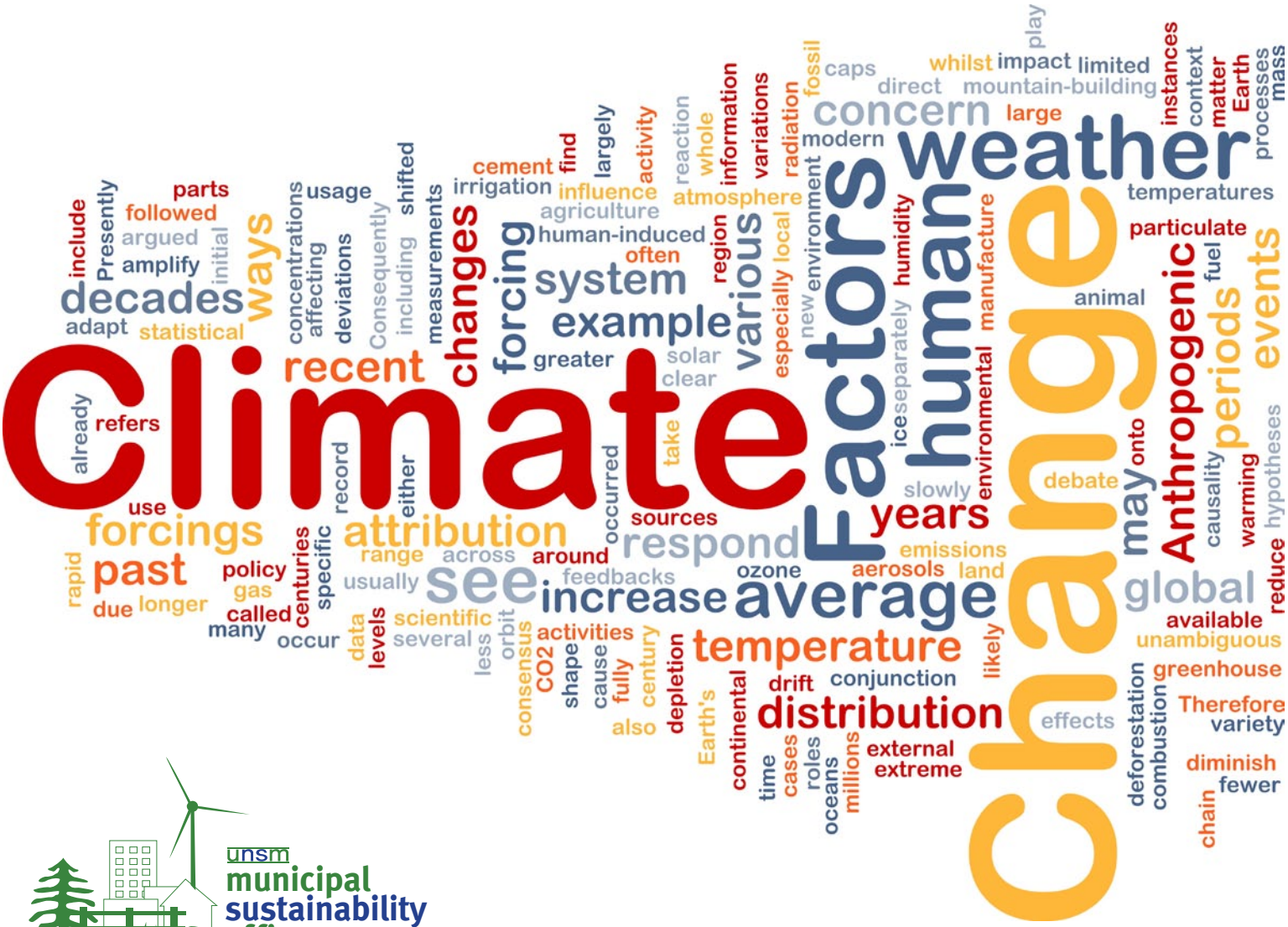

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REPORT

UNSM Municipal Climate Change Mitigation Plan Guide

Report Prepared for:
Union of Nova Scotia Municipalities' Municipal Sustainability Office
1809 Barrington Street, Suite 1106
Halifax, NS B3J 3K8

April 21, 2011

Stantec

This guide was developed with support from Nova Scotia Environment's Climate Change Directorate and Service Nova Scotia & Municipal Relations.

UNSM MUNICIPAL CLIMATE CHANGE MITIGATION PLAN GUIDE

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APPENDICES

1.0 INTRODUCTION

This Union of Nova Scotia Municipalities' (UNSM) Climate Change Mitigation Plan Guide was developed to provide assistance to UNSM member municipalities to develop climate change mitigation plans to reduce energy consumption, greenhouse gas (GHG) emissions, and municipal energy costs.

This document includes a step-by-step guide to producing a climate change mitigation plan adhering to best practice, outlines implementation and monitoring requirements, identifies resources for developing and implementing the plan, and showcases energy and GHG emission reduction projects across the country. The plan focuses on identifying opportunities to reduce your municipality's energy usage that will result both in a reduction of GHG emissions and ultimately reduce municipal operation costs.

