Local Government and Community Greenhouse Gas Emissions Inventory Baseline 2010

Village of Skaneateles, New York
November 2012

Village of Skaneateles

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Executive Summary

The Village of Skaneateles recognizes the importance of climate action planning to the long-term resilience and sustainability of the community. The Village was selected by the Central New York Regional Planning and Development Board (CNY RPDB) to take part in the Climate Change Innovation Program (C_2IP), a regional climate action program funded through the US EPA Climate Showcase Communities program. Conducting a greenhouse gas (GHG) inventory represents the first step in effective climate action planning. The inventory assessed Village government operations and broader community emissions in 2010, which will serve as the baseline year[1] for GHG reduction planning moving forward.

In 2010, Village government operations generated 828 metric tons of carbon dioxide equivalents ($MTCO_2e$). These emissions span seven sectors, including buildings and facilities, streetlights and traffic signals, vehicle fleet, water delivery, wastewater treatment, waste, and employee commuting. Community emissions totaled 29,167 $MTCO_2e$ in 2010. This total represents five sectors, namely residential, commercial and industrial energy use, transportation, and waste.

The Village carbon footprint will expand or contract due to many factors. Energy conservation measures, increased commercial development, reduced vehicle miles travelled, and efficiency upgrades are just a few examples of the interacting variables that affect greenhouse gas emissions levels. Through periodic assessments and forecasts, the Village will be able to determine emissions sources and target areas for reduction more efficiently. A baseline GHG inventory is just that, a baseline. In order to be truly meaningful it must be measured against future progress. The Village will need to continue to monitor and evaluate its performance by conducting additional GHG assessments in the future. Additionally, emission forecasts can offer a planning tool moving forward, and will enable the Village to target areas for emissions reduction as part of other climate action efforts.

Introduction

Village of Skaneateles Overview

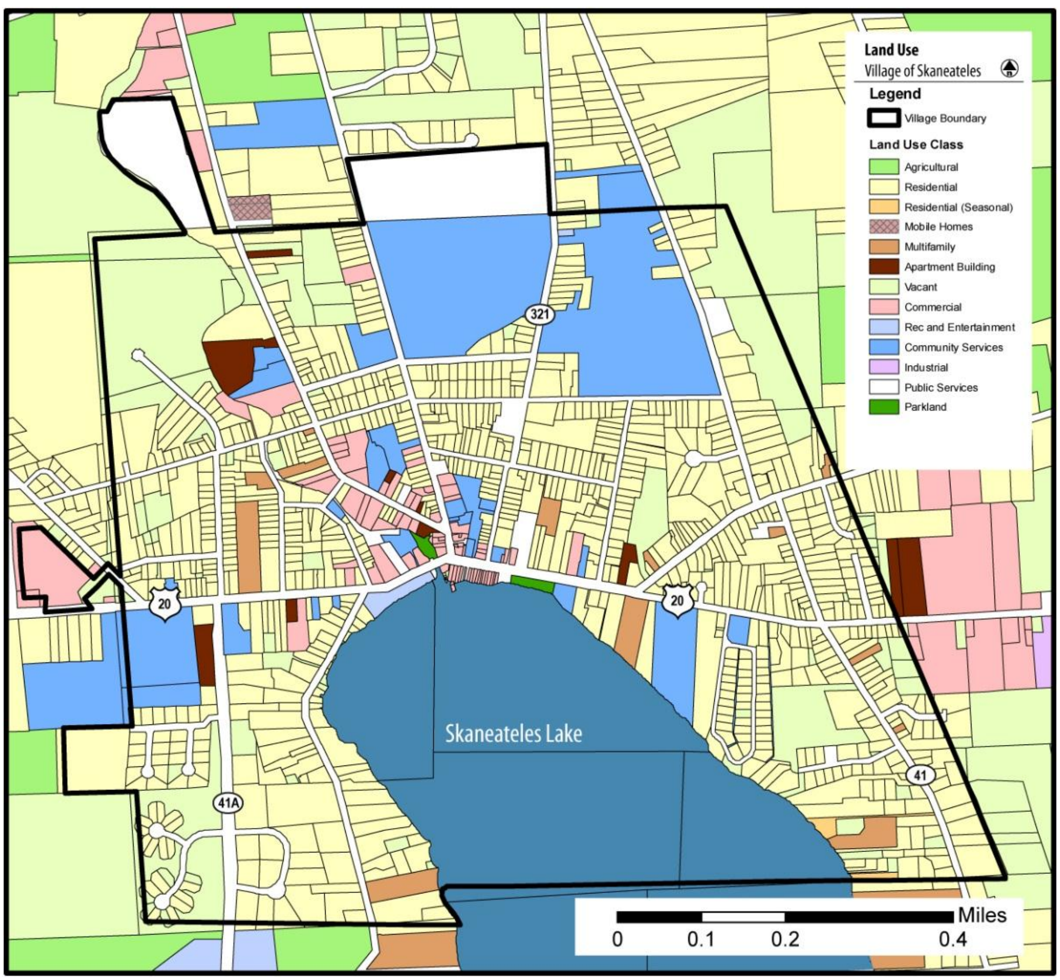
The Village of Skaneateles (pop. 2,450) is located southwest of the City of Syracuse, and covers a land area of approximately 1.34 square miles. The main routes of travel through the Village are US-20, NYS-321 and US-5. The Historic Village is located on the north shore of beautiful Skaneateles Lake, Eastern Gateway to the Finger Lakes Region of Central New York. Skaneateles Lake serves as the primary water supply for the City of Syracuse and historically supplies the Erie Canal. In the heart of the Finger Lakes region, carved by ancient glaciers, Skaneateles Lake curves south for 16 miles with breathtaking views. The name Skaneateles comes from the Iroquois term for "Long Lake." The Iroquois also named the Finger Lakes, viewing them as the hand print of the Great Spirit on creation.

[1] The baseline year is chosen based on several criteria: consider whether (1) data for that year are available, (2) the chosen year is representative, and (3) the baseline is coordinated to the extent possible with baseline years used in other inventories. (EPA 2012)

The first white settler, Abraham Cuddeback, came to survey the Military Tract under Moses Dewitt. At first a part of the township of Marcellus, the town of Skaneateles was separated and established independently on February 26, 1830, and the Village, at the head of the lake, was incorporated on April 19, 1833.

Many of the Village architectural treasures date from the 1830s. (A downtown Historic District was established in 1985.) Early agriculture was centered on dairy and grain. By 1850, the village and its surrounding hamlets had grown in industry as well, producing wool cloth, mill machinery, carriages, sleighs, paper, bricks, ironwork, and farm implements. The cultivation of the teasel, a natural burr used to raise the nap on woven wool, spurred the economy until the middle of the twentieth century. Well-known canoes, motor launches and sailboats, including the Lightning and the Comet, were crafted from 1876 to 1945.

Today, Welch Allyn is a major Skaneateles employer, and is one of the world's largest manufacturers of medical diagnostic instruments and bar code scanning products. Tourism is also a mainstay of the Skaneateles economy, welcoming visitors who are drawn by the beauty of the lake and the charm of the shops, restaurants, a museum, galleries, historic inns, the Skaneateles Music Festival, and the Dickens Christmas celebration.



Climate Change Background

New York State has outlined projected climate impacts and vulnerabilities in its 2011 ClimAid assessment.[2] The 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.

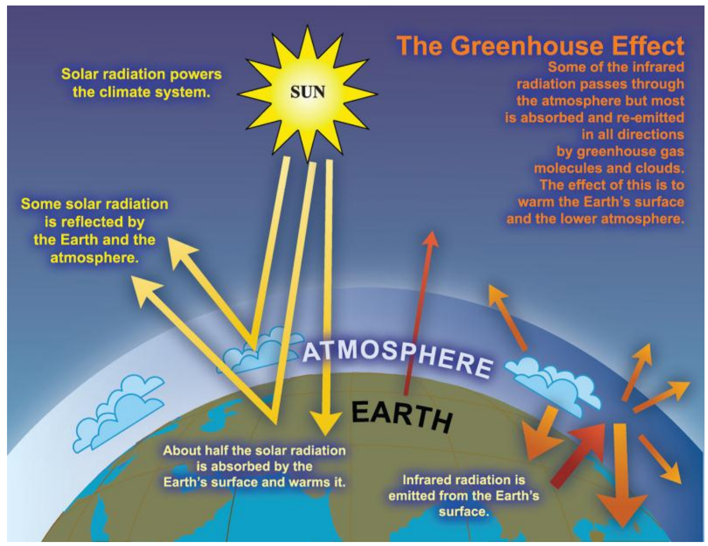


Figure 1 Greenhouse Effect

Global average temperatures and sea levels have been increasing for the last century and have been accompanied by other changes in the Earth's climate. As these trends continue, climate change is increasingly recognized as a major global concern. 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 90 percent chance that rising global average temperatures, observed since 1750, are primarily a result of greenhouse gas (GHG)-emitting human activities.[3]

The rising trend of human-generated GHG emissions is a global concern. 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 1).[4] 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.

In New York State, regional climate change impact and vulnerability assessments will likely increase moving forward, but many local governments across the nation are already taking action to lessen climate impacts through GHG reduction measures and climate adaptation planning.

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[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] NYS. 2011. ClimAid. http://www.nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/Response-to-Climate-Change-in-New-York.aspx

[4] IPCC. 2007. Fourth Assessment Report. http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch18s18-6.html

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.

