



## **Municipal Greenhouse Gas and Energy Use Baseline Report for TOWN**

This report is a summary of greenhouse gas emissions and energy use for the town of TOWN, NH for the year 2005. It has been prepared by the Cool Monadnock Project,<sup>1</sup> a collaborative project of Clean Air-Cool Planet, Antioch New England Institute, and the Southwest Regional Planning Commission. Data was gathered through the volunteer efforts of the Cool Monadnock Town Representative and analyzed by the Cool Monadnock team, using EPA Portfolio Manager software and Clean Air and Climate Protection software provided by ICLEI.<sup>2</sup>

Cool Monadnock Town Representative: PERSON

Town Representative phone/e-mail: \_

This report was prepared by COOL MONADNOCK PERSON.

### **Municipal overview**

Town population: 1,554 (U.S. Census Bureau, 2006)

Area of Municipality: 22.5 sq. mi.

Population Density: 69.8/sq. mi.

Number of municipal buildings: 4.

Total area of municipal building space: 10,108 sq. ft.

Average energy intensity of all municipal buildings: 74 kBtu/sq. ft.

Number of street lights: 1 (outdoor playground)

Number of vehicles in fleet: 6

Number of municipal employees: 8

Total cost of municipal energy use in 2005: \$31,419

Total municipal energy use in 2005: 2,167 MMBtu

Total municipal CO<sub>2</sub> emissions in 2005: 163 tons

### **Municipal Sector Analysis**

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<sup>1</sup> [www.coolmonadnock.org](http://www.coolmonadnock.org).

<sup>2</sup> For more information on EPA Portfolio Manager Software, see [www.energystar.gov/index.cfm?c=evaluate\\_performance.bus\\_portfoliomanager](http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager). Information on CACP software is at [www.cacpsoftware.org](http://www.cacpsoftware.org).

For each participating municipality, data was gathered on the operations of several sectors under the jurisdiction of the municipal government: the buildings, vehicle fleet, employee travel (how much municipal employees travel to work and other travel for municipal business), street lights, water and sewage, and waste. Different types of energy use were considered depending on the sectors, such as electricity use, heating fuel use, fuel for vehicles, and tons of waste. Where records were available, the costs of purchasing these energy sources were factored in to the analysis. The CACP software was used for the analysis of the aggregate data on all municipal sectors.

**Table 1. Energy use, equivalent carbon emissions<sup>3</sup>, and costs, by municipal sector**

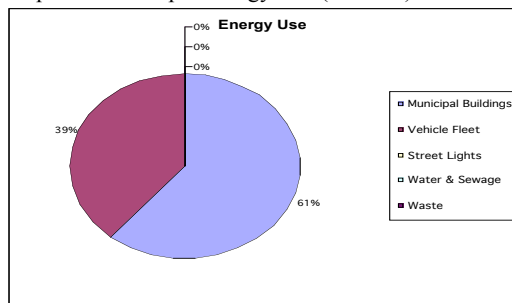
Municipal Sector	Energy Use (MMBtu) <sup>4</sup>	Energy Use (%)	Equivalent CO <sub>2</sub> (tons)	Equivalent CO <sub>2</sub> (%)	Energy Cost (US\$)	Energy Cost %
Municipal Buildings	1,322		80		17,586	
Vehicle Fleet	844		73		13,107	
Street Lights	1	0	0	0	96	0
Water & Sewage	0	0	0	0	0	0
Waste	0	0	10		630	0
<b>Total</b>	<b>2,167</b>	<b>100</b>	<b>163</b>		<b>31,419</b>	

