# Local Government and Community Greenhouse Gas Inventory

## Village of Pulaski, New York
## September 11, 2015

Village of Pulaski

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## Acknowledgements

The Village of Pulaski would like to acknowledge the contributions made to this report by the following:

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**Oswego County**
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**ICLEI Local Governments for Sustainability**

**Central New York Regional Planning and Development Board**
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# I. Introduction

## Background

The Village of Pulaski has adopted the Climate Smart Communities Pledge as a commitment to greenhouse gas (GHG) emission reduction and climate change mitigation. The Climate Smart Communities Program represents a partnership between New York State and local governments to reduce energy use and GHG emissions. Major steps involved in the program include:

1. Adopting the Climate Smart pledge
2. Compiling a GHG inventory
3. Developing a plan to reduce emissions (Climate Action Plan), and
4. Carrying out sustainable development projects.

ICLEI-Local Governments for Sustainability recommends a similar path to follow with 5 milestones (see Figure 1).

The first step in climate action planning is to compile a GHG inventory. A GHG emissions inventory is an audit of activities that contribute to the release of emissions. For this GHG inventory, energy use and waste generation information was gathered and methods of calculation explained in the Local Government Operations Protocol (LGOP) and the US Community Operations Protocol developed by ICLEI-Local Governments for Sustainability were utilized to generate emissions figures. Data for municipal and community-wide energy use and waste production were entered into ICLEI's ClearPath software. The outputs were aggregated into metric tons of $CO_2$ equivalent, and emissions were delineated by sector, source, and scope. Data from the inventory will guide policy decisions and energy improvements, inform sustainability projects, and build public support for broader sustainability initiatives in the Village of Pulaski.


Figure 1: ICLEI-Local Governments for Sustainability's 5 Milestone Process

## Climate Change and Greenhouse Gases

New York State outlined projected climate impacts and vulnerabilities during the 2011 ClimAid assessment.[1] The ClimAid report projects changes to ecosystems, with the increased presence of invasive species and shifts in tree composition, while water quality and quantity may also be impacted due to changes in precipitation. Furthermore, there may be beneficial economic impacts, such as a longer recreation season in the summer, and a longer growing season for the agricultural sector due to rising temperatures. Scientific evidence suggests that the impacts of global climate change will be different in various regions, and will include temperature shifts, sea level rise, and human health risks.

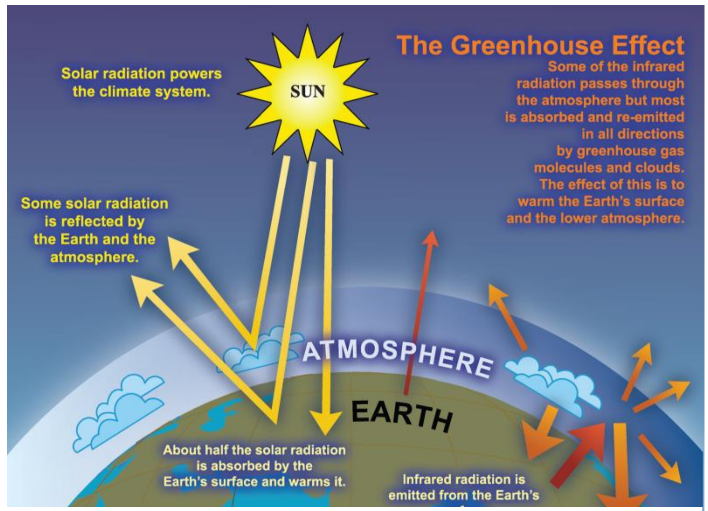

Figure 1: The Greenhouse Effect

Climate change is increasingly recognized as a global concern. Scientists have documented changes to the Earth's climate including the rise in global average temperatures, as well as sea levels, during the last century. An international panel of leading climate scientists, the Intergovernmental Panel on Climate Change (IPCC), was formed in 1988 by the World Meteorological Organization and the United Nations Environment Programme to provide objective and up-to-date information regarding the changing climate. In its 2007 Fourth Assessment Report, the IPCC states that there is **a greater than 95 percent chance that rising global average temperatures, observed since 1750, are primarily a result of greenhouse gas (GHG)-emitting human activities.**[2]

The rising trend of human-generated GHG emissions is a global threat. The increased presence of these gases affects the warming of the planet by contributing to the natural greenhouse effect, which warms the atmosphere and makes the earth habitable for humans and other species (see Figure 2).[3] Mitigation of GHGs is occurring in all sectors as a means of reducing the impacts of this warming trend. However, scientific models predict that some effects of climate change are inevitable no matter how much mitigative action is taken now. Therefore, climate mitigation actions must be paired with adaptation measures in order to continue efforts to curb emissions contributions to global warming, while adapting communities so that they are able to withstand climate change impacts and maintain social, economic, and environmental resilience in the face of uncertainty. Climate adaptation can take shape through infrastructure assessments and emergency planning, as well as through educational efforts to raise public awareness about potential climate change impacts. In New York State, regional climate change impact and vulnerability assessments will likely increase moving forward, but many local governments

[1] NYS. 2011. ClimAid. http://www.nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/Response-to-Climate-Change-in-New-York.aspx
[2] NYS. 2011. ClimAid. http://www.nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/Response-to-Climate-Change-in-New-York.aspx
[3] IPCC. 2007. Fourth Assessment Report. http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch18s18-6.html

across the nation are already taking action to lessen climate impacts through GHG reduction measures and climate adaptation planning.

As scientific evidence of climate change grows, the need for climate action and adaptation will also increase. The goal of building community resilience in order to protect the health and livelihood of residents, as well as natural systems, must serve as a motivating factor in the assessment of greenhouse gas contributions and effective sustainability planning.

## The Purpose of a Greenhouse Gas Inventory

Many local governments have decided to gain a detailed understanding of how their emissions and their community's emissions are related to climate change and have committed to reducing GHG emissions at the local level. Local governments exercise direct control over their own operations and can lead by example by reducing energy usage in municipal facilities, using alternative fuels for their fleets, and investing in renewable energy sources. Local governments can also influence community-wide activities that contribute to climate change by improving building codes and standards, providing cleaner transportation options, and educating members of the community about their choices as consumers. Each local government is unique with its own set of opportunities, challenges, and solutions, and therefore climate action needs to be tailored to each community at the local level.

Because local governments typically contribute less than ten percent of the total greenhouse gas emissions generated in a given community, ICLEI recommends developing both local government operations and community-wide greenhouse gas emissions inventories and reduction strategies. Before concerted management and reduction of greenhouse gas emissions can occur within our local governments and communities, local governments must undertake a careful measurement and analysis of all GHG sources. A GHG inventory should facilitate keen insight into the types and sources of GHG emissions within a local jurisdiction, and a GHG emissions forecast will project these emissions levels into the future, allowing for better planning and success in managing those emissions.

There are several major benefits for local governments that undertake emissions inventories:

1. **Fiscal benefits:** Developing climate and energy strategies can help your local government slash energy costs and save taxpayer dollars. Conducting a GHG emissions inventory will show you exactly where energy is being wasted and identify opportunities to become more efficient.

