

The Town of Hamilton's 2011 Greenhouse Gas Inventory



Photo Credit to <http://en.wikipedia.org/wiki/File:HamiltonNY-fall.jpg>

A step-by-step guide for completing the
Town of Hamilton, New York's greenhouse
gas inventory

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Summer Field School 2012

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Acknowledgements

Peter Darby, *Deputy Supervisor*

Julie Dudrick, *Project Director at Colgate University Upstate Institute*

Sean Graham, *Village Administrator*

Linda Manchester, *Secretary to the Town Supervisor*

John Pumilio, *Colgate University Director of Sustainability*

Eli Yewdall, *ICLEI Regional Officer*

Executive Summary

This inventory report contains an explanation of data collection methods and results used for the Town of Hamilton, New York's greenhouse gas inventory. It is recommended that this inventory be conducted annually. This report most directly follows the Local Government Operations Protocol V1.1 (May 2010). Within this protocol, there are three relevant sections called, "Introduction," "Identifying Your Emissions," and "Quantifying Your Emissions." I used a similar method of organization for this report. To begin, there is an overview of what kind of data one will be looking for when conducting a greenhouse gas inventory for a local government. It explains how certain areas of a government and different sources of carbon emissions are separated within a greenhouse gas inventory. Next, this report describes how emissions were accounted for from each sector that fell within the jurisdiction of the Town of Hamilton's government. The Master Data Workbook is briefly explained throughout the report, which was a useful tool, downloaded from ICLElusa.org that provided assistance in organization. Once all required data was accounted for, it was entered into the Clean Air & Climate Protection Software (CACP2009) software, also provided by ICLElusa.org. Once all required data was accounted for, it was entered into the Clean Air & Climate Protection Software (CACP2009) software, also provided by ICLElusa.org. From the final reports, I concluded that the Vehicle Fleet was the largest source of emissions; this was by a considerable margin. I suggest that purchasing hybrid, electric and/or more fuel efficient vehicles would mitigate carbon emissions. In addition, for future inventory reports I recommend that the Town of Hamilton keep more exact records of gasoline and diesel consumption by Town-owned vehicles. Also, the Employee Commute survey should account for part-time employees and alternate methods of transportation.

Introduction to a Greenhouse Gas Inventory

This Greenhouse Gas Inventory was done in accordance with the Local Government Operations Protocol V1.1 (May 2010). This document was developed by the California Air Resources Board, California Climate Action Registry, ICLEI, and The Climate Registry. It provides the reader with the proper accounting and reporting principles for a successful and credible Greenhouse Gas Inventory Report.

There are six total greenhouse gases covered under the Kyoto Protocol that a local government is required to assess (Section 2.1 of Local Government Operations Protocol). These six gases are: Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF₆). When the required information is entered into the Clean Air & Climate Protection 2009 software, it accounts for each emission separately, but also converts this measurement to metric tons of CO₂ equivalent (MTeCO₂).

Base Year

First, a base year must be chosen. It is recommended that this base year be in line with a calendar year, not a fiscal year. This base year is selected based on data availability and reliability. For the Town of Hamilton, 2011 was chosen as the base year, and the results from that greenhouse inventory are included in this report. Thus, all future inventories will be compared to this one in order to see if improvements have been made in specific areas. It is recommended that a local government conducts a greenhouse gas inventory report annually.

Operational Control

For this greenhouse gas inventory, the operational control approach method was utilized (detailed explanation on page 14 of the Local Government Operations Protocol). This approach means that anything that the Town of Hamilton has operational control over will be accounted for in the inventory. Operational control means that the local government owns a facility, or does not own it but has full authority over decisions regarding operational, health, safety, and environmental policies concerning that facility.

Scopes

Greenhouse gas emissions are separated into three different “scopes.” These categories were established by the World Resources Institute.¹ The scopes separate emissions into direct and indirect emissions. Refer to pages 23-26 of the Local Government Operations Protocol V1.1 to see detailed explanations of the possible types of direct and indirect emissions. It is required that all Scope 1 and Scope 2 sources are accounted for in a greenhouse gas inventory report.

¹ Colgate University's 2011 Greenhouse Gas Inventory

Scope 1: All direct greenhouse gas emissions; the Town of Hamilton has *direct* control over the sources responsible for these emissions. For example, using oil to heat the Town Garage is considered a Scope 1 emission.

Scope 2: All indirect greenhouse gas emissions related to the purchased electricity, steam, heating, or cooling; since we are purchasing the electricity and are not in control of generating it, this is considered an *indirect* emission. For example, the kWh consumption at the Town Office is considered a Scope 2 emission.

Scope 3: All other indirect emissions that have not already been accounted for; these emissions comes from actions that are a result of the organization, over which they do not have direct control. For the Town of Hamilton, this includes employee commuting.

