Completed in partnership with the Central New York Regional Planning & Development Board and the SUNY College of Environmental Science & Forestry

Greenhouse Gas Emissions Inventory Village of Fayetteville, NY

Baseline Year 2009

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SUNY- ESF Student Team:
Ielizaveta Iegorova
Darya Karpenko
Katie Racette
Beverly Reynolds

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Abstract

Greenhouse gas inventories are important tools for quantifying the amount of greenhouse gas emissions associated with a municipality or entity. Greenhouse gases are destructive forces to the ozone layer that can contribute to global warming, so it is helpful to know the amount of greenhouse gas being produced as a baseline for comparison with future improvements. The objectives of this inventory are to quantify the greenhouse emissions associated with the operation of the Village of Fayetteville and to project future emission outputs. The village provided energy use data to a SUNY-ESF student group, which input this data into an ICLEI (International Council for Local Environmental Initiatives) workbook using ICLEI Local Government Operations Protocol methods. The students then entered this data into CACP (Clean Air and Climate Protection) software which calculated the greenhouse gas emissions for the village. Expected results from this inventory are a 2009[1] emissions baseline. A greenhouse gas projection for the year 2020 will also be completed using the CACP software to allow the village to quantify projected emissions and implement specific projects.

I. Introduction

As climate change becomes more and more of a relevant issue in day to day life, it is important for action to be taken, not only at a personal level, but at a governmental level as well. The Village of Fayetteville is one of the local governments that are taking strides to combat climate change. By analyzing the impacts of their own actions on the environment through a greenhouse gas inventory, Fayetteville is taking the first step in becoming a more sustainable and environmentally friendly place to live.

The Village of Fayetteville is a small village located southeast of Syracuse, New York, in Onondaga County. According to the US Census Bureau, the population of the village in 2012 was 4,373 and it has a total area of 1.7 square miles. The town is located along Limestone Creek and is bordered by Green Lakes State Park. The old Erie Canal which used to provide business for the village is now a popular biking and walking trail, which now provides an important source of recreation and transportation for residents[1]. The Village of Fayetteville has made several green strides in the past several years, including the installation of porous pavement, rain gardens, and rain barrels, and is recognized as a Tree City USA by the National Arbor Day Foundation[2].

A greenhouse gas inventory involves measuring the emissions of government buildings, facilities, and operations in order to determine the village's overall output of climate change-

[1] 2010 data was used for the Community analysis since only partial data was available from National Grid for 2009.

causing emissions. The inventory is the first milestone in the International Council for Local Environmental Initiatives' Five Milestones for Climate Change Mitigation[3].

In this study, we have analyzed the emissions from the year 2009 to explore the results of the town's attempts at becoming more sustainable. Our study included emissions generated by both government and community. The government operations inventory included the emissions generated from the three municipal buildings, the village vehicle fleet, village lighting, wastewater facilities, and employee commuting. The community inventory included residential and commercial energy use, transportation of residents, and waste treatment.

A. Objectives

The main objectives of this project were as follows:

1. Evaluation of the level of greenhouse gas emissions of the village of Fayetteville for 2009.
2. Development of a forecast of the level of greenhouse gas emissions of the village of Fayetteville for 2020.
3. Identification of the areas for greenhouse gas emissions reduction for the village of Fayetteville.

B. Scopes

The analysis of Fayetteville includes three scopes of emissions.

Scope 1: Direct emissions from sources owned and controlled by Fayetteville.

Scope 2: Indirect emissions from sources that are not owned or operated by Fayetteville, but whose processes are directly required by the village.

Scope 3: Emission sources not owned nor operated by Fayetteville but either directly financed or encouraged by Fayetteville[4].

II. Methods

The first step in the greenhouse gas (GHG) inventory process was to learn about ICLEI, the International Council for Local Environmental Initiatives, which puts forth protocols and methods for completing greenhouse gas inventories. ICLEI also provides the Clean Air and Climate Protection (CACP) software which is used to calculate the greenhouse gas emissions associated with the processes and procedures attributed to a certain municipality. In this case, the municipality for which the greenhouse gas inventory was completed was the Village of Fayetteville, NY.

After reading about ICLEI and getting an idea of the procedures of a GHG assessment, the next step was to meet with contacts from the village and learn about types of buildings and processes they controlled that would have associated emissions. We learned what buildings they own, what types of vehicle uses they have, the types of government operations they control, and who owns lighting fixtures. This information allowed us to develop the boundaries for our assessment, and figure out which emissions sources were under which scope (for the government sector) according to the scope information provided by ICLEI. We determined that the natural gas usage in the buildings and the vehicle fleet fuel usage were under scope one because they were directly burned on site; the electricity usage in the buildings, the street lighting, and the wastewater facility (the sewage pumps) were under scope two because they used purchased energy that was burned elsewhere (at a power plant); and the employee commuting fuel usage was under scope three because the fuel was not directly purchased by the village but was required to get the village employees to work.

