The Town of Hamilton, NY
2017 Municipal Greenhouse Gas Inventory

A step-by-step guide for completing the Town of Hamilton, NY Greenhouse Gas Inventory

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ENST 241: Sustainability and Climate Action Planning for Local Governments

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Table of Contents

I. Acknowledgements

Chris Rossi, *Town of Hamilton Council Member*

Sue Reymers, *Town of Hamilton Clerk*

Andy Pattison,

2017

III. Climate Smart Communities Program Overview

New York State established the Climate Smart Communities program in 2009. The goal of this program is to engage with and provide guidance for local governments on how to reduce their greenhouse gas emissions, save taxpayer dollars, improve operations and infrastructure, and advance community goals for health and safety, energy independence, economic vitality, and quality of life (VHB, 2014). This program includes a partnership of the following six NY State agencies: the New York State Energy Research and Development Authority (NYSERDA), the Department of Environmental Conservation (DEC), the Department of Health (DOH), the Department of Transportation (DOT), the Public Service Commission (PSC), and the Department of State (DOS).

As part of this program, the CSC Regional Coordinator Program developed a guide in 2012 to provide local governments with resources and technical assistance so that they might achieve the program's goals of reducing GHG emissions, adapting to a changing climate, and saving taxpayers money.

Local governments should include all six of the greenhouse gases mentioned above in a GHG inventory. Figure 1 lists all of these GHGs and their respective global warming potential (GWP). GWP is a relative measure of how much heat a greenhouse gas traps in the atmosphere. The measure compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide over a given period of time (VHB, 2014).For example, each unit of nitrous oxide is 310 times more potent over a 100-year period than an equivalent unit of carbon dioxide. Because of this, it is important to account for the emissions of each GHG separately and to report these emissions in metric tons of each gas and metric tons of carbon dioxide equivalent (MTeCO2).

Figure 1: GHGs Required in the Inventory and their Global Warming Potential
Source: VHB (2014)

A. Base Year

In order to create a greenhouse gas inventory, a base year must be chosen. This base year should be based on a calendar year, not a fiscal year, and is selected based on data availability and reliability. This report uses 2015 as its base year. 2015 was selected as the baseline year based on the availability of reliable and comparable data. The Town of Hamilton will use this greenhouse gas inventory report moving forward as a baseline for all future inventories. All future inventories can be compared to this one to see how the emissions trend over time. It is recommended that the Town of Hamilton conduct a greenhouse gas inventory report annually.

B. Operational Control

2017

D. Government Sectors

This greenhouse gas inventory groups emissions by sector based on the format proposed by the CSC program guide. For the Town of Hamilton, the sectors included are:

- Buildings and Facilities
- Streetlights
- Vehicle Fleet
- Employee Commute

Note: The Town of Hamilton is currently in the process of constructing a new building for its Town Office. This construction began in 2016, which is why this GHG Inventory Report stops at 2015. The year 2016 is an anomaly due to the construction of the new building and the fact that the government operations were shifted mid-year to temporary facility. The Town is expected to be located in their new building my mid-2017.

Additional sectors included in the guide are traffic signals, water delivery facilities, port facilities, airport facilities, transit fleet, power generation facilities, solid waste facilities, and wastewater facilities. While these are listed in the guide, they will not be discussed in this report because they are not relevant to the Town of Hamilton as none of these sectors fall into the operational control of the Town. In other words, the Town's scope of municipal operations do not include these sectors and thus, according to the Local Government Operations Protocol V1.1 should not be included in the municipal inventory of the Town of Hamilton. One potential future sector to include in the Scope 3 section of the Town municipal GHG Inventory might be employee air travel-related emissions (e.g. as a result of traveling for training or a conference).

Using sectors as a framework for organizing emissions provides a more policy-relevant approach to reporting GHG emissions. Under the sectors approach, all types of emissions are summarized and reported for each separate s

Scope 2

Data Needed: Electricity consumption for Town Garage and Town Office

- *Primary Contact Person*: Sue Reymers, Town Clerk
- *Data Received*: Spreadsheet containing the Town of Hamilton's electricity usage from 2012-2015 and fuel usage from 2015
  - Under the 2015 Electric tab, data was divided into four sections, one for each location: Town Garage, Hubbardsville, Poolville, and the Town Office
  -

Figure 3: Total Energy Consumption and Production from 2013 to 2015 (scope 2)

It is important to note that, while the solar panel did offset some of the Town of Hamilton's GHG emissions, it only made a small dent in the total emissions produced by the Town due to the majority of the total emission resulting from the vehicle sector. Therefore, while solar panels may not the master solution to reducing all of the Town's GHG emissions, solar panels (or other renewables such as geothermal) could provide enough energy to offset all electric use of the Town if sized large enough, the existing system was just not built to do this. Other areas provide an opportunity for more significant reductions. This will be discussed a bit more in section VII below, which presents an overall summary of the Town's greenhouse gas emissions in 2015.

