Local Government and Community Greenhouse Gas Inventory

Village of Jordan, New York
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Village of Jordan

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Acknowledgements

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

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I. Introduction

Background

The Village of Jordan 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 Jordan.

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.

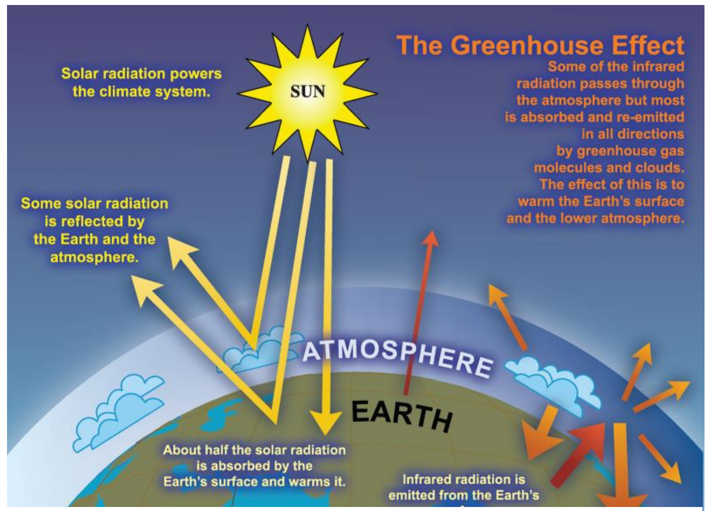

Figure 1: The Greenhouse Effect

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 Jordan is becoming increasingly interested with sustainable initiatives, and in 2014 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 Jordan is located in western Onondaga County within the Town of Elbridge. The village covers an area of 1.15 square miles, and the majority of that area is used for residential purposes. According to the 2014 American Community Survey, the village has a population of 1,390 residents, with 511 occupied housing units. Of the occupied housing units, 363 units are owner-occupied with an average household size of 3.07 persons, while 148 units are renter-occupied with an average household size of 1.85 persons.[4] The majority of homes, 55.1%, were built in 1939 or earlier. Most homes in the village are heated by natural gas (76.3%), although 19% are heated using electricity, 9% are heated with coal or coke, 2% are heated with wood, and 5% are heated with another fuel.[5]

The average July high temperature in the Village of Jordan is 81°F and the average January low is Jordan is 16.8°F. Jordan has an average of 39.3 inches of rainfall and 94.3 inches of snowfall per year, compared to the U.S. average of 36.5 inches of rainfall and 25 inches of snowfall.[6]

The majority of Jordan residents (94.5%) work outside of the village, and the majority of people who work in the Village of Jordan (94.5%) live outside of the village.[7] Approximately 20.4% of Jordan residents employed outside of the village work in the City of Syracuse, and 14.7% work in the Town of Elbridge. [8] Average travel time to work for a Jordan resident is 24.8 minutes.[9]

Considering the community's older housing stock, the fact that over one-fifth of homes use electricity or coal for heating, the community's geographic location relative to International Energy Conservation Code (IECC) climate zone[10], and the relatively high portion of residents that work outside of the village, it is expected that there are many opportunities to reduce community greenhouse gas emissions by increasing the use of air sealing and insulation in homes and businesses, cleaner technologies for heating such as ground or air source heat pumps, and electric and other alternative fuel vehicles. The implementation of these types of energy

[4] 2014 American Community Survey
[5] 2014 American Community Survey
[6] http://www.bestplaces.net/climate/city/new_york/jordan
[7] http://onthemap.ces.census.gov/index.html; Village of Jordan
[8] http://onthemap.ces.census.gov/index.html; Village of Jordan
[9] 2014 American Community Survey
[10] https://energycode.pnl.gov/EnergyCodeReqs/?state=New%20York

conservation measures can be explored in a Climate Action Plan which should be completed as a next step to this Greenhouse Gas Inventory report.

