NH Municipal Energy Assistance Program
Made possible through the NH Public Utilities

Municipal Greenhouse Gas and Energy Use Baseline

Report for Washington

This report is a summary of greenhouse gas emissions and energy use for the town of Washington, NH for the year 2008. The focus of this report is the municipal operations of the town, with special emphasis on town-owned buildings. It does not encompass residential, commercial, or industrial energy use. The following analysis of municipal energy use is based on data gathered from the municipality's utility bills for building electricity, building heating fuel, streetlight electricity, and municipal fleet vehicle fuel. Supporting data was also collected including building dimensions, hours of operation, number of streetlights, and vehicle types. The data was then analyzed using two software tools, Portfolio Manager software provided online by the US Environmental Protection Agency (EPA) and the Small Town Carbon Calculator (STOCC) software developed by the University of New Hampshire and Clean Air-Cool Planet.[1] The STOCC software provides comparative information between the various sectors of municipal energy use (buildings, vehicles, and streetlights) while the Portfolio Manager software provides in-depth analysis of energy performance in individual buildings. The energy use per square foot is presented for each building, and Portfolio Manager allows for comparison of this metric to buildings of similar types across the US and in New Hampshire specifically.

This report was made possible by the Municipal Energy Assistance Program (MEAP), a collaborative project of Clean Air-Cool Planet, Jeffrey H. Taylor and Associates, the SDES Group, the Sustainable Energy Resource Group, Vital Communities, and Carbon Solutions New England and funded by the Regional Greenhouse Gas Initiative (RGGI). The community applied for support from the MEAP program and was selected to receive this baseline energy inventory. Community officials, employees, and volunteers then assisted the MEAP Energy Project Assistant, who collected and analyzed the data in this report.

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[1] For more information on EPA Portfolio Manager Software, see www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager. Information on Small Town Carbon Calculator (STOCC) software is at www.cleanair-coolplanet.org.

Municipal Overview

Town population: 1,061.
Area of municipality: 45.5 sq. mi.
Population density: 23.3.
Number of municipal buildings: 14.
Total area of municipal building space: 33,226 sq. ft.
Average cost per square foot of all municipal buildings: $1.43
Number of street lights: 14.
Number of vehicles in fleet: 22.
Number of municipal employees: 58.
Municipal budget in baseline year: $2,146,164.
Total cost of municipal energy use in baseline year: $159,791.
Municipal energy use as a percentage of municipal budget: 7.4%
Total municipal energy use in baseline year: 5,946 MMBtu.
Total municipal CO2 emissions in baseline year: 985,390 lbs.

Community Profile

Washington, New Hampshire is located in Sullivan County and is bordered by the NH communities of Hillsborough, Lempster, Goshen, and Stoddard. According to the 2007 census, Washington is home to 1,061 residents, which places it 181st among NH's incorporated cities and towns. At the time of the 2007 Census, per capita income was $20,540 and median household income was $43,125. Washington's 2008 Municipal Budget Appropriations were $2,146,164.

Zoning ordinances were first established in 1974 and most recently updated in 2008. The Washington Master Plan was last updated in 1992. Washington voters elect representatives to the Board of Selectmen and Planning Board while Conservation Commission, and Zoning Board members are appointed. The Washington Energy Committee, a subdivision of the Conservation Commission, supported this energy inventory project.

Washington Energy Committee Background

The Washington Energy Committee has been at work since 2007 and has four active members, the first of which were appointed after a town meeting in March of 2007. Since their founding, they have initiated a change to more efficient lighting (after a PSNH audit) in several buildings as well as the streetlights. In addition, they have completely removed four of the town's streetlights.

Representatives from the Washington Energy Committee collected data on municipal building, vehicle, and streetlight operations. Different types of energy use were considered depending on the sector, such as electricity/heating fuel use for buildings and gasoline/diesel fuel for vehicles. This report also factors in the cost of purchasing this energy in cases where records were available.

Washington Energy Committee members were responsible for conducting the inventory along with support from a University of NH intern Corey Johnson and staff at Clean Air - Cool Planet. Town staff provided energy use data for each municipal building for a 1-year period beginning January 1, 2008 through December 31, 2008. Once this task was complete, the data was entered into STOCC and EPA Portfolio Manager. This inventory report was generated based on those results.