Source: Cool Monadnock inventory, 2008

Generated by CACP Software

### Snapshot of 2005 Municipal Energy Use, Emissions, and Costs by Sector

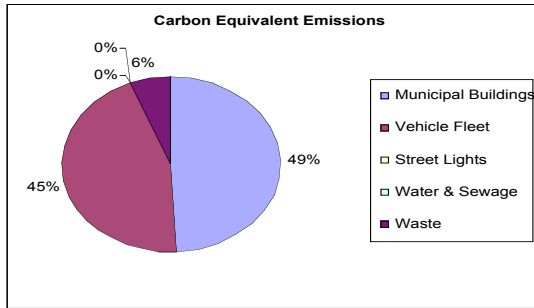
Graph 1a. Municipal Energy Use (MMBtu)



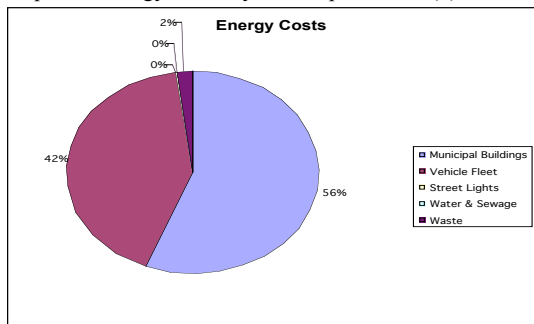
Graph 1b. Municipal Carbon Equivalent Emissions (tons)

<sup>3</sup> According to the Clean Air and Climate Protection software, “Equivalent CO<sub>2</sub> (eCO<sub>2</sub>) is a common unit that allows emissions of greenhouse gases of different strengths to be added together. For carbon dioxide itself, emissions in tons of CO<sub>2</sub> and tons of eCO<sub>2</sub> are the same thing, whereas for nitrous oxide, an example of a stronger greenhouse gas, one ton of emissions is equal to 310 tons eCO<sub>2</sub>.”

<sup>4</sup> The Clean Air and Climate Protection software presents energy use in MMBtus, which is one million British Thermal Units, a common measure of energy consumption (see [www.energyvortex.com/energydictionary/british\\_thermal\\_unit\\_\(btu\)\\_mbtu\\_mmbtu.html](http://www.energyvortex.com/energydictionary/british_thermal_unit_(btu)_mbtu_mmbtu.html)).



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



The three graphs illustrate the fact that buildings are the most significant sector in TOWN, accounting for 61% of energy use, 49% of emissions, and 56% of energy costs in 2005. While the waste sector does not generally contribute to energy use in towns, nor does it contribute significantly to costs (only 2%), it is shown that in TOWN, waste accounts for 6% of carbon equivalent emissions. The last sector to contribute to energy use and costs in TOWN is the vehicle fleet, which accounts for 39% of energy use, 45% of emissions, and 42% of costs. In TOWN, the four buildings present the greatest opportunity for municipal savings on energy costs as well as energy use and emissions, as it is the most significant sector in all categories. The vehicle fleet, with only six vehicles, makes up a very important second category where there are opportunities for energy and cost savings in TOWN. The following section should be helpful in identifying which buildings within the building sector present the greatest opportunities for savings.

### Building Performance: Energy Use, Emissions, Costs

Data was gathered for each individual building managed by the municipality. The following table combines data from EPA Portfolio Manager software (energy intensity, CO2 emissions) and CACP software (energy use). Data on costs were entered into the Portfolio Manager software. Graphs below illustrate the relative intensity of energy use and their costs among the buildings under the municipal jurisdiction.

**Table 2. Carbon emissions, energy use, and costs, by municipal building**

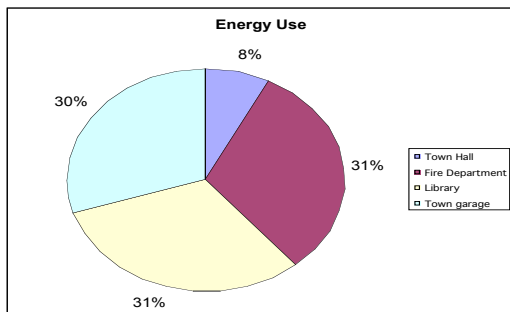
Name of Building	Energy Use (MMBtu)	Energy %	CO2 emissions (tons) <sup>5</sup>	CO2 %	Energy Cost (US\$)	Energy Cost %
Town Hall	100	8	9	11	2,350	2
Muni Bldg - Fire	414	31	36	45	7,288	13
Library	409	31	31	39	7,540	41
Town garage	398	30	4	5	408	44
<b>Total</b>	<b>1,321</b>	<b>100</b>	<b>80</b>	<b>100</b>	<b>17,586</b>	<b>100</b>