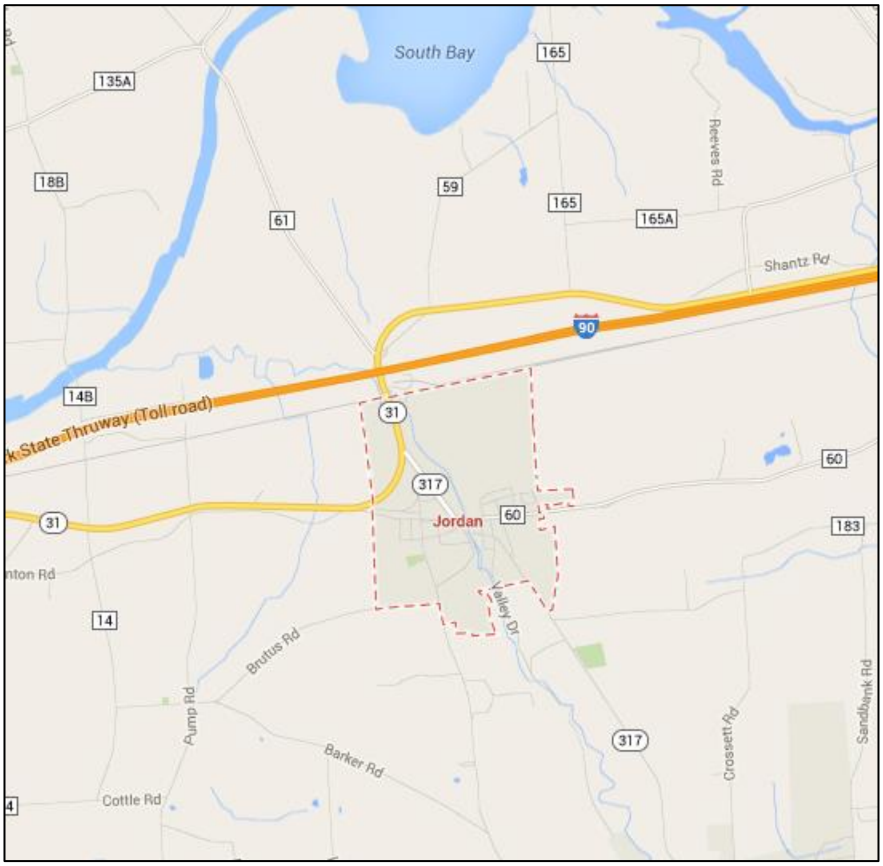

Figure 3: Village of Jordan Map

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 Jordan for the baseline year 2014 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 Onondaga 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 2014, the Village of Jordan's government emissions totaled 216 $MTCO_2e$. The largest sources of government emissions in the Village of Jordan in 2014 were electricity and natural gas, accounting for 69 $MTCO_2e$ (32%) and 68 $MTCO_2e$ (32%), respectively.