B. Streetlights

Scope 2

Data Needed: Electricity consumption for lighting districts in Hubbardsville, NY and Poolville, NY

- *Primary Contact Person*: Sue Reymers, Town Clerk
- *Data Received*: Spreadsheet containing the Town of Hamilton's electricity usage from 2012-2015 and fuel usage from 2015
  - Under the 2015 Electric tab, data was divided into four sections, one for each location: Town Garage, Hubbardsville, Poolville, and the Town Office
  - Data was further separated by company, meeting (month paid), service dates, kilowatt hours, and cost

Location	Consumption (kWh)	GHG Emissions (MTeCO2)
Poolville	9,245	2.62
Hubbardsville	11,575	3.28
Total	**20,820**	**5.9**

Table 4: 2015 electricity consumption for lighting districts in the Town of Hamilton (scope 2)

Table 4 contains the electricity consumption for the two lighting districts, Poolville and Hubbardsville, in the Town of Hamilton. Tot

how these explosions happen differentiate the two fuels. Due to this difference, diesel fuel is one of the most efficient and energy dense fuels available today. It contains much more usable energy than gasoline, and thus delivers better fuel economy and emits less pollution. However, diesel fuel still emits greenhouse gases, and is the largest contributor to the Town of Hamilton's emissions.

Fuel Type	Total Consumption (gal)	Cost ($)	Cost Per Gallon ($)	GHG Emissions (MTeCO2)
Gasoline	2,693.3	5,081.04	1.932	23.50
Diesel	12,821.1	29,451.34	2.21	130.86
Total	**15,514.4**	**34,532.38**	**4.142**	**154.36**

Table 5: 2015 data for Town of Hamilton-owned vehicles (scope 1)

Table 5 depicts the fuel consumption for the Town fleet. As described in the paragraph above, all of the vehicles consume diesel aside from the pickup truck, which consumes gasoline. The total gasoline consumption for the Town fleet in 2015 was 2,693.3 gallons, which produced 23.50 MTeCO2 GHG emissions. The diesel consumption was 12,821.1 gallons in 2015, which produced 154.36 MTeCO2 GHG emissions. It is evident from the table that diesel consumption and resulting emissions contributed much more to the Town of Hamilton's GHG emissions. In fact, diesel usage is the single largest contributor to GHG emissions in the Town of Hamilton. Therefore, the Town of Hamilton should target diesel fuel consumption as the main area in which they should try to reduce emissions. Recommendations for how to achieve this can be found in Section VIII.

D. Employee Commute

Scope 3

Data Needed: Measurement of mobile combustion concerning Town employees who drive to work

- *Primary Contact Person*: Sue Reymers, relaying information from Town employees
- *Data Received:* Survey responses from all 6 of the full-time employees

Below is the survey that was given to each employee of the Town:

Please fill out the following survey regarding the vehicle you used to drive to work from Jan 2015-Jan 2016. Please fill out and return to the Town Office ASAP.
Year, Make & Model of Vehicle:
This will be used in determining the "carbon footprint" of the Town of Hamilton.
Fuel Type (circle one): Gasoline, Diesel, Other
Average MPG:
Distance of commute (one way):
Number of days per week on average you commute to work:

Note: The survey was collected from employees in 2017, though the energy data for the Town is from 2015. It is assumed that the results of the survey are similar enough to those that would have been found if the survey was conducted in 2015 due to the fact that there are the same number of full-time and part-time employees now as was in 2015.

There are 6 full-time employees (FTE) for the Town of Hamilton, 3 part-time employees, and 3 salaried employees who do not have regular hours. We grouped the salaried employees without regular hours with the 3 part-time employees to equal 6 part-time employees. Each part-time employee is measured as 0.5 FTE. Therefore, the total number of employees is measured as 9 FTE. There are also 5 board members that are paid by the Town of Hamilton but do not have regular hours, and they are also separated from employees for tax and legal reasons. Thus, they were left out of our survey and analysis.