Municipal Sector Analysis

For each participating municipality, data was gathered on the operations of several sectors under the jurisdiction of the municipal government: the buildings, vehicle fleet, and street lights. Different types of energy use were considered depending on the sectors, such as electricity use, heating fuel use, and fuel for vehicles. Where records were available, the costs of purchasing these energy sources were factored in to the analysis. The STOCC software was used for the analysis of the aggregate data on all municipal sectors. The table below contains information on cost, co2 emissions, and energy usage for the three sectors.

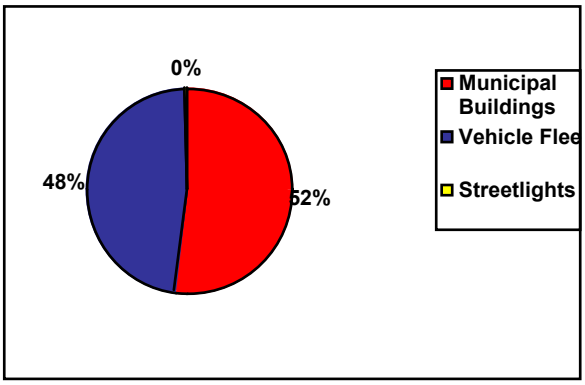
	Buildings		Vehicles		Streetlights		
	#	% of total	#	% of total	#	% of total	Grand Total
Cost	$86,310	54%	$71,327	45%	$2,154	1%	$159,791
CO2 (lbs)	523,467	53%	456,096	46%	5,827	1%	985,390
Energy (million BTUs)	3,081	52%	2,843	48%	22	0%	5,946

Table 1. Energy use, carbon emissions, and costs, by municipal sector

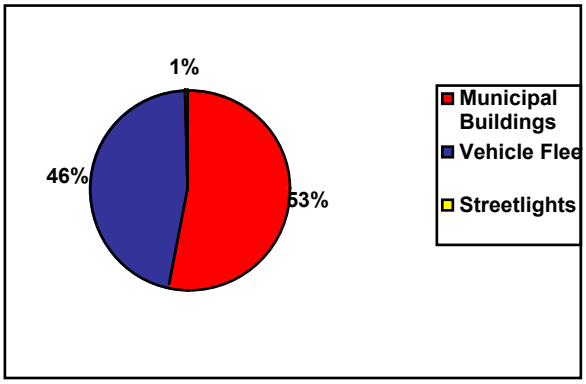
Generated by STOCC Software

Snapshot of Municipal Energy Use, Emissions, and Costs by Sector

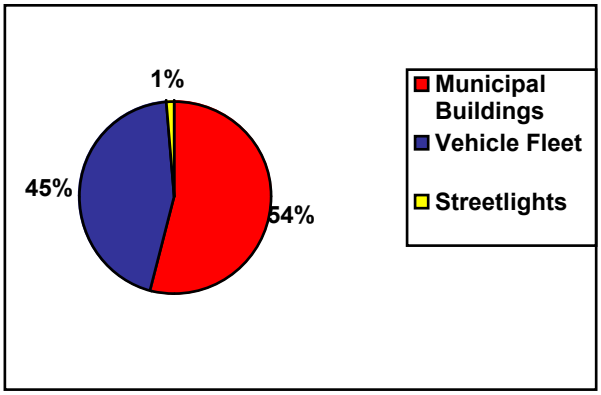
Graph 1a. Municipal Energy Use (MMBtu)



Graph 1b. Municipal Carbon Equivalent Emissions (tons)



Graph 1c. Energy Costs by Municipal Sector ($)



Graph 1a shows the amount of energy used in 2008 for the buildings, vehicle fleet, and streetlights in Washington. The municipal buildings in Washington used the most amount of energy, at 3,081 MMBtus, while the vehicles used 2,843 MMBtus. Energy use in the streetlight sector is minimal.

Graph 1b shows the total carbon dioxide generated from Washington in 2008, of which 53% came from buildings and 46% from the vehicle fleet. The buildings in Washington produced 523,467 pounds of carbon dioxide in 2008, while the vehicles produced 456,096 pounds.

Graph 1c shows the 2008 dollar amount for energy costs for Washington. Washington spent $86,310 for energy use on buildings, $71,327 on the vehicle fleet, and $2,154 on streetlights.

The municipal inventory includes 14 buildings for the town of Washington. This includes the Town Hall, Police Station, Library, Fire/Rescue, E.W. Fire Station, Camp Morgan Lodge, Highway Garage, Old Highway Garage, Transfer Station, Radio Tower, Gravel Pit, Pump Site, Solid Waste Office, and Band Stand.