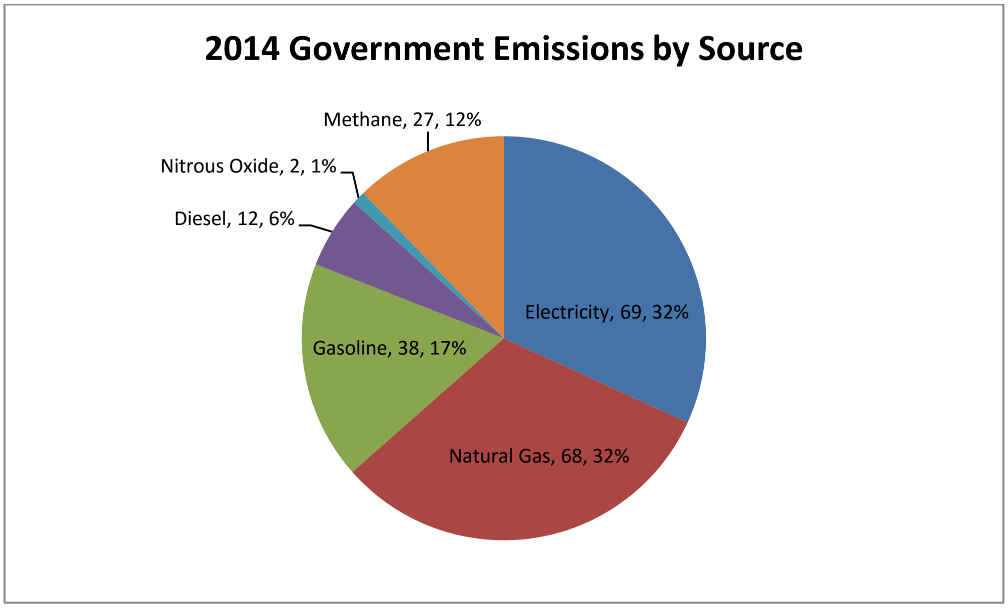

Figure 4: 2014 Government Operations Emissions by Source

Government emission sectors inventoried include: buildings and facilities, streetlights and traffic signals, water/sewer facilities, wastewater facilities, and vehicle fleet. The buildings and facilities fleet sector contributed to the largest percentage of emissions in the 2014 base year, accounting for 72 $MTCO_2e$, or 33% of the government's total emissions. The wastewater facilities sector was the next highest emitting sector, producing 68 $MTCO_2e$, or 32% of total municipal emissions, followed by the vehicle fleet sector, which produced 50 $MTCO_2e$, or 23% of total emissions, followed by the streetlights and traffic signals sector, which produced 15 $MTCO_2e$, or 7% of total emissions, and the water/sewer sector, which produced 10 $MTCO_2e$, or 5% of government emissions.

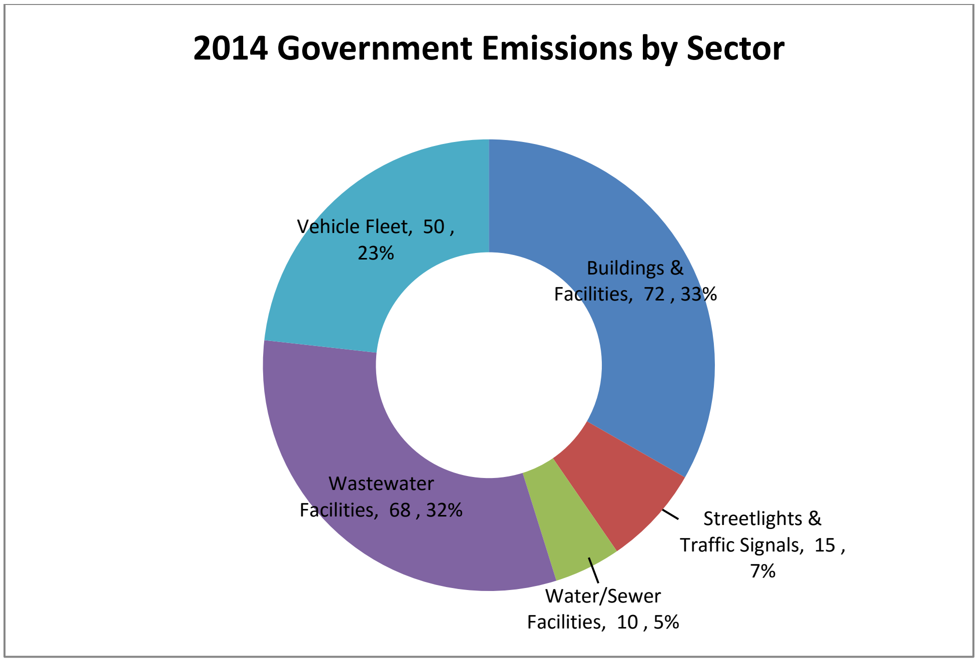

Figure 5: 2014 Government Operations Emissions by Sector

Energy use by sector in the government mimics emissions by sector in the government, with the buildings and facilities sector using the greatest amount of energy in 2014, using 1,344 million Btu (MMBtu) of energy, or 41% of the government's total energy use. The wastewater facilities and vehicle fleet sectors consumed the next highest amount of energy, both using 736 MMBtu, or 22% of total municipal energy use, followed by the streetlights and traffic signals sector, which consumed 283 MMBtu, or 9% of total energy used, and water/sewer facilities, which used 189 MMBtu, or 6% of total energy used by the government.