Source: Cool Monadnock inventory, 2008

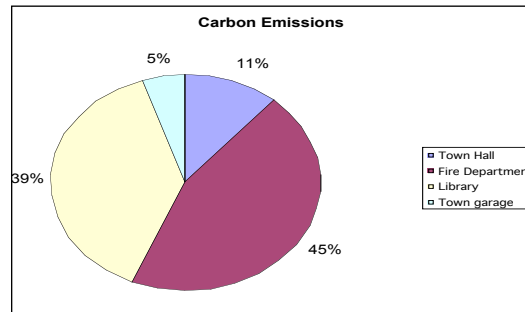
Carbon data generated by EPA Portfolio Manager Program; energy use generated by CACP software

**Snapshot of 2005 Energy Use, Emissions, and Costs, by Building**

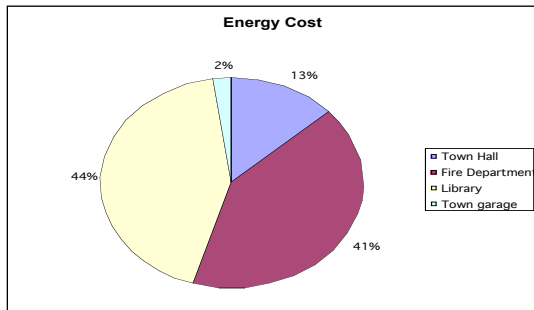
Graph 2a. Energy Use by Building (MMBtu)



Graph 2b. Carbon Dioxide Emissions by Building (tons)



Graph 2c. Energy Costs by Building (\$)



Graph 2a illustrates that three of the municipal buildings in TOWN – the municipal building/fire department, library, and town garage – used almost equal proportions of energy, while the town hall used a much smaller proportion of about 8%. However, the

<sup>5</sup> Carbon emissions on the EPA Portfolio Manager software are measured as carbon dioxide emissions only and do not include equivalents for other types of greenhouse gas emissions.

town garage appears to have had very low carbon emissions relative to the amount of energy used, as it only accounts for 5% of carbon emissions (and 2% of the energy costs) despite occupying 30% of the energy use. The fire department, on the other hand, accounted for a full 45% of the carbon emissions and 41% of the energy costs despite occupying only 31% of the energy use. The library, with 31% of the energy use, occupied 39% of the carbon emissions and a full 44% of the energy costs. The town hall, with the relatively small 8% of energy use, accounted for 11% of carbon emissions and 13% of costs. The library, town hall, and fire department have higher proportions of carbon emissions compared to their share of energy use. A closer look at the data would explain that the proportions of energy use, emissions, and costs are affected by the fact that the town garage used wood heat which was obtained cost free to the town. Wood heat appears to provide a larger amount of energy with lower carbon equivalent emissions as well.