Climate Change Innovation Program

The Central New York Regional Planning and Development Board (CNY RPDB) was an awardee of the U.S. Environmental Protection Agency's Climate Showcase Communities program in May of 2010. The CNY RPDB utilized the award to launch the Central New York Climate Change Innovation Program (C_2IP). The overall goal of the US EPA Climate Showcase Communities grant program is to create replicable models of community action that generate cost-effective and persistent greenhouse gas reductions while improving the environmental, economic, public health, or social conditions in a community.

The Village of Skaneateles was selected by CNY RPDB, as one of seven municipalities in Central New York, to receive technical assistance and financial incentives to complete carbon foot-printing and sustainability planning processes.

In addition to completing an emissions inventory, the Village was eligible for a sub-grant of up to $30,000 through C_2IP, which enabled the Village to implement a demonstration project. The Village of Skaneateles is moving forward with the renovation of a vacant fire station near the Village center into the new Village hall and the Village Police Department. The building is approximately 7,500 square feet, and requires substantial renovation. Current plans include utilization of 4,000 square feet of the space for municipal operations and the remaining 3,500 square feet will remain available for light commercial opportunities. The Village has applied to the CNY Regional Economic Development Council for financial assistance through the NYSERDA GHG Reduction program. The Village is seeking to develop the first municipal net zero LEED certified public building in New York State. Renovations include a HVAC system that will utilize geothermal technology, complete building envelope renovation, a lighting retrofit including LED lighting, and installation of a 50 kW Solar PV system on the building roof. The Village plans to utilize technologies that have been developed in Central New York including the HVAC system and the LED lighting components. The design of the building is expected to produce more energy than it consumes. The project will be a showcase for cutting edge technology and environmental stewardship for the region and the state.

ICLEI Partnership

The Village of Skaneateles has been a member of ICLEI Local Governments for Sustainability throughout the inventory process, and the completion of the government and community analyses is the first component of ICLEI's Five Milestones for Climate Mitigation (see Figure 1 below).

Figure 2 ICLEI Five Milestones for Climate Mitigation

The five milestones include:

- Milestone One: Conduct a Sustainability Assessment
- Milestone Two: Set Sustainability Goals
- Milestone Three: Develop a Sustainability Plan
- Milestone Four: Implement the Sustainability Plan
- Milestone Five: Monitor/Evaluate Implementation Progress

Inventory Methodology

There are established methods for conducting municipal inventories, as well as broader community assessments. The Village of Skaneateles GHG inventory utilizes a variety of tools, with the understanding that protocols and guidelines will continue to evolve and develop.

Organization by Sector

The Village GHG inventory analyzed both government operations and community-generated emissions. The sectors covered within these analyses are listed in Table 1 Government and Community Sectors below. The ability to determine larger sources of emissions, through individual sector assessment, allows a local government to more efficiently target specific actions or processes for emissions reductions. Furthermore, government operations inventories are distinctly different from community analyses due to the operational control local governments have over their emissions and the lack of operational control they have over community emissions sources. Organizing the inventory by sectors delineates this distinction.

Village Government Operations Sectors	Village Community Sectors
Buildings and Facilities	Residential Energy Use
Streetlights & Traffic Signals	Commercial Energy Use
Vehicle Fleet	Industrial Energy Use
Wastewater Treatment Facilities	Transportation

Water Delivery Facilities	Waste
Waste	
Employee Commute	

Table 1 Government and Community Sectors

Greenhouse Gases Covered

The three most prevalent greenhouse gases, and therefore the focus of the Village 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 the equivalent impact of 1 unit of each gas on the atmosphere when compared with 1 unit of CO_2 (see Table 2 Greenhouse Gases).

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

Table 2 Greenhouse Gases

Organization by Scope

Emissions can be categorized in terms of government control over the action that causes them. This is done through the scope distinction, which labels the emissions sources within a local government as either scope 1, 2, or 3, distinguishing between what is directly emitted (scope 1) and indirectly emitted (scopes 2 and 3) (see Table 3 Emissions Scopes). 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. 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. The Village has incorporated two scope 3 emissions sources in its inventory: employee commute and government operations-generated waste.

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 the Town of Skaneateles or Onondaga County) will likely account for the same emissions. If scope distinctions are not made, then there is the potential for double-counting certain sources (such as electricity consumed by the village (scope 2) and the same electricity generated by plants in the state (scope 1)).

Scope	Emissions Activity	Village Sector by Scope
1	All direct GHG emissions (with the exception of direct CO2 emissions from biogenic sources).	Vehicle Fleet, WWTP Processes, Buildings & Facilities (fuel use)
2	Indirect GHG emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling.	Buildings & Facilities, Streetlights & Traffic Signals, Water Delivery, WWTP

3	All other indirect emissions not covered in Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity (e.g., employee commuting and business travel), outsourced activities, waste disposal, etc.	Employee commute, Government operations-generated waste

Table 3 Emissions Scopes[5]

Calculation Tools

The Village GHG analysis followed the methods outlined in ICLEI's Local Government Operations Protocol (2010).[6] The protocol provides recommended and alternate approaches to calculating total emissions by individual sector, and provides emissions factors and global warming potential (GWP) to use in assessing the impact of each emissions source and greenhouse gas on government and community operations. ICLEI also provides members with its Clean Air and Climate Protection (CACP) Tool to use to aggregate emissions and generate forecast projections. An example fuel calculation from ICLEI's LGOP is shown below:

Equation 6.2	**Calculating CO_2 Emissions From Stationary Combustion (gallons)**
Fuel A CO_2 Emissions (metric tons) = Fuel Consumed (gallons) × Emission Factor (kg CO_2/gallon) ÷ 1,000 (kg/metric ton)	
Fuel B CO_2 Emissions (metric tons) = Fuel Consumed (gallons) × Emission Factor (kg CO_2/gallon) ÷ 1,000 (kg/metric ton)	
Total CO_2 Emissions (metric tons) = CO_2 from Fuel A (metric tons) + CO_2 from Fuel B (metric tons) + … (metric tons)	

Equation 6.7	**Converting to CO_2e and Determining Total Emissions**
CO_2 Emissions (metric tons CO_2e) =	CO_2 Emissions (metric tons) × 1 (GWP)
CH_4 Emissions (metric tons CO_2e) =	CH_4 Emissions (metric tons) × 21 (GWP)
N_2O Emissions (metric tons CO_2e) =	N_2O Emissions (metric tons) × 310 (GWP)
Total Emissions (metric tons CO_2e) =	$CO_2 + CH_4 + N_2O$ (metric tons CO_2e)

In addition to the ICLEI guidance discussed above, this analysis also utilized the EPA's State Inventory Tool (SIT), which provides default data for each state that is used to assess the emissions for sources that are difficult to estimate at a local level.[7] The particular tool used for the Village inventory was the wastewater treatment module within the SIT (see Appendix 2. Wastewater Treatment Process Emissions Method).

Normalization Factors

It is important to assess emissions in the context of changing conditions that affect sources such as electricity consumption or heating fuel use over time. A primary indicator of these patterns are heating and cooling degree days, which often correlate with a rise or fall in energy consumption (and therefore a

[5] ICLEI. 2010. Local Government Operations Protocol.
[6] ICLEI. 2010. Local Government Operations Protocol.
[7] EPA. 2012. State Inventory Tool. http://epa.gov/statelocalclimate/resources/tool.html

rise or fall in associated emissions).[8] In addition to other factors, such as changes in fuels used for heating and cooling, as well as energy conservation measures, HDDs and CDDs serve as explanatory variables affecting both municipal and community GHG emission patterns. Like emissions baselines, the comparison of HDD and CDD patterns is best done over a period of years, compared against a baseline analysis; therefore, this should be a component of future carbon footprint analyses.[9] (See Appendix 5. Regional Climate Data for more information.)

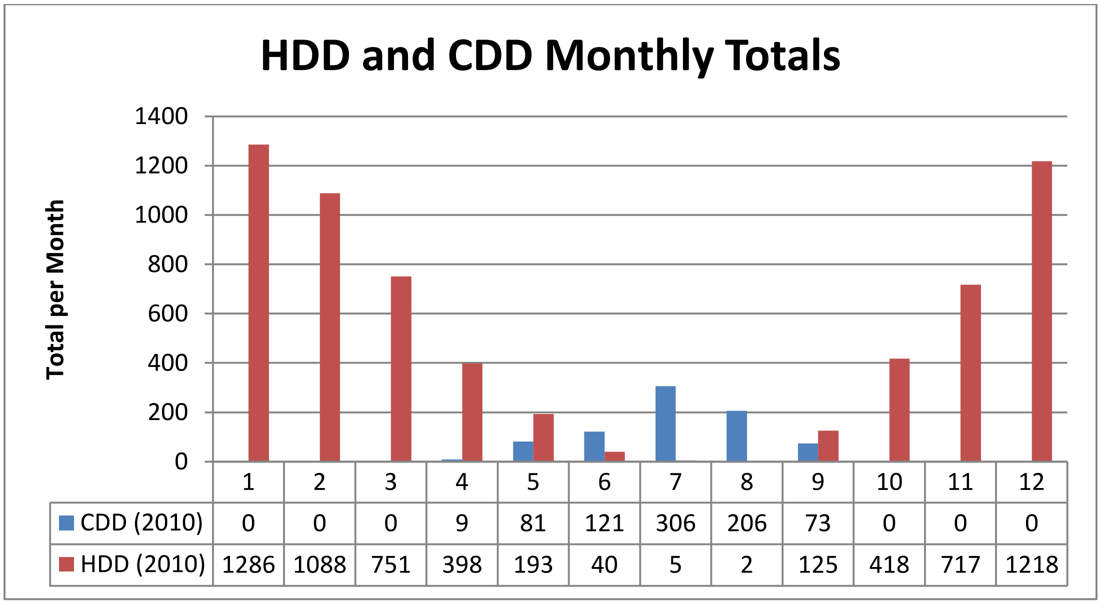

Figure 3 HDD and CDD Monthly Totals

Inventory Results

Government Operations Emissions

Emissions by Sector

The Village government emissions totaled 828 metric tons of CO_2e in 2010. This total covers emissions from village government buildings and facilities, streetlights and traffic signals, water delivery facilities, wastewater treatment facilities, government vehicles, government operations waste, and government employee commuting.