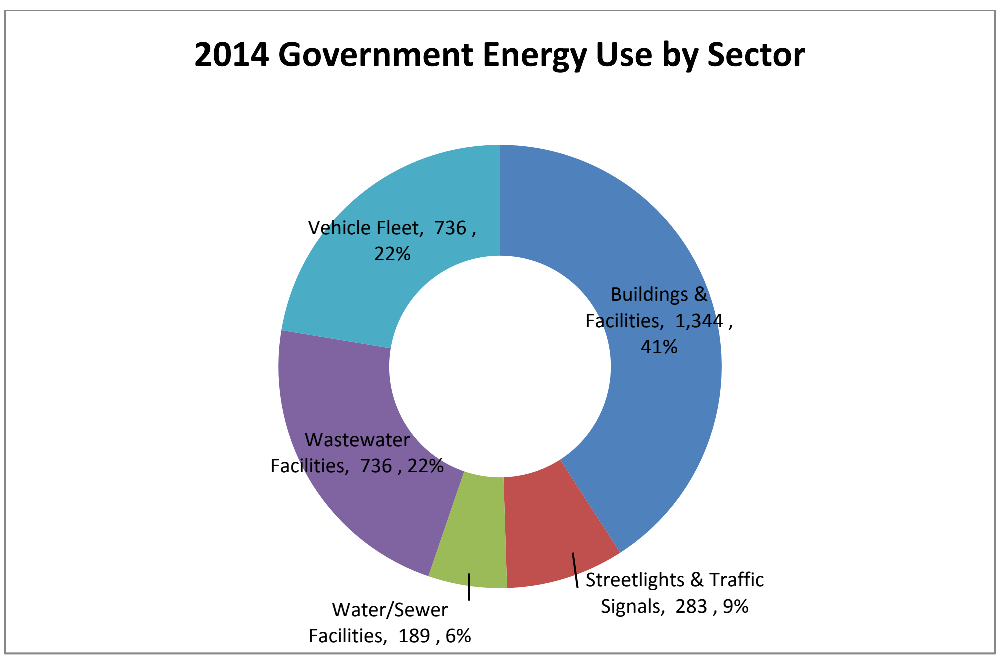

Figure 6: 2014 Government Operations Energy Use by Sector

Government emissions can also be broken down into scope. Scope 1 represents onsite emissions created and totaled 147 $MTCO_2e$, or 68% of government emissions in 2014. Scope 2 represents off-site emissions created by energy used by the municipality and totaled 69 $MTCO_2e$, or 32% of total government emissions in 2014. Scope 3 emissions were not inventoried for this report.

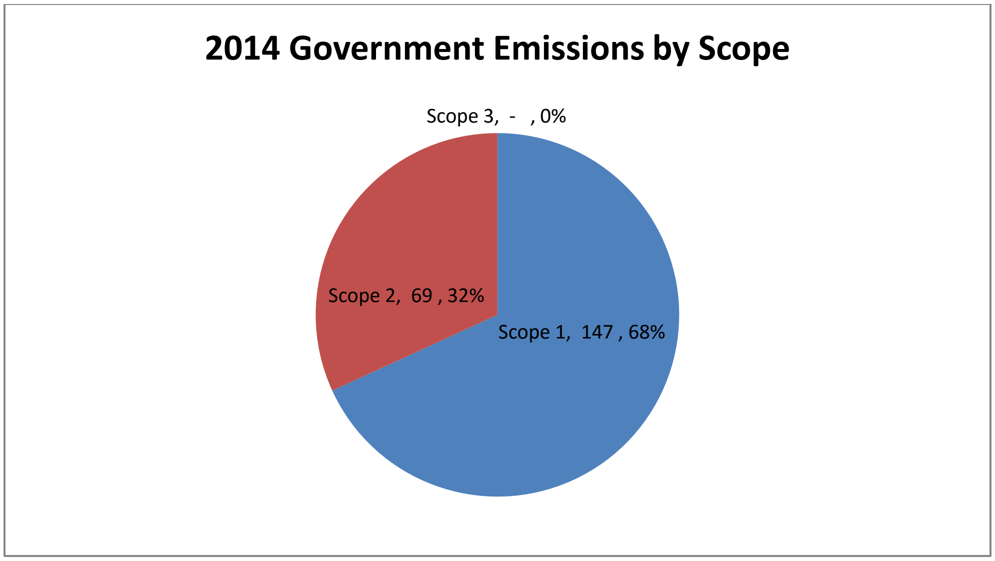

Figure 7: 2014 Government Operations Emissions by Source

Government Operations Emissions Forecast

The projected government greenhouse gas emissions for 2025 are 226 metric tons, which is 10 metric tons of CO_2e more 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 increase very slightly in all sectors.

