Conception Bay South
Greenhouse Gas Inventory
Milestone #1 and #2
Partners for Climate Protection

Submitted to:

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The Municipality of Conception Bay South

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1.0 INTRODUCTION

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), in conjunction with the Municipality of Conception Bay South is pleased to present the results of this study to the Government of Newfoundland and Labrador, Department of the Environment and Conservation to assist in the development and provision of a Carbon Footprint Analysis for CBS. The prime objectives of this work were as follows:

a) Present a Protocol for measuring current and future eCO_2 conditions for the municipality;
b) Identify Green House Gas (GHG) sources and sinks for the municipality;
c) Inventory the rates of the sources and sinks using a combination of utility/billing information, and spreadsheet calculations;
d) Provide a GHG Emission Inventory Report with suggestions to reach aggressive eCO_2 emissions targets; this will satisfy all the requirements of Milestone 1 and 2 of the Partners for Climate Protection (PCP) and satisfy some of the requirements for Milestone 3;
e) Provide and advise on a plan for the calculation of eCO_2 that can be used on an annual or semi-annual basis for the municipality; and
f) Provide a GHG emission inventory protocol and template that can easily be modified and adapted for other municipalities.

AMEC has obtained and reviewed the Climate Registry Carbon Accounting standards, Newfoundland and Labrador Climate Change Action Plan (2005), and the Climate Registry's Protocols among many other documents in order to prepare this Report. Our Report is structured to address each of the above-referenced objectives.

1.1 Community Profile

The Town of Conception Bay South is located in the southeast of Conception Bay on Newfoundland's Avalon Peninsula (Figure 1-1). The 2006 Census of Canada indicated that the population of the Town was 21,966, with 8,248 dwellings. The Town continues to grow, both in terms of population and infrastructure, and has a thriving business community (Town of CBS, Aug 25 2009).

1.2 Partners for Climate Protection

The Partners for Climate Protection (PCP) program is a network of Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change. The PCP is the Canadian component of ICLEI's (Local Governments for Sustainability) Cities for Climate Protection network, which involves more than 900 communities worldwide (PCP website, Aug 25, 2009).

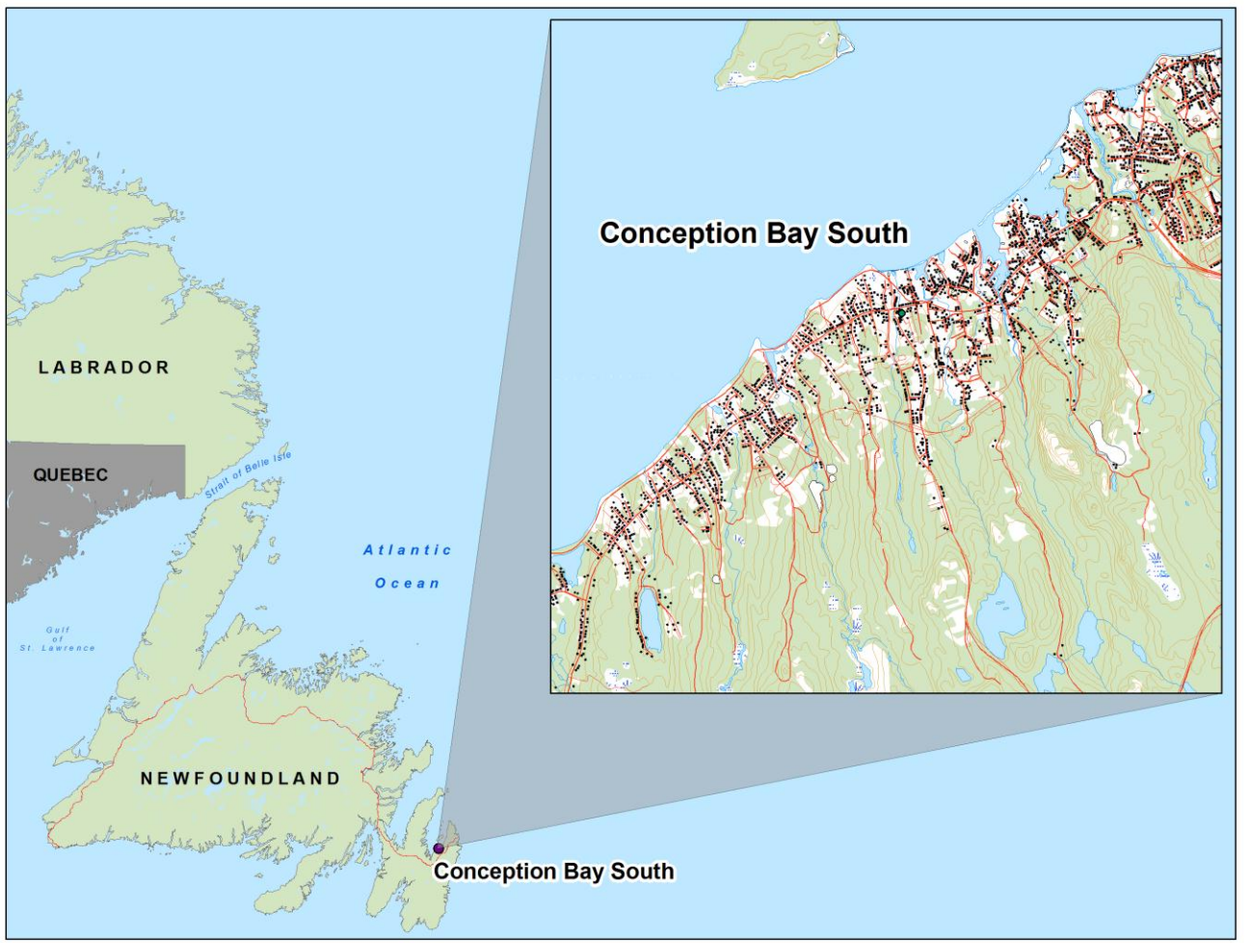


Figure 1-1. Location of CBS

1.2.1 Joining the Partners for Climate Protection Program

The Town of CBS joined the Partners for Climate Protection in 2003 but have not been able to complete any of five milestones, which includes a GHG Emissions Inventory. This report satisfies the first two milestones and gives the Town the tools to complete the other milestones and be in compliance with the PCP.

1.2.2 Partners for Climate Protection Process

PCP uses a five milestone framework to guide municipalities to reduce GHG emissions. The five milestone process is a performance-based model which remains flexible; milestones do not need to be completed in sequential order and each milestone provides an opportunity for municipal capacity building.

The five milestones are:

- Milestone 1: Creating a GHG emissions inventory and forecast;
- Milestone 2: Setting an emissions reductions target;
- Milestone 3: Developing a local action plan;
- Milestone 4: Implementing the local action plan or a set of activities; and
- Milestone 5: Monitoring progress and reporting results (PCP website, August 25, 2009).

This Project satisfied milestones 1 and 2, by creating a GHG inventory and forecast for CBS as well as setting an emissions reduction target. Additionally, the results of this report aid the Town in the development of a local action plan.