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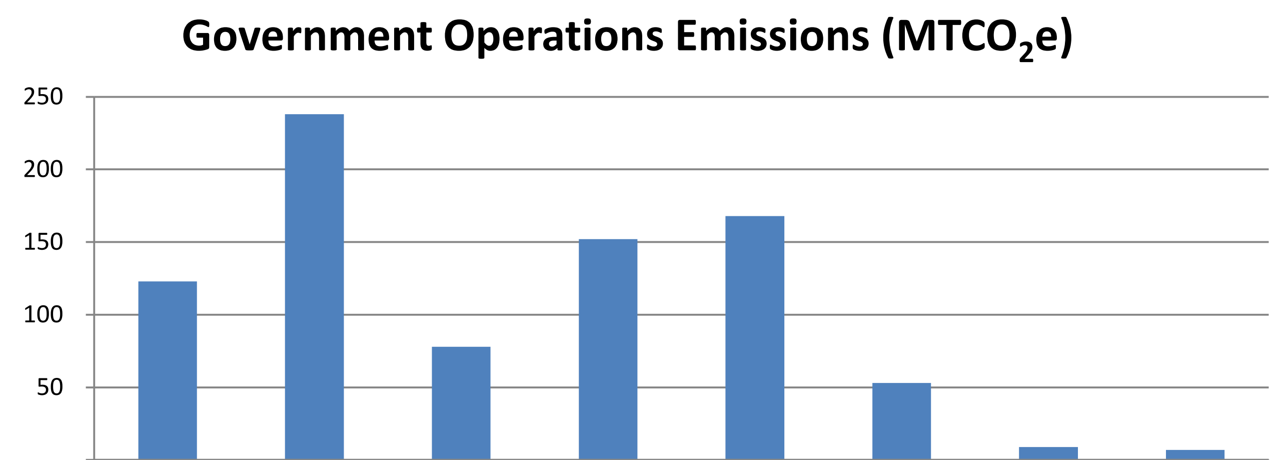
[8] HDD/CDD explanation: "A mean daily temperature (average of the daily maximum and minimum temperatures) of 65°F is the base for both heating and cooling degree day computations. Heating degree days are summations of negative differences between the mean daily temperature and the 65°F base; cooling degree days are summations of positive differences from the same base. For example, cooling degree days for a station with daily mean temperatures during a seven-day period of 67,65,70,74,78,65 and 68, are 2,0,5,9,13,0,and 3, for a total for the week of 32 cooling degree days" (NOAA National Weather Service: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/ddayexp.shtml)

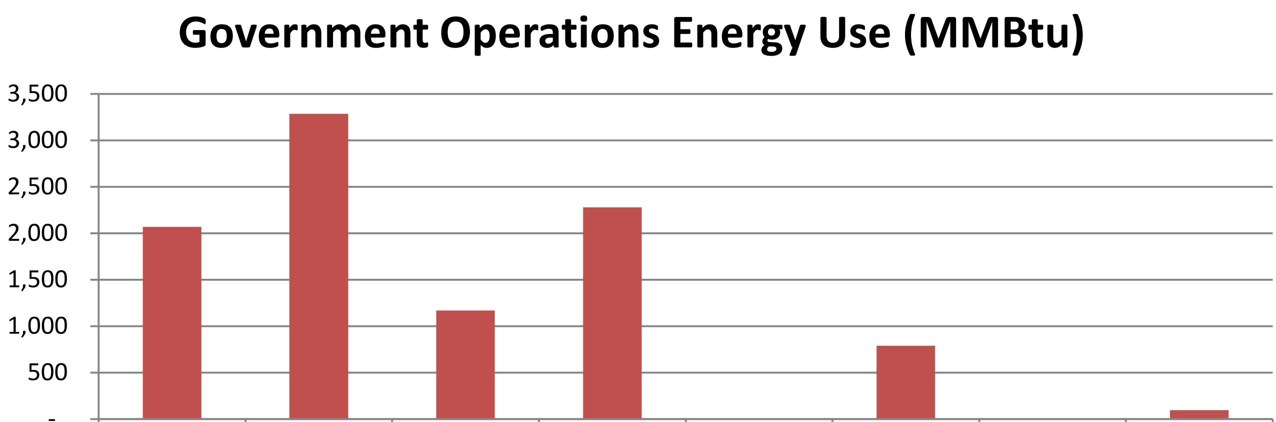
[9] Village-specific HDD/CDD NOAA weather station data was not available; therefore, the data for Syracuse Hancock Airport was used as a proxy: http://www.ncdc.noaa.gov/cdo-web/#t=secondTabLink

The largest source of emissions within village operations results from wastewater treatment plant energy use and processes (combined 320 $MTCO_2e$), followed by vehicle fleet fuel use emissions (238 $MTCO_2e$), and building and facility energy use (123 $MTCO_2e$). The buildings and facilities sector encompasses all facilities under Village government operational control, but does not include water delivery and wastewater treatment facilities, which would result in double-counting.



	Buildings and Facilities	Vehicle Fleet	Water Delivery	Wastewater facilities	Wastewater Treatment Processes	Streetlights & Traffic Signals	Waste	Employee Commute
2010	123	238	78	152	168	53	9	7

Figure 4 Government Emissions



	Buildings and Facilities	Vehicle Fleet	Water Delivery	Wastewater facilities	Wastewater Treatment Processes	Streetlights & Traffic Signals	Waste	Employee Commute
2010	2,067	3,286	1,169	2,279	-	790	0	94

Figure 5 Government Energy Use

Government operations energy use is highest within the vehicle fleet sector as a result of gasoline and diesel use. Village vehicles from the fire, police, DPW, water, and utility departments consumed a combined 15,767 gallons of gasoline and 9,689 gallons of diesel in 2010. Due to national and state requirements, all gasoline in New York has 10% ethanol content; therefore, the emissions calculations take this biogenic component into account, making the fuel breakdown approximately 14,190 gallons of gasoline and 1,577 gallons of ethanol.[10]

Electricity and natural gas use in facilities such as the Village wastewater treatment plant, department of public works and water delivery facilities encompass most of the remaining energy use emissions.

[10] Biogenic sources refer to fuels that are derived from biomass, which was recently contained in living organic matter, and the CO_2 emissions from biogenic sources must be accounted for separate from CO_2 emissions caused by non-biogenic, fossil fuel sources (ICLEI Local Government Operations Protocol)

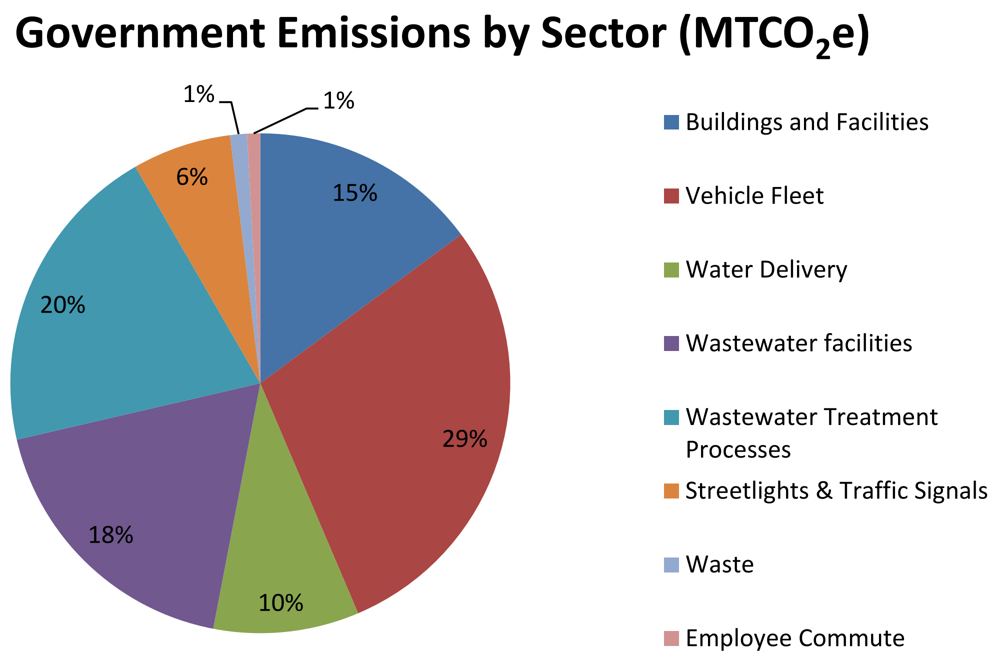


Figure 6 Government Emissions by Sector

Emissions by Scope

Government emissions totaled 464 $MTCO_2e$ in scope 1 and 348 $MTCO_2e$ in Scope 2. Scope 2 emissions are due to the use of utility-provided electricity in facilities and lighting sectors. While the Village runs its own municipal utility, the energy provided by this service is not directly generated within the Village boundary and is therefore an indirect emissions source.