2. **Climate leadership:** By taking action now to address climate change, your local government and elected officials can be recognized for their leadership on climate and energy issues.

3. **Community benefits:** Measures to reduce GHG emissions and energy consumption typically have many co-benefits. They can improve air quality and public health, stimulate the local economy, create green jobs, and make communities more livable and walkable.

4. **Regulatory preparedness:** Although the federal government has yet to produce legislation addressing GHG emissions, a variety of actions at the state and regional levels specifically impact local governments and planning agencies. Taking action now will help your jurisdiction prepare for any future legislative requirements and position your local government for successful compliance.

The Village of Pulaski is becoming increasingly interested with sustainable initiatives, and in 2015 signed on with a team from the Central New York Regional Planning and Development Board to conduct a greenhouse gas inventory. Through this initiative, the Village hopes to monitor and audit their emissions in order to discover new ways to decrease their carbon footprint as well as incorporate sustainable alternatives into their Village planning.

## Village Profile

The Village of Pulaski is located in northern Oswego County. The Village covers an area of 3.4 square miles, and the majority of the area is used for residential purposes, is used for commercial purposes, or is vacant. According to the 2010 US Census, the Village has a population of about 2,365 residents, with 1,048 occupied housing units. Of the 1,048 occupied housing units, 489 units are owner-occupied with an average household size of 2.6 persons, while 507 units are renter-occupied with an average household size of 1.92 persons.

The Village provides its residents with many services through the following departments: Building and Zoning, Police, Public Library, Public Works, Village Cemetery, Village Clerk/Treasurer, and Wastewater Treatment Plant.

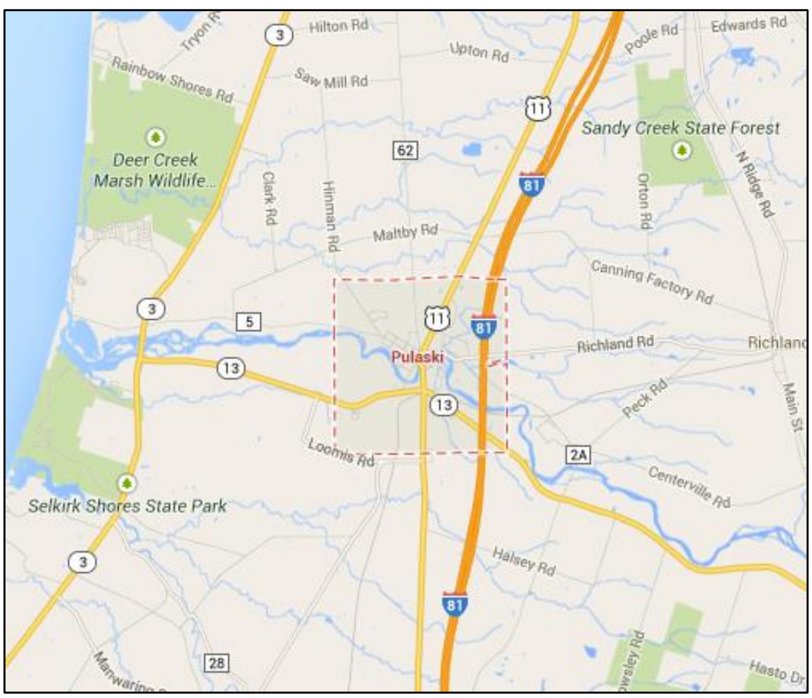


Figure 3: Village of Pulaski Map

# II. Methods

## Data Collection and Analysis

Fuel and energy use data associated with GHG emissions were collected for community and municipal operations within the Village of Pulaski for the baseline year 2010 following ICLEI-Local Governments for Sustainability's Local Government Operations Protocol (LGOP) and the US Community Operations Protocol. Emissions were also forecasted for the year 2025 for both government and community operations based on current and projected energy use trends and waste production trends. ICLEI's ClearPath software was used to analyze energy use and convert information into emissions data, measured in metric tons of carbon dioxide equivalent ($MTCO_2e$). The software streamlines the process of converting different sources, units, and varieties of emissions into comparable energy use and emissions figures.

## Reporting

The three most prevalent greenhouse gases, and therefore the focus of this analysis, are carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$). The units used to discuss these gases in aggregate is carbon dioxide equivalent ($CO_2e$), which is a conversion based on each gas' Global Warming Potential (GWP), or the impact of 1 unit of each gas in the atmosphere compared to 1 unit of $CO_2$ (see Table 1). Emissions measured in $CO_2e$ can be categorized in various ways, including by scope, sector, and source.

| **Greenhouse Gas (GHG)** | **Global Warming Potential (GWP)** |
|---|---|
| Carbon Dioxide ($CO_2$) | 1 |
| Methane ($CH_4$) | 21 |
| Nitrous Oxide ($N_2O$) | 310 |

Table 1: Global Warming Potential of Greenhouse Gases

The scope distinction, which labels the emissions sources within a local government as either scope 1, 2, or 3, distinguishes between what is directly emitted (scope 1) and indirectly emitted (scopes 2 and 3) (see Table 2). Local governments inherently have more control over the emissions in scopes 1 and 2 due to the behavioral and often function-specific nature of scope 3 emissions sources, and therefore scope 3 emissions are optional to report in GHG inventories. However, governments and communities are increasingly accounting for all three scopes in their inventory analyses in an effort to conduct more comprehensive carbon footprint assessments.

It is important to use the scope distinction, rather than just an aggregate emissions total, when evaluating the local government GHG footprint because other government inventories (such as Oswego County or New York State) will likely account for the same emissions. If scope distinctions are not made, then there is the potential for double-counting certain sources in these aggregated reporting formats (such as electricity consumed by the Village (scope 2) and the same electricity generated by plants in the State (scope 1)).

| Scope | Emissions Activity | Examples |
|---|---|---|
| 1 | All direct GHG emissions | Onsite governmental emissions, vehicle fleet emissions, onsite commercial, residential, and industrial emissions |
| 2 | All indirect GHG gases related to the consumption of purchased energy | Emissions related to purchased steam, heating, cooling, and electricity |
| 3 | All other indirect emissions not included in Scope 2 | Emissions from wastewater and solid waste processes, employee commute, household waste, and commercial waste |

Table 2: Emission Scope Distinctions

Emissions data can also be reported by sector.  Sectors are included or excluded in the boundaries of GHG inventories based on availability of data, relevance to emissions totals, and scale to which they can be changed.  For example, if a municipality's wastewater is treated at a wastewater treatment facility that is located outside of the municipality's boundaries and is therefore not able to be changed by the municipality alone, facility emissions do not need to be included in the inventory).

Finally, emissions data can be reported by source.  Electricity, natural gas, wood, and fuel oil would be sources of emissions within the "Residential Energy Use" or "Commercial Energy Use" sectors, while gasoline, diesel, and ethanol would be sources of emissions within the "Transportation" sector.