2.0 Methodology

Developing a one-time estimate of the current and future carbon footprint is relatively straight forward; however, the challenge of the Project was the careful documentation and management of the method and future expectations. In order to ensure that the approach developed meets the best current standards and the best standards for future verification and audit, the World Business Council on Sustainable Development & World Resources Institute Corporate Accounting and Reporting Standards (Corporate Standard) (2004) (GHG Protocol) and International Standards Organization for Standardization (ISO) 14064: International Standard for GHG Emissions Inventories and Verification (2006) approaches were followed and adhered to. ISO has released a series of standards on GHG reporting that requires a consistent and well documented approach. The key aspect of this approach is a “process” standard on accounting and reporting of GHG emissions. The use of recognized standards in footprint development adds weight and credibility to the body of work provided and helps to anticipate any future

change in government policy. It is also important to note that the Climate Registry's Protocol is also based upon ISO 14064-1.

The Project focused on using the GHG Protocol/ISO 14064 process structure to direct and document all steps of the Carbon Footprint Analysis. In so doing, the final product meets the necessary GHG Protocol/ISO 14064 requirements, but more importantly ensures it is well documented and can be used and updated as needed. A very tight, well defined approach was necessary to provide sufficient guidance and direction to allow for rapid re-assessment and modification for different proposals and approaches.

Similarly, there are many other significant considerations that were defined through the GHG Protocol/ISO 14064 process as part of the Project. Our approach was designed to not only follow the GHG Protocol/ISO 14064 process, but also to ensure that key decisions and assumptions are made at appropriate times during the Project and are well documented.

In an effort to clearly understand, document and communicate the complexity of calculating an accurate Carbon Footprint for this municipality, AMEC professionals visited CBS at the beginning of the Project and presented methodology and data requirements. Results of the Project will also be presented to the Town.

2.1.1 Terminology and Calculations

All estimates have been calculated using the ICLEI spreadsheet available on the PCP website. Some of the calculations had to be modified based on the available data. These calculations that have been added to the spreadsheet have been clearly marked within the spreadsheet itself.

Calculations are presented in CO_2 equivalence (eCO_2), which represents how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO_2) as the reference. Only CO_2, NO_2, and CH_4 were considered for this study.

It should be noted that eCO_2 emissions intensity on Newfoundland and Labrador Hydro's Island Interconnected System is mainly determined by output at the Holyrood Thermal Generating Station, which is influenced by the amount of inflow to reservoirs, changes in load forecast (i.e. downtime at an industrial customer, and/or new industrial customers like Vale Inco), a warmer or colder than usual winter, etc. GHG intensity for Newfoundland and Labrador Hydro's Island Interconnected System will vary from year to year, due to variances in the amount of emitting and non-emitting generation used to serve load.

2.1.2 Baseline Year

The PCP program suggests that local governments compile their inventories for 2000 or for the year with the best available information. As the best available, detailed, and completed information at the time of the project initiation was **2008**, this was deemed the best year for the baseline. The emissions reduction targets and forecasting will be 10 years after the baseline year **(2018)**.

2.1.3 Footprint

The footprint of the inventory covered the jurisdictional boundaries of the municipality as shown in **Figure 2-1**. The NL Power municipality code for CBS is 114.

As some of the reference material had calculations based on larger areas (province-wide, region-wide, or Canada-wide), those estimates had to be scaled to the municipality by multiplying the original estimate by the population of the town divided by the population included in the original estimate.

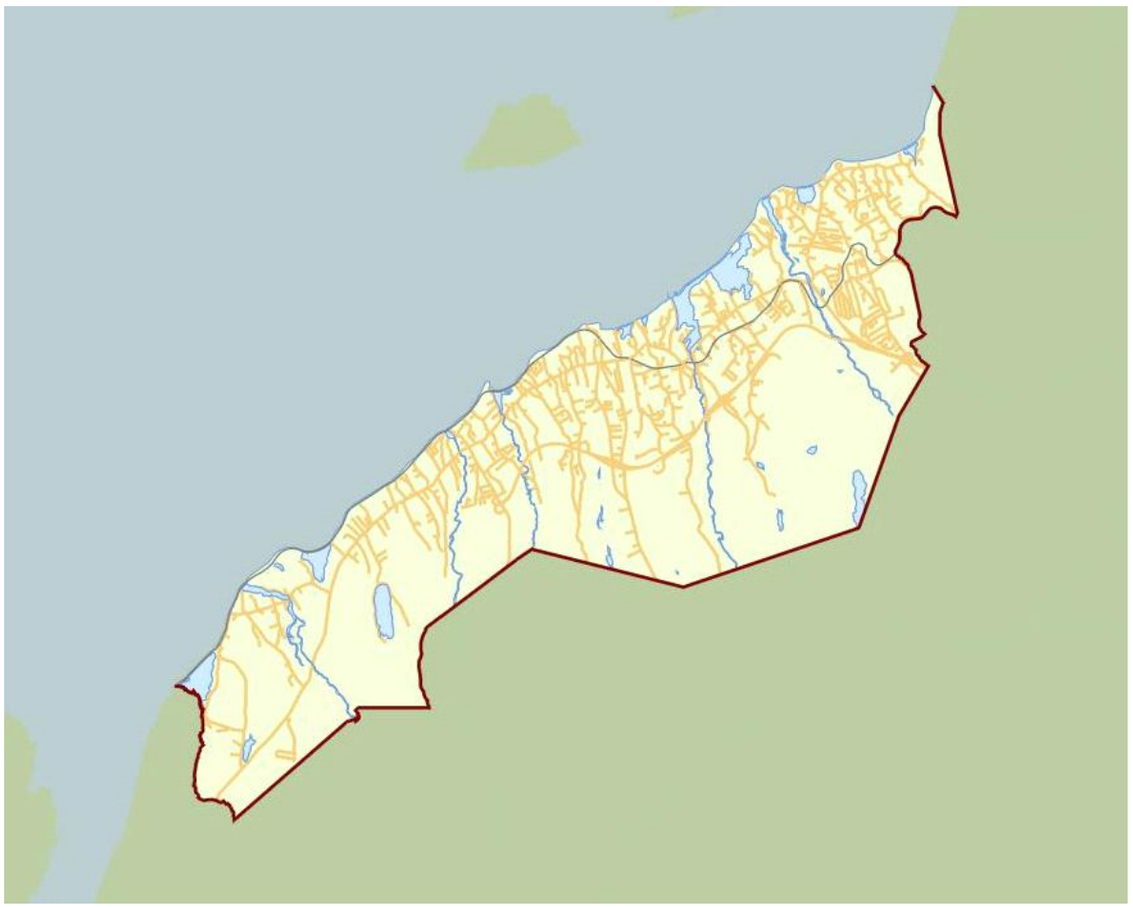


Figure 2-1. Footprint of CBS Inventory

2.1.4 Data Sources

The data were collected from a variety of sources as outlined below in **Table 2-1**. All data within the spreadsheet is referenced listed in Section 8.0 of this report.