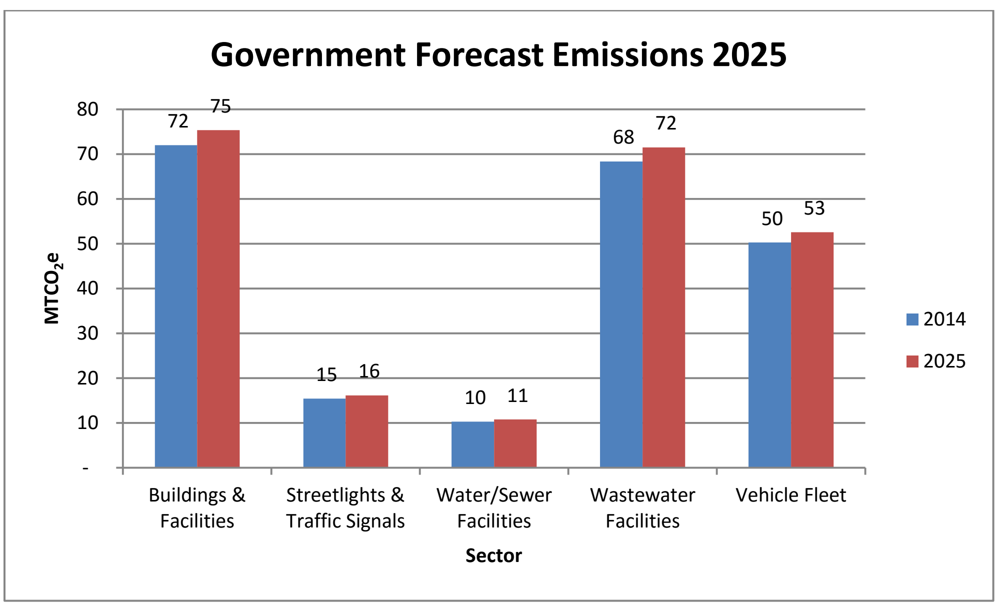

Figure 8: Government Operations Emissions Forecast

IV. Community Results

Community Emissions Inventory

In 2014, the Village of Jordan's community emissions totaled 7,560 $MTCO_2e$. The largest source of community emissions in the Village of Jordan in 2014 was electricity, accounting for 3,449 $MTCO_2e$, or 41% of all community emissions. Natural gas and gasoline were also large emitting sources, producing 2,766 $MTCO_2e$ (37%) and 1,240 $MTCO_2e$ (16%), respectively. Jordan residents used an average of 7,867 kWh and 83.0 MMBtu of natural gas per household, compared to an average of 6,570 kWh and 86.4 MMBtu of natural gas used per household in CNY (Cayuga, Cortland, Madison, Onondaga, and Oswego Counties).[11]

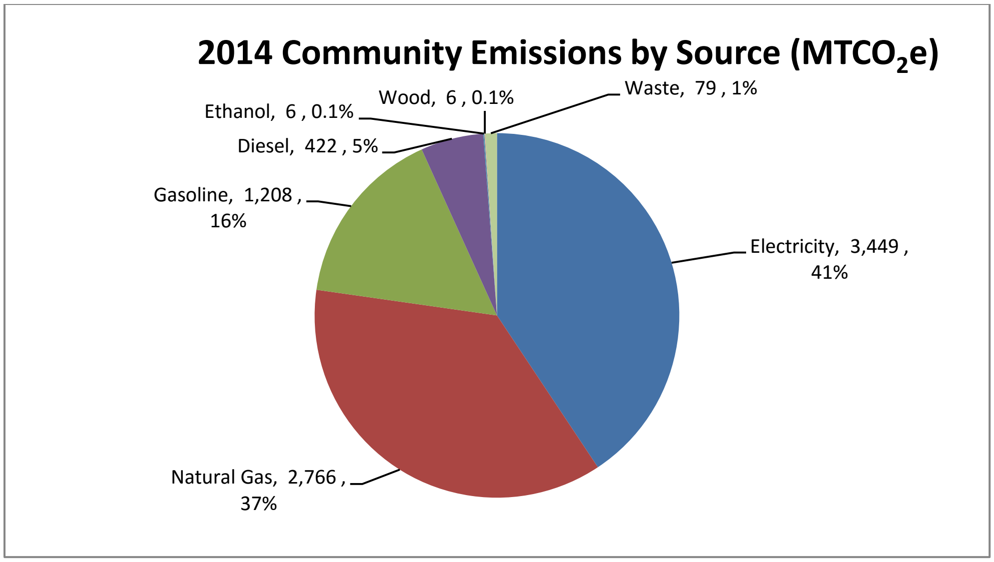

Figure 9: 2014 Community Emissions by Source

Community emission sectors inventoried include: residential energy use, commercial/industrial energy use, transportation, and solid waste. The residential energy use sector contributed to the largest percentage of emissions in the 2014 base year, accounting for 3,005 $MTCO_2e$, or 40% of the community's total emissions. Commercial/industrial energy use was the next highest emitting sector, producing 2,840 $MTCO_2e$, or 37% of total community emissions, followed by the transportation sector, which produced 1,637 $MTCO_2e$, or 22% of total emissions. The smallest emitting sector was solid waste, which produced 79 $MTCO_2e$, or 1% of total community emissions. Annually, community members in the Village of Jordan create about 4.2 $MTCO_2e$ per capita through residential, commercial, and industrial energy usage, which is 27% higher than the 2010 CNY average of 3.3 $MTCO_2e$ per capita in these sectors.[12]