### Building Performance: Energy Intensity

Table 3. Energy Intensity, by municipal building

Name of Building	Type(s) heating fuel used	Area (Sq. Ft.)	Site energy intensity (kBtu/sq ft) <sup>6</sup>	Average Site kBtu/sq ft for building type	Source energy intensity (kBtu/sq ft) <sup>7</sup>	Average source kBtu/sq. ft for building type
Town Hall	#2	2,196	43	77	67	182
Muni Bldg - Fire	#2	3,312	67	77	93	182
Library	#2, propane	1,800	184	104	211	246
Town garage	Wood, propane	2,800	2	77	8	150
<b>Total</b>		<b>10,108</b>				

Source: Cool Monadnock inventory, 2008

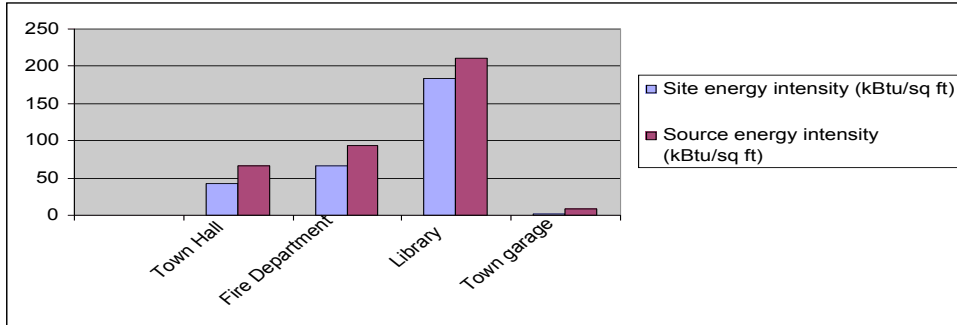
Energy intensity data generated by EPA Portfolio Manager Program

### Snapshot of 2005 Energy Intensity by Building

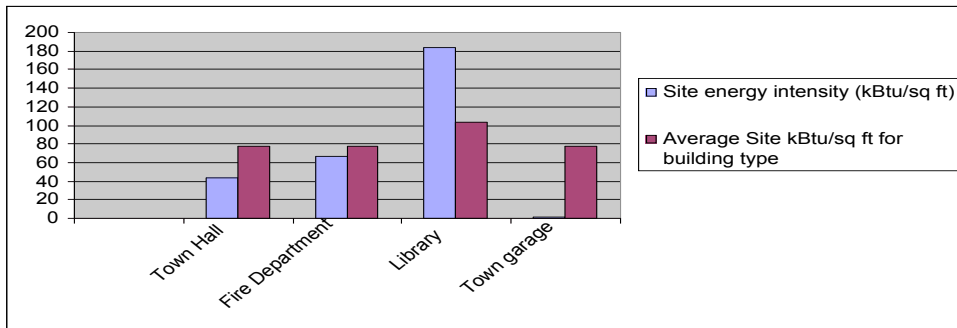
Graph 3a. Site and Source Energy Intensity by Building (kBtu/sq.ft.)

<sup>6</sup> 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.

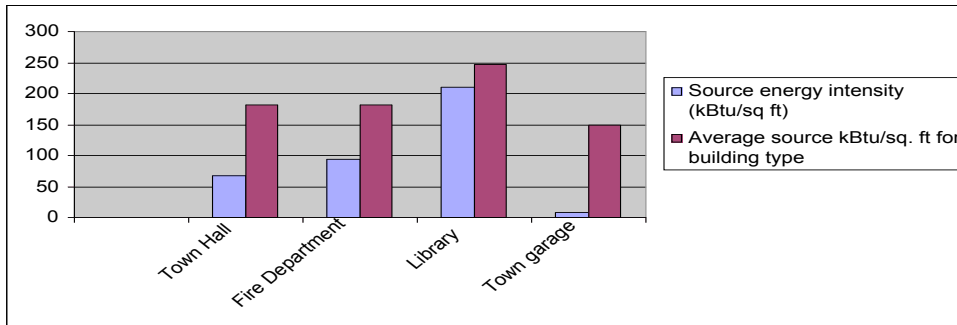
<sup>7</sup> Source energy intensity = amount of energy expended per square foot based on the source of energy (hydropower, nuclear, coal, fuel oil, etc) and the efficiency of that fuel type.