Table 2-1 List of Data Sources

Data	Name and Title	Department	Contact Information
All Municipal Information (Buildings, fleet info, water and wastewater)	Elaine Mitchell, MCIP, Director of Planning and Development	Town of CBS	emitchell@conceptionbaysouth.ca
Residential and General Service Accounts (kWh)	Sharon Keough	Newfoundland Power	skeough@newfoundlandpower.com
Detailed General Service Accounts (kWh)	Marcia Sheppard	Newfoundland Power	msheppar@newfoundlandpower.com
Emission Factor for Grid	Trent Carter, Ecologist	Environmental Services Newfoundland and Labrador Hydro	709 737-1955 TCarter@nlh.nl.ca
2006 Census Data 2001 Census Data	-	Statistics Canada	http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E
Estimates of Heating Oil Usage	Glen Ewaschuk Senior Economist	Demand Policy & Analysis Division Office of Energy Efficiency Natural Resources Canada	(613) 947-8758 Glen.Ewaschuk@NRCan-RNCan.gc.ca

2.2 Inventory Quantification Support Spreadsheet

This GHG Inventory was produced using a modified version of the ICLEI Inventory Quantification Support Spreadsheet (IQSS) and the associated International Local Government Greenhouse Gas Emission Protocol. The IQSS is designed to summarize both Corporate and Community emissions and to provide indicators against which the emissions may be benchmarked. While every effort has been made to include data for all benchmarks, this has

not always been possible where either data was missing or where there was a high degree of uncertainty.

2.2.1 Corporate Emissions

Corporate GHG Emissions are broken down into the five categories of Buildings, Vehicle Fleet, Street Lights, Water & Wastewater and Solid Waste.

2.2.2 Community Emissions

Community GHG Emissions are broken down into the five categories of Residential Buildings, Commercial Buildings, Industrial Buildings, Transportation, and Solid Waste.

3.0 Milestone #1- GHG Emissions Inventory and Forecast

3.1 The Corporate (Local Government) Inventory

The local government operations inventory considers five sectors:

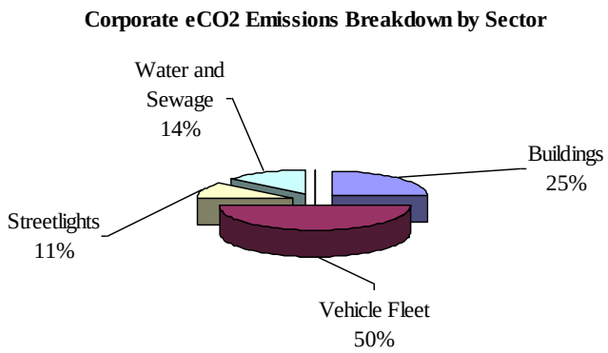
- Buildings
- Outdoor lighting
- Wastewater and potable water
- Vehicle fleet
- Solid Waste collected at a facility-owned and operated by the local government

As the local government only picks up and transports waste to the collection facility run by the City of St. John's, all solid waste collected within the Town of CBS was allocated to the community inventory as detailed in Section 3.2.2.

The other four sectors are illustrated in **Figure 3-1** and outlined below. This totalled **1,403 tonnes** of eCO_2 for the corporate inventory for the Town of CBS.

2008 Corporate eCO_2 Emissions Breakdown by Sector

Sector	Total eCO_2 (t)
Buildings	346
Vehicle Fleet	706
Streetlights	154
Water and Sewage	197
Corporate Waste*	-
Total	**1,403**



2008 Corporate eCO_2 Emissions Breakdown by Source

Energy Type	Total eCO_2 (t)
Electricity	678
Natural Gas	0
CNG	0
Diesel	422
District Energy	0
Ethanol Blend	0
Fuel Oil	19
Gasoline	284
Propane	0
Waste	0
Total	**1,403**

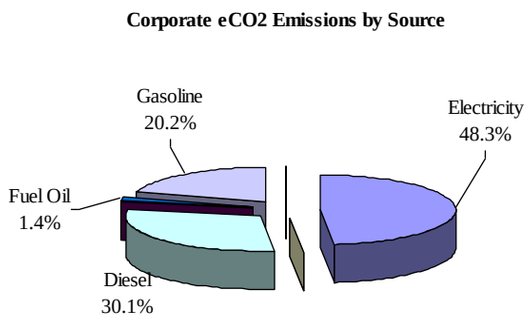


Figure 3-1. Breakdown of Corporate Inventory by Sector and Source

3.1.1 Buildings

The Town of CBS pays utilities on 23 facilities consisting of buildings (5), houses (8), emergency fire services (2), and recreational facilities (8).

For each facility, the amount of electricity consumed (kWh) and area (m^2) was collected. The top five emitters are listed in **Table 3-1**.

Table 3-1 Highest Facility Emissions

Address	Function	Emissions ($t\ eCO_2$)	Emissions per 1000 m^2
70 Legion Road	Public Stadium	128.3	52.3
10 Rideouts Rd	Public Pool	126.6	72.1
C B Hwy Manuac-	Public Works Depot	25.1	52.5
Lions Rd-	Soccer Hut	14.1	58.5
Bldg, C B Hwy Manuac	Town Hall	12.8	40.5

3.1.2 Vehicle Fleet

The Town of CBS has a vehicle fleet of 59 vehicles including 23 diesel and 36 gasoline vehicles. The top ten highest and lowest emitters are listed below in **Table 3-2**.

Table 3-2 Highest/Lowest Vehicle Emitters

Highest Emitters		Lowest Emitters	
Vehicle (Year and Make)	Annual eCO_2 Emissions (t)	Vehicle (Year and Make)	Annual eCO_2 Emissions (t)
07 Sterling Roll-off	75.5	97 Ford Pickup	0.5
97 Tandem	35.1	08 Dodge Ram	1.0
07 Sterling Dump	34.2	02 Ford 150 Pickup	1.7
07 Komatsu Loader	34.0	06 Ford Pickup	2.3
05 Sterling L Series	30.5	06 Ford Pickup	2.4
02 Dump	26.3	08 Dodge Ram	2.8
05 JD Backhoe	23.0	08 Dodge Ram	3.3
04 Sweeper	21.2	99 Pumper	3.8
99 Dump	20.9	06 Ford Pickup	4.0
02 Chevy Dump	18.4	06 Ford Pickup	4.1

3.1.3 Street, Traffic, and Area Lights

All the street, traffic, and crosswalk lights and their corresponding emissions are listed in **Table 3-3**. A total of 154 tonnes of eCO_2 is released every year due to lighting.

Table 3-3 Emissions from Electricity for Lights

Light Type	Annual eCO_2 Emissions (t)
Street Lighting	145.32
Traffic Lights, C B Hwy Manuac-Cherry Lane	4.58
Traffic Lights at Bishops Rd & C B Hwy	0.73
Traffic Lights at CRN Terminal Rd & Hwy	1.35
Traffic Lights LonPoc-corner Perrins Rd Tilley's Rd S opposite Ultramar	1.03
Crosswalk Long Pond	0.55
Lighting in Culvert, Country Path Rd-121-147	0.43
Culvert Over Pass, Ancorage Rd-123-143	0.06
Total	**154.04**

3.1.4 Water and Waste Water System

All electricity consumption for water and wastewater was identified and is listed in **Table 3-4**. A total of 177.6 tonnes of eCO_2 is released every year due to the water and wastewater system.