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[11] *VisionCNY: Central New York Regional Sustainability Plan*, June 2013, page 23.
[12] *Central New York Greenhouse Gas Inventory*, page 18.
http://www.dec.ny.gov/docs/administration_pdf/cnymethod.pdf

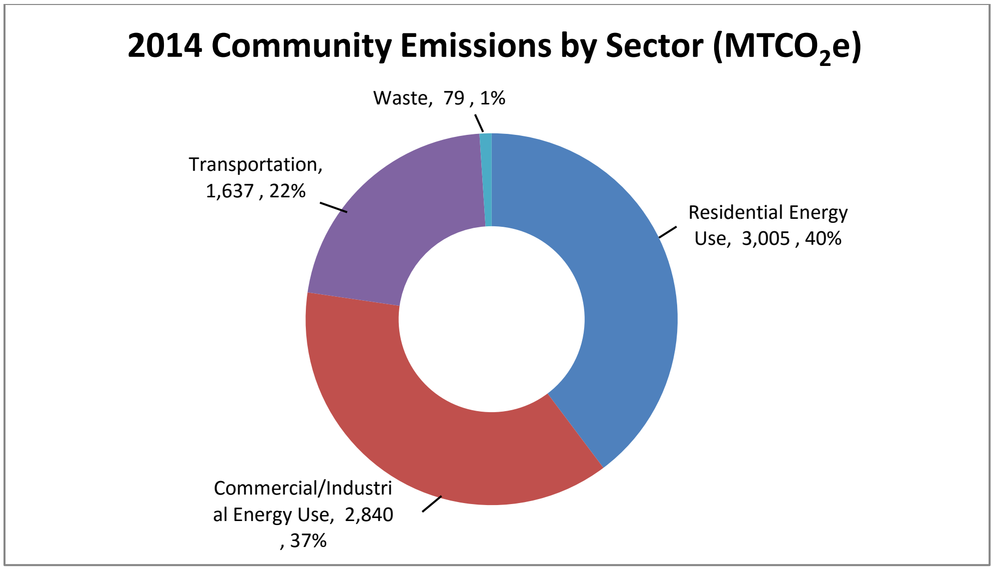

Figure 10: 2014 Community Emissions by Sector

Energy use by sector in the community mimics emissions by sector in the community, with the residential energy use sector using the greatest amount of energy in 2014, using 56,276 million Btu (MMBtu) of energy, or 42% of the community's total energy use. Commercial/industrial energy use consumed the next highest amount of energy, using 52,589 MMBtu, or 40% of total community energy use, followed by the transportation sector, which consumed 24,510 MMBtu, or 18% of total energy used. The solid waste sector did not use any energy.