The guide is modular in nature, and can be used to develop a comprehensive climate change mitigation plan, to select potential energy use and GHG emission reduction projects, and / or to identify resources for further research on topics of interest. It is recognized that there are a variety of approaches that your municipality can take to address climate change and UNSM is providing this information so that you can successfully tailor your approach, given your unique circumstances.

A summary of the content in each section of this guide is provided below:

Section 2.0: About Climate Change Mitigation includes information explaining climate change, and how municipal energy use is linked to GHG emissions. This section also includes two tables. The first is a table of resources that your municipality can use to explain climate change to stakeholders. The second table is a list of resources that can be used to explore the links between energy use and GHG emissions.

Section 3.0: Climate Change Mitigation Plan Content is intended to serve as a climate change mitigation plan outline. Each part of Section 3.0 should form a chapter within your municipal climate change mitigation plan, if your municipality chooses to develop one. Guidance is provided on the expected content within each section, as well as information on how to develop the plan.

Section 4.0: Options for Reducing GHG Emissions includes information on measures that can be implemented to reduce energy and GHG emissions, identifies specific projects and best practices implemented in municipalities in Nova Scotia and across the country, and includes select project profiles. This section also includes information on how to build a business case for a municipal energy and GHG reduction project. The section is divided into standard municipal energy and emission categories including:

- Buildings;
- Water and Wastewater;
- Vehicle Fleet;
- Streetlights;
- Solid Waste; and
- Other Initiatives.

Section 5.0: Implementation Plan includes information on how to produce an action plan, including information on setting goals and actions and assigning a specific time frame, responsibility, and where possible, cost to those actions. Like the content in Section 3.0, this section should also form a chapter within your mitigation plan.

Section 6.0: Monitoring Plan includes information on how to monitor the progress of initiatives and activities committed to during the development of the mitigation plan.

UNSM gratefully acknowledges the contribution made to this report by the Federation of Canadian Municipalities (FCM) and ICLEI Local Governments for Sustainability (ICLEI). Many of the project profiles and energy and emission reduction measures in this report were derived from FCM and ICLEI documents, and references to the root reports are provided in the references section of this guide.

2.0 ABOUT CLIMATE CHANGE MITIGATION

2.1 CLIMATE CHANGE, GREENHOUSE GASES AND MUNICIPAL ENERGY USE

When fossil fuels or energy sources like oil, gasoline, and propane are used by municipalities, GHGs are produced. These GHG emissions are the result of carbon bonds breaking, releasing energy that can be used to power our buildings and vehicles, and those carbon bonds reform as carbon dioxide (CO_2), at which point they are emitted to the atmosphere. Although GHGs are naturally occurring, human activities are increasing the concentration of GHGs to an extent where the Earth's climate system can no longer maintain a balance. Additionally, human ingenuity has created new GHG emissions that are synthetic (human-made) such as hydrofluorocarbons (HFC), sulphur hexafluoride (SF_6) and perfluorocarbons (PFC), which are far more potent than naturally occurring gases. The quantity and potency of the GHGs emitted to the atmosphere have disrupted global climate patterns, and inspired international efforts to reconcile patterns of consumerism with the need to shift to more sustainable behavior.

Municipalities are responsible for approximately 44% of all GHG emissions in Canada, as key providers of daily services (i.e., water), public housing, health services, transit, recreational facilities, waste management, streetlights and infrastructure; most requiring energy derived from fossil fuels and consequently producing GHG emissions (Federation of Canadian Municipalities, 2009). Of these approximately 52% are produced from buildings, 3% from water and wastewater, 5% from streetlights, 30% from fleet vehicles and 5% from solid waste (Federation of Canadian Municipalities, 2010).

In particular, GHGs are produced in Nova Scotia when fossil-fuel based energy sources like oil, gasoline, and propane are used, but also when electricity is used. The majority of electricity in the province is generated by coal-fired power plants. Further exacerbating the release of GHG emissions, most of Nova Scotia's coal is imported. By reducing electrical energy use within our communities, a municipality can contribute both to reducing GHGs while simultaneously lowering energy consumption costs.

The Bottom Line on Climate Change Mitigation	–	Reduces Energy Use
	–	Reduces GHG Emissions
	+	Provides Increased Cost Savings
	+	Creates a More Vibrant, Sustainable Municipality

As global energy demand continues to increase, the finite nature of fossil fuel-based energy supplies creates cause for concern. Although the subject is debated, the global energy demand may exceed energy supplies available from conventional sources in the future; as a result, energy security, along with reducing GHG emissions, is a pressing twenty first century issue. Energy security can be defined as the physical availability of energy supplies to satisfy energy demands at an affordable price. As costs for fossil fuels rise, it will be increasingly difficult to maintain energy security within our communities. In Nova Scotia, developing means through which these energy demands can be reduced or made more efficient is a way to develop more resilient, energy secure communities. A simple energy hierarchy can be used to demonstrate the most efficient and economical way to develop greater energy security in a community:

1. Reduce the need for energy → *i.e.,* Streamlining operations in all sectors so that the optimal amount of energy is used to support service delivery.
2. Use energy more efficiently → *i.e.,* Reducing demand for energy by integrating efficient technologies into aging facilities and infrastructure.
3. Supply energy from renewable sources → *i.e.,* Implementing commercial or small scale renewable energy projects to supplement fossil fuel-based supply.