Table 3-4 Water and Waste Water Systems

System	Annual eCO_2 Emissions (t)
Main/Treat Plant Hwy Topsac	9.9
Lift Stations	91.1
Sewage Treatment-22 Goodland	76.1
Water Towers-Fowlers road	0.5
Total	**177.6**

3.2 The Community Inventory

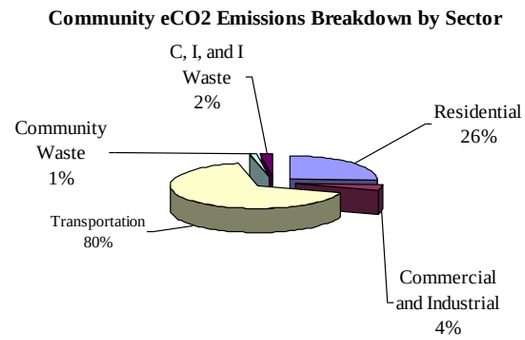
The community inventory considers four sectors:

- Residential
- Commercial, Industrial, and Institutional
- Transportation
- Waste

These four sectors are illustrated in **Figure 3-2** and outlined below. This totalled **143,753** tonnes of eCO_2 for the community inventory for the Town of CBS. It is important to note that the waste estimates also include municipal wastes.

2008 Community eCO_2 Emissions Breakdown by Sector

Sector	Total eCO_2 (t)
Residential	37,596
Commercial and Industrial	5,093
Transportation	96,044
Community Waste	2,008
C, I, and I Waste	3,012
Total	**143,753**



2008 Community eCO_2 Emissions Breakdown by Source

Energy Type	Total eCO_2 (t)
Electricity	28,809
Natural Gas	-
District Energy	-
Fuel Oil	13,879
Diesel	31,355
Gasoline	64,690
Propane	0
Waste	5,021
Total	**143,753**

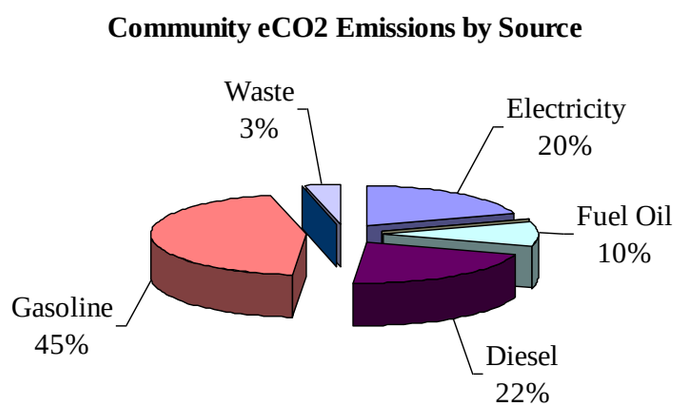


Figure 3-2. Breakdown of Community Inventory by Sector and Source

3.2.1 Residential Sector

As can be seen in **Figure 3-3**, the majority of the emissions from the residential sector comes from electricity (63%, or 23,716 tonnes) followed by fuel oil (37%, or 13,879 tonnes).

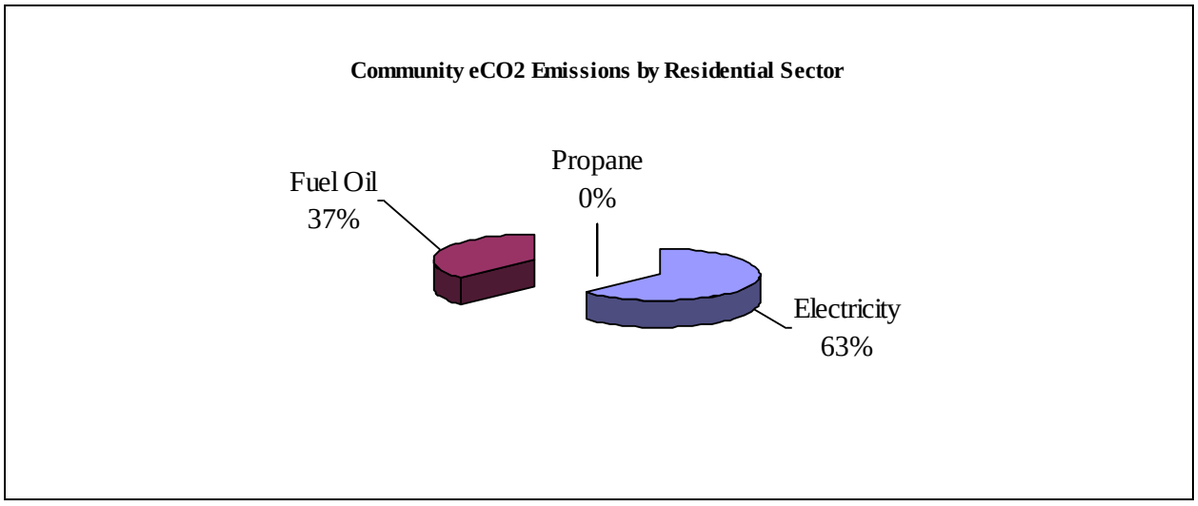


Figure 3-3. Breakdown of Residential Sector by Source

3.2.2 Commercial, Industrial, and Institutional Sectors

The commercial sector accounts for **5,093 tonnes** of eCO_2 which breaks down to ~597 tonnes per establishment or ~1,793 tonnes per employee.

3.2.3 Transportation

Transportation was based on the net and gross sales of gasoline and diesel fuel in NL, respectively. Data for gross diesel in NL was unavailable due to confidentiality restrictions (Alex Smale, Department of Transportation, personal communication). Diesel consumption by transportation was responsible for **31,355 tonnes** of eCO_2 and gasoline was responsible for **64,690 tonnes** of eCO_2.

3.2.4 Community Waste

Community waste was partitioned into residential waste and waste from commercial, industrial, and institutional sources (CII). A total of **3,012 tonnes** of eCO_2 was contributed to CII and **2,008 tonnes** were contributable to residential waste.

2008 Waste Estimates

Waste Source	Solid Waste (t)	Total eCO_2 (t)
Residential Waste to landfill	4,169	**2,008**
C, I, and I Waste to landfill	6,254	**3,012**

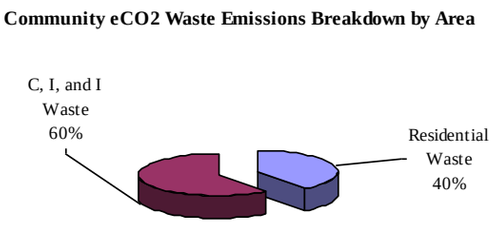


Figure 3-4. Breakdown of Residential Sector by Source

3.3 Average Household Inventory

Household emissions were also estimated by scaling the community wide estimates into the number of households. As can be seen, the largest source by far in the average household is gasoline from the automobile.