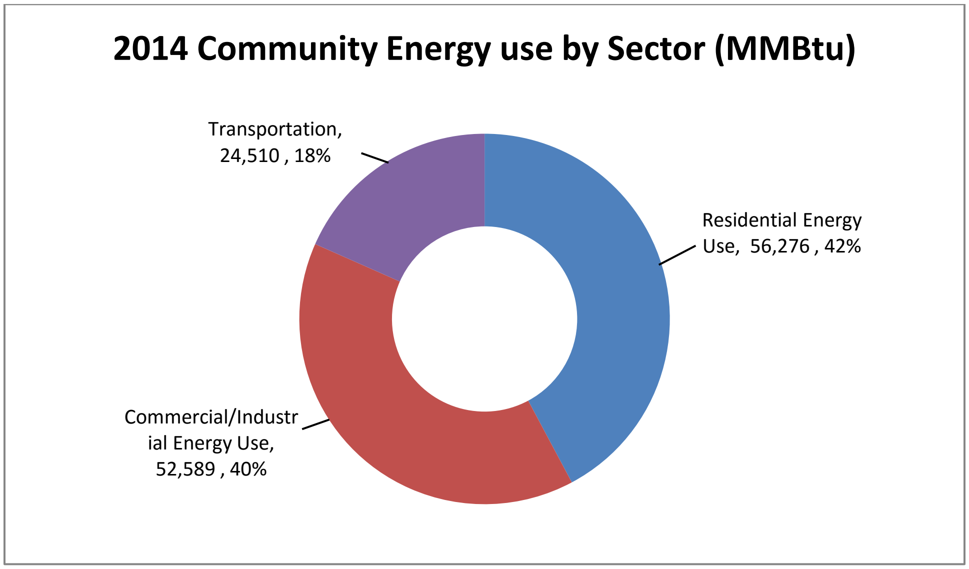

Figure 11: 2014 Community Energy Use by Sector

Community Forecast

Community emissions in the Village of Jordan are forecasted to total 7,921 $MTCO_2e$ in 2025, a 4.8% increase from the 2014 baseline year, with decreases in emissions in the residential energy use sector and increases in the commercial/industrial energy use, transportation, and waste sectors compared to the 2014 baseline year. This forecast takes into consideration local and statewide energy use and waste production trends.

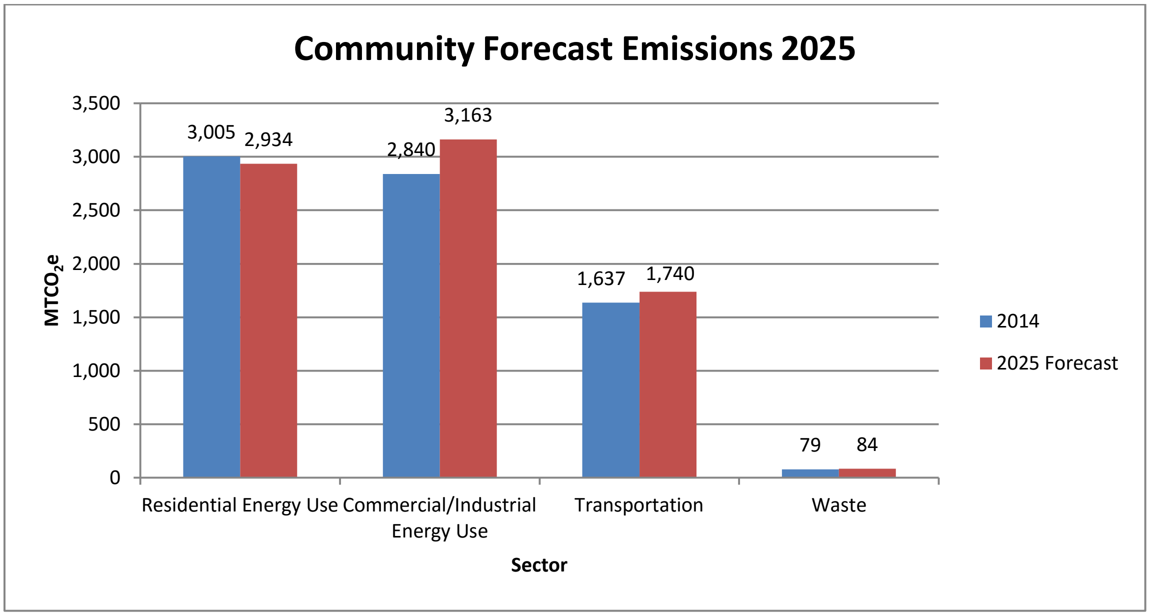

Figure 12: Community Emissions Forecast

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 Jordan was scope 1 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 buildings and facilities sector and should therefore be a focus of the village's Climate Action Plan. The results of this study also indicate that the largest percentage of community emissions came from the residential energy sector for 2014, and this sector is forecasted to remain one of the largest emitting sector through 2025, with the commercial/industrial sector forecasted to surpass it in emissions by 2025. Residential and commercial/industrial emissions should be targeted in the village's future Climate Action Plan so that energy use from these sectors 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 Jordan. 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, Onondaga County, NYS DEC, and the EPA.