Within the last decade, the Province of Nova Scotia has increased funding and support for climate change, energy efficiency, renewable energy and related initiatives substantively. The Province created a division of the Provincial Government with a mandate to increase energy efficiency, and created a fund to support various projects that reduce emissions. The Nova Scotia Department of Environment also released "Toward a Greener Future, the NS Climate Change Action Plan" in 2009 which highlights goals and targets for the Province. The main goal of the action plan is to reduce GHG emissions within the province by 5 Mt annually by 2020 to achieve a goal of 10% below 1990 levels. Within this document the Province outlines 68 actions that can be taken to reduce GHG emissions. Local governments are mentioned as key stakeholders in many of the action items. In addition, the Province is providing greater opportunities for communities and municipalities in particular to become involved in the development of community-scale renewable energy projects through the Renewable Electricity Plan.

Many municipalities are recognizing the importance of climate change and the connections between municipal energy consumption, GHG emissions, and municipal costs. By examining municipal operations and finding opportunities to both reduce energy use and develop more energy efficient infrastructure, municipalities can reduce operating costs over the short-term planning horizon, and help develop more energy secure communities over the long-term planning horizon. Ultimately, these actions contribute to a healthier community both by reducing and freeing up operating costs and reducing GHG emissions in an effort to contribute to global efforts to be more sustainable as a society.

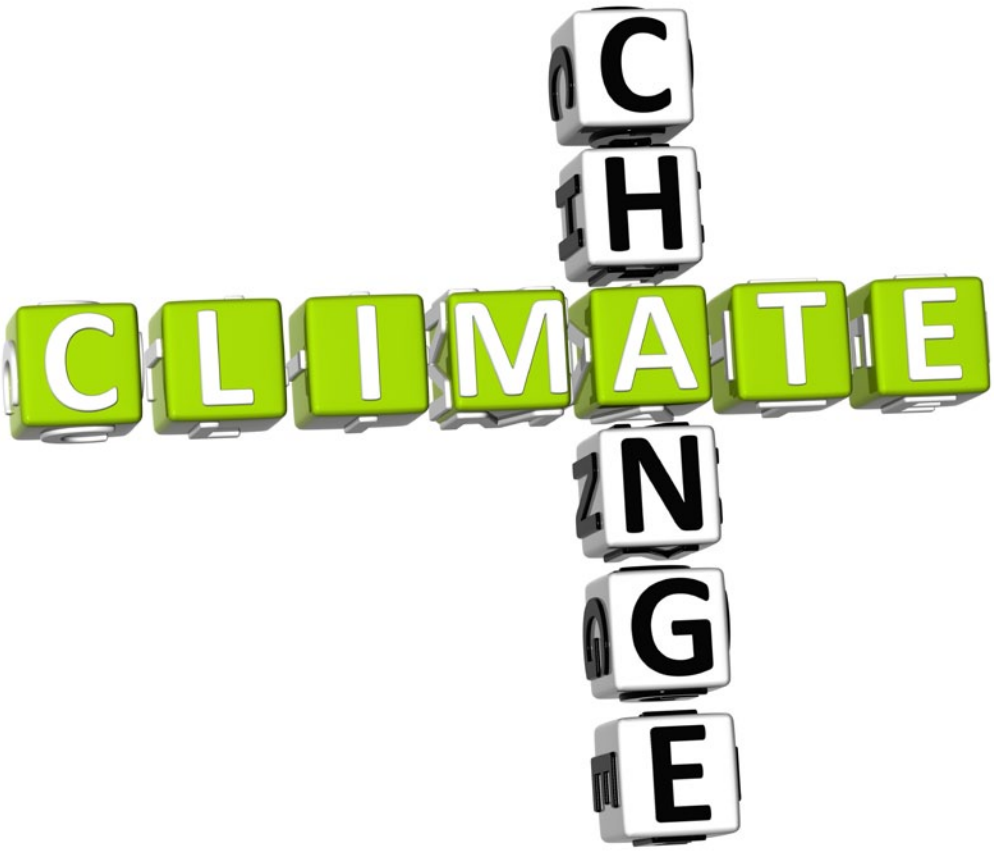
All levels of government are actively working to tackle these important challenges, and there are already many resources available to assist your municipality in developing a climate change mitigation plan.

What resources are available for explaining climate change?