We did not receive information for the part-time employees, so we took the average of the responses for the 6 FTE and extrapolated to create data for the additional 3 FTE. These calculations are provided in the Appendix. This data only captures commenting from home to work. Potential future GHG emissions could include commuting resulting from town business-related travel.

Miles to Work	Number of Employees
0-5	9
6-10	0
11-15	0

Table 6: 2015 length of commute for Town of Hamilton employees (scope 3)

To calculate the numbers in Table 7, we scaled up the responses from per one-way commute to per year. These calculations can be found in the Appendix along with the others. We did this so that all of the data and results provided in this report are annual numbers for 2015.

Type of Fuel	Gasoline Consumption (gal)	GHG Emissions (MTeCO2)
Diesel	0	0
Gasoline	931.57	8.13
Total	**931.57**	**8.13**

range of gallons consumed per year. These numbers and calculations can be found in the Appendix.

VI. Gross Greenhouse Gas Emissions

This section provides a holistic view of the Town of Hamilton's electricity and fuel consumption, as well as the resulting GHG emissions.

Overall, the Town's electricity usage has increased from 2012 to 2015, as seen in Figure 4 below. The Town Office used 23,810 kWh in 2015, the most of any building in 2015. The Town Garage had the second highest electricity consumption in 2015 with 20,475 kWh. Electricity consumption for Poolville and Hubbardsville has stayed relatively constant across all four years.

Figure 4: Town of Hamilton annual electricity consumption by location (scope 2 emissions)

In terms of annual fuel usage, diesel comprises the largest component with 12,821 gallons used during 2015. This can be seen in Figure 5 below. Overall diesel fuel consumption has generally increased over the past four years, with gaso

Figure 5: Town of Hamilton annual fuel usage by fuel type (scope 1 emissions)

Given the magnitude of diesel use for the Town of Hamilton, we recommend that the Town target diesel consumption as an area for reduction. This provides the most significant opportunity for greenhouse gas emission reductions. Potential ways in which to achieve this goal are provided in section VIII of this report.

A. GHG Emissions Summary by Sector

The Town of Hamilton's vehicle fleet produced the largest number of GHG emissions compared to the other sectors. These greenhouse gas emissions amounted to 154.36 MTeCO2, which accounts for 71.7 percent of the Town of Hamilton's 2015 GHG emissions. The main contributor to this total was diesel usage, which accounts for 84.8 percent of the GHG emissions from mobile fuel usage in the Town of Hamilton. In terms of the other sectors, Buildings & Facilities accounts for 21.8 percent of the Town's 2015 GHG emissions, Streetlights account for 2.7 percent, and the Employee Commute accounts for 3.8 percent. A holistic summary of these numbers can be found in Table 8 below.

Sector	**GHG Emissions Count (MTeCO2)**
Buildings & Facilities	46.94
Streetlights	5.9
Vehicle Fleet	154.36
Employee Commute	8.13
Total	215.3

Table 8: 2015 GHG Emissions Summary by Sector

Note: This total includes the reduction from the solar panel on the Town Garage. This reduction

Figure 6: Graph of GHG Emissions Count by sector

Figure 7: 2015 GHG emissions by C
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VII. Next Steps and Recommendations

This section includes recommendations for the Town of Hamilton for future work and ways to achieve reductions targets based on the emissions described above. These recommendations come from the model of a Climate Action Plan, which is described below.

A. Climate Action Plan

The Town of Hamilton Greenhouse Gas Inventory can be used to inform policy decisions for the Town moving forward. One method used by local municipalities to organize and implement sustainability-related policy is the creation of a Climate Action Plan (CAP). A CAP describes the policies and measures that a local government will enact to reduce greenhouse gas emissions and increase the community's resilience to unavoidable climate change (NY State DEC, 2017). Below, we propose various policy recommendations that the Town may consider. These recommendations are organized by sector. This section also includes case studies highlighting the effects of proposed policies in municipalities similar to the Town of Hamilton.

B. Sample Case Studies and Policies

Case studies are a vital aspect of the recommendations section of this document because they validate the specific policies we put forth below. They provide us with the data and evidence we need to confidently recommend what we believe will reduce emissions in the Town of Hamilton. The various case studies provide evidence for the effectiveness of these recommendations since local governments have implemented them in the past. The selection of these case study locations was based on a set of criteria that allows us to justifiably make comparisons between those towns and the Town of Hamilton. If the towns are too dissimilar, the links will not be as strong. As such, we believe the most important factors