VI. Conclusion

As a Climate Smart Community, the Village of Jordan 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 Jordan in the 2014 baseline year totaled 7,777 $MTCO_2e$ for all activity covered in this inventory, 216 $MTCO_2e$ (2.8%) of which was from government activity and 7,560 $MTCO_2e$ (97.2%) of which was from community-wide activity. The majority of government emissions came from scope 1 sources that are easiest to influence 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 (2014 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	42,405	53.02 kg CO_2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR)	Collected data from utility and put into ClearPath	CA		2,255
Use of fuel in residential stationary combustion (fuel oil, wood, LPG- MMBtu)	source and activity	150	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		1
Use of fuel in commercial stationary combustion (nat. gas- MMBtu)	source and activity	9,609	53.02 kg CO_2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR)	Collected data from utility and put into ClearPath	CA		511
Use of commercial stationary combustion (fuel- MMBtu)	source and activity	324	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		3
Industrial Stationary combustion sources (nat. gas- MMBtu)	source and activity	N/A			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	16,518	eGrid 2012 subregion factors (EPA)	Collected data from utility and put into ClearPath	CA		3,074
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			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	3,529,133	ClearPath emission factors for gasoline and diesel (varies by vehicle class for N2O & CH4): LGOP gasoline EF=8.78 kgCO_2/gal; diesel EF= 10.21 kgCO_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		1,637
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			NA		
generation and disposal of solid waste by the community	source and activity	939.43		Used ICLEI's US Community Protocol Appendix E (Solid Waste Emission Activities and Sources), SW 2.2	CA		79.041
Water and Wastewater							
Potable Water- Energy Use							
Operation of water delivery facilities in the community	source	N/A			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			NE		
Centralized Wastewater Systems- Process Emissions							
Process emissions from operation of wastewater treatment facilities located in community	source	N/A			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 Jordan. 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.

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 Jordan, 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 Jordan with traffic counts is 1.934 miles in 2014, while 7.509 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 Jordan for the roads without AADT counts. It was determined that there are 511 occupied households in the Village of Jordan, according to the 2010 US Census. It was assumed that all 511 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 Jordan did not have an AADT count. By multiplying 511 homes by 6, a combined AADT count of 3,066 was calculated for all 7.509 miles of roads without AADT counts available. In order to calculate VMTs, an average AADT value was needed, and derived by dividing 3,066 by the 7.509 miles of uncounted roadway. This gave an average AADT value of 408, which was applied to all roadways that did not have a count.

There is some error involved in 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 Jordan without AADT counts available. In addition, there may have been some double counting if homes in Jordan 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, 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 JORDAN (MILES)	RATIO OF LENGTH IN VILLAGE OF JORDAN	DVMT
WHITING RD	MAIN ST	NY317	3,778	0.701	0.701	1.000	2,647.594
RT 317 JORDAN	RT 173	NY31	3,604	5.880	0.314	0.053	1,130.694
Cayuga/Onon Co Line	RT 317 JORDAN	NY31	3,321	1.070	0.359	0.336	1,192.730
MAIN ST	RT 31 JORDAN END RT 317	NY317	2914	0.560	0.560	1.000	1,631.840
						Total DVMT:	6,602.86
						Days per year:	365
						Total Annual VMT (AVMT):	2,410,043.16

Table 3: 2014 Village of Jordan Traffic Data for Road Segments with Available AADT

# occupied housing units:	511
Total AADT for roads not accounted for above:	3,066
Days per year:	365
Average AADT for roads not accounted for above:	408
Total Annual VMT for manually calculated roads:	**1,119,090**

Table 4: 2014 Village of Jordan 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 Jordan, 3,529,133.164 miles in 2014.

Appendix C: Estimation Method for Community Waste Sector

Waste generated in the Village of Jordan is sent to the Onondaga County Resource Recovery Agency's (OCRRA) Waste-to-Energy (WTE) Facility for disposal. The Onondaga County Resource Recovery Facility is a WTE facility that processes 97% of OCRRA's total non-recyclable waste. Close to 100% of the incoming waste stream is processable by the WTE facility. This means that almost all of the waste brought to the WTE facility is combusted and turned into steam to be used for electricity generation. The electricity generated at the facility is then sold to National Grid, providing enough electricity to power approximately 25,000-30,000 households and the Facility itself.

Waste information for the Village of Jordan was compiled using 2014 waste billing information by tonnage that the Village Hall collects for the entire village. 216.01 total tons of waste were billed to the village in 2014. This information was then put into ICLEI's ClearPath software using the "Combustion of Solid Waste Generated by the Community" calculator and using the US Community Protocol's estimates for waste share by type.[13]

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