2008 Per Household Estimates

Source	Total Use	Total eCO_2 (t)
Electricity	20,977 kWh	3
Fuel Oil	620 L	2
Gasoline	8 L	8
Waste	1 t	0
Total	**-**	**13**

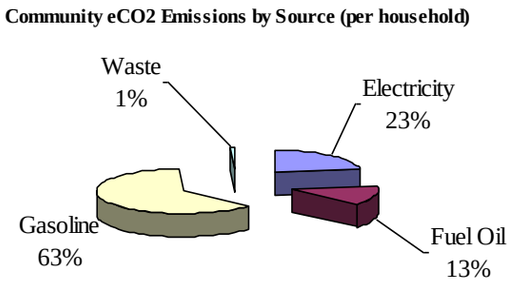


Figure 3-5. Breakdown of Residential Sector Per Household

3.4 GHG Forecast

3.4.1 Growth Estimates

Population growth is based on census results from 2001 and 2006 and new residences and business are based on number of permits from the last 9 years as well as census results from 2001 and 2006.

This data was compiled and illustrated in **Figure 3-6**. Bases on these projections, the number of residences in CBS from 2008 to 2018 is projected to grow from **8,149** to **10,590** and the number of businesses is projected to increase from **597** to **731**, an increase of 26% and 22%, respectively.

It was assumed that the municipal infrastructure would grow at a similar rate (24%).

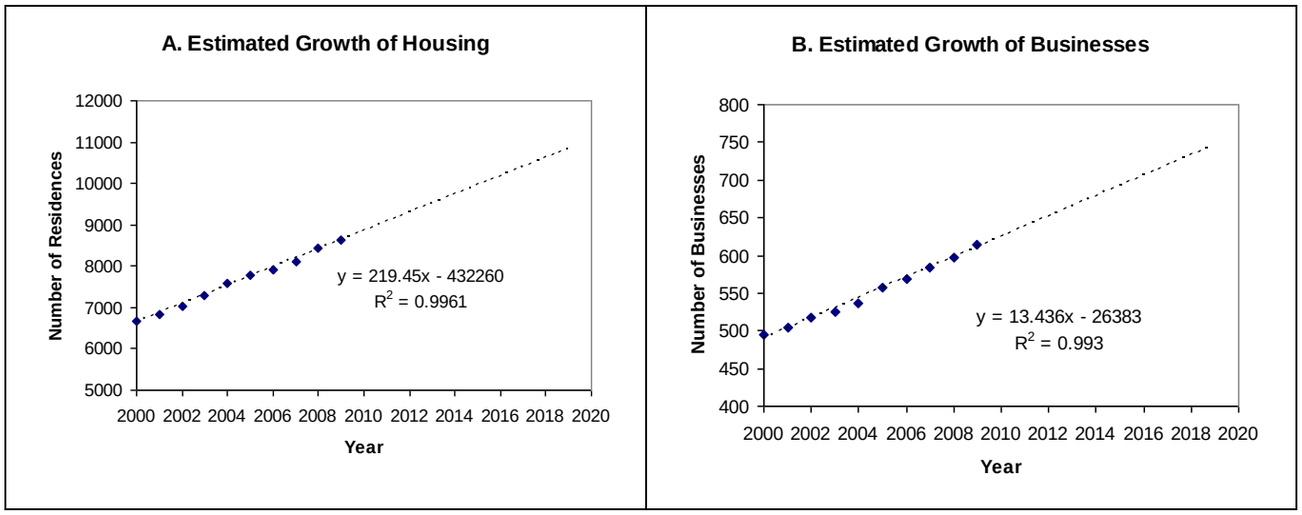


Figure 3-6. Forecasts of Growth

3.4.2 GHG Forecast

The forecast is a projection of the inventory for 2018 assuming a business as usual model. It is also assumed that the emission coefficients will remain the same, although there is a possibility that this may change due to the Lower Churchill Hydro Electric Development Project.

Using these assumptions, the GHG emissions in 2018 for the community is forecast to be **191,624 tonnes** of eCO_2, a 34% increase from 2008. The corporate inventory is projected to increase to **1,740 tonnes** of eCO_2, a 24% increase from 2008.

4.0 Milestone #2- Developing GHG Reduction Targets

4.1 Recommended Emissions Targets

An emission reduction target is the quantity of emissions the municipal government aims to reduce through various emissions reduction measures outlined in a local action plan. The PCP recommends the following reductions:

- A **20% reduction** in GHG emissions below baseline levels for municipal operations within 10 years.

- A **six percent** reduction in GHG emissions below baseline levels for the community within 10 years.

For CBS, this would equal a reduction of **281 tonnes** of GHG reductions by 2018 by the municipal operations and **8,625 tonnes** reduction on the community level as compared to the 2008 levels.

Note that these are not the required targets from the PCP but just suggested targets. It is up to the municipality to set their own targets.

5.0 Milestone #3- Developing a Local Action Plan

A local action plan (LAP) is a strategic document that outlines how your municipality will achieve its GHG emissions reduction target. Links must also be established between the LAP and the municipal government's official plan and other planning documents.

Many communities develop two separate LAPs — one for municipal operations and one for the community as a whole. Although the reduction potential from the community is significantly greater than that from municipal operations, PCP encourages municipal governments to develop and implement a plan for municipal operations first. By going first, your municipality can demonstrate leadership and provide a positive example for the community to follow. Also, the experience gained in making the smaller municipal LAP can then be applied to the community-wide LAP, which is typically more complex to develop and implement, requiring input and coordination from many stakeholders, such as citizens' groups, non-governmental organizations and the private sector.

An LAP generally includes:

- a summary of baseline emissions forecasts and targets (Section 3.0 and 4.0 of this report);
- a set of existing and proposed emissions reduction actions (section 5.1);
- implementation strategies, including the resources involved; and
- input from stakeholders.

5.1 Existing Emission Reduction Actions

The Town of CBS has already enacted some important GHG reduction initiatives as outlined below.

All calculations for reduction actions are listed in **Appendix 3.**

Tree Planting Scheme

The Town of CBS has undertaken a tree planting program whereby each lot built within a subdivision must plant a tree in the front of the property. In 2008, it was estimate that 175 trees were planted on residential lots due to this requirement. The most popular variety are maple but the building inspectors see a mixture of deciduous and coniferous trees.

Recycling Program

The Town of CBS undertakes a small recycling operation and has recycling estimates of paper and cardboard for 2008 and 2009. CBS recycled 346.39 tonnes of cardboard and paper in 2008. Assuming this waste would have been disposed of in a landfill if it had not been recycled, this action saved **485 tonnes** of eCO_2 annually.

Paperless Meetings

Started in 2010, the Town has instituted a policy of paperless meetings. All Council and committee meetings are paperless and reference material is viewed digitally. This is estimated to save approximately 25,000 sheets each year and saving three to four trees each year, an annual reduction in eCO_2 **0.2 tonnes**.

5.2 Proposed/Potential Emission Reduction Actions

There are numerous programs and initiatives that can be implemented in order for CBS to meet its target reductions. Listed below is a non-exhaustive list of several options that are available, many of which are based on the *Quick Action Guide: Municipal Action on Climate Protection.* Other resources that can be used to gather ideas regarding GHG reduction initiatives are outlined in **Table 5-1**. It is also important the proposed actions have variable amounts of GHG reductions, financial costs, and effort. It is up to the Town and residents of CBS to decide the most cost-effective option to pursue.