Report Title	Organization	Access
Climate Change 101	PEW Center for Global Climate Change	http://www.pewclimate.org/global-warming-basics/climate_change_101
Climate Change 101	Government of Canada	http://www.climatechange.gc.ca/default.asp?lang=En&n=65CD73F4-1
Climate Change Basic Information	United States Environmental Protection Agency	http://www.epa.gov/climatechange/basicinfo.html
Climate Change in Nova Scotia: A Background Paper to Guide Nova Scotia's Climate Change Action Plan	Nova Scotia Department of Energy	http://oee.nrcan.gc.ca/Publications/statistics/trends06/pdf/trends06.pdf
From Impacts to Adaptation: Canada in a Changing Climate 2007	Government of Canada	http://adaptation.nrcan.gc.ca/assess/2007/pdf/full-complet_e.pdf
Our Coast Live. Work. Play. Protect. The 2009 State of Nova Scotia's Coast Technical Report	Province of Nova Scotia	http://www.gov.ns.ca/coast/documents/report/Coastal-Tech-Report-Nov-09.pdf Chapters 5 and 7.
Submission for Nova Scotia Department of Energy's Energy Strategy and Climate Change Action Plan	Clean Nova Scotia	http://www.clean.ns.ca/files/30/CNS27s20submission20for20DOE.pdf
Toward a Greener Future: Nova Scotia's Climate Change Action Plan	Nova Scotia Department of Environment	http://climatechange.gov.ns.ca/doc/ccap.pdf

What resources are available for exploring the links between energy use and GHG emissions?

Report Title	Organization	Access
Energy Efficiency Trends in Canada 1990-2004	Natural Resources Canada	http://oee.nrcan.gc.ca/Publications/statistics/trends06/pdf/trends06.pdf
Greenhouse Gas Emissions Forecasting: Learning from International Best Practices	National Round Table on the Environment and the Economy	http://www.ec.gc.ca/Content/6/3/A/63A6D41E-8017-4826-A40C-6C940BF71BC5/nrtee-ghg-emissions-forecasting-eng.pdf
Halifax Regional Municipality Community Local Action Plan to Reduce Greenhouse Gas Emissions	Naturally Green Halifax Regional Municipality	http://www.halifax.ca/environment/documents/CommunityLocalActionPlan.pdf
Halifax Regional Municipality Corporate Local Action Plan to Reduce Greenhouse Gas Emissions	Naturally Green Halifax Regional Municipality Dillon Consulting Limited	http://www.halifax.ca/environment/documents/HRMCorporateClimateLocalActionPlan.pdf
Improving Energy Performance in Canada. Report to Parliament Under the Energy Efficiency Act for the Fiscal Year 2007-2008	Natural Resources Canada ecoENERGY	http://oee.nrcan.gc.ca/publications/statistics/parliament07-08/pdf/parliament07-08.pdf
National Inventory Report 1990-2008: Greenhouse Gas Sources and Sinks in Canada	The Canadian Government's Submission to the UN Framework Convention on Climate Change	http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=492D914C-2EAB-47AB-A045-C62B2CDACC29
Act Locally. The Municipal Role in Fighting Climate Change	Federation of Canadian Municipalities	http://www.fcm.ca//CMFiles/FCM_Climate_En_Final1RSG-1272009-2598.pdf



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2.2 BENEFITS OF IMPLEMENTING A CLIMATE CHANGE MITIGATION PLAN

The reduction of energy use and GHG emissions provides environmental benefits, and can also provide financial and social benefits for your municipality. Energy reduction benefits can include cost savings, job creation, improved air quality and health, conservation of the community's natural resources, opportunities for leadership and increased awareness of important community issues. The follow section introduces the benefits if implementing a climate change mitigation plan (City of Iqualuit, 2008).

2.2.1 Cost Savings

Although energy-efficiency measures may require an initial capital investment, your municipality may benefit from cumulative cost savings beyond the payback period. Energy conservation can reduce costs and improve a building's energy performance, as well as extend the life of municipal assets.

Research demonstrates that construction and retrofitting costs are minimal relative to operating costs over a building's lifespan. For example, construction costs represent only eight percent of a building's lifetime costs, whereas operating costs, which include operation, maintenance and repairs, account for 92 % (FCM, 2003). Investments in energy-efficiency measures now by building owners can provide substantive savings over a building's lifespan.

2.2.2 Job Creation

Improving existing building practices and implementing innovative technologies may create new jobs. An economic by-product of these labour-intensive projects is the "re-spending" of money earned from energy savings. Several municipalities have created revolving green funds and use money saved from conserving energy to purchase innovative technology and equipment, and hire staff to carry out new projects.

2.2.3 Improved Air Quality and Health

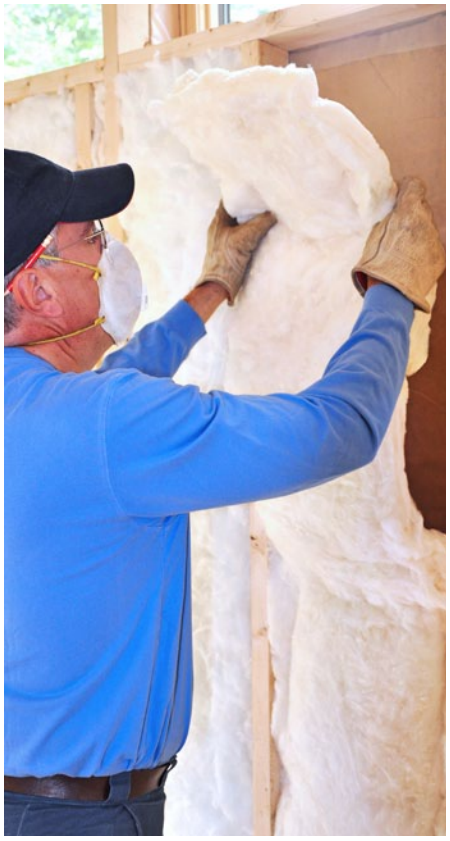
By reducing fossil fuel consumption, your municipality will produce fewer pollutants, such as sulphur dioxide, volatile organic compounds, particulate matter and carbon monoxide, improving local air quality. Annual health care costs due to illnesses caused by ozone and airborne particulate matter, and loss in productivity can have substantial economic repercussions. The likelihood of climate-related health problems, such as the spread of vector-borne diseases, may decrease as communities around the world reduce emission levels.