- Appliances may include Town office and garage space heaters, water heaters, refrigeration, lighting, air conditioners
    - May include replacing lights with LED light bulbs, insulating buildings, and using energy efficient power strips, among others
- "Rightsizing" fan circulation systems
    - "Rightsizing" a fan system involves better matching fan capacity to the requirements of the load (ie for air circulation systems)
        - Excellent way to save energy
    - EPA study found that almost 60 percent of building fan systems were oversized by at least 10 percent, with an average oversizing of 60 percent (Practice Greenhealth, 2017)
- Install solar panels on Town Office
    - Town solar panel saved 17.917 kWh of electricity, or 3.01 MTeCO2 GHG emissions in 2015
    - Installing a similar solar panel on the Town Office would help to reduce these GHG emissions even further
- Draft a Green Buildings Standard for the Town
    - Align all future Town construction and renovation with a Green Building Certification program
        - Certification programs include LEED, Green Globes
    - Green Building Standard document considers lifetime of the building, from inception to implementation (Roseland, 2012)
- Review building codes to ensure new projects comply with existing regulation
    - Include compliance costs in development budget

Sample Case Study - Town of Cazenovia (NY)

- Population: 2,933
- Rural environment
- Buildings and Facilities of Town Municipal Operations account for 21 percent of GHG emissions (97 MTeCO2)

The Town of Cazenovia breaks its Climate Action Plan[4] into two parts, one that provides a Municipal Operations Analysis and the other that provides a Community Analysis. For the purposes of this case study, we focus on the municipal operations, since it is most similar to the report that we provide for the Town of Hamilton. In 2010, the Town of Cazenovia's municipal emissions were 703 MTeCO2. The total estimated municipal emissions by 2025 from their strategy implementation are projected to be 317 MTeCO2 (a 55%, or 386 MTeCO2 in reductions). The total estimated cost of implementation is $760,810, and the total estimated

[4] Town of Cazenovia Climate Action Plan Executive Summary: http://townofcazenovia.org/content/Generic/View/102:field=documents;/content/Documents/File/1004.pdf

annual cost savings are $139,018. Therefore, they estimate that the payback period for their plan will be 5.47 years (Town of Cazenovia, 2015).

The Town of Cazenovia outlines several municipal operations strategies for reducing emissions, below we highlight the strategies for vehicles and buildings. These include:

2017

Figure 10: Town of Tiburon's Mitigation Measures for Government Operations (2011)
Source: Town of Tiburon (2011)

The Town of Tiburon outlines several potential strategies for reducing emissions from its vehicle fleet in the table provided in Figure 10 above. The strategies relevant to the Town of Hamilton are to replace town vehicles with hybrid or electric vehicles and offset emissions from town vehicles (Town of Tiburon, 2011). The cost to implement and annual savings give an idea of what these sorts of programs would cost. The anticipated GHG reductions are also helpful in providing a holistic picture of the sorts of benefits that would result from implementing these strategies. Measure 3.2.G3 could also be adapted to the vehicle fleet. Rather than replacing police patrol cars with more fuel-efficient vehicles, the Town of Hamilton could replace vehicles in its fleet with more fuel-efficient alternatives.

Employee Commute

Potential policies to reduce the total number of VMT per day and per person:

- Encourage flexible employee work schedules

- Host events/competitions for commuters dedicated to encouraging cleaner, environmentally-friendly transportation

Whether or not this is feasible for the Town of Hamilton depends upon the roles of each employee and the potential for telecommuting. If this could be done, however, it could save the Town at least 1 MTeCO2 of GHG emissions per year, as mentioned above.

C. Converting Lighting Districts to LED

We recommend that the Town of Hamilton look to convert its two lighting districts to LED lights. LED lights, formally known as light-emitting diodes, are a technological alternative to incandescent or halogen light bulbs. LED lights are more efficient, durable, versatile, and longer lasting than standard bulb alternatives (Energy Star, 2017). There are many benefits to LED lights, such as energy cost-savings, maintenance cost-savings, an extended lifecycle, reduced carbon emissions, reduced light pollution at night, increased lighting quality, and greater perceived security (Northeast Energy Efficiency Partnerships, 2015).

The Northeast Energy Efficiency Partnerships (NEEP) highlight three potential barriers to implementation: technical, regulatory, and financial barriers. These barriers are described in depth on pages 4-5 of the LED Street Lighting Assessment and Strategies for the Northeast and Mid-Atlantic report created in 2015 (Northeast Energy Efficiency Partnerships, 2015). While these barriers are mentioned in the report, they are not difficult to overcome if a plan is created and implemented correctly.