Table 5-1 List of References and guides to reducing GHG emissions

Author	Title	Description
Government of Alberta	[1]Alberta's 2008 Climate Change Strategy	Can view community initiatives from Alberta that have been enacted to reduce GHG emissions
Government of Alberta	[2]Alberta's Action Plan to Reduce GHG Emissions	Can view community initiatives from Alberta that have been enacted to reduce GHG emissions
Conservation Corps of Newfoundland and Labrador	[3]Climate Change Education Centre	Provides public education and outreach that covers a wide scope of climate change related information.
Pew Centre on Global Climate Change	[4]State and local net greenhouse gas emissions reduction programs	Can view community initiatives from all over the US that have been enacted to reduce GHG emissions

Table 5-1 List of References and guides to reducing GHG emissions

Author	Title	Description
Federation of Canadian Municipalities	[5]*Quick Action Guide: Municipal Action on Climate Protection-20 steps you can take to curb greenhouse gas emissions-now!*	List of 20 steps to reduce GHG emissions that includes examples of successful programs in other parts of Canada
Government of Manitoba	[6]Manitoba Action Plan to Reduce GHG Emissions	Can view community initiatives from Manitoba that have been enacted to reduce GHG emissions

[1]http://www.environment.alberta.ca/2430.html
[2]http://environment.alberta.ca/2792.html
[3]www.climatechangeeducation.ca/&title=Climate%20Change%20Education%20Centre
[4]http://www.pewclimate.org/states.cfm
[5]http://www.sustainablecommunities.fcm.ca/files/Capacity_Building_-_PCP/pcp-quick-action-guide-En.pdf
[6]http://www.gov.mb.ca/conservation/climate/index.html

Corporate Inventory Initiatives

Municipal Fleet

Alternative Fuel

Many alternative fuels such as ethanol, biofuel, or natural gas can be used in existing engines with little or no modifications. If CBS were to switch to a 20% biodiesel mixture, the emissions relating to the municipal fleet, would decrease by **84 tonnes**. Just this change alone would help CBS reach one third of the way to the 281 tonne reduction target.

Anti-idling Campaigns

Municipally-owned vehicles account for an average of 50% of corporate GHG. Municipalities can achieve reductions in the fleet sector by including information on climate-friendly actions in driver instruction procedures and encouraging employees to use alternative transport. In 2001, the City of Mississauga (ON) partnered with Natural Resources Canada (NRCan) to deliver a pilot anti-idling program. NRCan's online tool kit of anti-idling ideas and promotional materials was used in combination with personal interventions to address idling issues with residents, the private sector and professional drivers (including GO public transit staff and school bus drivers). The campaign reached 69% of the city's residents; a survey of those reached reported a decrease in idling times by three to four times, compared to citizens who had not been exposed to the project. School bus drivers achieved similar idling time reductions and the city's public transit company adopted a policy to decrease its maximum bus idling time from 15 minutes to five minutes.

Gander also introduced anti-idling and driving guidelines in its employee driving manual. It was estimated that these policies would increase mileage by 25%. If CBS enacted similar guidelines, this could translate into a potential GHG reduction of **177 tonnes** of eCO_2.

Traffic Lights

Traffic lights accounted for three percent of the corporate inventory emissions. LED lights are 80-90% more efficient and last ten times longer than ordinary lights. If all current lights in CBS were replaced by LEDs, this would decrease emissions due to lights by approximately **six tonnes**.

New Building Guidelines

LEED Canada is Leadership in Energy and Environmental Design Green Building Rating System. The LEED council works to change industry standards, develop best design practices and guidelines, advocate for green buildings, and develop educational tools to support its members in implementing sustainable design and construction practices. Using LEED approved designs and architects will reduce the GHG emissions from any future buildings built within the municipality as compared to standard practices.

Community Inventory Initiatives

Clothesline Initiatives

The average Household clothes dryers emit two kg of eCO_2 per load. If all of the residents of CBS use their clothesline even 30% of the time in lieu of the dryer, over **1,897 tonnes** of eCO_2 emissions would be eliminated every year assuming an average family rate of 400 loads per year[1].

Residential Energy Efficiency Initiatives

Municipalities promote residential energy efficiency in many different ways. Several communities host non-profit organizations that provide residential audits of waste, water and energy use under Natural Resource Canada's EnerGuide for Houses Program. Once evaluations are completed, staff provide residents with recommendations for infrastructure and lifestyle changes they can make to generate financial savings and reduce their GHG emissions. The Town of Okotoks (AB) has undertaken a groundbreaking project by developing a 74-home subdivision that will demonstrate solar seasonal storage technology. Through the winter, homes will be heated with solar energy collected during the spring, summer and fall and distributed by a district heating system. The project is the first of its kind to employ solar seasonal storage in North America. It will lead to GHG reductions of approximately 2.4 tonnes per year, per household, along with a reduction in water use of 200 litres per household, per day as a result of added water conservation measures. CBS had 299 new home permits issued in 2008. If a similar project to the one in Okotoks was undertaken, this would result in a reduction of **718 tonnes**.

[1] 400 loads per year is average for a single family home in the US according to *Washington Post* Nature's Dryer Revisited Thursday August 17, 2006

Tree Planting

CBS currently has a tree planting regulation for new home construction. Each lot built within a subdivision must plant a tree in the front of the property. In 2008, it was estimated that 175 trees were planted on residential lots due to this requirement. The most popular species in a maple but the building inspectors see a mixture of deciduous and coniferous trees, an estimated annual reduction of **96 tonnes** of eCO_2.

Water Conservation Initiatives

Rain barrels at reduced prices
Other municipalities such as the City of Vancouver (BS) manufacture and sell rain barrels at 50% of their cost. Barrels are useful in serving the practical purpose of collecting rainwater for use in home gardening, but also useful in raising public awareness of wasteful irrigation practices. This means less water is pumped and treated. A 30% reduction in the amount of energy used for pumping would reduce the inventory by **27 tonnes**.

Clean Water Awareness Programs
More than 220 Canadian communities have joined an awareness and outreach initiative called the Yellow Fish Road Program. Working with volunteer groups like the Girl Guides of Canada, your municipality can co-ordinate this education and outreach program designed to raise awareness of the importance of clean water, the water supply process, and the need to protect water sources by keeping harmful chemicals out of storm sewer systems. Volunteers use a special stencil to paint yellow fish beside storm sewer drains and hand out literature to remind residents not to dump chemicals down the storm sewer. If residents can be taught the importance of protecting and conserving clean water, these lessons may translate into reduced water use. Improved water conservation means reduced water treatment and pumping requirements, less energy use at treatment facilities and a reduction in associated GHG production. The City of Calgary (AB) employed the Yellow Fish Road Program as part of its campaign to teach thousands of the city's children about clean water issues.