The building performance inventory includes the top eight buildings with the highest-ranking energy use and energy intensity. Of these buildings five (Town Hall, Police Station, Library, Fire/ Rescue, E.W. Fire Station) use strictly propane. The Camp Morgan Lodge uses propane and oil. The Highway Garage uses oil and the Old Highway Garage uses no heat.

Building Performance: Energy Use and Energy Intensity

Table 2. Energy Use and Intensity, by municipal building

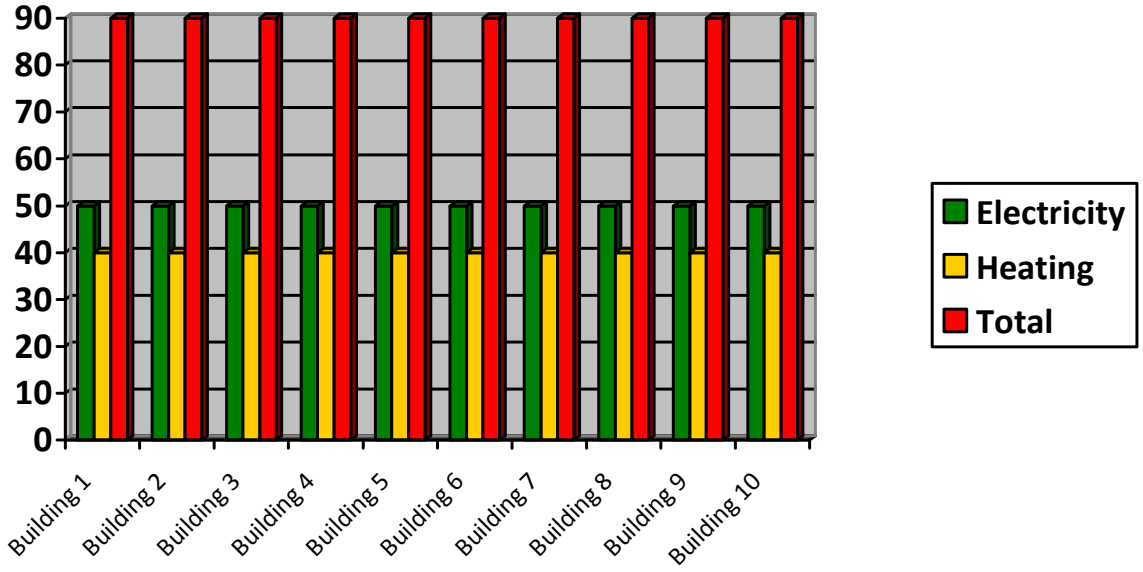
Name of Building	Fuel Type(s)	Area (Sq. Ft.)	Energy Use: Electricity (million Btu)	Energy Use: Heating Fuel (million Btu)	Total Building Energy Use (million Btu)	Site energy intensity (kBtu/sq ft)[2]	EPA Average Site kBtu/sq ft for building type	NH Average Site kBtu/sq ft for building type
Camp Morgan Lodge	No. 2 Fuel Oil, Propane	8,428	32	225	257	30.5	52	50.5
East Washington Fire Station	Propane	725	4.5	49.3	54	74.6	78	60.5
Fire Station/ Rescue	Propane	3,930	38.3	166.1	205	52.2	78	60.5
Library	Propane	1,794	25.4	77	102	57.4	104	84.5
New Highway Garage	No. 2 Fuel Oil	8,540	57.2	394.47	452	53.3	77	47.5
Old Highway Garage	None	2,100	10.0	0	10	4.8	77	47.5
Police Station	Propane	1,794	21.8	142.81	165	92	77	107
Town Hall	Propane	5,915	29.8	365.32	396	67.1	101.4	69.5
Average		4,153	27	17854	170	54	81	65.9

Energy use data generated by STOCC software; energy intensity data generated by Portfolio Manager software.

[2] Site energy intensity = amount of energy expended per square foot *on site* to heat, cool, and electrify the area. This measure relates to how much is being used on site and fluctuates directly with how much lighting is being used, how thermostats are kept, etc.