# III. Government Results

## Government Operations Emissions Inventory

In 2011, the Village of Pulaski's government emissions totaled 252 MT$CO_2$e. The largest source of government emissions in the Village of Pulaski in 2011 was electricity, accounting for 159 MT$CO_2$e, or 63% of community emissions. Gasoline and diesel were also large emitting sources, producing 38 MT$CO_2$e (15%) and 33 MT$CO_2$e (13%), respectively.

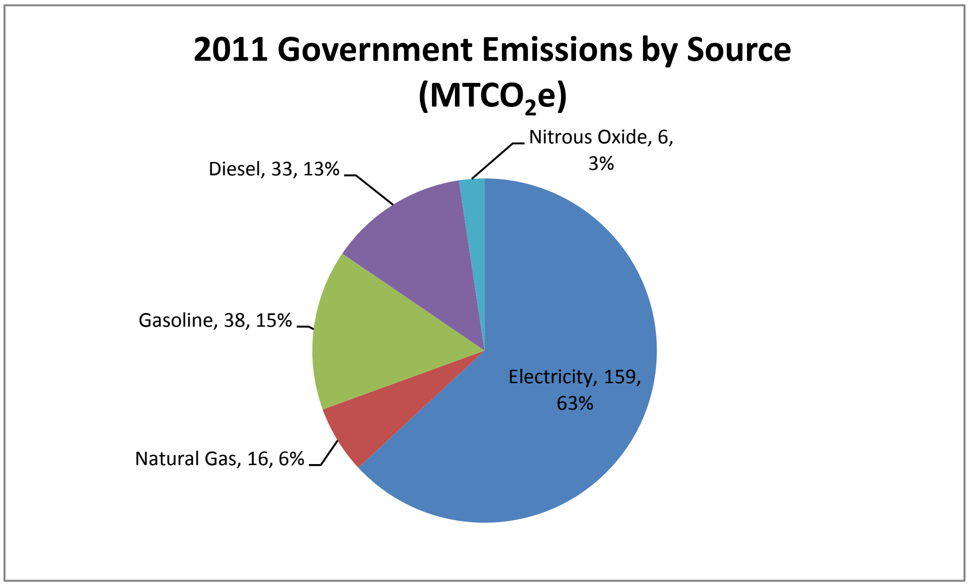


Figure 4: 2010 Government Operations Emissions by Source

Government emission sectors inventoried include: buildings and facilities, streetlights and traffic signals, water/sewer, and vehicle fleet. Water/sewer contributed to the largest percentage of emissions in the 2011 base year, accounting for 93 MT$CO_2$e, or 37% of the government's total emissions. The vehicle fleet sector was the next highest emitting sector, producing 71 MT$CO_2$e, or 28% of total municipal emissions, followed by the buildings and facilities sector, which produced 54 MT$CO_2$e, or 21% of total emissions, and the streetlights and traffic signals sector, which produced 34 MT$CO_2$e, or 14% of government emissions.

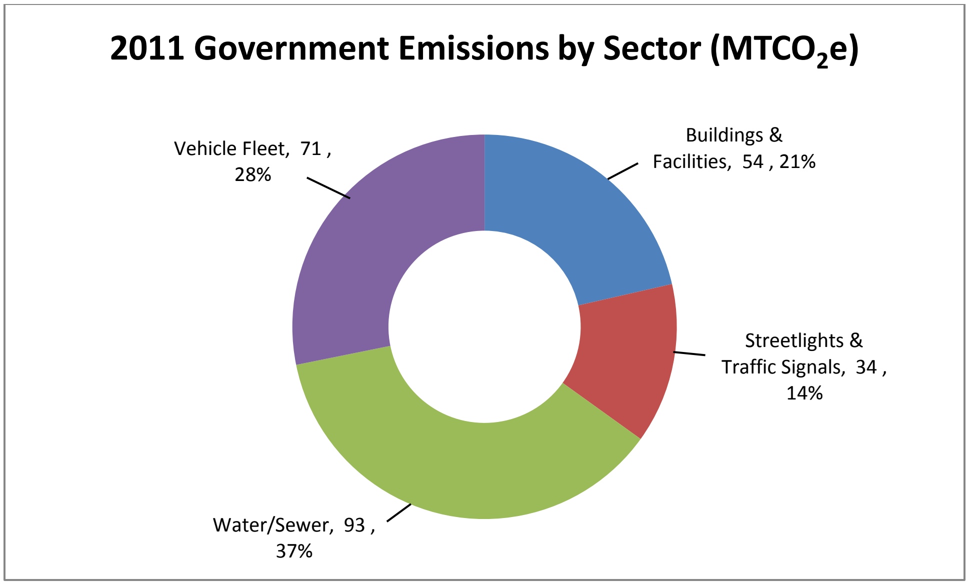


Figure 5: 2010 Government Operations Emissions by Scope

Energy use by sector in the government mimics emissions by sector in the government, with the water/sewer sector using the greatest amount of energy in 2011, using 1,328 million Btu (MMBtu) of energy, or 36% of the government's total energy use. The vehicle fleet sector consumed the next highest amount of energy, using 989 MMBtu, or 27% of total municipal energy use, followed by the buildings and facilities sector, which consumed 866 MMBtu, or 23% of total energy used, and streetlights and traffic signals, which used 506 MMBtu, or 14% of total energy used by the government.

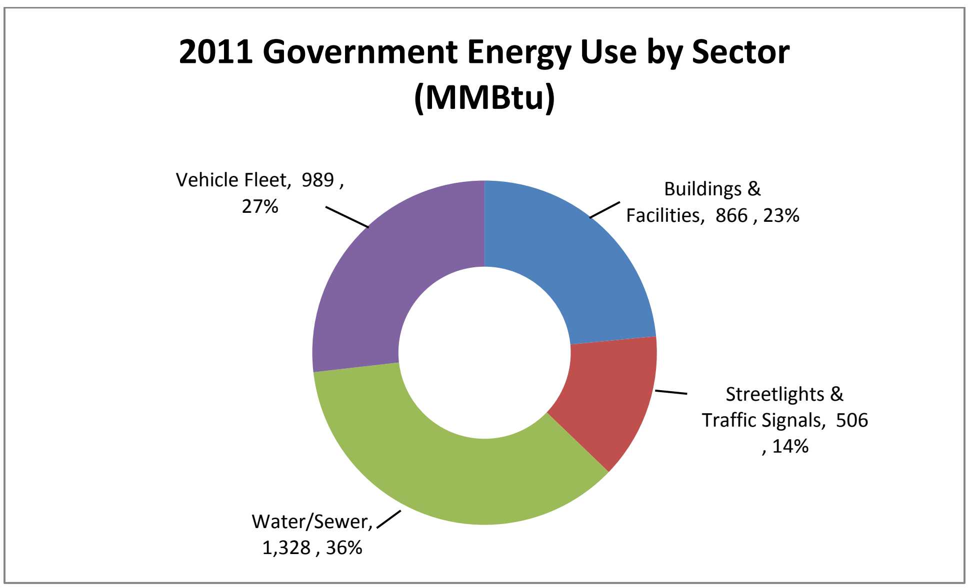


Figure 6: 2010 Government Operations Emissions by Sector

Government emissions can also be broken down into scope. Scope 1 represents on-site emissions created and totaled 93 $MTCO_2e$, or 37% of government emissions in 2011. Scope 2 represents off-site emissions created by energy used by the municipality and totaled 159

$MTCO_2e$, or 63% of total government emissions in 2011. Scope 3 emissions were not inventoried for this report.