Scope 1 emissions include all stationary combustion sources. Namely, vehicle emissions that result from travel within the Village boundary, natural gas use in facilities, as well as the wastewater treatment plant process emissions that occur within the Village boundary as a service to Village residents. These emissions are direct- occurring within the Village and serving the Village population.

All scope emission sources can be targeted and reduced through Village government operations; however, scope 3 sources such as employee commuting are the most challenging because governments cannot mandate the personal choices of their employees. Local governments can influence behavior choices through incentives, competitions, or other programmatic efforts that encourage and recognize staff participation and contribution to reductions in municipal GHG emissions.

Scope	Emissions ($MTCO_2e$)	Sectors
Scope 1 (direct)	464	Vehicle Fleet, WWTP Processes, Buildings & Facilities (fuel use)
Scope 2 (indirect)	348	Buildings & Facilities, Streetlights & Traffic Signals, Water Delivery,

		WWTP facilities
Scope 3 (other indirect)	16	Employee commute, Government operations-generated waste

Table 4 Government Emissions by Scope

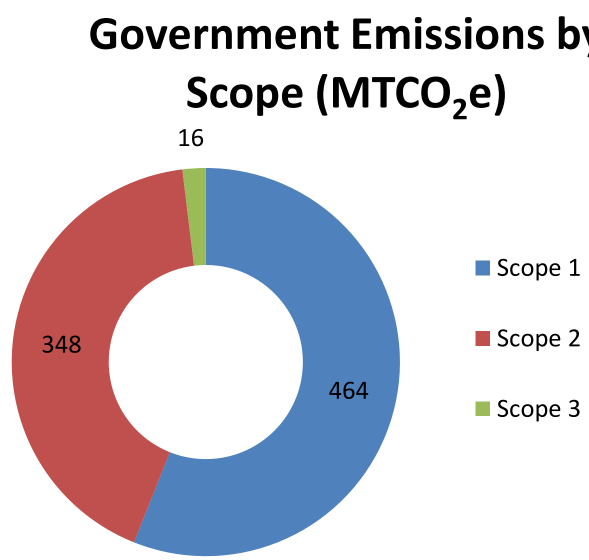


Figure 7 Government Emissions by Scope

Emissions by Source

When considering government emissions by source, electricity comprises 42% of the village carbon footprint (see Figure 8 Government Emissions by Source). Estimated methane emissions and gasoline emissions follow at 20% each of government totals. While estimates of methane from treatment plant operations vary based on a number of factors (e.g., equipment efficiency and treatment processes), the potency of the gas (methane has 21 times the global warming potential of carbon dioxide) means that a moderate source of methane has a large impact. Diesel and natural gas make up a combined 17% of government operations emissions, while sources from waste composition combine with ethanol and nitrous oxide from wastewater treatment to make up the remaining (1%) government operations emissions.

Estimation methods used for the Village wastewater treatment plant involve default metrics provided by the EPA's State Inventory Tool wastewater module, in addition to Village-specific population data. The approach is described in detail in Appendix 2. Wastewater Treatment Process Emissions Method.

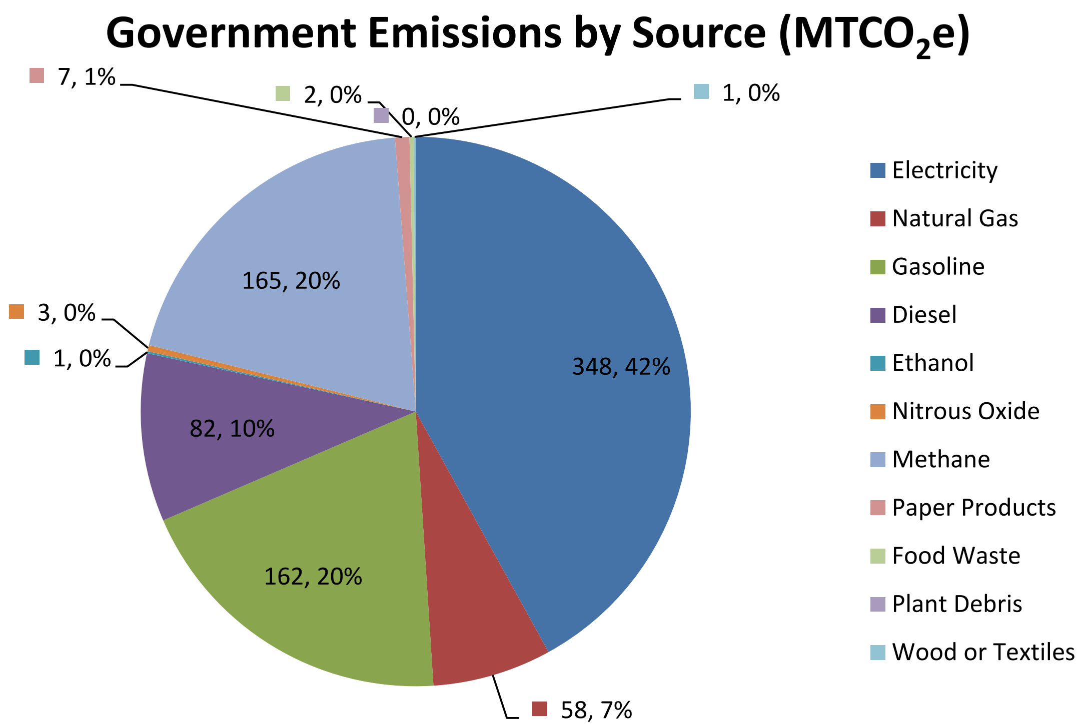


Figure 8 Government Emissions by Source

Community Emissions

Community emissions are often outside the operational and financial control of local governments. The activities of many commercial and industrial businesses, for example, do not fall under the authority of municipalities and are not always directly impacted by municipal decision-making. However, the actions taken by local governments can have a direct impact and influence on all community members, and conducting an assessment of community emissions provides governments with a framework to evaluate what sectors have the potential for the most impact.

Emissions by Sector

The sectors covered in the Village community analysis include residential, commercial and industrial energy use, transportation and waste. Residential energy use comprises the bulk of community emissions at 14,780 metric tons of CO_2e (see Figure 9 Community Emissions). Waste generated in the community is tracked by the Skaneateles transfer station, and totaled 2,992 tons in 2010, which is delivered to the Cayuga County landfill. Waste represents the lowest emitting sector in the community analysis.

Transportation sector emissions are based on estimates of vehicle miles traveled (VMT) allocated to specific fuel types, namely gasoline, diesel and ethanol, for the community. The VMT estimate developed for this analysis covers only main roads through the Village community and is therefore not inclusive of all vehicles travelling in and around the area. The estimated annual VMT for the area totaled over 8.5 million. The estimation method used to generate Village community VMT totals is outlined in Appendix 3. VMT Estimation Method.

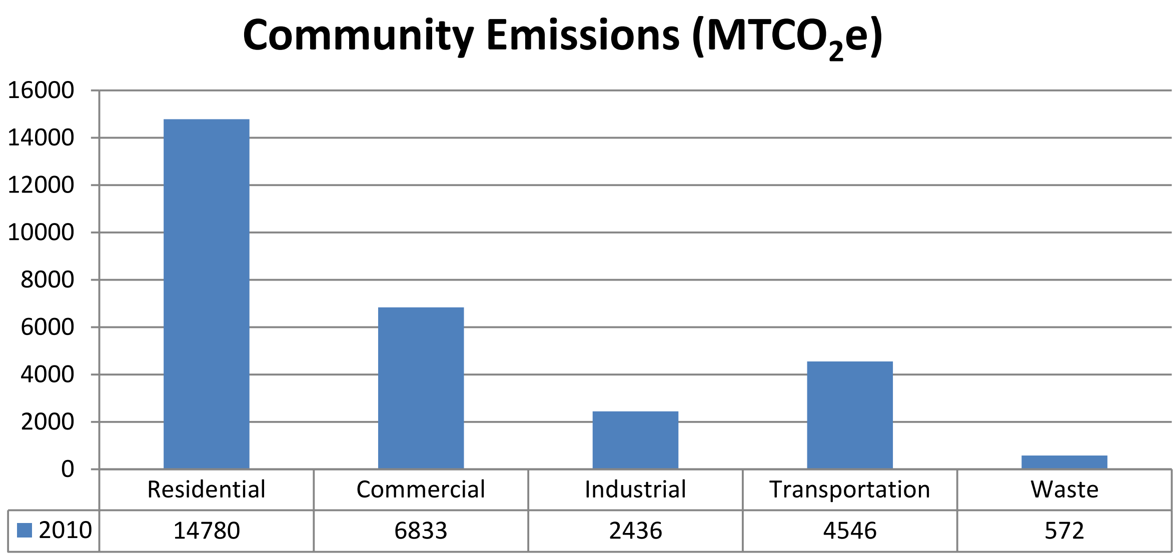


Figure 9 Community Emissions

Community energy use mirrors emission totals by sector, with residential and commercial energy use comprising the majority of community MMBtu (see Figure 10 Community Energy Use).