Snapshot of Energy Use by Building

Graph 2a. Energy Use for Electricity, Energy Use for Heating, and Total Energy Use in Municipal Buildings



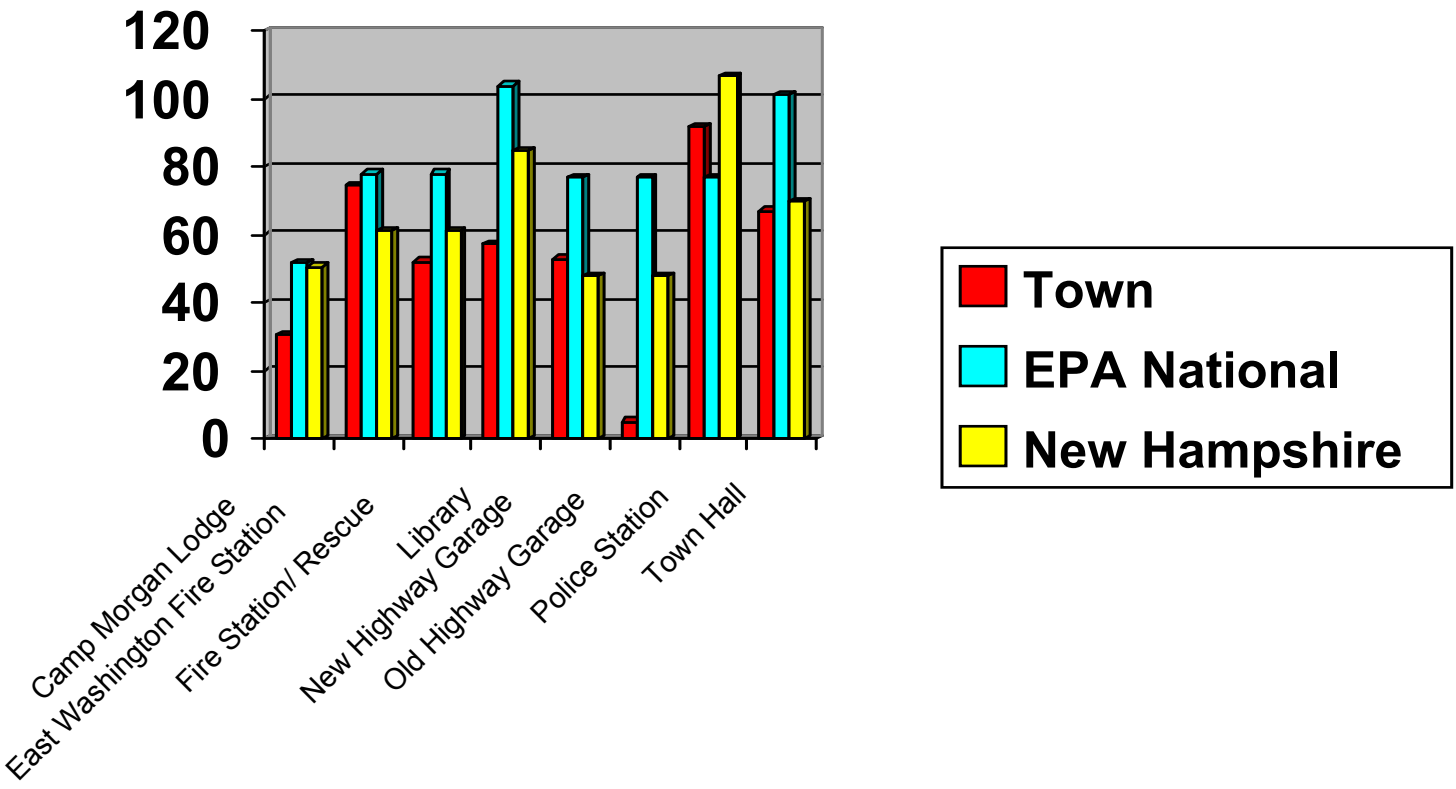
The New Highway Garage is Washington's largest building and uses the most energy at 452 Million BTUs. The New Highway garage consumes the most electricity and heat at 57 million BTUs and 394 million BTUs respectively. The Town Hall is the second greatest consumer of total energy at 396 Million BTUs. The majority of the energy consumption comes from propane use at 365 million BTUs. The Town Hall is the third largest building in square footage after The New Highway Garage and The Camp Morgan Lodge.

Camp Morgan Lodge is the second largest building and comes in third as the largest consumer of energy. Fire Station/Rescue is the fourth largest building and the fourth largest consumer of energy.