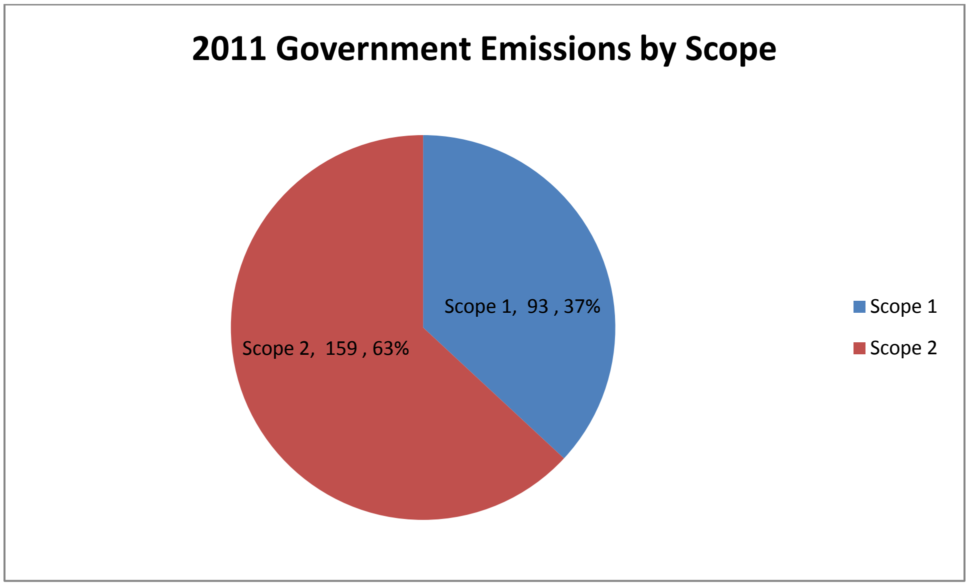


Figure 7: 2010 Government Operations Energy Use by Sector

## Government Operations Emissions Forecast

The projected government greenhouse gas emissions for 2025 are 247 metric tons, which is 5 metric tons of $CO_2e$ less than the baseline year total. The projected forecast for 2025 government emissions is based on a single-rate population growth factor. Emissions are expected to decrease very slightly in all sectors.

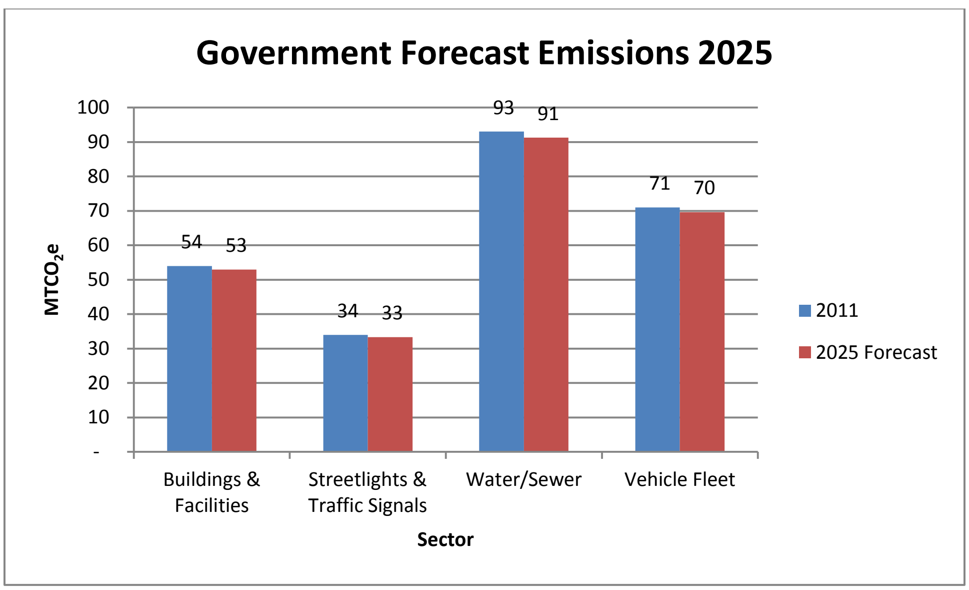


Figure 8: Government Operations Emissions Forecast

# IV. Community Results

## Community Emissions Inventory

In 2010, the Village of Pulaski's community emissions totaled 24,593 $MTCO_2e$. The largest source of community emissions in the Village of Pulaski in 2010 was natural gas, accounting for 7,466 $MTCO_2e$, or 30% of all community emissions. Gasoline and electricity were also large emitting sources, producing 7,447 $MTCO_2e$ (30%) and 5,335 $MTCO_2e$ (22%), respectively.