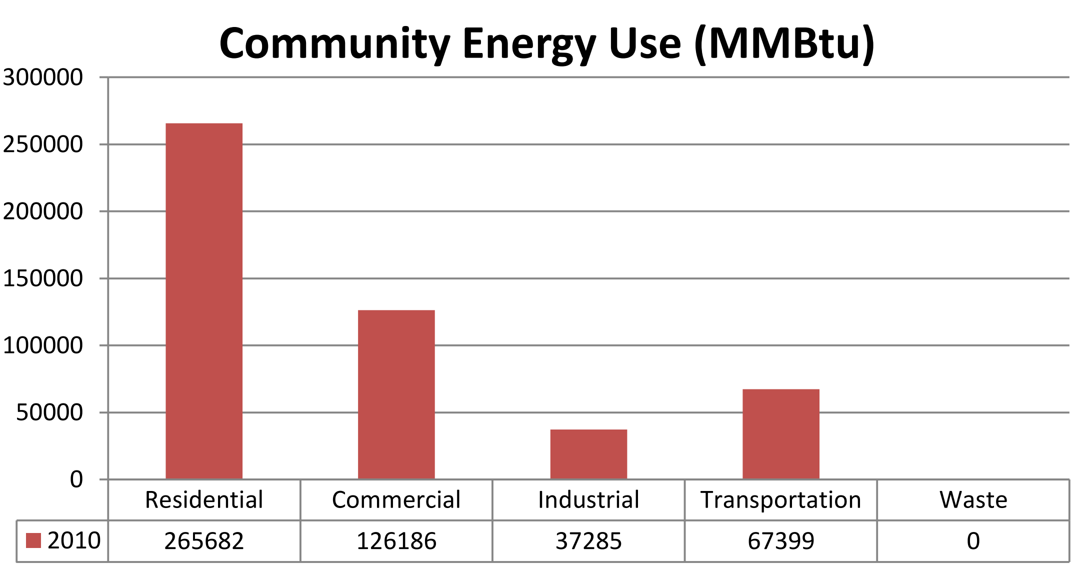


Figure 10 Community Energy Use

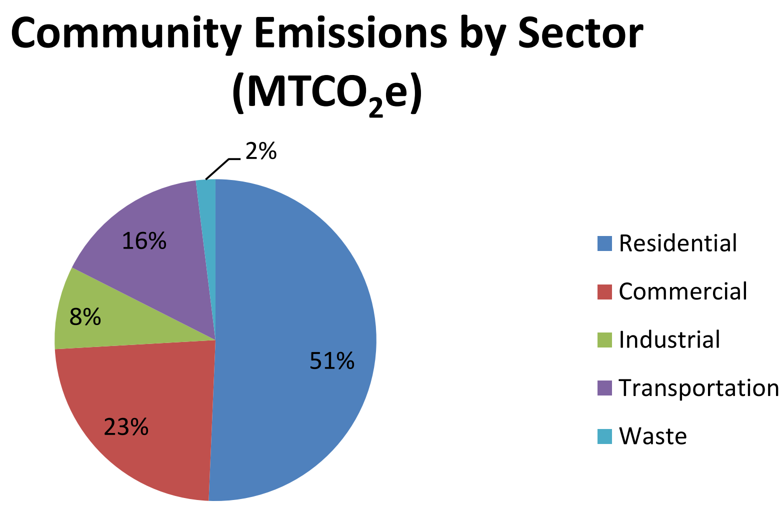


Figure 11 Community Emissions by Sector

Emissions by Source

Natural gas consumption is the largest source of emissions for the Village community, followed by electricity and gasoline use. Combined with diesel and ethanol consumption, the various components of waste materials make up the remaining emission sources for the community sector (see Figure 12 Community Emissions by Source).

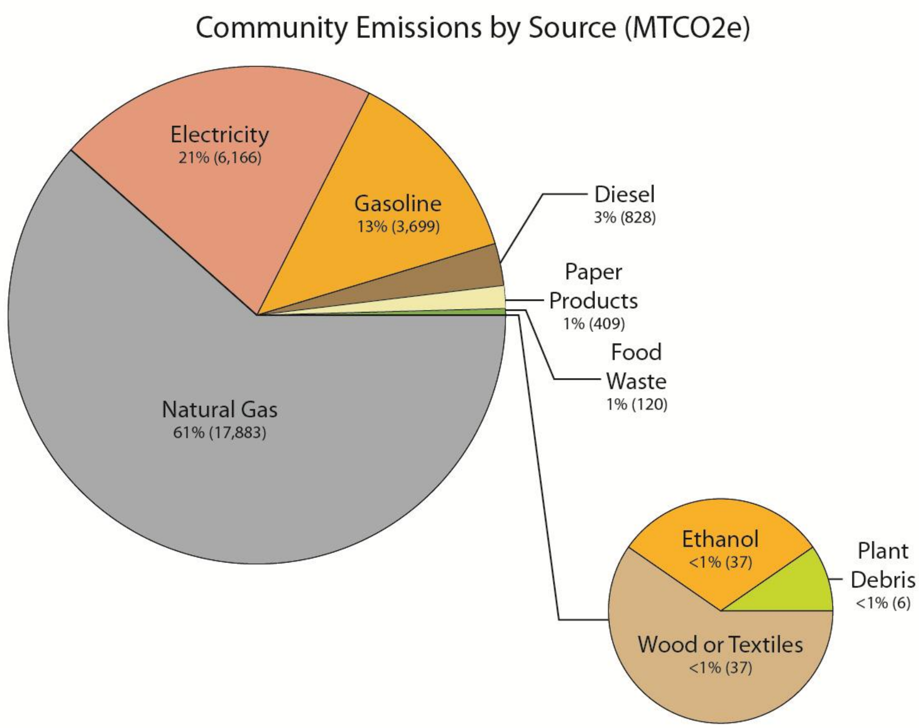


Figure 12 Community Emissions by Source

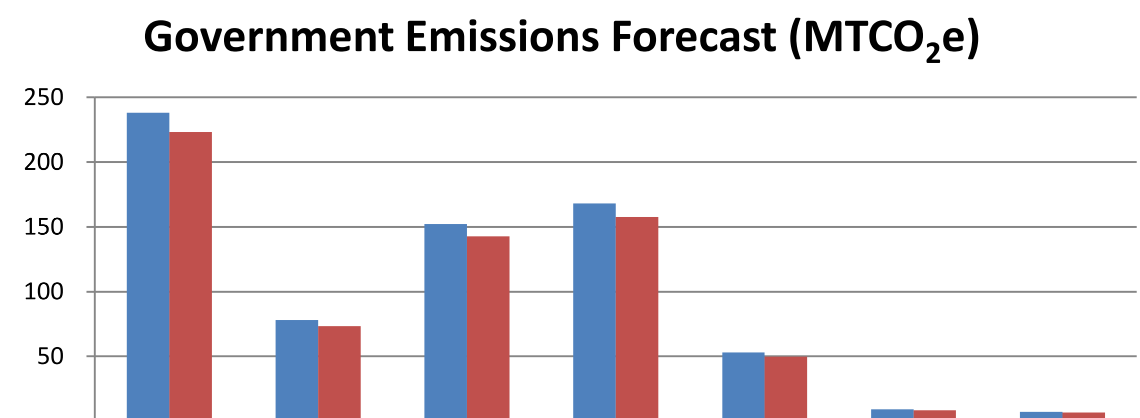
Emission Forecasts

Government Operations Forecast

The Village government operations forecast was generated using a single rate compounding method ($FV=PV(1+i)^n$). This approach utilizes baseline data and a growth factor (in this case population), applied to the number of years between the baseline and the forecast year. The Village forecast followed the ten-year Census timeframe and population estimates.

Given the declining Village population (2,616 in 2000 down to 2,450 in 2010), the government forecast shows a slight decline from 2010 emissions levels in 2020 (see Figure 13 Government Emissions Forecast and Figure 14 Government Emissions Trend). The sectors with the highest emissions in 2010 remain the areas with the highest emissions in 2020: wastewater treatment, vehicle fleet and buildings and facilities; however, all sectors decline by 6% as a reflection of the declining population and the assumed decrease in demand for municipal services.

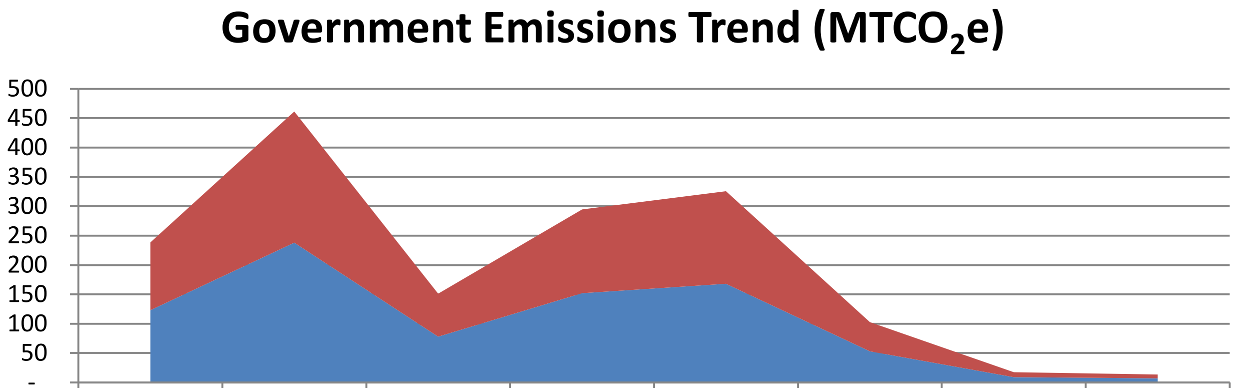
It is important to consider the impact of an increase in population or capital planning (as well as an increase in energy conservation measures) on the forecast projection. This number is an estimate, and requires updates based on periodic re-evaluations of the GHG inventory baseline and other government planning efforts.