We do not have the data or information to perform a cost-benefit analysis of converting the Town of Hamilton's lighting districts to LED. More information would be needed to do so[5]. We recommend that, once the data is available, the information be plugged into the LED Savings Calculator from LED Waves: https://www.ledwaves.com/pages/led-calc (LED Waves, 2017). The calculator is very simple and easy to use, and would provide a sense of how much the Town might save through converting its lighting districts to LED. It requires the user to answer a few questions on current lighting usage, plus the LED replacement, in order to calculate savings from switching to LED lights. The information is fairly basic and should not be difficult to obtain. Other calculators exist as well, so if this is not the Town of Hamilton's preferred calculator, it would be easy to find another based on the desired company.

Since we could not calculate this on the behalf of the Town of Hamilton, we have conducted several case studies on similar towns and their retrofitting projects. We did so in order to determine the effects of a LED conversion program, which would presumably be similar to the effects that we would see from such a program in the Town of Hamilton. These case studies can be found in the Appendix. It is evident from these case studies that communities of all sizes can

[5] From Amanda Mazzoni

benefit from converting their streetlights to LED. While the specific numerical costs and benefits will vary by community, these benefits are evident in all locations. Therefore, we recommend that the Town of Hamilton convert its lighting districts to LED.

VIII. Conclusion

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2017

2017

2 miles/21 mpg = 0.095 gallons, one way
(0.095 gallons) x 2 = 0.19 gallons, per day
(0.19 gallons) x 5 = 0.952 gallons per week — gasoline
(0.952 gallons) x 52 = 49.504 gallons of gasoline per year

5 miles/12 mpg= 0.4167 gal, one way
(0.4167 gallons) x 2 = 0.8334 gal per day
(0.8334 gallons) x 6 = 5.0004 gallons per week — gasoline
(5.0004 gallons) x 52 = 260.02 gallons of gasoline per year

3 miles/21 mpg = 0.1428 gal, one way
(0.1428 gallons) x 2 = 0.2857 gal, per day
(0.2857 gallons) x 5 = 1.428 gallons per week — gasoline
(1.428 gallons) x 52 = 74.2857 gallons of gasoline per year

3 miles/15 mpg = 0.2 gal, one way
(0.2 gallons) x 2 = 0.4 gal per day
(0.4 gallons) x 5 = 2 gallons per week — gasoline
(2 gallons) x 52 = 104 gallons of gasoline per year

3.5 miles/18 mps = 0.194 gal, one way
(0.194 gallons) x 2 = 0.388 gal per day
(0.388 gallons) x 4 = 1.56 gal per week — gasoline
(1.56 gallons) x 52 = 80.89 gallons of gasoline per year

To find the total for all 6 FTE:
81.25 gallons + 49.504 gallons + 260.02 gallons + 74.28 gallons + 104 gallons + 80.89 gallons = 649.94 gallons of gasoline per year
^ per 6 FTE

Calculate average of 6 FTE to extrapolate for 6 part-time employees (3 FTE):
Average miles per employee = (5 miles + 2 miles + 5 miles + 3 miles + 3 miles + 3.5 miles)/6 = 3.58 miles
Average mpg per employee = (32 mpg + 21 mpg + 12 mpg + 21 mpg + 15 mpg + 18 mpg)/6 = 19.83 mpg
Based on this, calculate gallons used for one person. Then, multiply this by 3 to get the total additional gallons used for the 6 part-time employees.
3.58 miles/19.83 mpg = 0.181 gal, one way
(0.181 gallons) x 2 = 0.361 gal per day

(0.361 gallons) x 5 = 1.805 gal per week
(1.805 gallons) x 52 = 93.88 gallons of gasoline per year

6 PTE = 3FTE
3 (93.88 gallons) = 281.63 gallons

Add the two totals together to obtain the total for the 9 FTE:
649.94 gallons + 281.63 gallons = 931.57 gallons of gasoline per year

Calculate the GHG emissions:
(total gasoline consumption) x (conversion of 1 gallon of gasoline to MMBtus) x (emission factor for gasoline) / (1,000 because want Btus rather than MMBtus)

(93

2017

Community	County in Iowa	Area (square miles)	Population (in 2010 census)
Algona	Kossuth	4.51	5,560
Auburn	Sac	0.50	322
Independence	Buchanan	6.22	5,966
Montezuma	Poweshiek	2.49	1,462
Mount Pleasant	Henry	8.53	8,668
Muscatine	Muscatine	18.35	22,886
Pocahontas	Pocahontas	2.02	1,789
Spencer	Clay		

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