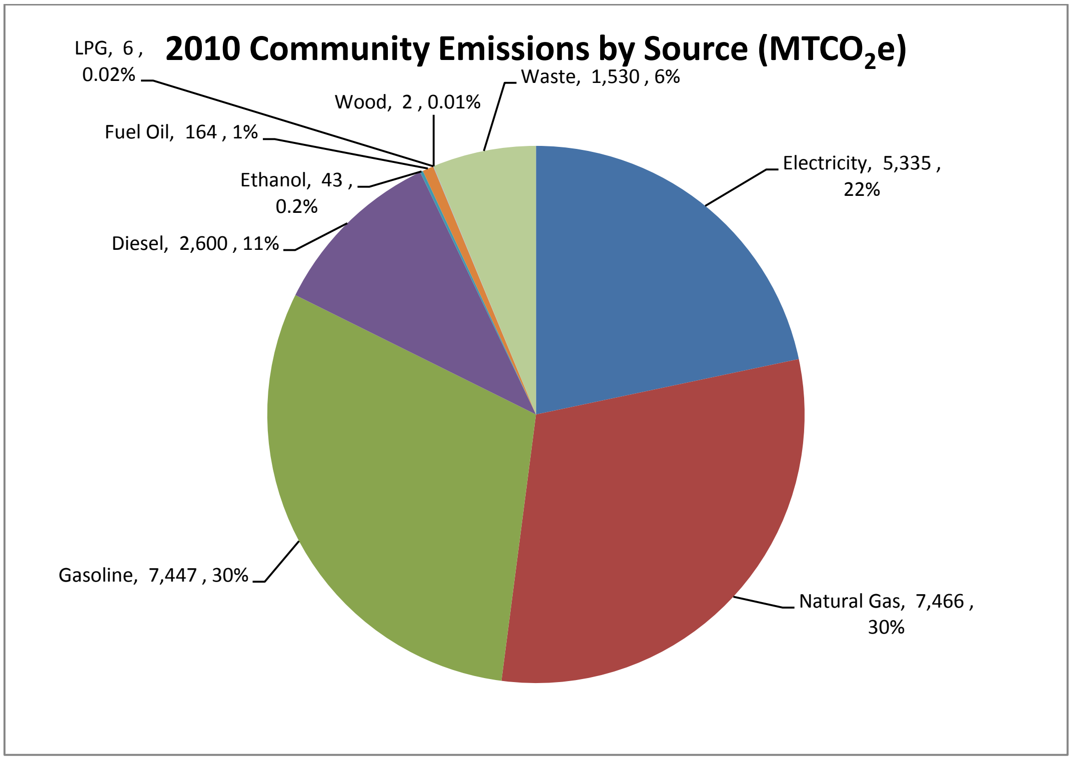


Figure 9: 2010 Community Emissions by Source

Community emission sectors inventoried include: residential energy use, commercial energy use, industrial energy use, transportation, and solid waste. The transportation sector contributed to the largest percentage of emissions in the 2010 base year, accounting for 10,090 $MTCO_2e$, or 41% of the community's total emissions. Commercial energy use was the next highest emitting sector, producing 7,160 $MTCO_2e$, or 29% of total community emissions, followed by the residential energy use sector, which produced 5,590 $MTCO_2e$, or 23% of total emissions, and the waste sector, which produced 1,530 $MTCO_2e$, or 6% of emissions. The smallest emitting sector was industrial energy use, which produced 223 $MTCO_2e$, or 1% of total community emissions.

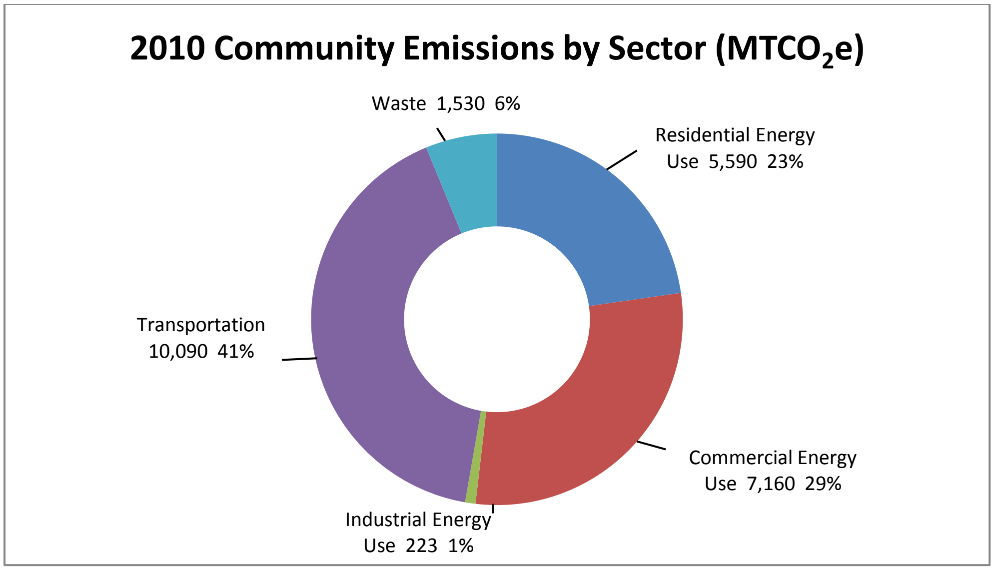


Figure 10: 2010 Community Emissions by Sector

Energy use by sector in the community mimics emissions by sector in the community, with the transportation sector using the greatest amount of energy in 2010, using 151,080 million Btu (MMBtu) of energy, or 40% of the community's total energy use. Commercial energy use consumed the next highest amount of energy, using 121,952 MMBtu, or 33% of total community energy use, followed by the residential energy use sector, which consumed 97,894 MMBtu, or 26% of total energy used, and the industrial energy use sector, which consumed 3,360 MMBtu, or 1% of energy used. The solid waste sector did not use any energy.

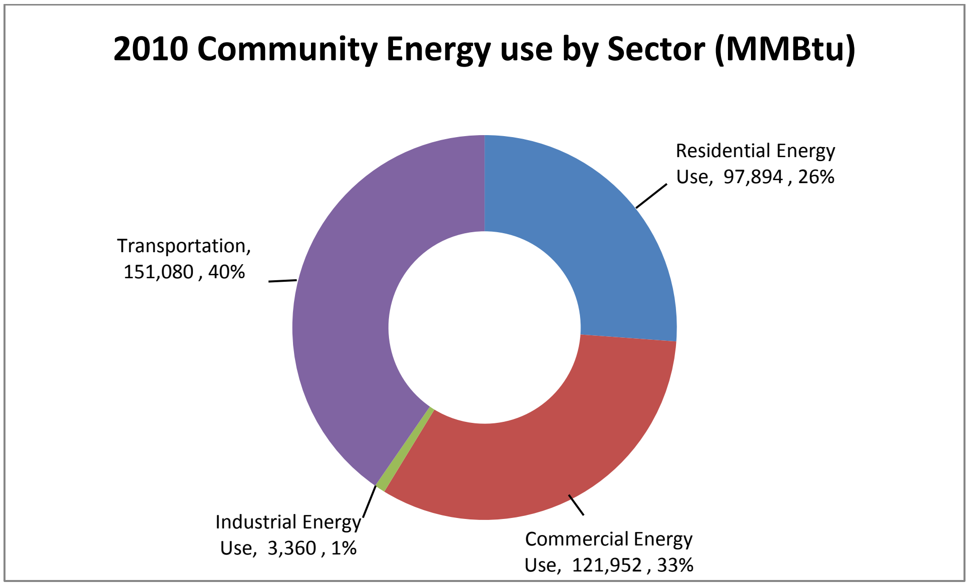


Figure 11: 2010 Community Energy Use by Sector

## 2025 Community Forecast

Community emissions in the Village of Pulaski are forecasted to total 26,129 $MTCO_2e$ in 2025, a 6.25% increase from the 2010 baseline year, with decreases in emissions in the residential energy use and waste sectors, and increases in the transportation, industrial energy use, and commercial energy use sectors compared to the 2010 baseline year.  This forecast takes into local and statewide energy use and waste production trends.