	Vehicle Fleet	Water Delivery	Wastewater facilities	Wastewater Treatment Processes	Streetlights & Traffic Signals	Waste	Employee Commute
2010	238	78	152	168	53	9	7
2020	223	73	143	158	50	8	7

Figure 13 Government Emissions Forecast

**These sources remain the same in each forecast year, under the assumptions that 1) employee commuting distance does not change; and 2) that government operations waste totals do not increase*



	Buildings and Facilities	Vehicle Fleet	Water Delivery	Wastewater facilities	Wastewater Treatment Processes	Streetlights & Traffic Signals	Waste	Employee Commute
2020	115	223	73	143	158	50	8	7
2010	123	238	78	152	168	53	9	7

Figure 14 Government Emissions Trend

Community Forecast

The Village community forecast involves the use of several different sources to create a multi-rate projection. The use of several rates leads to a more dynamic forecast, that, when paired with municipal data on development patterns and population trends, can enable a local government to create more effective targets and reduction strategies.

The rates used in the Village analysis include those from the 2009 New York State Energy Plan, the Skaneateles Transfer Station 2008-2010 Annual Reports, the Energy Information Agency's 2011 Annual Energy Outlook, and transportation estimates generated from New York State Department of Transportation traffic count models (see Appendix 3 for more detail).

Growth Rates (2009-2028)	Natural Gas	Distillate	Kerosene	LPG*	Motor Gasoline	Coal
Residential	0.10%	-1.84%	0.89%	-0.09%	-0.13%	0.00%
Commercial	0.65%	-0.42%	-0.01%	0.23%	-0.13%	0.00%
Industrial	-0.70%	0.00%		-0.04%	-0.13%	-0.97%
Transportation		1.46%			-0.13%	

Table 5 NYS Energy Plan Fuel Demand Rates

Waste Disposal	Waste Collected (tons)
2008	2992.32
2009	3015.53
2010	3182.39

Table 6 Village Transfer Station Annual Waste Collection

Regional Consumption (quadrillion Btu)	Residential	Commercial	Industrial
2012	0.44	0.57	0.26
2020	0.43	0.62	0.27

Table 7 EIA Annual Energy Outlook (2011) Electricity Consumption Projections

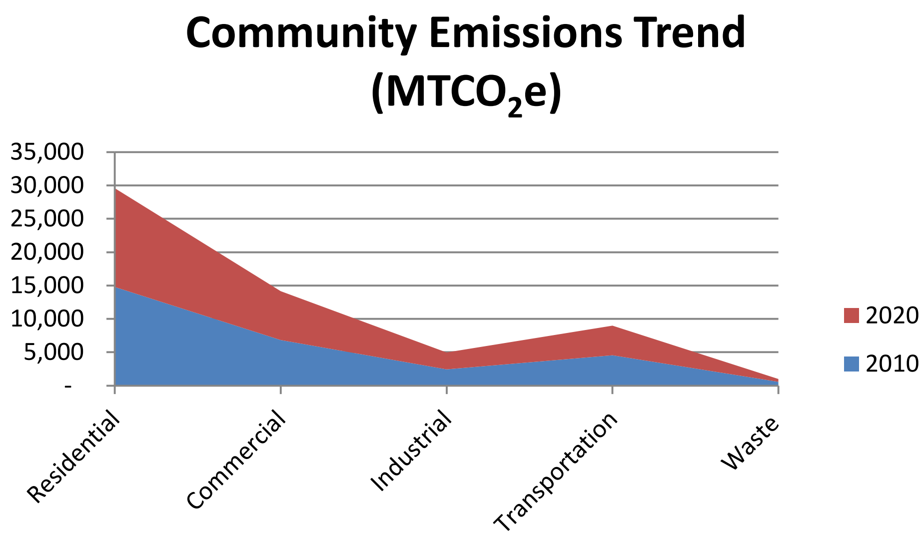
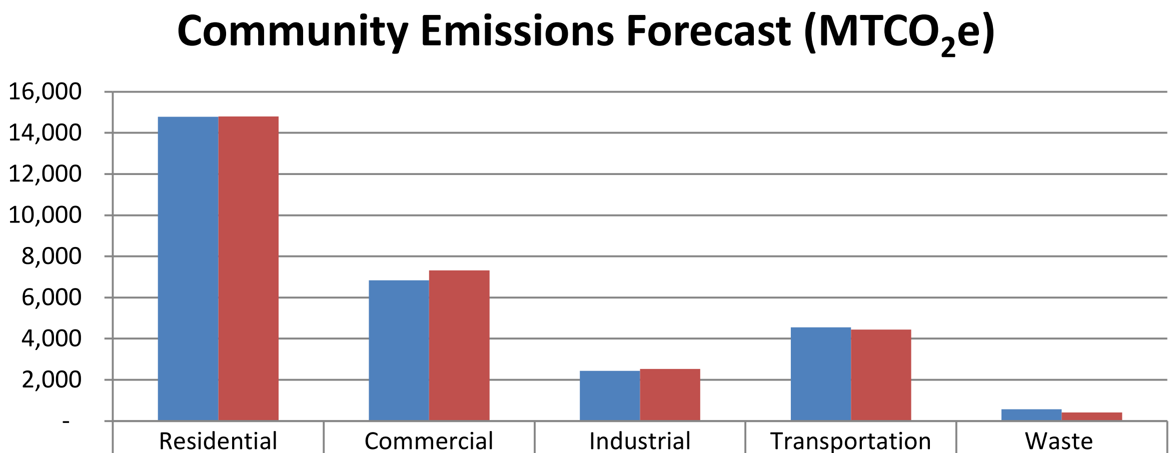


Figure 15 Community Emissions Trend

From 2010 to 2020, the largest community emissions source remains the residential energy use sector. While emissions projections are subject to change due to a number of factors (e.g., targeted reduction measures, fuel prices), it is likely that the largest sources of emissions will remain so in the near future, all else constant.



	Residential	Commercial	Industrial	Transportation	Waste
2010	14,780	6,833	2,436	4,546	572
2020	14,804	7,321	2,536	4,441	422

Figure 16 Community Emissions Forecast

Conclusion

Emission totals for the Village of Skaneateles in 2010 were 828 $MTCO_2e$ for government operations and 29,167 $MTCO_2e$ for community sectors. Under a business as usual scenario, emissions are not expected to increase substantially; however, ongoing monitoring and updates to forecast projections are needed as development patterns or energy conservation strategies change over the next eight years. Additionally, this inventory should be re-conducted and updated periodically to ensure accurate planning and to measure progress made toward reduction goals.

Appendices

Appendix 1. CACP Output[11]

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Government Greenhouse Gas Emissions in 2010
Report by Source

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Buildings and Facilities Sector							
Electricity	65	1	2	65	0	978	0
Natural Gas	58	0	5	58	0	1,090	0
Subtotal	122	1	8	123	0	2,067	0
Streetlights & Traffic Signals Sector							
Electricity	52	1	2	53	0	790	0
Subtotal	52	1	2	53	0	790	0
Water Delivery Facilities Sector							
Electricity	77	1	2	78	0	1,169	0
Subtotal	77	1	2	78	0	1,169	0
Wastewater Facilities Sector							
Electricity	151	2	5	152	0	2,279	0
Methane	0	0	7,850	165	0	0	0
Nitrous Oxide	0	10	0	3	0	0	0
Subtotal	151	12	7,855	320	0	2,279	0
Vehicle Fleet Sector							
Diesel	82	0	0	82	0	1,105	0
Ethanol (E100)	0	2	1	1	9	133	0
Gasoline	153	10	9	156	0	2,182	0
Subtotal	235	12	11	239	9	3,419	0
Employee Commute Sector							
Gasoline	7	0	0	7	0	94	0
Subtotal	7	0	0	7	0	94	0
Scope 3 Waste Sector							
Food Waste	0	0	94	2	0		0
Paper Products	0	0	319	7	0		0
Plant Debris	0	0	4	0	0		0
Wood or Textiles	0	0	29	1	0		0
Subtotal	0	0	446	9	0		0
Total	644	27	8,323	828	9	9,819	0

This report has been generated for Skaneateles, New York using ICLEI's Clean Air and Climate Protection 2009 Software.

[11] CACP employs independent rounding, so totals shown in this output may differ slightly from totals shown elsewhere in this report.

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Skaneateles

Government Greenhouse Gas Emissions in 2010

Summary Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Buildings and Facilities	122	1	8	123	0	2,067	0
Streetlights & Traffic Signals	52	1	2	53	0	790	0
Water Delivery Facilities	77	1	2	78	0	1,169	0
Wastewater Facilities	151	12	7,855	320	0	2,279	0
Vehicle Fleet	235	12	11	239	9	3,419	0
Employee Commute	7	0	0	7	0	94	0
Scope 3 Waste	0	0	446	9	0		0
Total	644	27	8,323	828	9	9,819	0

This report has been generated for Skaneateles, New York using ICLEI's Clean Air and Climate Protection 2009 Software.