Government Sectors

Another way to group our emissions is by sector. The emissions are then broken up into “scopes” within that sector. Due to the format of ICLEI’s CACP2009 Software, this guide will be organized based on this method of categorization. For the Town of Hamilton, the sectors provided by the software used in this inventory are:

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

Additional sectors listed in the software but unnecessary for the purposes of the Town of Hamilton include: Airport Facilities, Water Delivery Facilities, Wastewater Facilities, Port Facilities, Solid Waste Facilities, Transit Fleet, Electric Power, Other Process Fugitive, and Mobile Source Refrigerants.

Within CACP2009, scope is automatically accounted for; it does not need to be noted when entering the data. For each building, for example, it asks for specific quantities for each possible type emission source, such as propane usage, and the scope in which this is classified is already programmed into the software.

Data Collection

To assist in Data Collection, the Master Data Workbook should be downloaded from the ICLEI website (icleiusa.org). This can be found by going to the Resources tab, clicking on tools and then clicking on the Greenhouse Gas Inventory Guidance link. On this page, there will be a link that says “Master Data Workbook.” After clicking on it, it needs to be unzipped and placed in a permanent location on the computer being used to perform the inventory. For additional assistance, one can also download “ICLEI Instructions: Data Gathering & Quality Control on the Master Data Workbook,” which can be found on the same page as the Master Data Workbook.

As noted earlier, the sectors that must be covered in any greenhouse gas inventory for the Town of Hamilton are:

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

Note: All final GHG emissions calculations are expressed in metric tons of carbon dioxide equivalents. This is an internationally recognized unit that allows for a standard unit of measurement for all greenhouse gas emissions. This standard unit of measurement allows comparability between local governments, businesses, and organizations of all types.

Emissions Factors

Emissions factors are used in emissions calculations and specific to each source. For example, the emissions factor for propane used for heating is different than the emissions factor for diesel fuel burned by a large truck. These factors are multiplied by the total consumption to yield a final emissions value. Most of these emissions factors are programmed into CACP2009. Emissions factors for electricity, however, are not programmed into the software. When the software is first opened, it will ask the user to enter electricity emissions factors based on the Town of Hamilton’s designated eGRID subregion. eGRID is the “Emissions and Generation Resource Integrated Database.” More information about this can be found at <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>. These factors are based on the amount of green power generation versus fossil fuel generation that takes place within each region. Hence, these numbers are subject to change often. Hamilton is located in the NYUP subregion. The emissions factors for the NYUP and all other regions, including a map of these designated areas, are located at www.theclimateregistry.org. These factors need to be entered into the software in order for it to perform accurate greenhouse gas emissions calculations for purchased electricity.

Buildings and Facilities:

Scope 1

Data Needed: Heating oil consumption for Town Garage

- *Primary Contact Person:* Linda Manchester, Secretary to the Town Supervisor
- *Data Received:* Spreadsheet containing Heating Oil consumption for 2011
 - Data was split up by bill dates and total was included at the end
- **Total cost** was included

Consumption (gal)	Cost (\$)	GHG Emissions (MTeCO2)
3114.1	8,880	32

Scope 2

Data Needed: Electricity consumption for Town Garage and Town Office

- *Primary Contact Person:* Linda Manchester, Secretary to the Town Supervisor
- *Data Received:* Spreadsheet including purchased electricity for each building in 2011
 - Data was split up by bill dates and total was included at the end
- **Total cost** was not included

Location	Consumption (kWh)	GHG Emissions (MTeCO2)
Town Garage	18,984	6
Town Office	18,986	6
Total	37,970	12

Streetlights and Traffic Signals:

Scope 2

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

- *Primary Contact Person:* Linda Manchester, Secretary to the Town Supervisor
- *Data Received:* Spreadsheet including purchased electricity for each district
 - Data was split up by bill dates and total was included at the end
- **Total cost** was not included

Location	Consumption (kWh)	GHG Emissions (MTeCO ₂)
Hubbardsville	11, 723	4
Poolville	9,089	3
Total	9,089	7

Vehicle Fleet:

Scope 1

Data Needed: Gasoline and diesel consumption for Town owned vehicles; model year of each vehicle