For scope one analysis, we received natural gas usage in the form of bills and vehicle fleet data that showed the amount of fuel that each government vehicle used throughout the year. We organized this data in the ICLEI master workbook by vehicle type, and then input this data under scope one in CACP to elicit the emissions produced from these sources.

For scope two data, we received electricity bills with the street lighting and building usage and Signal Hill sewage pump electricity usage. This data was also organized in the ICLEI master workbook by facility sector, using kWh of electricity consumed. Some sections of electricity data for certain facilities were missed, so we used proxy data from 2010 electricity bills and assumed that these values were the same for 2009. Then we input this data into CACP to determine the resulting GHG emissions.

For scope three, we received a list of the general vehicle types driven by each employee and the distance that they drive to work each day. We doubled the distance (assuming it was one-way) to get the round-trip distance. We sorted the vehicles into the two applicable ICLEI vehicle categories (light truck/SUV and car), and then chose an average vehicle representative of the two vehicle types and looked up the fuel efficiency for these vehicles. It turned out that both representative vehicles (for car and light truck) had an MPG rating of 19MPG, so this was the fuel efficiency that we assumed all of the employee vehicles to have. We multiplied the MPG times the round-trip miles driven to determine the daily fuel usage, then we picked a standard fuel cost so that we could determine the cost of the fuel used. We assumed that all vehicles used gasoline and that the cost of gasoline was a constant $3.60/gallon for the years 2009.[5] Then we put the round-trip mileage and the fuel costs into CACP to determine the emissions from employee commutes.

Next we looked at the emissions associated with the community of Fayetteville. The sectors for the community of Fayetteville were residential energy use, commercial energy use, industrial energy use, transportation, waste, wastewater treatment, and water conveyance, treatment, and distribution. We calculated water conveyance, treatment, and distribution using calculation WW.14 in Appendix F of the ICLEI US Community Protocol using data provided by OCWA (Onondaga County Water Authority). Wastewater data was only available from the Meadowbrook wastewater treatment plant (the treatment center that processes the wastewater from Fayetteville) for the entire area that the Meadowbrook plant served, so we used calculation WW.8 from Appendix F (wastewater and water emissions activities and sources), which uses the proportion of the population of Fayetteville to the population of the entire area served by the Meadowbrook facility to figure out the correct amount of N_2O emissions to attribute to the waste from Fayetteville processed by the facility. We also used calculation WW.12alt in Appendix F to calculate the amount of fugitive N_2O emissions associated with the effluent discharge of the treatment plant. These amounts were converted into $MTCO_2e$ for the final results. For the waste sector, we used annual solid waste and recycling tonnages for 2010[2] provided by OCRRA (Onondaga County Resource Recovery Agency). There was no separation of the government waste from the community waste, so all waste was included in the community sector of the inventory. Our partner at the CNYRPDB (Central New York Regional Planning and Development Board) provided estimated data on the residential, commercial, and industrial energy usages and the community transportation based on regional studies performed by the CNYRPDB. After all community data was collected, we input this data into the community section of CACP to figure out the emissions produced by community operations.

This software also gave a projection of the emissions that would be released in 2020, based on a constant increase in population of 0.4%, which was obtained from census data. This projection could be used to show the village what their emissions would look like if nothing changed in their village and operations continued at constant levels. However, the village is making steps to reduce their emissions, which the software does not account for. One change that the village has said that they will be making is changing their two sewage pumps at Signal Hill into gravity-fed pumps, which means that the electricity currently used by these pumps will no longer be needed. In order to account for this in our projection, we subtracted the energy use associated with these

[2] 2010 data was used as a proxy for 2009

pumps from the emissions projection, to give the village a more accurate assessment of their projected emissions.

III. Results

The following section demonstrates the governmental and community emissions of Fayetteville.

A. Government Operations Inventory Results

In the inventory baseline year (2009), the Village of Fayetteville emitted approximately 672 metric tons of CO_2 equivalent. This total represents emissions from the five sectors, which are: buildings and facilities, vehicle fleet, wastewater facilities, streetlights & traffic signals, employee commute. Table 1 illustrates how each of these sectors contributed to the overall emissions.