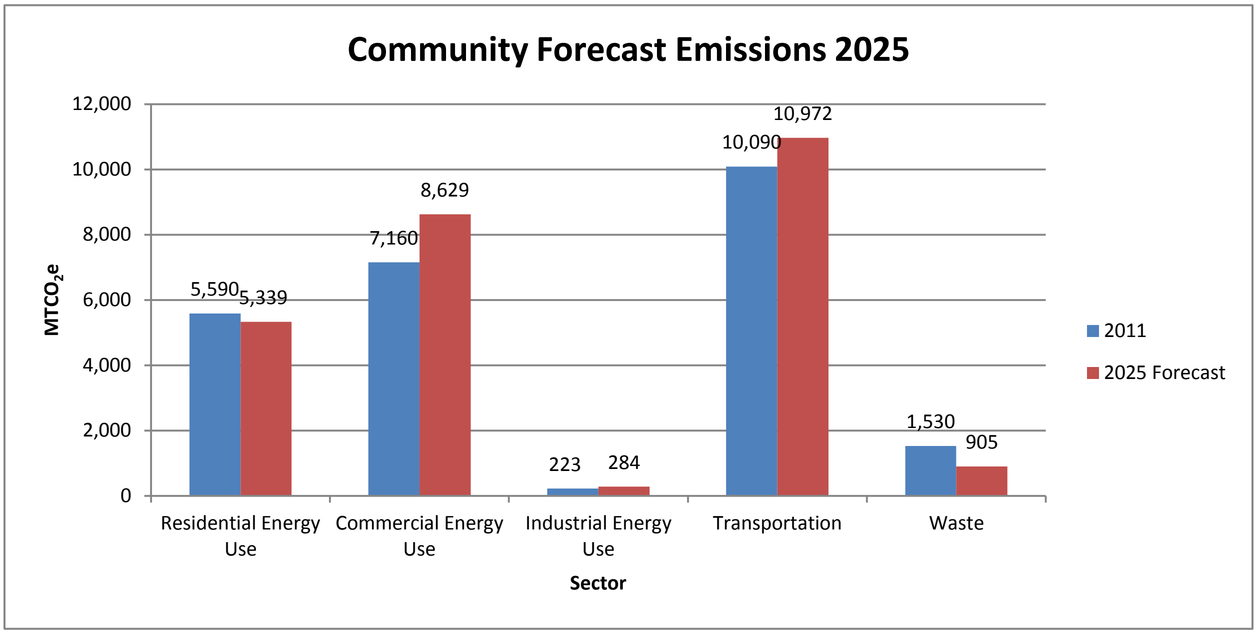


Figure 12: Community Emissions Forecast

## V. Discussion

For this study a scope distinction was important because it isolated emissions information into categories that can be addressed with different means and tools. Direct emissions can be linked back to specific fuel types, whereas indirect emissions from the consumption of electricity are more difficult to quantify. Indirect scope 2 and, to a greater degree, scope 3 emissions have lower potentials to be affected by local policy initiatives. The vast majority of government emissions for Pulaski was scope 2 emissions, and thus should garner the most attention when mitigation plans are considered.

The greenhouse gas inventory and forecast is the first milestone in climate action planning, to be followed by developing a reduction goal and then creation of a climate action plan. The reduction goal and climate action plan should take scope differences into account. Sector and source analyses are also important because they will indicate more specifically where emissions are derived from, and because the scope distinction does not apply to community generated emissions which represent the majority of emissions within a municipality.

The data indicated that the greatest percentage of government emissions came from the water/sewer sector. The results of this study also indicate that the largest percentage of community emissions came from the transportation sector for 2010, and this sector is forecasted to remain the largest emitting sector through 2025. Water/sewer and transportation emissions should be targeted in the Village's future Climate Action Plan so that energy use from this sector can be reduced, therefore lowering both energy costs and GHG emissions.

The boundaries of this study did not include several considerable sources of emissions, including, but not limited to: employee commute, and waste generated by government operations. These sources were left out due to lack of clarity in data and low potential for influence. This does not diminish the potential for these sectors to be included in future emissions inventories.

This study is the first of its kind for the Village of Pulaski. Several other CNY municipalities have undergone inventories, proving that climate mitigation requires local participation. Local participation will no doubt reflect the character and capacity of the particular municipality and should be in accordance with a comprehensive plan. Moving forward, institutionalizing data collection is also important in order to broaden the boundaries of the inventory, streamline further studies, and provide more comprehensive sets. Local participation can continue to be aided with efforts from regional support, including the CNY RPDB, Oswego County, NYS DEC, and the EPA.

## VI. Conclusion

As a Climate Smart Community, the Village of Pulaski has partnered with state and local agencies to combat climate change and pledge to reduce greenhouse gas emissions. The first milestone for meeting climate mitigation goals, according to ICLEI-Local Governments for Sustainability, is to conduct a baseline emissions inventory and forecast. This study was the first attempt to comprehensively quantify these emissions for the Village. It will provide a benchmark for planning purposes with the goal of setting an emissions reduction target and developing a Climate Action Plan.

Emissions for the Village of Pulaski in the 2010 baseline year totaled 24,845 $MTCO_2e$ for all activity covered in this inventory, 252 $MTCO_2e$ (1.0%) of which was from government activity and 24,593 $MTCO_2e$ (99.0%) of which was from community-wide activity. The majority of government emissions came from scope 2 sources that can be influenced through planning initiatives. Although a considerable proportion came from the community, which is outside direct governmental control, the local government can take steps to reduce their energy use and GHG emissions to serve as an example to the community. The local government can also provide information and assistance to community members to encourage them to take related actions.

