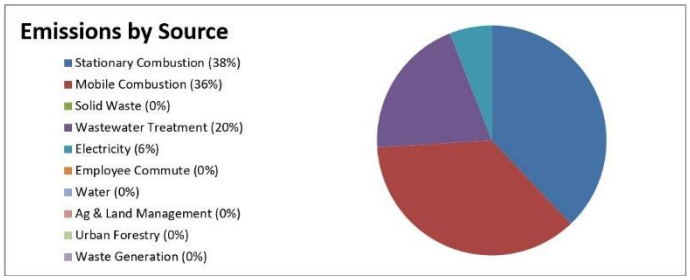

Figure 2 2018 Emissions

Further reductions in emissions could come from upgrades to heating and cooling systems in municipal buildings, such as installing air source heat pumps or geothermal installation. Replacing or improving insulation in the village hall and other municipally owned buildings will also reduce heat loss in the winter and improve overall energy efficiency. This would also eliminate the need for space heaters in working areas, which are very costly in terms of electricity use. Further energy cutting solutions include installing building energy management systems, water efficiency fixtures, and installing new windows.

There are also a variety of energy-conscious actions that village employees can take to reduce their contribution to greenhouse gas emissions. Opting for alternative modes of transportation, such as carpooling, or biking or walking in warmer months not only drastically reduces automobile emissions but can also have benefits for personal health and wellbeing. Turning off and unplugging computers and other electronics, such as microwaves, coffee makers, printers, etc. when not in use reduces electricity consumption as well, as these things consume electricity even when they are not in use.

Though solid waste was not taken into consideration in this inventory, smart recycling practices throughout the village can drastically reduce the overall carbon footprint. If the average American household were to divert half of its garbage to recycling, they would save 2,400 pounds of CO_2 per year. In fact, for every 10% of waste reduction, 1,200 pounds of CO_2e are avoided.

The Village of Montour Falls has already begun the process of increasing its use of more efficient energy-efficient technology such as LED lights. Further actions such as installing solar panels on municipal buildings and replacing the current fleet with all

electric or hybrid vehicles are just some of the efforts that the village can implement and see a major decrease in overall greenhouse gas emissions in government operations.

For Questions Regarding this Greenhouse Gas Inventory

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Sources and Further Information

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