Solid Waste Reduction Initiatives

Bag Limits
Having bag limits on curbside waste would also reduce the amount of waste sent to the landfill and encourage more waste to be diverted into the current cardboard and paper recycling or other potential programs like the composting initiatives. Bag limits send a message aimed at changing behaviour and setting community standards for waste. Other communities have implemented "pay as you throw" (PAYT) and bag limits and have seen reductions in waste by as much as 50%. For CBS to reduce their waste by 50%, this would translate into a reduction in **1,004 tonnes** of eCO_2.

Composting Programs

According to MMSB, organics make up to 30% of household wastes in Newfoundland and Labrador. A 30% reduction in waste in CBS would result in a reduction in **602 tonnes** of GHG emissions. A community composting program in conjunction with the cardboard and paper recycling program make a large impact on the GHG reduction for the community.

Transportation Initiatives

Transportation accounts for over 80% of the community GHG emissions. Community programs such as bike-friendly infrastructure, commuter challenges, and carpooling initiatives offer a cost-effective way to make a significant impact on GHG emissions reduction targets.

Bike-friendly infrastructure

Bike lanes, trails and racks make cycling a safer, more attractive option for travel and commuting. For example, employers might be encouraged to provide a bicycle for employees to travel to local meetings. With a little research, employers can determine which type of bike and equipment will be most useful to employees. In the City of Fredericton (NB) cyclists, skiers, snowshoers and pedestrians alike can enjoy some 65 km of linear trails. By giving priority to the continued expansion and development of linear trails in its Capital City Municipal Plan, Fredericton has committed itself to developing a city-wide trail network that will enhance the recreational and commuting options of its residents.

Commuter Challenges

The Commuter Challenge is a friendly competition between Canadian communities to encourage as many people as possible to use sustainable and active modes of transportation. Environment Canada organizes the event for one week each spring. Community registration is easily completed online. Many communities promote the event through their transportation departments and often partner with local non-profit groups to increase the awareness of the program and participation. Intercommunity challenges between government and large business spur friendly rivalries. More than 97 communities participated in the 2004 Commuter Challenge, reducing their GHG emissions by more than 600 tonnes. Municipalities of all sizes participated in the Challenge, including: Annapolis Royal (NS), Sackville (NB) and Montreal (QC).

Carpooling Initiatives

A large number of residents in CBS commute to nearby areas such as Mount Pearl (11 km from CBS) and St. John's (19 km from CBS) for work. In the 2006 census, 1,930 people worked in CBS and 6,610 worked outside of CBS. If every person were to buddy up, and assuming an average commute of 15 km each way, assuming 240 working days per year, a buddy up system would save approximately **5,949 tonnes** of GHG emissions per year (assuming car MPG of 10.6 L per 100km). This action alone could account for 80% of the community reduction goal. Another option is a shuttle bus that runs between CBS and some of the major employment areas.

Community Gardening

Surplus municipal land can be given new life when allocated to community groups interested in gardening. These gardens provide many benefits to the community, including the fact that food is produced locally, thereby reducing emissions generated by transporting food from outside the community. Community gardens also improve community security and spirit, and serve as meeting places and educational tools for school children. Further, the plants in these gardens will sequester carbon, offsetting a portion of a community's GHG emissions and improving air quality. Many municipalities have established partnerships with community groups to deliver garden programs and promote additional urban greening initiatives such as rooftop gardening. The City of Vancouver's (BC) Parks Board allows non-profit groups to establish gardens on unused parkland. The city provides the land, clears the grass and adds compost, while community groups establish educational programs for school children and other residents. To date, ten gardens have been planted.

5.3 Cost/Benefit of Initiatives

Listed below in **Table 5-2** are the potential initiatives outlined above, the potential annual reductions, and the type of effort the initiative would take. Notice that only 4 of the twelve listed have a substantial capital expenditure.

Table 5-2 List of References and guides to reducing GHG emissions

Initiative	Potential Savings (tonnes)	Process
Cardboard/paper Recycling	485	**Ongoing**
Paperless Meeting	0.2	**Ongoing**
Alternative Fuel	84	**Capital Expenditure**
Anti-idling Campaign	177	**Procedural**
Traffic Lights	6	**Capital Expenditure**
Clothesline Initiative	1,897	**Educational**
Residential Energy Efficiencies	718	**Capital Expenditure**
Tree Planting	96	**Ongoing**
Water Conservation	27	**Capital Expenditure**
Bag Limits	1,004	**Procedural**
Composting	602	**Educational**
Carpooling	5,949	**Educational**

5.4 Local Action Plan- Next Steps

One of the most important steps of creating a local action plan is engaging the public. Public meetings should be held to engage, educate, motivate, and support local residents in regards

to the local action plan. The meeting should include a background presentation as well as a community discussion.

The presentation will include background information on the importance of GHG emissions reductions, a summary of the GHG inventory, the projections for 2018, and the targets. The public participation component of the meeting will include listing and explaining potential community and Town initiatives to reduce GHG emissions as outlined in Section 5.1 and 5.2 of this Report. Residents can then voice their opinion on the various pros and cons of each initiative and bring other ideas to the table.

The suggestions and consensus reached from the meeting will then be synthesized to create a Local Action Plan. Implementation strategies should include, but are not limited to:

- Details on costs, responsibilities, schedules, and funding sources;
- Plans to monitor the progress made towards the emissions reduction target and the implementation status of GHG reduction measures; and
- Consider integrating your GHG plans with Air Quality and Community Energy plans.

It is important to note that public funding is available to help municipalities with Milestone #2 through Milestone #5. Information on these funds is available on the sustainable communities' website[2].

6.0 Changes to the Grid

There is a possibility that all power provided to the Avalon will be generated by the proposed Lower Churchill Generation Project. The Lower Churchill Generation Project's two proposed installations, Gull Island and Muskrat Falls, will have a combined capacity of 3,074 MW and can provide 16.7 Terawatt hours of electricity per year. That is enough to supply hundreds of thousands of households annually and contribute significantly to the reduction of GHG emissions from thermal, coal and fossil fuel power generation.

The Project will address climate change concerns by reducing GHG emissions. In fact, the Project is a major part of the Province's strategy to reduce GHG emissions from increased electricity demand and to offset GHG emissions from other sources. Once in operation, the Project can displace more than 16 megatonnes of carbon dioxide emissions annually - the equivalent to the taking of 3.2 million vehicles off the road each year.

For CBS, assuming the Lower Churchill is online, the transmission line is built and sources the Avalon region, this would make the projected corporate inventory from 2018 to **899 tonnes**, a 35% decrease from 2008 levels and the community inventory to **153,620 tonnes**, a seven percent increase from 2008 levels.

[2] http://www.sustainablecommunities.fcm.ca/GMF

It is important to note that even if the proposed Lower Churchill Plan is developed and online in 2018, CBS will not meet its targets without supplemental actions.

7.0 Summary

On January 29, 2010, Canada inscribed in the Copenhagen Accord, its 2020 economy-wide target of a 17% reduction in greenhouse gases from 2005 levels. CBS's strong and aggressive commitment to a target reduction plan will help Canada to reach that goal; not only by reducing its own GHG emissions, but by paving the way for other communities within Newfoundland and Labrador to fulfill their obligation to making this world more sustainable.