Energy intensity is the most powerful tool available for measuring the relative energy efficiency of particular buildings. Site energy intensity is calculated by taking the amount of energy used in the building (a total aggregate of heating fuel and electricity) and dividing it by the square feet of space. It can be reduced through behavioral and energy conservation measures. The best opportunities for saving energy on site would involve behavioral changes (such as keeping lights and computers turned off; turning down thermostats) and energy conserving technologies (such as motion sensor lighting).

Information about the source energy intensity of these buildings is available on your EPA Portfolio Manager account. Source energy is the energy used to produce the energy used in each building. Your municipality may consider reducing source energy intensity as a long-term goal. This can be accomplished through projects such as installing solar panels or a municipal combined heat and power plant.

Graph 2b. Site Energy Intensity and Average Site Energy Intensity for Type of Building (kBtu/sq.ft.)



As illustrated by the graph 2b above, Washington's Police Station, E.W. Fire Station and Town Hall have the highest site energy intensity of the municipal buildings. It is interesting to note that the Town Hall is the second largest energy consumer and has the third highest energy intensity.

Building Performance: Cost and Emissions

Table 3. Energy Cost and Emissions, by municipal building

Name of Building	Area (Sq. Ft.)	Energy Cost ($)	Energy Cost per Square Foot	Energy Emissions (lbs of CO2)	Energy Emissions per Square Foot
Camp Morgan Lodge	8,428	$6,202	$.74	43,935	5
East Washington Fire Station	725	$1,404	$1.94	8,063	11
Fire Station/ Rescue	3,930	$5,674	$1.44	33,245	8
Library	1,794	$2,978	$1.66	17,464	10
New Highway Garage	8,540	$9,348	$1.09	78,813	9
Old Highway Garage	2,100	$586.72	$0.28	2,660	9
Police Station	1,794	$4,498	$2.51	25,616	1
Town Hall	5,915	$10,600	$1.79	58,635	10
Average	4,153	$5,161	$1.43	33,554	9

Emissions data generated by STOCC software

Table 3 is a secondary means of analyzing buildings through energy cost per square foot and energy emissions per square foot. Washington's top three buildings for energy cost per square foot are The Police Station, E.W. Fire Station, and Town Hall. The E.W. Fire Station, Library, and Town Hall have the three highest ratings for energy emissions per square foot. The Town Hall is in the top three ranking for energy cost per square foot, energy emissions per square foot, total energy use, and energy intensity.

Analysis: Priorities and Custom Recommendations

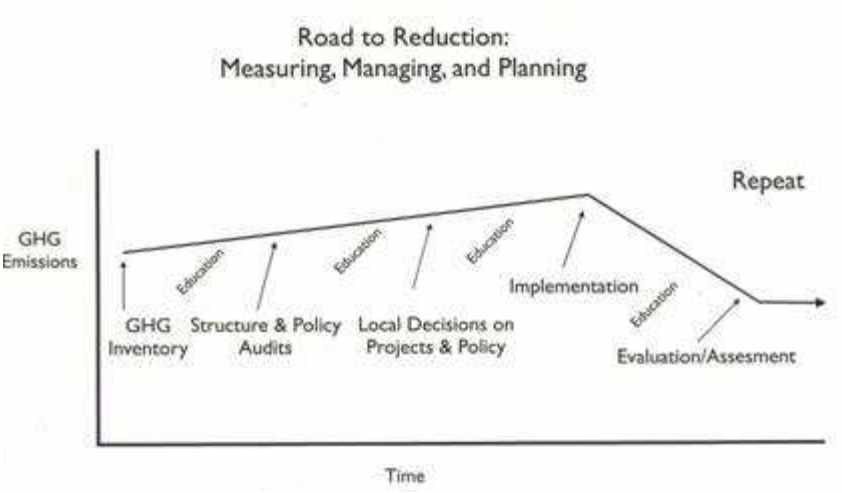
1. Further fuel costs analysis – with the rising cost of fuel, it may be informative to gather and/or keep detailed records on the costs of fuel for heating buildings and powering town vehicles in order to compare these costs to other energy related municipal costs such as electricity. Implement a behavioral change program in municipal buildings with municipal employees. Work with LEC Working Group for guidance to implement this initiative.
2. Begin gathering data for 2010. This will allow for a year-to-year comparison for the town.
3. Within the building sector, address the Town Hall first as it is in the top three ranking for energy cost per square foot, energy emissions per square foot, total energy use, and energy intensity. In case there are circumstances that make the Town Hall a poor candidate for the first building audit, the East Washington Fire Station would make a good second candidate because of the energy intensity and cost per square foot.
4. An overview tour with a certified buildings auditor is recommended to identify obvious energy efficiency issues with the buildings and which of the buildings would offer the best payback for a decision or investment grade audit. If prioritizing buildings, begin with the Town Hall based on results.
5. Begin the application process for an **Energy Efficiency and Conservation Block Grant Program** administered through the NH Office of Energy and Planning. Visit www.nh.gov/oep/recovery/eecbg.htm for more information.
6. Use Washington facility maintenance staff to recommission buildings that continue to perform poorly after walk-through audit recommendations have been implemented. Recommissioning examines the building's equipment systems operation and maintenance procedures and compares them to intended or design operations procedures. The primary focus of recommissioning is to identify operation and maintenance improvements that will result in energy cost savings and that are relatively fast and inexpensive to implement. Recommissioning does not necessarily involve the purchase or installation of new equipment or technology and in-house staff can typically implement many of the operation and maintenance improvements. Example recommissioning activities include calibrating building controls such as thermostats and occupancy sensors, adjusting operating schedules to ensure equipment is only on when necessary, checking for leaky or improperly functioning steam traps, cleaning air handler, condenser and evaporator coils, cleaning heat exchangers in boilers and furnaces, and replacing air filters, etc., to maintain optimal efficiency. Priority should be given to buildings that do not have an active preventative maintenance program.