# Appendix A: Community Protocol Compliance

ICLEI protocol-compliant inventories must include a table illustrating included and excluded emissions sources and activities, along with final emissions figures. The table below depicts the included and excluded emissions sources and activities and final emissions figures for this inventory and uses ICLEI's notation keys found in the U.S. Community Protocol, Appendix B.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | IE- Included Elsewhere | SI- Local government signi |
| **Emissions Report Summary Table (2010 baseline year)** | | | | | | NE- Not estimated | CA- community-wide activi |
| | | | | | | NA- not applicable | |
| *Include estimates of emissions associated with the 5 basic emissions generating activities* | | | | | | NO- not occurring | |
| **Emissions Type** | **Source or Activity** | **Activity Data** | **Emissions Factor & Source** | **Accounting Method** | **Included (SI, CA)** | **Excluded (IE, NA, NO, NE)** | **Emissions (MTCO2e)** |
| **Built Environment** | | | | | | | |
| Use of fuel in residential stationary combustion (nat. gas- MMBtu) | source and activity | 70,062 | 53.02 kg $CO_2$/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR) | Collected data from National Grid and put into CACP | CA | | 3,726 |
| Use of fuel in residential stationary combustion (fuel oil, wood, LPG- MMBtu) | source and activity | 1,104 | Averaged distillate fuel oil #1, 2,4 EF= 74.5 kg $CO_2$/MMBtu; LPG= 62.98 kg $CO_2$/MMBtu; EPA Mandatory Reporting Rule (MRR) | Used ICLEI's US Community Protocol Appendix C (Built Environment), BE 1.2 | CA | | 73 |
| Use of fuel in commercial stationary combustion (nat. gas- MMBtu) | source and activity | 39,071 | 53.02 kg $CO_2$/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR) | Collected data from National Grid and put into CACP | CA | | 3,673 |
| Use of commercial stationary combustion (fuel- MMBtu) | source and activity | 1,462 | Coal/coke mixed commercial sector= 93.4 kg $CO_2$/MMBtu; Averaged distillate fuel oil #1, 2,4 EFs= 74.5 kg $CO_2$/MMBtu; LPG= 62.98 kg $CO_2$/MMBtu; EPA Mandatory Reporting Rule (MRR) | Used ICLEI's US Community Protocol Appendix C (Built Environment), BE 1.3 | CA | | 99 |
| Industrial Stationary combustion sources (nat. gas- MMBtu) | source and activity | N/A | 53.02 kg $CO_2$/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR) | | NA | | |
| Industrial Stationary combustion sources (fuel- MMBtu) | source and activity | N/A | | | NA | | |
| **Electricity** | | | | | | | |
| Power generation (natural gas use- therms) | source | N/A | | | NA | | |
| use of electricity by the community (MWh) | activity | - | eGrid 2009 subregion factors (EPA) | Collected data from National Grid and put into CACP | CA | | 4,963 |
| **District Heating/Cooling** | | | | | | | |
| District Heating/Cooling facilities in community | source | N/A | | | NA | | |
| Use of district heating/cooling by community | activity | N/A | | | NA | | |
| Industrial process emissions in the community | source | N/A | EPA GHGRP data reported here: ghgdata.epa.gov | | NA | | |
| Refrigerant leakage in the community | source | N/A | | | NE | | |
| **Transportation and other Mobile Sources** | | | | | | | |
| **On-road passenger vehicles** | | | | | | | |
| on-road passenger vehicles operating within the community (VMT) | source | 21,715,467 | CACP (Version 3.0) & EPA MRR emission factors for gasoline and diesel (varies by vehicle class for N2O & CH4): LGOP gasoline EF=8.78 kg$CO_2$/gal; diesel EF= 10.21 kg$CO_2$/gal | Used formula: AADT x Road Length x 365 days per year = AVMT. For roads without AADT counts, used "Minimum Maintenance Standards Regulation 239/02," which meant taking length of roadway without AADT counts, multiplying by a factor of 6 for rural roads, and then dividing the sum by total roadway length to receive an average AADT count. | CA | | 10,071 |
| on-road passenger vehicle travel associated with community land uses (VMT) | activity | N/A | | | NE | | |
| **On-road freight vehicles** | | | | | | | |
| on-road freight and service vehicles operating within the community boundary | source | N/A | | | NE | | |
| on-road freight and service vehicle travel associated with community land uses | activity | N/A | | | NE | | |
| On-road transit vehicles operating within the community boundary | source | N/A | | | NE | | |
| **Transit Rail** | | | | | | | |
| transit rail vehicles operating within the community boundary | source | N/A | | | NE | | |
| use of transit rail travel by community | activity | N/A | | | NE | | |
| Inter-city passenger rail vehicles operating within the community boundary | source | N/A | | | NE | | |
| Freight rail vehicles operating within the community boundary | source | N/A | | | NE | | |
| **Marine** | | | | | | | |
| Marine vessels operating within community boundary | source | N/A | | | NA | | |
| use of ferries by community | activity | N/A | | | NA | | |
| Off-road surface vehicles and other mobile equipment operating within community boundary | source | N/A | | | NE | | |
| Use of air travel by the community | activity | N/A | | | NE | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Solid Waste** | | | | | | | |
| **Solid Waste** | | | | | | | |
| Operation of solid waste disposal facilities in community | source | N/A | Process emissions reported to the EPA GHGRP annually; stationary combustion emissions accounted for in the energy use sector | | NA | | |
| generation and disposal of solid waste by the community | source and activity | 1,777.65 | | Used ICLEI's US Community Protocol Appendix E (Solid Waste Emission Activities and Sources), SW 2.2 | CA | | 2272 |
| **Water and Wastewater** | | | | | | | |
| **Potable Water- Energy Use** | | | | | | | |
| Operation of water delivery facilities in the community | source | N/A | CACP 3.0 eGrid 2009 electricity emission factors; and natural gas emission factors= 53.02 kg CO2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu | | IE | | |
| Use of energy associated with use of potable water by the community | activity | N/A | | | IE | | |
| Use of energy associated with generation of wastewater by the community | activity | N/A | CACP 3.0 eGrid 2009 electricity emission factors; and natural gas emission factors=53.02 kg CO2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu | | NE | | |
| **Centralized Wastewater Systems- Process Emissions** | | | | | | | |
| Process emissions from operation of wastewater treatment facilities located in community | source | N/A | Method WW.8= EF without nitrification or denitrification= 3.2 g $N_2O$/person equivalent/year; Method WW.12a= EF for stream/river discharge= 0.005 kg $N_2O$-N/kg sewage-N discharged | | NA | | |
| process emissions associated with generation of wastewater by community | activity | N/A | | | NA | | |
| Use of septic systems in community | source and activity | N/A | | | NA | | |
| **Agriculture** | | | | | | | |
| Domesticated animal production | source | N/A | | | NE | | |
| Manure decomposition and treatment | source | N/A | | | NE | | |
| **Upstream Impacts of Community-wide Activities** | | | | | | | |
| Upstream impacts of fuels used in stationary applications by community | activity | N/A | | | NE | | |
| upstream and transmissions and distribution impacts of purchased electricity used by the community | activity | N/A | | | NE | | |
| upstream impacts of fuels used for transportation in trips associated with the community | activity | N/A | | | NE | | |
| upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary | activity | N/A | | | NE | | |
| Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community (additional community-wide flows of goods & services will create significant double counting issues) | activity | N/A | | | NE | | |
| **Independent Consumption-Based Accounting** | | | | | | | |
| Household consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all households in the community) | activity | N/A | | | NE | | |
| Government consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all governments in the community) | activity | N/A | | | NE | | |
| Lifecycle emissions of community businesses (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all businesses in the community) | activity | N/A | | | NE | | |

## Appendix B: Estimation Method for Vehicle Miles Traveled

The New York State Department of Transportation (NYSDOT) Traffic Data Viewer and information collected by the Syracuse Metropolitan Transportation Council (SMTC) provided data on the Annual Average Daily Traffic (AADT) going through the Village of Pulaski. Internal GIS data was utilized to generate road lengths within the Village boundary, and these lengths were multiplied with the traffic counts to derive estimates for daily vehicle miles travelled (DVMT). DVMT was then multiplied by 365 days per year to derive annual vehicle miles traveled (AVMT). These estimates were entered into ClearPath to calculate emissions using the VMT & MPG calculator.[4]

The NYSDOT relies on actual and estimated traffic counts for their model, which may result in slight over or under estimations in the average daily traffic data. Additionally, the counts do not distinguish between origin and destination; therefore, these counts represent all vehicle trips that begin, end, and travel through the Village of Pulaski, therefore resulting in slight overestimations of Village VMT. Also, the NYSDOT tracks traffic counts for main arteries only; therefore, additional calculations for AADT were needed to estimate AVMT for local/collector roads, as well as some main arteries that do not have AADTs available. The total length of roads in Pulaski with traffic counts is 8.4 miles in 2010, while 20.685 miles of roads do not have AADT counts available.

According to the *Minimum Maintenance Standards Regulation 239/02*, a set of guidelines produced by the Association of Municipalities of Ontario to help local communities estimate traffic volume, while conducting an AADT count, it is possible to estimate the traffic volume for dead-ends and cul-de-sacs to avoid resource intensive counts. This is done by multiplying the number of houses on the roadway by a factor of 6 for rural areas and 10 for urban areas.