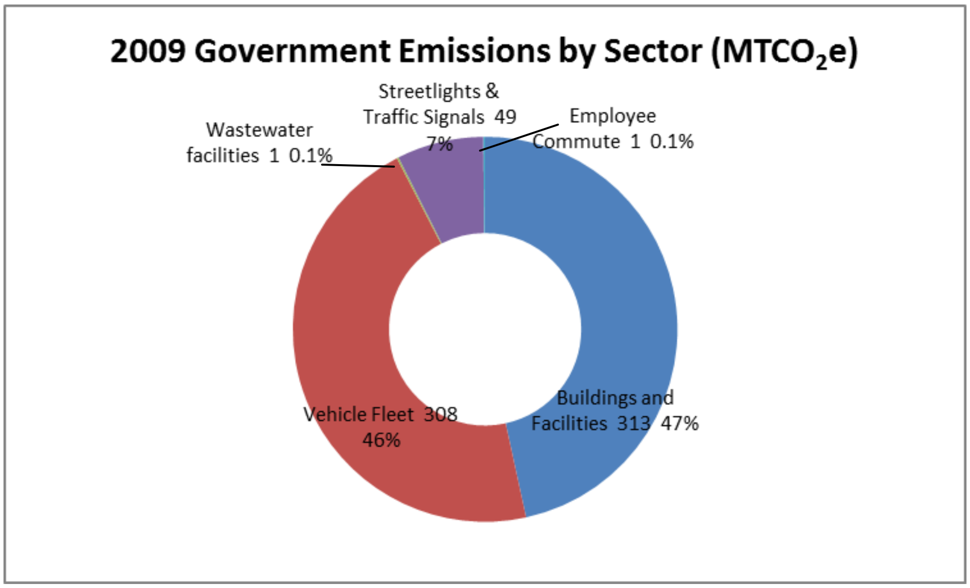

Figure 1: 2009 Government Emissions by Sector

	CO_2 equivalent (tonnes)		Energy (million Btu)	Cost ($)
Government Emissions by Sector	2009	% of total (2009)	2009	2009
Buildings and Facilities	313	46.7%	5,783	48,359
Vehicle Fleet	308	45.8%	4,156	70,822
Wastewater facilities	1	0.1%	13	1,080
Streetlights & Traffic Signals	49	7.3%	745	47,820
Employee Commute	1	0.1%	6	0
Total	672	100.0%	10,703	168,082

Table 1: Government Emissions by Sector 2009

As can be seen in Figure 1, the three buildings owned and operated by the Village of Fayetteville were responsible for 47% (2009) of overall emissions. They used 5,783 MMBtus of energy and emitted 313 metric tons of CO_2 equivalent, costing the town $48,359 annually.

The second major source responsible for 46% (2009) of overall emissions is vehicle fleet, using 4,156 MMBtus of energy, emitting 308 metric tons of CO_2 equivalent, at a total cost of $70,822.

The streetlights and traffic signals under the jurisdiction of the town in 2009 were responsible for 7.3% of overall emissions, using 745 MMBtus of energy, emitting 49 metric tons of CO_2 equivalent, at a total cost of $47,820.

Wastewater facilities and employee commute each represented only 0.1% of overall emissions.

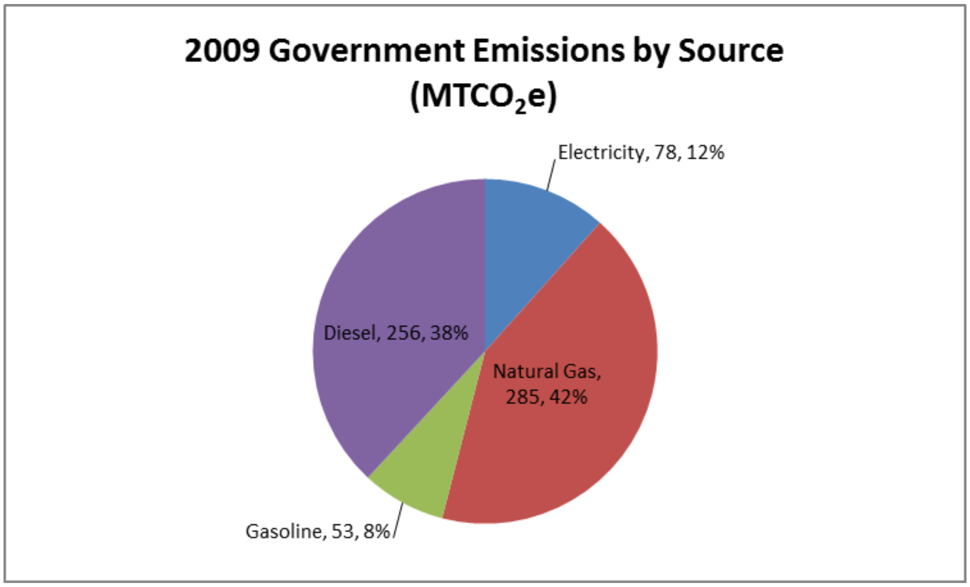

Figure 2: Government Emissions by Source (2009)

Figure 2 demonstrates the breakdown of 2009 government emissions by source. When examining the sources of emissions, it can be seen that natural gas and diesel are the primary culprits in Fayetteville. Natural gas and diesel are responsible for 42.4% and 38.1% of emissions respectively in 2009, as demonstrated in Table 2.

Table 2: Sources of Government Emissions in 2009

Government Emissions by Source	**MTCO2e**	
	2009	% of total (2009)
Electricity	78	11.6%
Natural Gas	285	42.4%
Gasoline	53	7.9%
Diesel	256	38.1%
Ethanol	0	0.0%
TOTAL	672	100.0%

The sources of emissions from the Village government can also be examined by scope. Table 3 and Table 4 show the total government emissions in terms of Scope 1 (direct emissions), Scope 2 (indirect emissions), and Scope 3 (indirect emissions).