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Skaneateles

Government Greenhouse Gas Emissions in 2010

Scope Summary Report

Equivalent CO_2

	Scope 1 (tonnes)	Scope 2 (tonnes)	Scope 3 (tonnes)	Total (tonnes)
Buildings and Facilities	58	65	0	123
Streetlights & Traffic Signals	0	53	0	53
Water Delivery Facilities	0	78	0	78
Wastewater Facilities	168	152	0	320
Vehicle Fleet	239	0	0	239
Employee Commute	0	0	7	7
Scope 3 Waste	0	0	9	9
Total	465	347	16	828

This report has been generated for Skaneateles, New York using ICLEI's Clean Air and Climate Protection 2009 Software.

Community Greenhouse Gas Emissions in 2010
Report by Source

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)
Residential Sector						
Electricity	3,260	44	104	3,276	0	49,261
Natural Gas	11,475	22	1,082	11,504	0	216,422
Subtotal	14,734	66	1,186	14,780	0	265,682
Commercial Sector						
Electricity	622	8	20	625	0	9,403
Natural Gas	6,192	12	584	6,208	0	116,784
Subtotal	6,814	20	604	6,833	0	126,186
Industrial Sector						
Electricity	2,254	31	72	2,265	0	34,056
Natural Gas	171	0	3	171	0	3,229
Subtotal	2,425	31	75	2,436	0	37,285
Transportation Sector						
Diesel	827	2	2	828	0	11,191
Ethanol (E100)	0	57	47	19	320	4,678
Gasoline	3,620	242	206	3,699	0	51,530
Subtotal	4,447	302	255	4,546	320	67,399
Waste Sector						
Food Waste	0	0	5,711	120	0	
Paper Products	0	0	19,487	409	0	
Plant Debris	0	0	266	6	0	
Wood or Textiles	0	0	1,760	37	0	
Subtotal	0	0	27,223	572	0	
Total	28,421	419	29,344	29,167	320	496,552

This report has been generated for Skaneateles, New York using ICLEI's Clean Air and Climate Protection 2009 Software.

12/4/2012 Page 1

Skaneateles

Community Greenhouse Gas Emissions
Time Series Report

Scope 1 + Scope 2

Year	2010	2020
Residential		
eCO2 (tonnes)	14,779.7	14,803.6
Energy (MMBtu)	265,682.1	266,474.8
Commercial		
eCO2 (tonnes)	6,833.0	7,320.5
Energy (MMBtu)	126,186.1	135,085.8
Industrial		
eCO2 (tonnes)	2,436.0	2,535.5
Energy (MMBtu)	37,285.3	38,736.6
Transportation		
eCO2 (tonnes)	4,546.2	4,441.3
Energy (MMBtu)	67,398.8	65,826.5
Waste		
eCO2 (tonnes)	571.7	422.2
Total		
eCO2 (tonnes)	29,166.5	29,523.0
Energy (MMBtu)	496,552.3	506,123.8
Cost ($)	0.0	0.0

This report has been generated for Skaneateles, New York using ICLEI's Clean Air and Climate Protection 2009 Software.

Appendix 2. Wastewater Treatment Process Emissions Method

The EPA's State Inventory Tool wastewater module User's Guide states that there are 12 steps to estimating emissions using the Tool:

> *(1) Select industrial wastewater sources; (2) select a state; (3) select emission factors and other variables used throughout the module; (4) complete municipal wastewater worksheet; (5) review direct N2O emissions from municipal wastewater treatment worksheet; (6) complete municipal wastewater N2O emissions worksheet; (7) complete industrial wastewater CH4 - fruits and vegetables worksheet; (8) complete industrial wastewater CH4 – red meat worksheet; (9) complete industrial wastewater CH4 – poultry worksheet; (10) complete industrial wastewater CH4 – pulp and paper worksheet; (11) review summary information; and (12) export data. The Wastewater module will automatically calculate emissions after you make choices on the control worksheet and enter the required data on the individual sector worksheets. The tool provides default data for most sectors.*[12]

The default New York State metrics built into the tool were selected for the Village wastewater treatment plant, and the 2010 Village population was entered into the methane and nitrous oxide tabs to allocate state-level data down to the Village scale.

The resulting SIT calculation shows methane (CH4) emissions below:

CH4 Emissions																						
State Population		Per capita BOD5		Days per year		Unit Conversion		Emissions Factor		WW BOD5 anaerobically digested		Emissions		CH4 GWP		Unit Conversion		C/CO2		Emissions		Emissions
		(kg/day)		(days)		(metric tons/kg)		(Gg CH4/Gg BOD5)		(percent)		(metric tons CH4)		(CO2 Eq.)		(MMT/MT)				(MMTCE)		(MMTCO2E)
2450	x	0.09	x	365	x	0.001	x	0.6	x	0.1625	=	7.84704375	x	21	x	0.000001	x	0.272727	=	4.49E-05	=	0.000165

Table 8 Wastewater Treatment Emissions

[12] EPA. 2012. State Inventory Tool. Wastewater Module User's Guide. Pg. 7

Appendix 3. VMT Estimation Method

The Syracuse Metropolitan Transportation Council, which tracks transportation data for Onondaga County, is not able to project down to the Village level to determine vehicle miles traveled for Skaneateles. Given that the SMTC's model is informed by state-level data, such as traffic counts, the Village VMT estimate was derived using an existing New York State Department of Transportation (NYSDOT) tool.

The NYSDOT Traffic Data Viewer provided data on the Annual Average Daily Traffic (AADT) going through the Village.[13] 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). These estimates were entered into CACP where the program then uses default fuel allocations (7% diesel and 93% gasoline) and vehicle class data to generate emissions estimates. These VMT estimates are for main roads only, due to the fact that the NYSDOT tracks traffic data only for main arteries. Therefore, the VMT total does not represent all of the roads in the Village and must be considered as an estimate that requires further refinement.

VMT projection for Village of Skaneateles (2012)			
Route/Road	**DVMT**	**Average Annual Daily Traffic Count**	**Road Length (in Village boundary)**
US20: Rt 41A to Rt 321	5661.889	11590	0.488515
US20: Cayuga/Onondaga County line to Rt 41A	1472.526	8734	0.168597
NY41A: Rt 359 Mandana to Rt 20 Skaneateles	2024.980	3414	0.59314
US20: Rt 321 Skaneateles to Old Route 175	3112.090	11967	0.260056
NY321: Rt 20 to Halfway Road	3286.506	5104	0.643908
Jordan St.: Genesee St to Village line	2212.349	3592	0.61591
US20: Old Rt 175 to Rt 41	3640.452	10455	0.348202
NY41: Rt 174 Borodino to Rt 20 Skaneateles end Rt 41	1022.251	1988	0.514211
US20: Rt 41 to Rt 175 Lee Mulroy Road	949.405	6982	0.135979
Estimated Daily vehicle miles traveled on roads reporting AADT*:	**23,382.45**		
Estimated Annual VMT on roads reporting AADT:	**8,534,593.91**		
**The traffic count website provided counts for main roads only in the village; therefore, this total does not include village roads without AADT figures and is an estimate*			
Source for Skaneateles AADT & road lengths: http://gis.dot.ny.gov/tdv/			

Table 9 Village VMT Estimate

13 NYS DOT. 2012. Traffic Data Viewer. http://gis.dot.ny.gov/tdv/

Appendix 4. Student Team Recommendations

- Efforts should be made to reduce consumption from the vehicles; for example, the village has plans to install a solar power charging station for electric vehicles. GHG emissions reductions can be made through the installation of this charging station by decreasing the amount of fossil fuel burning vehicles in the village, allowing municipal and commercial operations as well as village residents to use vehicles powered by solar energy.

- In the future the village could purchase electric powered vehicles or provide incentives for village businesses to purchase EVs as a means to further reduce vehicle emission. However, from the perspective of the life cycle analysis, it can only contribute to direct emission reductions and will potentially increase indirect emissions.

- Another suggestion that will allow the village to collect all available electricity would be using pico-hydro or even micro-hydro turbines from the water pumping stations and waste water treatment facilities. These small-scale water turbines produce a minute amount of electricity per unit, but if many channels of the water delivery and sewer system were utilized, the amount of power generated would make a significant difference. Since the pumping stations and sewer system rely upon gravity on the back-end, it would simply harvest the energy created by the flow of water through the sewer pipes. The amount of electricity produced by a pico-hydro and micro-hydro turbines is dependent on the amount of head or drop in elevation and the volume of water flowing (Alternative Energy, 2006). There is a possibility that the head and volume of water will not be great enough to produce electricity in a majority of the sewer system, so the points of insulation need to be carefully considered. One large disadvantage associated with installing turbines in the sewer system is the risk of blockage, the sewers may require more maintenance, which in turn could be costly and a risk to human health.

- To help fight the problem of high emission from building heating, we recommend that older buildings under the village municipal control be updated to reduce the amount of heat loss. Old single pane and drafty windows can be replaced with windows that have better heat retention and new insulation can be added to the buildings to reduce heat loss during future winters. The old HVAC systems can be replaced with newer and more energy efficient systems to help promote the commercial sector reduce the amount of emission from their heating incentives. In addition, regulations can be created for installing more energy efficient windows, heating systems, and insulation.