This method was applied to the Village of Pulaski for the roads without AADT counts. It was determined that there were 1,048 occupied households in the Village of Pulaski in 2010, according to the 2010 US Census. It was assumed that all 1,048 homes are on roadways that do not have a count, since most houses are on local/collector roads and almost all local/collector roads in Pulaski did not have an AADT count. By multiplying 1,048 homes by 6, a combined AADT count of 6,288 was calculated for all 20.685 miles of roads without AADT counts available. In order to calculate VMTs, an average AADT value was needed, and derived by dividing by 6,288 by the 20.685 miles of uncounted roadway. This gave an average AADT value of 304, which was applied to all roadways that did not have a count.

There is some error involved in using this method. For instance, the method is meant to be applied to dead end streets and cul-de-sacs, but this study applied it to all roads in Pulaski without AADT counts available. In addition, there may have been some double counting if homes in Pulaski are located on roads that have AADT counts available. However, counting the number of houses on each road that did not have an AADT count would have been time consuming, and this VMT calculation is supposed to serve as a general reference for the Village,

[4] Default MPGs and emissions factors from ICLEI's LGOP were used. To account for the 10% ethanol in most modern gasoline blends, VMT was entered for gasoline as 90% of the total VMT and for ethanol as 10% of the total VMT, and the same MPG was used for ethanol calculations as gasoline calculations.

not as an exact figure. Although this method involves some error, it is the best estimation of traffic volume given the availability of data.

| BEGINDESC | ENDDESC | TDV_ROUTE | AADT | LENGTH (MILES) | LENGTH IN VILLAGE OF PULASKI (MILES) | RATIO OF LENGTH IN VILLAGE OF PULASKI | DVMT |
|---|---|---|---|---|---|---|---|
| RT 13 | CR 5 PULASKI | US11, SALINA ST | 9599 | 0.370 | 0.370 | 1.000 | 3,550.852 |
| RT 11 | RT 3 END RT 13 | NY13 | 2178 | 3.170 | 0.998 | 0.315 | 2,172.607 |
| CR 48 PINEVILLE | ACC RT 81I | NY13 | 2371 | 4.349 | 0.327 | 0.075 | 775.998 |
| NY 13 (OFF) | I-81 SB (ON) | NY13 to I81 SB | 1561 | 0.407 | 0.263 | 0.647 | 411.240 |
| ACC RT 81I | RT 11 | NY13 | 9564 | 0.790 | 0.790 | 1.000 | 7,554.365 |
| JCT CR 2 RICHLAND RD | JCT LAKE ST CR 15 LACONA | I81 | 15671 | 5.609 | 0.790 | 0.141 | 12,377.725 |
| CR 5 PULASKI | CR 15 SANDY CREEK | US11 | 2189 | 5.758 | 0.919 | 0.160 | 2,010.610 |
| JCT CR TINKER TAVERN RD | JCT RT 13 | I81 | 16832 | 3.380 | 0.234 | 0.069 | 3,943.591 |
| I-81 NB (OFF) | NY 13(ON) | I81 NB to NY13 | 1499 | 0.226 | 0.226 | 1.000 | 339.303 |
| I-81 SB (OFF) | CR 2 (ON) | I81 SB to CR2 | 1068 | 0.285 | 0.285 | 1.000 | 304.739 |
| JCT RT 13 | JCT CR 2 RICHLAND RD | I81 | 16997 | 0.810 | 0.810 | 1.000 | 13,765.377 |
| CR 41 AND WOOD RD | RT 13 | US11, SALINA ST | 3101 | 0.768 | 0.684 | 0.890 | 2,120.470 |
| PULASKI VL | RICHLAND TL | RICHLAND RD, CR 2 | 1730 | 4.430 | 0.086 | 0.019 | 149.112 |
| E VIL LINE | CR 2 | CENTERVILLE RD, CR 2A | 0 | 0.490 | 0.490 | 1.000 | 0.000 |
| CR2 (ON) | I-81 NB (ON) | CR2 to I81 NB | 1023 | 0.268 | 0.268 | 1.000 | 274.016 |
| US 11 | PULASKI VL | RICHLAND RD, CR 2 | 4143 | 0.860 | 0.860 | 1.000 | 3,563.059 |
| | | | | | | **Total DVMT:** | 53,313.06 |
| | | | | | | Days per year: | 365 |
| | | | | | | **Total Annual VMT (AVMT):** | 19,459,268.42 |

**Table 3: 2010 Village of Pulaski Traffic Data for Road Segments with Available AADT**

| | |
|---|---|
| **# occupied housing units:** | 1,048 |
| **Total AADT for roads not accounted for above:** | 6,288 |
| **Days per year:** | 365 |
| **Average AADT for roads not accounted for above:** | 304 |
| **Total Annual VMT for manually calculated roads:** | **2,295,120** |

**Table 4: 2010 Village of Pulaski Traffic Data for Road Segments without Available AADT**

AVMT for road segments with available AADT and for road segments without available AADT were then added to generate total AVMT for the Village of Pulaski, 21,754,388.417 miles in 2010.

## Appendix C: Estimation Method for Community Waste Sector

Waste generated in the Village of Pulaski is sent to the Bristol Hill Landfill and the Oswego County Energy Recovery Facility for disposal. Waste information for the Village of Pulaski was compiled using data received by Frank Visser, Oswego County Department of Solid Waste. Because waste data is not broken down by municipality, additional calculations were needed to determine approximate tons of waste generated by the Village of Pulaski.

First, total tons of waste processed each facility was determined by information provided by Frank Visser. Tons of waste disposed per person per year was then calculated by dividing Oswego County's total population by the total tons of waste processed at each facility. Finally, tons of waste disposed by the Village of Pulaski at each facility was determined by multiplying the Village's population by the tons of waste disposed per person, calculated in the previous step. See table 5 for more information.

**Bristol Hill Landfill**

| Inventory Year | County Population | Village of Pulaski population | Total tons waste processed at landfill | Tons of waste disposed per person | Tons of waste disposed from Village of Pulaski |
|---|---|---|---|---|---|
| 2010 | 122,109 | 2,365 | 30,062 | 0.25 | 582.24 |

Table 5: Village of Pulaski Community Waste Calculation from Bristol Hill Landfill

**Energy Recovery Facility**

| Inventory Year | County Population | Village of Pulaski population | Total tons waste processed at Energy Recovery Facility | Tons of waste disposed per person | Tons of waste disposed from Village of Pulaski |
|---|---|---|---|---|---|
| 2010 | 122,109 | 2,365 | 61,721 | 0.51 | 1,195.41 |

Table 6: Village of Pulaski Community Waste Calculation from Energy Recovery Facility

This information was then put into ICLEI's ClearPath software using the "Waste Generation" calculator for the Bristol Hill Landfill data (noting that the landfill does not have methane collection on the active portion) and the "Combustion of Solid Waste Generated by the Community" calculator for the Energy Recovery Facility data and using the US Community Protocol's estimates for waste share by type.[5]

[5] Default waste characterization found on page 32 of Appendix E, Solid Waste Emission Activities and Sources, of the US Community Protocol.