2.2.4 Conservation of the Community's Natural Resources

Reducing energy consumption and GHG emission levels can help ensure that natural resources are preserved effectively, and used less. Protecting the natural environment and the community can ensure cleaner air, water and soil locally, and globally.

2.2.5 Leadership and Increased Awareness

A commitment to reducing GHG emissions shows leadership and can influence other municipalities to take action. Your municipalities work on climate change has tremendous potential to lead the way in making energy conservation and climate change mitigation a priority.



3.0 CLIMATE CHANGE MITIGATION PLAN CONTENT

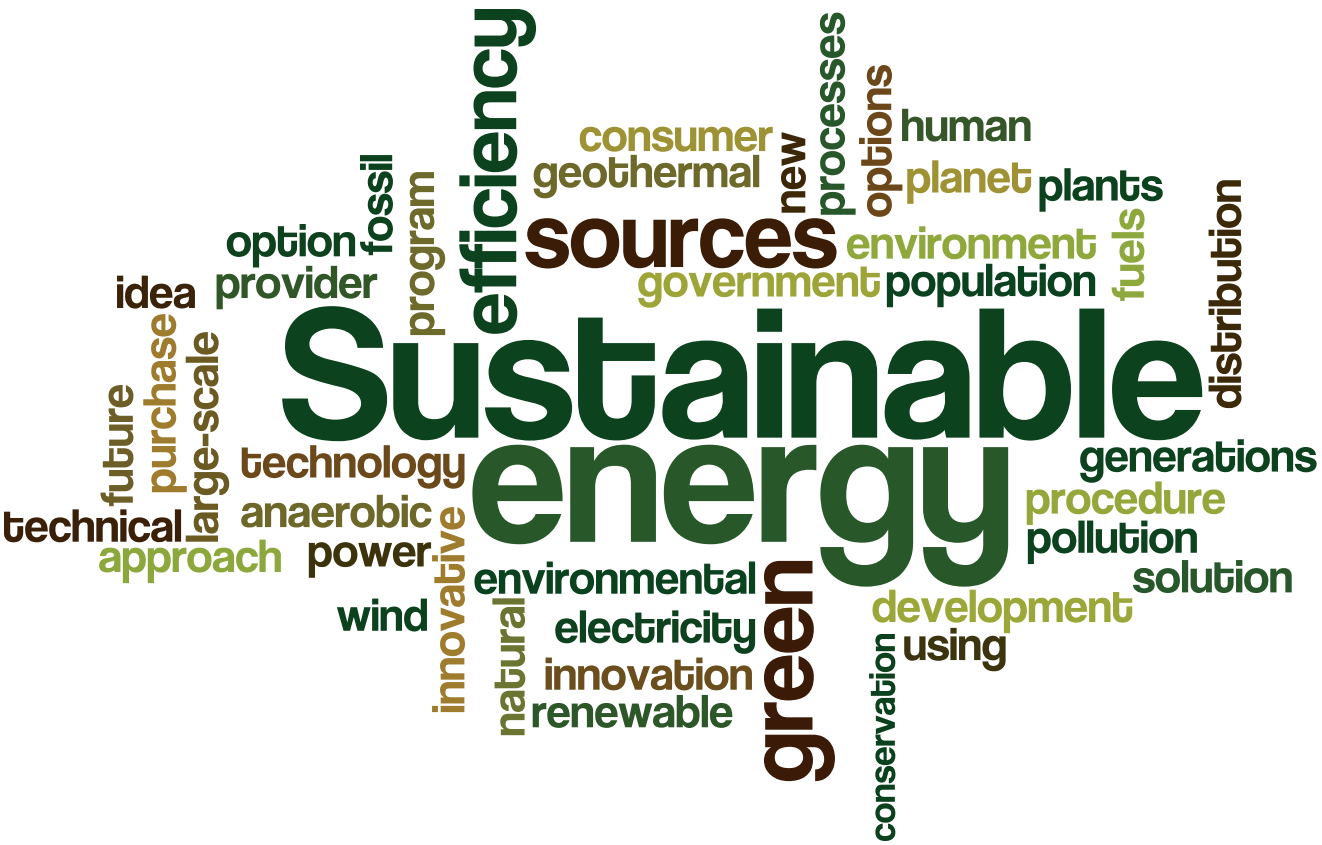
The following are all expected sections within your municipality's climate change mitigation plan. They include an Introduction section (with a Community Profile and Engagement Approach sub-section), and an Energy and Emissions Inventory section (with a Baseline and Update Inventories, and an Energy and Emission Reduction Targets subsection). *Section 5.0* includes an Implementation Plan section (with a Goals, Actions, and Accountability and Timing sub-section), and a *Section 6.0* includes a Monitoring Plan section. These should also form sections within you municipality's climate change mitigation plan.