- *Primary Contact Person:* Linda Manchester, Secretary to the Town Supervisor; Peter Darby, Deputy Supervisor
- *Data Received:* Total gasoline and diesel consumption for all vehicles owned by the Town in 2011; List of Town-owned vehicles with model year and type of fuel consumed by each
 - Each vehicle from the vehicle list was labeled “Light Truck” or “Heavy Truck.” If it was a piece of equipment, it was labeled “Agricultural Equipment” or “Construction Equipment.”
 - For **Gasoline:** There were two “Light trucks” and one piece of “Agricultural Equipment” that used gasoline.
 - It was estimated that the piece of Agricultural Equipment only consumed 100 gallons annually. 100 gallons were taken out of the total and the corresponding percentage of the cost was taken out of the total cost.
 - So, 3,424.9 gallons, costing \$11,563.85 were entered for “Light Trucks.”
 - For **Diesel:** There were six “Heavy Trucks,” one “Light Truck,” three pieces of “Construction Equipment,” and one piece of “Agricultural Equipment.”
 - Since the exact amount of fuel consumed for each vehicle was not available, the calculations were done using percentages.
 - The six “Heavy Trucks” were estimated to consume 70% of the total diesel consumption in 2011, so 70% of this total consumption and 70% of the total cost were entered into the CACP 2009 software for “Heavy Trucks.”
 - After the “Heavy Trucks” were accounted for, there was 30% of the total diesel consumption and cost left to analyze. This was done similar to gasoline-fueled vehicles.
 - The “Light Truck” makes up 20% of the remaining 30%; 6% of the total. So, 6% of the total diesel consumption and cost were entered into the CACP 2009 software for “Light Trucks.”
 - The “Construction Equipment” made up 60% of the remaining 30%, so 18% of the total consumption and total cost were entered into the software for “Construction Equipment.”

- The “Agricultural Equipment” made up the last 20% of the remaining 30%, so 6% of the total consumption and total cost were entered into the software for “Agricultural Equipment.”

Note: Although the model year of a vehicle is important in most cases, model year was not a factor here because the only vehicles manufactured before 2005 were “Heavy Trucks” and “Construction Equipment.” In the software, entering data based on model years is not required in these categories for diesel engines.

Gasoline

Vehicle Type	Total Consumption (gal)	Cost (\$)	GHG Emissions (MTeCO2)
Light Truck	2,349.9	7,934	21
Agricultural Equipment	1,175.0	3,967	10
Total	3,524.9	11,901	31

Diesel

Vehicle Type	Total Consumption (gal)	Cost (\$)	GHG Emissions (MTeCO2)
Heavy Truck	10278.4	28,624	105
Light Truck	881.0	2,453	9
Construction Equipment	2643.0	7,360	27
Agricultural Equipment	881.0	2,453	9
Total	14683.4	40,891	150

Employee Commute

Scope 3

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

- *Primary Contact Person:* All Town employees
- *Data Received:* Survey responses from 7 of the 20 total employees from the
- **Cost** was not calculated for this sector

Below is an image of 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 2011-Jan 2012			This will be used in determining the “carbon footprint” of the Town of Hamilton.	
Year, Make & Model of Vehicle: _____				
Fuel Type (circle one):	Gasoline	Diesel	Other	Please fill out and return to the Town Office ASAP.
Average MPG: _____				
Distance of commute (one way): _____				If you have any questions, feel free to contact me at EDolfi@colgate.edu .
				Thank you!

The information from the seven responses was entered into the Master Data Workbook. Based on the make and model of the vehicle, each must be classified as “Passenger Car,” “Light Truck,” or “Heavy Truck.” This is because the CACP2009 software asks for the data to be entered the same way as the Vehicle Fleet data. Also in this spreadsheet in the Master Data Workbook were columns for the average days a week travelled to work, the average number of weeks one works per year, and so on. Based on the average miles per gallon of each vehicle, the distance of the commute to work (one way) and the average number of days one drives to work per year, the total annual miles travelled for each respondent was calculated. The classifications were used to enter this data into CACP2009 in order to calculate the total GHG emissions from the Employee Commute.