Analysis: General Recommendations for Municipal Energy Savings

1. Review existing Master Plan, Zoning Ordinances, and other town policies for inconsistencies with the goal to reduce energy usage.
2. Implement a behavioral change program in municipal buildings with municipal employees. Work with LEC Working Group for guidance to implement this initiative.
3. Implement buying strategy of Energy Star equipment and Products and environmentally sensitive office products, and implement awareness campaigns to encourage "thoughtful" consumption of equipment and products.
4. Evaluate ways to reduce fuel usage with vehicle fleet. This can be done by analyzing routes, usage, and a strict anti-idling policy. A good start is to start tracking how much fuel each vehicle is consuming.
5. Find alternative energy sources to reduce escalating fossil fuel prices and emissions. Investigate payback for possibly installing: a small CHP unit, biomass heating system or geothermal heat pump.
6. Encourage recycling and composting to the extent possible, in order to divert the amount of municipal solid waste (organic matter) going to landfill.

Next Steps

Once this draft inventory is finalized, the MEAP project team will work with your town to identify a low-performing building and to carry out an energy audit for that building. The selected building will receive a Decision Grade or Investment Grade energy audit. The audit will culminate in a set of recommendations for building retrofits and renovations that would allow the town to reduce its building's energy use.



Once the audit report is complete, the MEAP project team will provide on-going support to your town as your municipality begins the process of identifying priority renovations/retrofits, creating RFPs, hiring contractors and realizing potential reductions. All phases of this project will be accompanied by a program of public engagement and education.

Methods

Greenhouse gas inventory approach

Data collection for this inventory involved collaborative efforts between the Clean Air-Cool Planet staff, which organized the data collection process over all, and the local town representative volunteers. With personal connections to their home towns, volunteers were better able to ascertain where to access certain data and to spend time at local offices sorting through bills and records. To collect the data in each town, data sheets were developed based on the software/program that was used for data processing. We used 2008 as a baseline year to collect the fuel and energy consumption information. Data sheets were sent to the town representative, who then collected and/or accessed the data. Follow-ups were done on a regular basis to make sure that the inventory progressed, the data collection process was effective, and the data needed was more or less accurately collected.

Data processing and data analysis

To process the data collected, we used two types of fuel and energy assessment software. The first was the Small Town Carbon Calculator (STOCC) software used to quantify and estimate the amount of energy used and the greenhouse gases (GHG) generated from the energy usage. The STOCC software allowed us to make a municipal energy assessment by municipal sector. The second was the EPA Portfolio Manager Benchmarking Program, used to assess the energy consumption and GHG generated in specific buildings, based on square footage.

List of Acronyms

CA-CP	Clean Air-Cool Planet
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
kBtu	Kilo British Thermal Units
MMBtu	Million British Thermal Units
STOCC	Small Town Carbon Calculator