Table 3: Government Emissions by Scope (2009)

Scope	Emissions (metric tons of CO_2e)	Sector
Scope 1 (direct emissions)	593	Vehicle Fleet and Buildings and Facilities (natural gas usage)
Scope 2 (indirect emissions)	78	Buildings and Facilities (electricity usage), Wastewater Facilities, Streetlights and Traffic Signals,
Scope 3 (indirect emissions)	1	Employee Commute

The forecast for 2020 shows a 4.26% increase of overall emissions for the governmental operations for the Village of Fayetteville, as seen below in Figure 3.

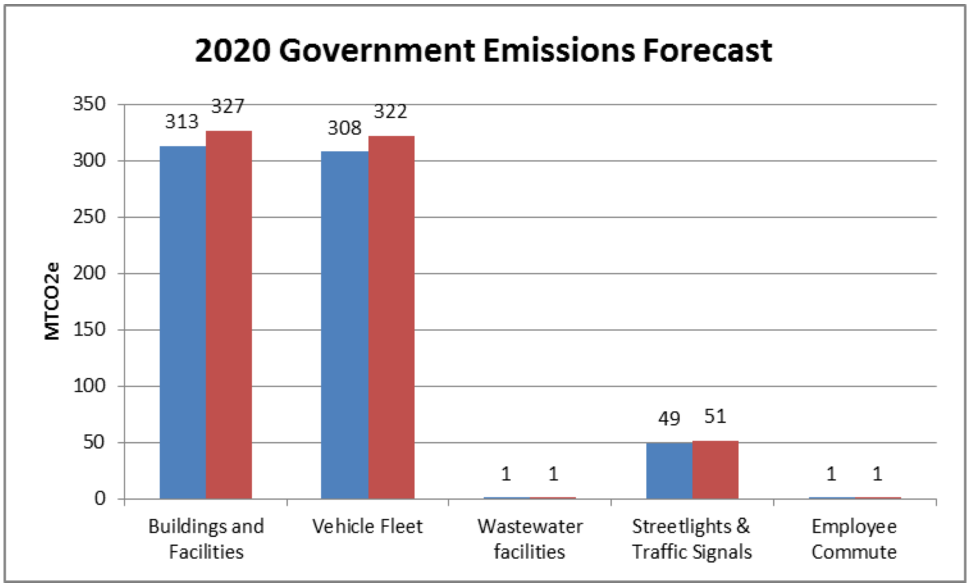

Figure 3: 2020 Forecast of Government Emissions

B. Community Inventory Results

In 2009 Fayetteville community emissions totaled 31,614 metric tons of CO_2 equivalent. Transportation and residential energy use were two primary sources of emissions and responsible for the 37% and 38% of overall emissions in 2009, respectively.

Table 4: Community Emissions by Sector

Community Emissions by Sector	CO_2 equivalent (tons)		Energy (million Btu)
	2009	2009	2009
Residential Energy Use	12,072	38%	218,592
Commercial Energy Use	6,787	21%	116,796
Industrial Energy Use	1	0.003%	23
Transportation	11,818	37%	175,169
Waste	623	2%	-
Wastewater	88	0.28%	-

Treatment			
Water Conveyance, Treatment, Distribution	225	1%	-
TOTAL	31,614	100%	510,580