3.1 INTRODUCTION

A brief introduction can be used to specify the plan content and any other valuable contextual information. In the introduction it is important to identify the intent and purpose of the plan, and the benefits of developing and implementing the plan for your municipality.

The introductory section should include the following:

- A description of climate change and its potential effects;
- How energy use and GHG emissions correlate (i.e., the more fossil fuel-based energy used the more GHG emissions created);
- Provide support and a rationale for the development and implementation of a climate change mitigation plan (i.e., your municipality's reduction of GHG emissions and operational cost savings); and
- A summary of specific energy intensive and/or GHG emissions intensive activities and infrastructure in the municipality that need to be addressed.



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3.1.1 Community Profile

A community profile is a valuable component to the plan as it provides contextual information on population trends, development patterns, services and infrastructure. This information will identify possible sectors where the highest levels of energy are consumed and GHG emissions produced (i.e., buildings, water and wastewater, streetlights, vehicle fleet and solid waste). In addition, it will provide helpful information to readers unfamiliar with your municipality.

This section of the plan should provide detailed background information on community characteristics including:

- Geographic location and size;
- Statistical information (i.e., population trends; increasing/decreasing population; population age; household size; transportation modes; age of housing);
- Information on municipal infrastructure, including an inventory of municipal buildings, number of fleet vehicles, streetlights, age of key infrastructure (including buildings and wastewater infrastructure);
- Land use information (i.e., community history, development patterns);
- Municipal services provided; and
- Economy (i.e., industry sectors, development trends, primary building activities by sector).

What resources can be used to develop our community profile?

Statistics Canada 2006 Community Profiles provides information for communities, counties and large and small metropolitan areas. The information includes, but is not limited to, population and dwelling counts, age of population, dwelling characteristics, education, occupation and income. This information will provide municipalities with demographic, economic and housing information to develop the section on community characteristics.

Additionally, a variety of other sources can be used to develop this section, as noted in the following table.

Sources to Build a Community Profile

Source	Access
2006 Community Profiles (Statistics Canada)	http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/search-recherche/lst/page.cfm?Lang=E&GeoCode=12
Municipal Website Links (Service Nova Scotia and Municipal Relations)	http://www.gov.ns.ca/snsmr/muns/link
Nova Scotia Community Counts	http://www.gov.ns.ca/finance/communitycounts
Nova Scotia Environment	http://www.gov.ns.ca/nse
Nova Scotia Online	http://nsonline.com/communities.html

3.1.2 Engagement Approach

Engagement is an important component of developing the plan as it allows the municipality to identify potential opportunities and challenges from the perspectives of the municipal staff, key stakeholders and the public. In many instances, broad public engagement has occurred through the development of a municipal plan or integrated community sustainability plan (ICSP), both of which identify wide-ranging goals and a public vision for issues related to sustainability and often climate change. Actions and goals identified in the municipal plans or ICSP often include climate change mitigation plans or identify projects resulting in a reduction in GHG emissions. Generally, a climate change mitigation plan is focused on identifying opportunities for energy savings and a reduction in GHG emissions within municipal operations. At this stage it is critical to focus engagement strategies on consultation with key stakeholders and municipal actors.

This section of the plan should include:

- Identification of any previous public stakeholder consultation (e.g. in preparations of the Municipal Planning Strategy or Integrated Community Sustainability Plan); and
- Summary of the engagement and consultation process undertaken to develop the plan.

At this stage, engagement will focus on identifying key municipal staff and stakeholders who can assist in identifying and implementing actions aimed at reducing energy use, creating opportunities for energy efficiency, or replacing fossil fuel energy sources to reduce GHG emissions. Interviews and focus groups with municipal staff working at all levels of the organization will assist in identifying current infrastructure, services and policies that might present opportunities for your municipality. This engagement process should also highlight potential issues or barriers that need to be overcome in order to realize these opportunities.

Typically, steering committees are formed and led by municipalities as part of the climate change mitigation plan development process. A committee including municipal staff, council and other stakeholders would be beneficial for organizing and obtaining the necessary information for the development of the plan. Please see Section 5.0, Implementation Plan, for further information on the possible reasons for and outcomes from municipal engagement, including the identification of goals, actions, and accountability mechanisms.

3.2 ENERGY AND EMISSIONS INVENTORY SUMMARY

A preferred first step prior to developing a climate mitigation plan is completing a baseline GHG inventory for municipal operations, taking into account energy and emissions associated with municipal buildings, water and wastewater, streetlights, vehicles, and waste. This is important for developing a baseline of information and understanding how energy is being used in municipal operations.