Graph 3b. Site Energy Intensity and Average Site Energy Intensity for Type of Building (kBtu/sq.ft.)



Graph 3c. Source Energy Intensity and Average Source Energy Intensity for Type of Building (kBtu/sq.ft.)



Energy intensity is the most powerful tool that the Cool Monadnock Project has available for measuring the relative energy efficiency of particular buildings. Site energy intensity can be addressed through behavioral and energy conservation measures whereas source energy intensity would require alterations in the type of energy being used to power, heat, or cool a space. 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).

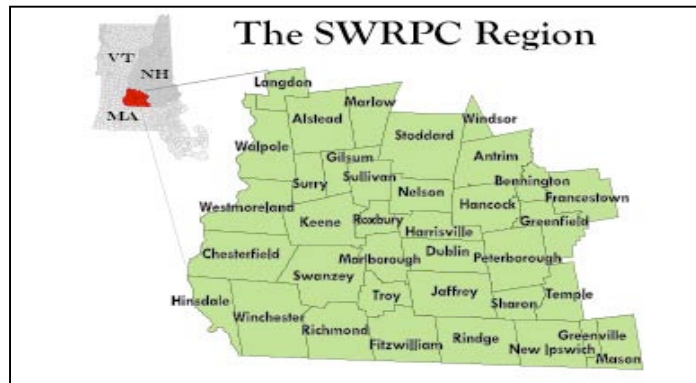
Measures to save source energy would include switching the type of fuel being used to heat or cool a space and asking your electricity provider to use green sources of energy.

In TOWN, the building with the highest energy intensity in both categories is the library. The town garage has extremely low energy intensity numbers. When compared to standardized averages for both site and source energy intensity, only the library exceeds averages for their building type. It exceeds the averages by a greater proportion in site energy intensity, so it should be expected that energy conservation measures would go far to lower the energy intensity of the building.

### **Analysis: Priorities and Custom Recommendations**

1. Review existing Master Plan, Zoning Ordinances, and other town policies for inconsistencies with the goal to reduce energy usage
2. Encourage recycling and composting to the extent possible, in order to divert the amount of municipal solid waste (organic matter) going to landfill.
3. 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.
4. Increase the energy efficiency of the vehicle fleet by switching from conventional fuels to more environmentally-friendly fuels. Research may be required to identify the most efficient ones.
5. Focus on the library for energy conserving updates such as windows and insulation.
6. Focus on the Library for: Implementation of a behavioral change program based on the CA-CP guide. Then expand the program to all other buildings. See attached guide.
7. 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.
8. Create an Energy Savings Trust Fund to be used in the future for energy saving initiatives within a 5 year payback. Submit this Fund for majority vote at 2009 Town Meeting. Work with CA-CP to create this fund.

## Comparison to Cool Monadnock Region



Map of the Southwest region, NH  
<http://www.swrpc.org/index.htm>

*(UNDER CONSTRUCTION)*

Total regional population: 97,598.

Percent of regional population resident in Municipality: 1.6 %.

Percent of regional municipal CO<sub>2</sub> emissions from Municipality:            %.

Total regional municipal facilities square footage:           sq. ft.

Average regional site energy intensity in municipal buildings:           kBtu/sq. ft.

Average site energy intensity in municipal buildings in Municipality:           kBtu/sq. ft.

## **Methods**

### **Greenhouse gas inventory approach**

Data collection for this inventory involved collaborative efforts between the Cool Monadnock 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 2005 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 Clean Air and Climate Protection (CACP) software used to quantify and estimate the amount of energy used and the greenhouse gases (GHG) generated from the energy usage. The CACP software allowed us to make community and government analysis of the GHG inventory. 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**

CACP	Clean Air and Climate Protection (software)
CA-CP	Clean Air-Cool Planet
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
kBtu	Kilo British Thermal Units
MMBtu	Million British Thermal Units
SWRPC	Southwest Region Planning Commission