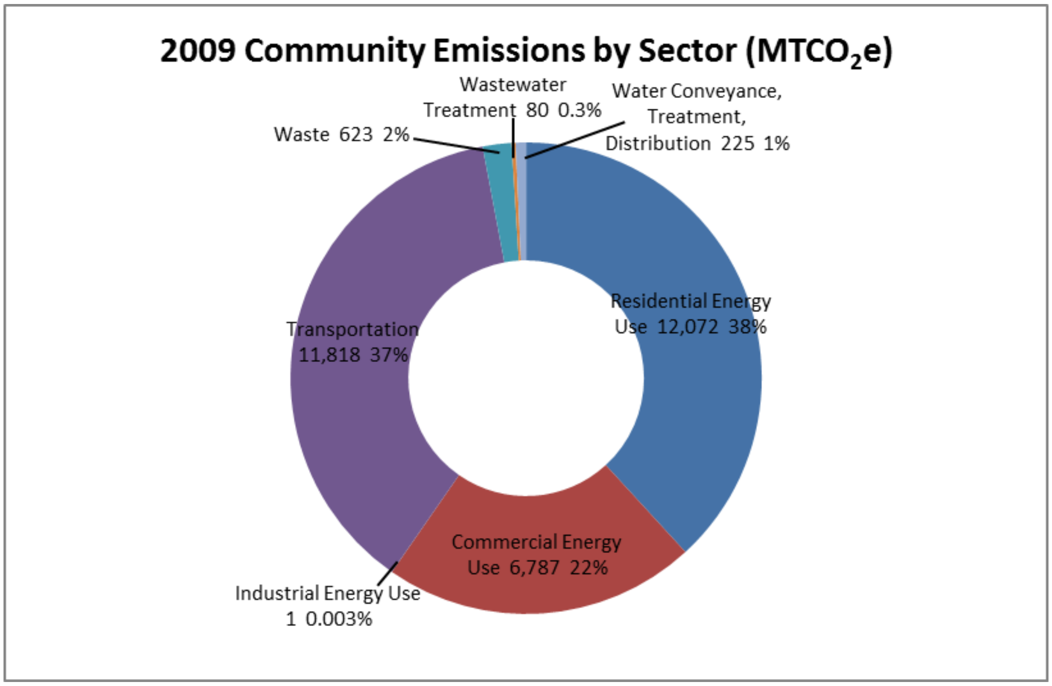

Figure 4: Community Emissions by Sector

Gasoline, natural gas and electricity are primary sources of emissions for Fayetteville community in 2009 responsible for 30%, 36% and 20% of emissions, respectively (see Table 6). The forecast for 2020 shows a 7.1% increase from 2009 levels totaling 34,031 metric tons of CO_2 equivalent (see Figure 6).

Table 5: Community Emissions by Source

Community Emissions by Source	**CO_2 equivalent (tons)**	
	2009	2009
Electricity	6,438	20.4%
Natural Gas	11,408	36.1%
Gasoline	9,620	30.4%
Diesel	2,149	6.8%
Ethanol	49	0.2%
Fuel Oil	701	2.2%
Wood	87	0.3%
LPG	221	0.7%
Commercial Coal	5	0%
Waste	623	2%
Water Conveyance,Treatment, Distribution	225	0.7%
Nitrous Oxide (WWTP)	88	0.3%
TOTAL	31,614	100%

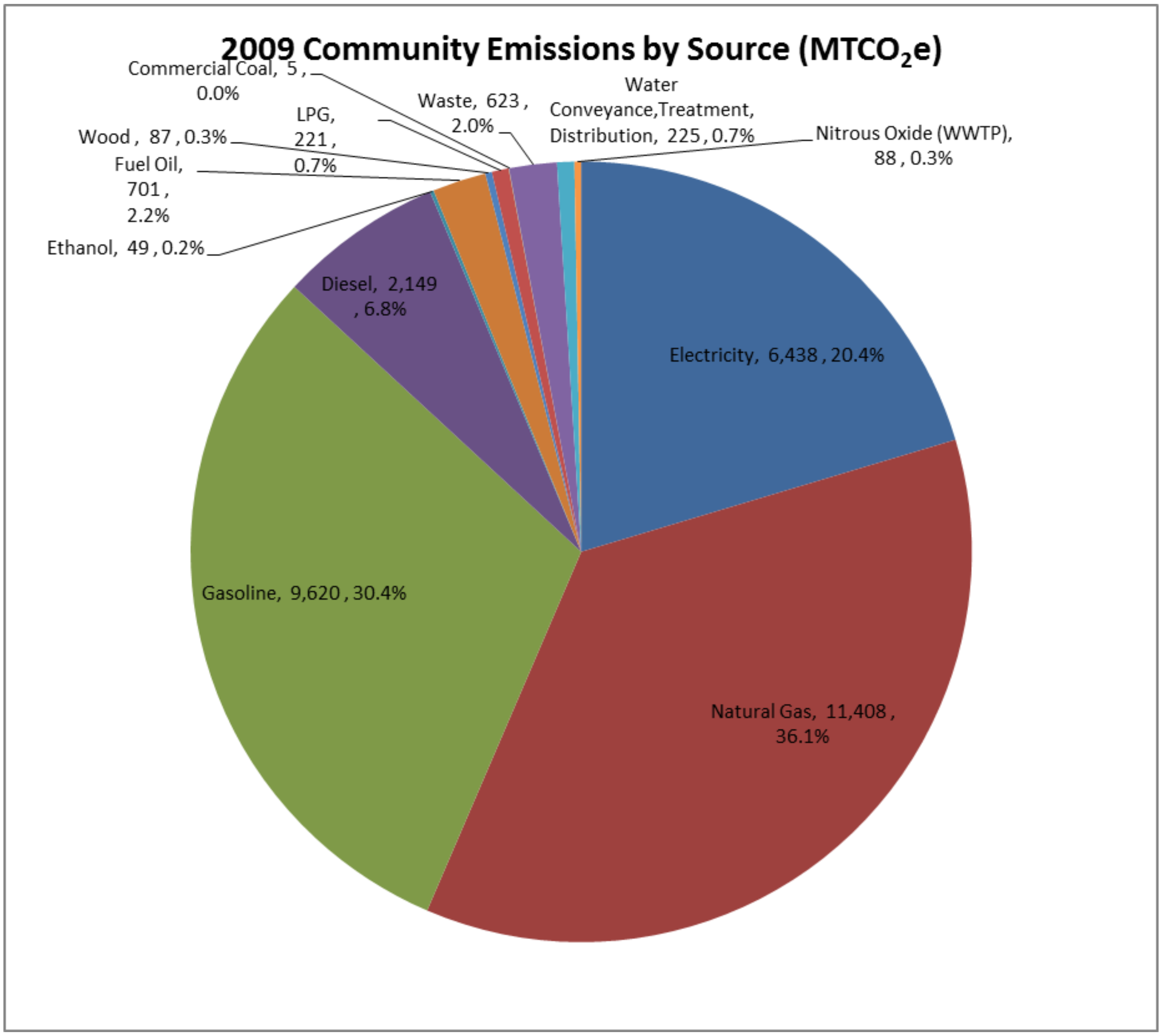

Figure 5: Community Emissions by Source (2009)