UNSM's Municipal Sustainability Office created a Corporate Energy and Emissions spreadsheet and User Guide for doing so, available on its website (www.sustainability-unsm.ca). Completing this spreadsheet to develop an energy and emissions inventory will result in a compilation of the information required to populate this section of your municipality's climate change mitigation plan.

Section 3.2.1 and Section 3.2.2 below includes information on the expected plan content.

3.2.1 Baseline and Update Inventories

This section of your climate change mitigation plan should include:

- The results of the baseline energy and emissions inventory, including energy consumption and emissions for all emission categories. If any inventories have been completed in the years following the baseline inventory, these should also be summarized.

In this sub-section of the plan, introduce energy and emission categories, and contextualize the emission category as appropriate. For example, it would be beneficial to explain the types of buildings in your buildings portfolio before introducing energy and emission levels for the buildings emission category. This can be explained in text before using the following table template to show the reader more information about energy and emissions in municipal operations.

The following table is a sample, and can be modified as necessary to suit the inventory prepared by your municipality.

Sample Energy and Emissions Inventory Table

Emission Category	Energy Type	Energy Consumption	Cost ($)	Units	Emission Factor (t CO_2e / unit)	Emissions (t CO_2e)	Notes
Buildings	Electricity			kWh			
	Natural Gas			m^3			
	Fuel Oil			L			
Water and Waste Water	Electricity			kWh			
Streetlights	Electricity			kWh			
Vehicles	Regular Gasoline			L			
	Diesel			L			
Waste	n/a			tonnes			

If an updated energy and emissions inventory was completed following the baseline inventory to measure a more current year of performance, this information should be included in this section. The table above could be modified to include more than one year's worth of data, or a similar table could be developed to include more recent inventories.

In cases where there are multiple GHG inventory years to compare, it is preferable, although not necessary, to include some analysis on trends by comparing relevant emission categories to one another. For example, it would be helpful to know that building energy consumption increased by 10% over two years in a town hall building, which increased emissions for the buildings emissions category as a result. It would also be helpful to know how baseline energy and emissions in total compare with more recent inventories.

3.2.2 Energy and Emission Reduction Targets

Although optional, if your municipality chooses to establish a reduction target, the following information should be included in the climate change mitigation plan:

- The process for identifying a suitable energy and emissions reduction target (this may have links to the engagement section of your plan); and
- Identify the target(s) relative to a baseline year and a historical as well as future year (i.e. reduce building energy consumption from 2006 levels by 15% by 2020).

There are multiple approaches for setting a GHG emission reduction target for municipal operations which is a preferred but not necessary component of a climate change mitigation plan. If your municipality chooses to set a reduction target, the following approaches will provide you with options.

Municipalities may choose to establish targets for several facets of their operation. This could include specific targets for whole emission categories (for example, a target to reduce building emissions), or targets for specific facilities or vehicles. Targets could also be set relative to total energy and/or emissions (for example, a target to reduce total energy consumption or total emissions by 10% relative to a stated baseline).

Municipalities could identify targets where the effect of energy conservation or emission reduction measures will be measurable. For example, if significant measures are being implemented to increase the efficiency of water and wastewater systems, and those are expected to result in

measurable decreases in emissions year over year, a specific emission category reduction target could be established. It should be noted that in this case it is likely that, all things being equal, an emission reduction in a specific emission category or facility will also lead to an overall reduction in emissions. A target could also be set relative to total energy consumption and emissions.

In addition to the various types of targets, there are various approaches that can be employed to set those targets. Your municipality may:

- Choose to establish targets without a complete investigation into potential measures. This can be a way to encourage investment and focus energy on the issue, but municipalities are cautioned to be realistic when setting targets in such a manner.
- Commission detailed energy audits to determine energy management and conservation measures which could be implemented to reduce energy consumption and emissions. Following this quantitative analysis, specific targets could be established.
- Develop a climate change mitigation plan, and set a target following approval of the plan.
- Complete a baseline energy and emissions inventory, and follow this up with a subsequent inventory in future years, considering the trends before setting an emission reduction target.

Remember, targets should be SMART, meaning that they are Specific, Measurable, Attainable, Realistic, and Time Bound. For context, PCP recommends, although does not enforce, the following emission reduction target to members looking to reduce emissions from municipal operations:

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

Participation in the PCP program is voluntary, and a municipal government may choose to revise its target as reduction measures are implemented.

4.0 OPTIONS FOR REDUCING GHG EMISSIONS

4.1 BUILDINGS

Municipal buildings, including administrative buildings, public works buildings, recreational centres, arenas and pools have different energy profiles depending on service requirements, lighting, machinery used, ventilation and water requirements (Federation of Canadian Municipalities, 2010). Buildings typically represent 52% of Canadian municipal government corporate GHG emissions (Federation of Canadian Municipalities, 2010). Your municipality has a variety of choices for improving energy efficiency and reducing GHGs in buildings. For example, under the building sector, potential opportunities range from improving operations to reduce energy demand to installing energy efficient lighting to investing in solar panels.

What measures can our municipality implement?

To reduce the need for energy

Energy Audits: Conduct energy audits of corporate buildings to identify possible improvements to reduce energy use. Continue to monitor energy performance at facilities following the energy audit.