Miles to Work	Number of Employees
0 to 5	5
6 to 10	1
11 to 15	1

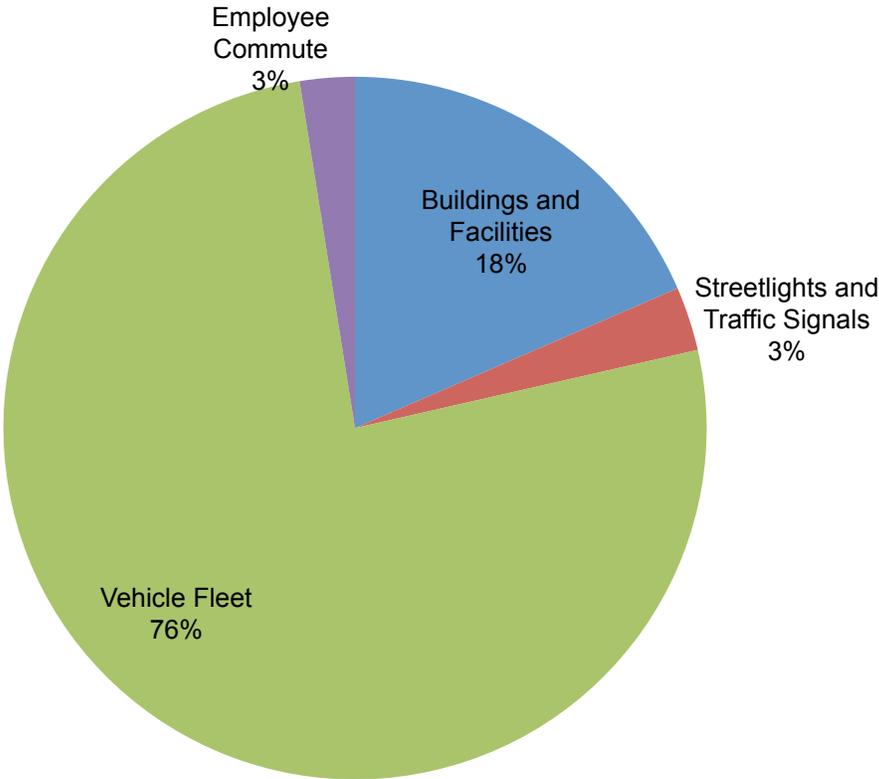
Type of Vehicle	Gasoline Consumption (gal)	GHG Emissions (MTeCO ₂)
Passenger Car	285	2
Light Truck	397	4
Total	682	6

Note: None of the respondents' vehicles consumed diesel fuel.

Gross Greenhouse Gas Emissions

GHG Emissions Summary by Sector

Sector	GHG Emissions
Buildings and Facilities	44
Streetlights and Traffic Signals	6
Vehicle Fleet	181
Employee Commute	6
Total	237



GHG Emissions Summary by Scope and Source

Source of Emissions	GHG Emissions (MTeCO₂)
Scope 1	
Fuel Oil (#1, #2, #4)	32
Vehicle Fleet	181
Scope 1 Total	213
Scope 2	
Purchased Electricity	18
Scope 2 Total	18
Scope 3	
Employee Commute	6
Scope 3 Total	6
Gross Emissions	237

Reducing Emissions

The next step in reducing the Town of Hamilton's carbon emissions is to develop a plan that explains how this will be done. This is called a Climate Action Plan. This is a formal document that specifies which strategy the Town has developed in order to mitigate its carbon emissions. Certain projects to reduce carbon emissions must be introduced along with timelines for each. This plan will force the Village to set a goal to reduce its carbon footprint by a certain percentage in a definite amount of time.

Below are some preliminary suggestions:

Reduce gasoline and diesel consumption

- Consider purchasing energy efficient vehicles such as hybrids or electric
- Exchange current vehicles with newer models which were manufactured with updated emission requirements
- Consolidate trips and vehicles
- Walk or bike when possible
- Encourage more carpooling, especially for longer trips

Reduce energy costs

- Switch from oil to natural gas
- Seal leaks that cause poor insulation
- Consider performing an energy audit

Reduce electricity consumption

- Consider purchasing more energy efficient devices and appliances
- Increase the use of power strips
- Only turn on devices when they are needed; otherwise, make sure they are turned off
- Upgrade lighting

Conclusion and Recommendations

The Town of Hamilton's total greenhouse gas emissions were 237 MTeCO₂. In order to attain a more accurate assessment of these emissions, it is important that there are as many exact measurements as possible. For the Vehicle Fleet, the exact number of gallons consumed by each vehicle is extremely important. Each type of vehicle has a different emission factor so if the actual numbers were considerably different than the estimates using percentages, the total Greenhouse Gas emissions from the Vehicle Fleet would likely be different, as well. Seeing as this sector is responsible for 76% of the gross emissions, this difference would have a significant effect on the Town of Hamilton's carbon footprint.

In addition, the Employee Commute survey should contain more questions in order to account for the part-time employees of the Town of Hamilton. Knowing the average number of days a part-time employee drives to work would provide for a more accurate calculation. Also, other methods of transportation should be recognized. Since nearly half of the employees live within 5 miles of where they work, knowing which employees walk or ride bicycles and how often they use this alternate method of transportation would make a substantial impact on the survey results. The survey done for this inventory did not request all information that was needed for the analysis of this sector. Moreover, attaining more than seven responses from the twenty total employees would yield a more accurate result.

Scope 3 government-generated waste was not included in this inventory. There was no data available for the total tons of waste generated by the Town of Hamilton. The number for the state average of pounds of waste per day per person in a business setting was requested, but never received. Attaining this number would yield the most accurate estimate if the exact number of total tons generated by the Town of Hamilton was not available.