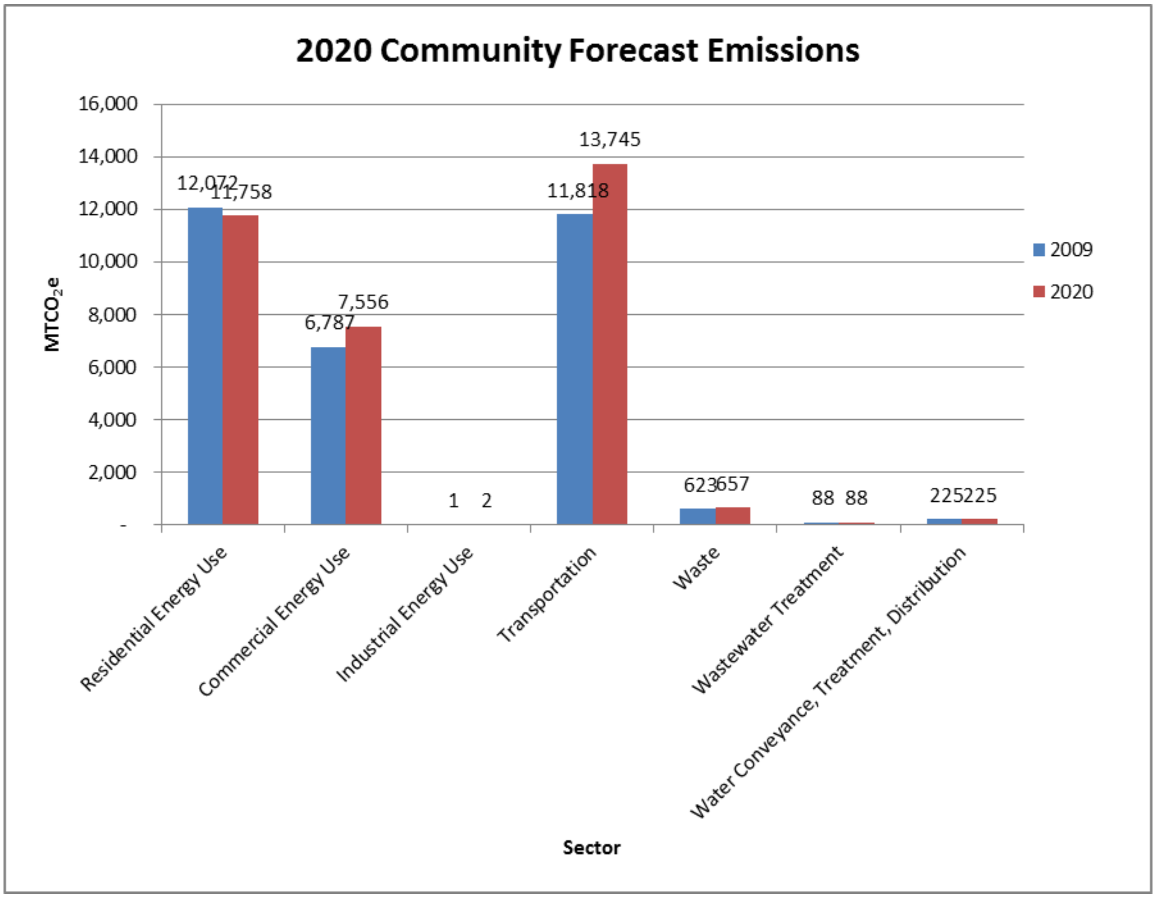

Figure 6: Community Forecast Emissions (2020)

IV. Discussion

The municipality of the village of Fayetteville is open to the need for reductions in greenhouse gas emissions, and it greatly helped us to develop a reliable greenhouse gas emissions inventory, which it will use for future actions in this field.

What is more, the village is developing future projects that help to reduce emissions. The bright example is Signal Hill Gravity Sewer Project. If the village removes the pump stations and puts in gravity-fed sewer lines, the annual cost for the electricity to power the pumps would be eliminated, as well as the emissions produced in the government operations wastewater sector[2]. The approximate annual cost reduction will equal $1,064 annually, with the reduction in carbon dioxide emissions being 1 ton annually.

There are few debatable points that appeared during development of our inventory. They are refrigerant type used in village municipality buildings and water delivery.

The refrigerants the village uses are the most environmentally friendly type of refrigerant (glycol). Nevertheless there is an uncertainty in this issue, because while glycol as a cooling agent has a low greenhouse gas potential, the energy needed to circulate it is more than that for the ordinary agents with higher greenhouse gas potential[6].