- The village can reduce GHG emissions by focusing on lighting. Skaneateles village is lit by 254 cobra head streetlamps and 116 ornamental streetlamps high-pressure sodium bulbs, which require a significant amount of electricity. By installing LED light bulbs in municipally operated buildings electrical consumption can be drastically reduced. The City of Syracuse upgraded streetlights to decrease annual GHG emissions and yielded a reduction of 2,269 tons of CO_2e (DEC, 2012). Although the Village of Skaneateles is smaller in size than the City of Syracuse, this installation of LED lights can greatly reduce village emissions.

Appendix 5. Regional Climate Data

The comparison of CDDs and HDDs over time often correlates with energy use and emissions over the same period. While Village carbon footprint data is not available for 2000, illustrating the trend in these indicators is useful for planning and comparison purposes. Figure 17 shows that CDDs have increased overall in 2010 over 2000 levels, by 86%.[14] This indicates that temperatures have risen over the ten-year time frame, and that there was likely a need for increased cooling. Furthermore, the number of heating degree days declined (Figure 18), which also indicates a temperature shift and a likely decreased need for heating. This data is available from NOAA on an annual basis, so it is possible to consider HDD and CDD totals with GHG data moving forward.

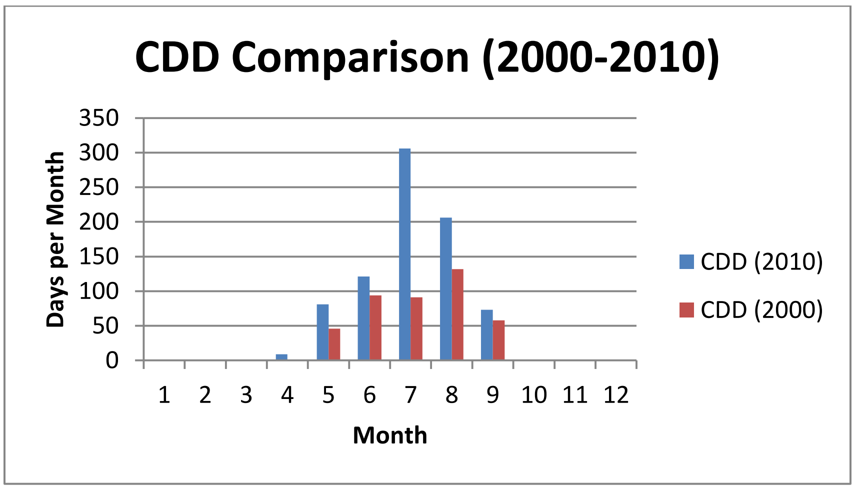


Figure 17 CDD Comparison (2000-2010)

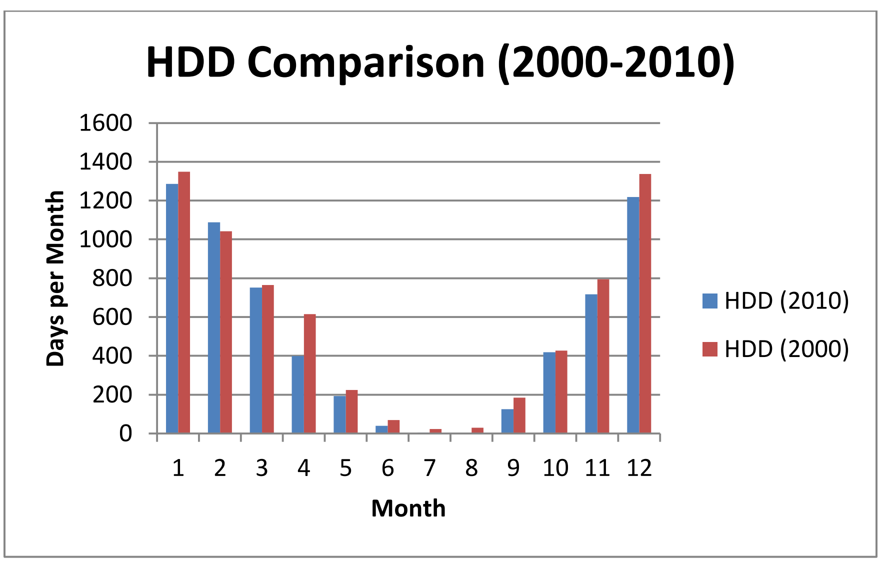


Figure 18 HDD Comparison (2000-2010)

[14] NOAA. 2012. Climate Data Center. http://www.ncdc.noaa.gov/cdo-web/ (Data for Syracuse Hancock Airport for 2010; generated an Annual Summary, including computed data, precipitation and temperature).

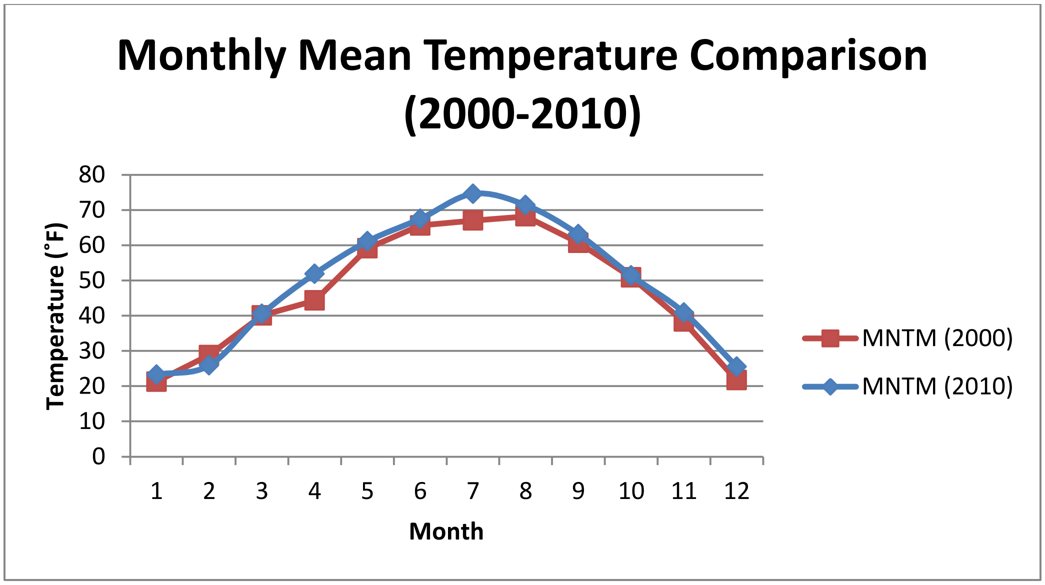
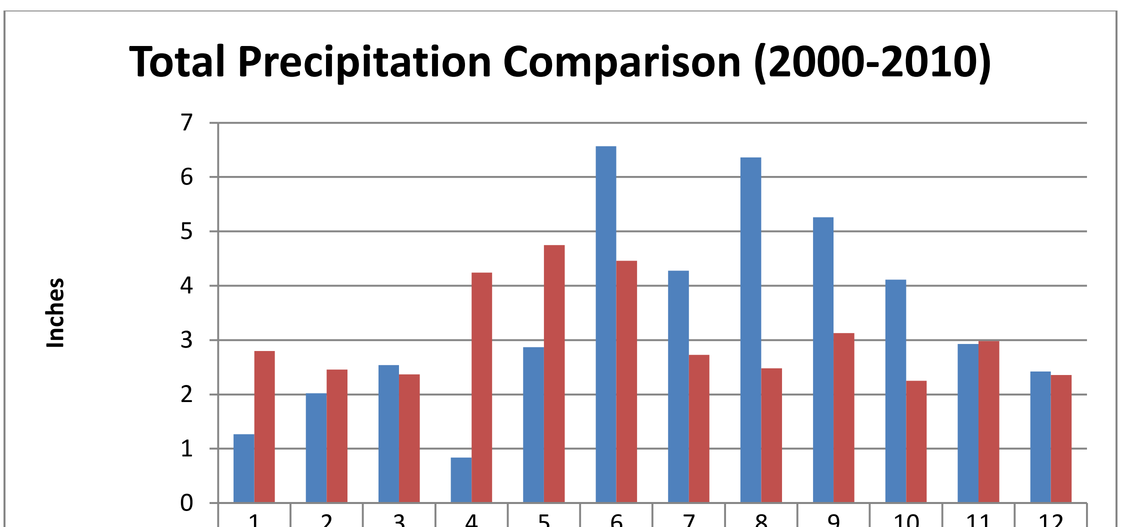


Figure 19 Monthly Mean Temperature Comparison (2000-2010)

The mean monthly temperature data illustrates a slight shift in temperature over the 10-year timeframe, and while this data is not village-specific, it does reflect an overall pattern of warming in the area, which will affect energy use and associated emissions. Precipitation levels from 2000 to 2010 show a 12% increase in monthly totals, which is evident particularly in the summer months (see Figure 19 and 20).



	1	2	3	4	5	6	7	8	9	10	11	12
TPCP (2010)	1.27	2.02	2.54	0.84	2.87	6.57	4.28	6.36	5.26	4.11	2.93	2.42
TPCP (2000)	2.8	2.46	2.37	4.24	4.75	4.46	2.73	2.48	3.13	2.25	2.98	2.36

Figure 20 Total Precipitation Comparison (2000-2010)