8.0 References

(all references used for the baseline calculations are included in **Appendix A**)

Federation of Canadian Municipalities (no date). *Quick Action Guide: Municipal Action on Climate Protection-20 steps you can't take to curb greenhouse gas emissions-now!*

Government of Canada, Statistics Canada (2006). Census of Canada. www.statscan.gc.ca.

McPherson, E.G., and J.R Simpson. 1999. Guidelines for calculating carbon dioxide reductions through urban forestry programs. Gen. Tech. Rep. PSW-171. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

APPENDIX A

List of References

APPENDIX B

GHG Inventory Spreadsheet

APPENDIX C

Table of Calculations for GHG Reductions and Annual Savings

Table C-1. Table of Calculations for GHG Reductions and Annual Savings

Initiative	Calculation	Values	Potential Savings (tonnes)
Cardboard/ paper Recycling	$\Delta GHG_{an} = c * B$ **Whereas:** ΔGHG_{an}= Annual amount of eCO_2 reductions (in tonnes) due to activity ***C*** = eCO_2 (in tonnes) per tonne of paper and cardboard diverted from a landfill[1] **B** = Amount of paper and cardboard (in tonnes) recycled per year in 2008	***C*** = 1.4 **B** = 346.39	485
Paperless Meeting	$\Delta GHG_{an} = c_1 * c_2 * B$ **Whereas:** ΔGHG_{an}= Annual amount of eCO_2 reductions (in tonnes) due to activity C_1 = eCO_2 (in tonnes) per tonne of paper and cardboard diverted from a landfill[1] **B** = Amount of paper recycled per year (in sheets). C_2 = weight on one sheet of paper (in tonnes)	C_1 = 1.4 **B** = 25000 C_2 = 4.53 X 10^{-06}	0.2
Alternative Fuel	$\Delta GHG_{an} = \%_R * B$ **Whereas:** ΔGHG_{an}=Annual amount of eCO_2 reductions (in tonnes) due to activity ***B*** = 2008 eCO_2 (in tonnes) emissions for the diesel fleet $\%_R$ = Reduction in emissions from 20% biodiesel mix (%)	***B*** = 422 $\%_R$ = 20	84
Anti-idling Campaign	$\Delta GHG_{an} = \%_R * B$ **Whereas:** ΔGHG_{an}= Annual amount of eCO_2 reductions (in tonnes) due to activity ***B*** = 2008 eCO_2 (in tonnes) emissions for the entire municipal fleet $\%_R$ = Reduction in emissions anti-idling campaigns (%)	***B*** = 706 $\%_R$ = 25	177
Traffic Lights	$\Delta GHG_{an} = \%_R * B$ **Whereas:** ΔGHG_{an}= Annual amount of eCO_2 reductions (in tonnes) due to activity ***B*** = 2008 eCO_2 emissions for traffic lights (tonnes) $\%_R$ = Reduction (%) in emissions from LED lights[2]	***B*** = 7.69 $\%_R$ = 80	6

Initiative	Calculation	Values	Potential Savings (tonnes)
Clothesline Initiative	$\Delta GHG_{an} = \%_R * B$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity **$\%_R$** = Percent of the time using the clothesline in lieu of the dryer (%) **B** = Estimated 2008 emissions (in tonnes) from dryer use in CBS $B = c*\#_L*\#_F$ **Whereas:** ***C*** = average amount of eCO_2 per load for a dryer (kg) **$\#_L$** = Average amount (#) of loads of laundry for year for a family[3] **$\#_F$** = Number of families (based on residences) in CBS(#)	**$\%_R$** = 30 **B** = 6325 ***C*** = 2 **$\#_L$** = 400 **$\#_F$** = 7906	1897
Residential Energy Efficiencies	$\Delta GHG_{an} = C * R$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity ***C*** = Total eCO_2 tonnes reduction per year from each household [4] **R** = new homes in 2008 (#)	***C*** = 2.4 **R** = 299	718
Tree Planting	$\Delta GHG_{an} = c * B$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity ***c*** = amount of eCO_2 (tonnes) absorbed by a red maple per year[5] **B**= number of trees planted in 2008 (#)	***c*** = 0.5484 **B**= 175	96
Water Conservation	$\Delta GHG_{an} = \%_R * B$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity ***$\%_R$*** = Amount of reduction (%) in water usage due to rain barrels[4] **B** = Annual amount of eCO_2 emissions in 2008 from lift station (tonnes)	***$\%_R$*** = 30% **B** = 91.1	27
Bag Limits	$\Delta GHG_{an} = \%_R * B$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity **$\%_R$** = Amount of potential reductions (%) in waste with bag limits[4] **B** = Total eCO_2 emissions (tonnes) produced from waste in CBS in 2008	**$\%_R$** = 50% **B** = 2008	1004

Initiative	Calculation	Values	Potential Savings (tonnes)
Composting	$\Delta GHG_{an} = R * \%_R$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity **$\%_R$** = Amount of potential reductions (%) in waste if organic matter is removed and composted[6] **R** = Estimated total eCO_2 emissions (tonnes) produced from waste in CBS in 2008	**$\%_R$** = 30 **R** = 2008	602
Carpooling	$\Delta GHG_{an} = \%_R * B$ **Whereas:** **ΔGHG_{an}**= Annual amount of eCO_2 reductions (in tonnes) due to activity **$\%_R$** = 50% = Amount of potential reductions (%) in waste all commuters sharing a ride B = Estimated amount of eCO_2 emissions (in tonnes) from commuters in 2008 $B = \frac{c_1 * D*\#*T}{c_2}$ **Whereas:** **c_1** = average gas mileage for car in liters consumed per 100 km traveled (L/100 km)[7] ***D* =** average two-way distance from CBS to Mt. Pearl-St. John's (km) **T** = average number of commuting days in a year (days) # = number of commuting cars (number) **c_2** = Litre of gasoline combusted to produce per tonne of eCO_2 emitted (L/T)[7]	**$\%_R$** = 50% **B** = 11898 **c_1** = 10.6 ***D* =** 30 **T** = 240 # = 6610 **c_2** = 424	5949

[1]http://www.paper.org.uk/information/factsheets/greenhouse_gas.pdf
[2]LED lights are estimated to be 80% more efficient than incandescents
[3]This assumes that no clotheslines are currently being used whereas some clothesline use is probably common but no estimate is available
[4]Savings per household estimated from Okotok (AB) example in Federation of Canadian Municipalities *Quick Action Guide: Municipal Action on Climate Protection-20 steps you can take to curb greenhouse gas emissions-now!*
[5]Estimates based on M.-C. Lambert, C.-H. Ung, and F. Raulier "Canadian national tree aboveground biomass equations", 2005 NRC Canada and 2006 IPCC Guidelines for national Greenhouse Gas inventories", Table 4.3 and 4.4 of Chapter 4: Forest Land
[6]Estimated amount of household waste that is compostable in Newfoundland and Labrador (http://www.mmsb.nf.ca)
[7]ICLEI Spreadsheet