Also, the water for village is delivered from Lake Ontario[7]. The energy for the transportation for such a long distance is considerable. In the inventory we only used the total amount of water delivered to the village, which does not show the distance and energy used in water transportation.

We should admit that village leaders are taking steps in reducing the village's greenhouse gas emissions. While the procedures for conducting a greenhouse gas inventory do not include providing prescriptive measures to reduce emissions, it is worth mentioning that the village has a Tree Commission, which was formed in 1991 to care for and maintain the village's street trees. Though this program can help to reduce emissions, it cannot be used in calculations since the resulting emissions reductions would be not comparable with other communities that do not have the physical opportunity to enlarge the area occupied by trees.

V. Conclusion

In this study, we have analyzed Fayetteville's government operations emissions from 2009 to get a baseline for emissions for Fayetteville's future Climate Action Plan. Our study included GHG outputs generated by both government and community. CACP software projected that small increases in emissions would occur by 2020. This information is useful for Fayetteville to examine where it can put effort into reducing its emissions in future operations. Future inventories and assessments of Fayetteville will be required as the village continues to grow and implement new energy saving technologies.

VI. Acknowledgements

We would like to thank Carolyn Ramsden, a Planner at the Central New York Regional Planning and Development Board, for support and assistance in developing this inventory. She greatly contributed to our work.

Also we are grateful to the representatives of the municipality of the Village of Fayetteville, Dennis Duggleby, the Village Trustee, and Lorie Corsette, the Village Clerk, for the opportunity

to work with the real data of the Village and for all the support they provided for this inventory to be developed.

VII. References

[1]Rivette, Barbara S. "About the Village of Fayetteville." *Village of Fayetteville*. N.p., 14 Feb. 2005. Web.
[2]The Village of Fayetteville. The official website. Web.
[3]ICLEI. "ICLEI's Five Milestones for Climate Mitigation." *ICLEI Local Governments for Sustainability USA.* N.p., n.d. Web.
[4]Carey et al. 2011 Environmental and Energy Audit of SUNY ESF.
[5]Selam Gebrekidan, Reuters. "Average Gas Price In 2012 Was $3.60, Topping Record High: AAA." *The Huffington Post*. TheHuffingtonPost.com, 31 Dec. 2012. Web. 23 Apr. 2013.
[6]Greenlogic Refrigerants - Williams Refrigeration: brochure. Web.
[7]OCWA. The official website. Web.

VIII. Appendix: ICLEI Community Protocol Compliance Table

						IE- Included Elsewhere	SI- Local government significant influence	
Emissions Report Summary Table (for 2010 baseline year)						NE- Not estimated	CA- community-wide activities	
						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)**	**Notes/Explanations/Comments**
Built Environment								
Use of fuel in residential stationary combustion (nat. gas- MMBtu)	source and activity	159,058	53.02 kg CO_2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR)		CA		8,455	Estimate from National Grid (which is the only utility provider in the Village of Fayetteville)
Use of fuel in residential stationary combustion (fuel oil, wood, LPG- MMBtu)	source and activity	7,760	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)	Allocated to municipal scale in the regional GHG inventory	CA		174	Derived fuel use from 2010 5-year estimated American Community Survey (ACS) data and regional GHG inventory analysis
Use of fuel in commercial stationary combustion (nat. gas- MMBtu)	source and activity	55,543	53.02 kg CO_2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR)		CA		2,952	
Use of commercial stationary combustion (fuel- MMBtu)	source and activity	16226	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)	Allocated to municipal scale in the regional GHG inventory	CA		840	
Industrial Stationary combustion sources (nat. gas- MMBtu)	source and activity	23	53.02 kg CO_2/MMBtu; 1 g CH4/MMBtu; 0.1 g N2O/MMBtu; EPA Mandatory Reporting Rule (MRR)		CA		1.00	
Industrial Stationary combustion sources (fuel- MMBtu)	source and activity	N/A	EPA GHGRP		CA		-	
Electricity								
Power generation	source					NE		
use of electricity by the community (MWh)	activity	28,363	eGrid 2009 subregion factors (EPA)	Collected data from utility providers and input into CACP	CA		6,438	Includes residential, commercial and industrial consumption (National Grid data)
District Heating/Cooling								
District Heating/Cooling facilities in community	source					NE		
Use of district heating/cooling by community	activity					NE		
Industrial process emissions in the community	source					NE		
Refrigerant leakage in the community	source					NE		

Transportation and other Mobile Sources								
On-road passenger vehicles								
on-road passenger vehicles operating within the community (VMT)	source	22,139,799	CACP (Version 3.0) & EPA MRR 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	Appendix D: TR.1.B Alternative Method for Estimating In-boundary Passenger Vehicle Emissions; Input VMT estimate into CACP community sector tab	CA		11,818	Estimation method used the NYSDOT Traffic Data Viewer Tool, in conjunction with in-house GIS analysis to determine what portion of AADT and road length existed within the Village boundary. The emissions estimate includes all vehicle traffic counted in NYSDOT AADT metrics (no vehicle descriptive data was available; CACP utilizes default fuel allocations: 93% gasoline and 7% diesel, which were adjusted to account for the 10% NYS ethanol blend: 83% gasoline, 10% ethanol and 7% diesel); these totals are distributed to alt method vehicle categories in the software, with the assumption that diesel is used by HDV and gasoline is used by LDV and passenger vehicles.
on-road passenger vehicle travel associated with community land uses (VMT)	activity					NE		Data from the Syracuse Metropolitan Transportation Council (our only MPO) travel demand model only covers 1 county in the CNY region, with partial coverage of two other counties; therefore, the model is not able to provide data for all municipalities, on trip origin or destination, or to exclude trans-boundary trips from VMT estimates.
On-road freight vehicles								
on-road freight and service vehicles operating within the community boundary	source					IE		As stated above, these vehicles operate on roads included in the AADT counts and are therefore assumed to be included in this estimation method; the emissions estimate above includes CACP default metrics for heavy duty vehicles, as they travel many of the roads measured within the city boundary
on-road freight and service vehicle travel associated with community land uses	activity					IE		As stated above, these vehicles operate on roads included in the AADT counts and are therefore assumed to be included in this estimation method; the emissions estimate above includes CACP default metrics for heavy duty vehicles, as they travel many of the roads measured within the city boundary
On-road transit vehicles operating within the community boundary	source					IE		As stated above, these vehicles operate on roads included in the AADT counts and are therefore assumed to be included in this estimation method; the emissions estimate above includes CACP default metrics for transit vehicles (in the case of Fayetteville, CENTRO buses specifically), as they travel many of the roads measured within the Village boundary
Transit Rail								
transit rail vehicles operating within the community boundary	source					NE		
use of transit rail travel by community	activity					NE		
Inter-city passenger rail vehicles operating within the community boundary	source					NE		
Freight rail vehicles operating within the community boundary	source					NE		
Marine								
Marine vessels operating within community boundary	source		Non-commercial vessel data is from NYSDEC NONROAD model reporting by county & commercial vessel data is from the 2008 National Emissions Inventory	This data was provided by the NYSDEC		NE		
use of ferries by community	activity					NE		
Off-road surface vehicles and other mobile equipment operating within community boundary	source					NE		
Use of air travel by the community	activity					NE		
Solid Waste								
Solid Waste								
Operation of solid waste disposal facilities in community	source					NA		Assumed (and was advised that) all Village-generated MSW is sent to the Onondaga County waste-to-energy facility (OCRRA)
generation and disposal of solid waste by the community (tons)	source and activity	2,953.1	Utilized the CACP 3.0 waste sector tab for the community analysis; entered estimated tonnage for City residents, selected the controlled incineration disposal method, and entered NYS DEC waste composition estimates *(source: 2008 Beyond Waste Report)*	Process emissions associated with waste incineration at Waste to Energy Facility located outside the City boundary	CA		623	Solid waste tonnage for residential households in the City community were assumed to total approximately 1.1 tons per year, on average, per household (source: Oswego Waste-to-Energy facility); this assumption was used to allocate tonnage processed at the County WTE plant to Oswego households in 2010. This estimation method is employed by the WTE as part of their pricing strategy as well.

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	various; see Fayetteville_Water tab for calculations	Followed the ICLEI Community Protocol methods WW.14-14.6 to calculate emissions associated with conveyance, treatment and distribution	Used eGrid 2009 electricity emission factors= 500.35	CA		224.99	The Village does not operate any water delivery facilities or infrastructure within their boundary; therefore, the emissions were estimated from the usage and water source data acquired from the Onondaga County Water Authority.
Use of energy associated with generation of wastewater by the community (kWh)	activity	3,770	CACP 3.0 eGrid 2009 electricity emission factors		SI	IE		The Village operates two wastewater pumps (Signal Hill) that convey Village sewage to the Meadowbrook Treatment Plant in DeWitt. This electricity use is captured in the government operations energy use/commercial sector for the community.
Centralized Wastewater Systems- Process Emissions								
Process emissions from operation of wastewater treatment facilities located in community	source	N/A			SI			
process emissions associated with generation of wastewater by community	activity		Followed ICLEI Community Protocol methods WW.8, WW.12 alt and WW.13			NA	87.98	The Village wastewater is delivered to a facility outside of the Village boundary; therefore the proportion of Village process emissions for treatment were estimated
Use of septic systems in community	source and activity					NE		No data available
Agriculture								
Domesticated animal production	source					NE		Limited agricultural sources in this community
Manure decomposition and treatment	source					NE		
Upstream Impacts of Community-wide Activities								
Upstream impacts of fuels used in stationary applications by community	activity					NE		Not included in scope of analysis due to limited data availability
upstream and transmissions and distribution impacts of purchased electricity used by the community	activity					NE		
upstream impacts of fuels used for transportation in trips associated with the community	activity					NE		
upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary	activity					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					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					NE		This analysis focused on the sources under local government significant influence, rather than consumption-based accounting
Government consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all governments in the community)	activity					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					NE		