Building Standards: Review current building standards and identify ways to improve energy efficient guidelines for new buildings (i.e., LEED building standards)

To use energy more efficiently

Commence retrofitting all corporate buildings including:

- Insulate: Insulate walls and floors, including exposed floors over unheated spaces; insulate buildings on the outside by adding insulation to the outside of main wall areas to prevent heat and cooling loss.
- Air Seal: Identify older windows and doors that could be repaired, air sealed or replaced with energy efficient doors and windows.
- Thermostats: Install thermostats in municipal buildings.
- Heating, ventilation and air condition systems (HVAC): Install energy efficient HVAC systems, including integrated space, water and ventilation systems, high efficiency condensing commercial heating equipment, and micro-cogeneration systems (with overall efficiencies and GHG emissions reduction potential 3 times higher than conventional central electricity generation plants) (Natural Resources Canada, 2009).
- Lighting: Replace existing outdated light bulbs with high efficiency light bulbs and fixtures (i.e., use compact fluorescent lamps and use linear fluorescent lighting labeled T-8 rather than tubes labeled T-12)

District Heating – As furnaces or boilers reach end-of-life, investigate the feasibility of replacing them with a district heating system, either a combine heat and power plant or a heat-only boiler system. A district heating system will allow heat to be transferred to a heat carrying fluid and distributed to a number of buildings (Federation of Canadian Municipalities, 2010). This opportunity is particularly advantageous for densely populated areas where there would be more heat loss in the distribution network as opposed to lower density communities (Federation of Canadian Municipalities, 2010).

To use energy from renewable sources

Natural Gas: Investigate the feasibility of converting to a natural gas system such as replacing existing boiler plants with co-generation systems fired by natural gas. Heritage Gas is the local gas distribution company in Nova Scotia. For more information on natural gas and its availability, visit Heritage Gas' website (http://www.heritagegas.com).

Geothermal: Investigate the feasibility of installing geothermal heating (i.e., for a community or recreation centre etc.) to reduce your dependence on fossil fuels. Geothermal systems are generally made up of three parts; a loop, heat pump and distribution system and is used to transfer heat from the ground to heat your buildings. More information on the types of geothermal systems can be found on the Canadian GeoExchange Coalition website (http://www.geo-exchange.ca/en).

Solar: Investigate the feasibility of installing solar panels on municipal buildings. The solar potential of your buildings can be determined by using Green Power Labs Inc.'s Solar Resource Online tool (http://solarrating.ca). This interactive

tool takes key information into account, such as location (e.g., amount of projected sun exposure for your area); orientation to the sun; slope of your roof; and shading, to determine your building's solar potential.

Wind: Investigate the feasibility of installing wind turbines to reduce your dependence on fossil fuels. (See the Nova Scotia wind atlas at: http://www.nswindatlas.ca).

What are other communities doing to reduce energy use in their municipal buildings?

Project Examples for Municipal Buildings

Description of Measure	Community	Cost	Annual Energy Savings	Approx. $ Value of Energy Savings*	GHG Reduction (t CO_2e / year)	Pay-back
The Town of Bridgewater conducted municipal building retrofits which included the installation of a solar space heating system for its town hall and energy saving measures at the local arena, wastewater treatment plant, and other facilities.	Town of Bridgewater, NS	$330,000	250,000 kWh 25,000 L fuel oil	$50,000	300	6.5 yrs
The volunteer-run Inverness Arena Commission opted for a new energy efficient compressor for the rink, which runs on ammonia instead of Freon. In addition, high-efficiency fluorescent lighting was installed.	County of Inverness, NS	N/A	Savings of 45% on their power bill in 2011	N/A	N/A	N/A
Several municipal facilities converted from gas boilers to high-efficiency natural gas boilers. These facilities included the Halifax Metro Centre, Dartmouth Sportsplex and several fire stations.	Halifax Regional Municipality, NS	$750,000	N/A	$400,000	N/A	1.9 yrs
Halifax North Memorial Library underwent a retrofit of existing lighting to more energy efficient lighting.	Halifax Regional Municipality, NS	$30,000	N/A	$7,000	N/A	4.3 yrs
The Dartmouth Sportsplex installed a refrigeration heat recovery system.	Halifax Regional Municipality, NS	$18,000	N/A	N/A	270	1.2 yrs
The Lunenburg fire department installed two solar heating systems, upgraded its insulation and installed higher efficiency lighting and a new furnace.	Municipality of the District of Lunenburg, NS	$17,000	30% reduction in electricity use and a 35% reduction in furnace oil costs	N/A	N/A	N/A
The Town of New Glasgow installed state-of-the-art heat pumps in several historic buildings which have been notoriously difficult to insulate, heat and cool. Installation of the heat pumps has generated cost-savings, even from modern heat pumps installed in 1999. Other retrofits to the library and local stadium are expected to result in total energy savings of nearly $35,000 a year. The heat pumps realized an air pollution reduction of 10 tonnes in the first four months of operation.	Town of New Glasgow, NS	N/A	N/A	Energy savings of nearly $35,000 a year	Reduction of 10 tonnes in the first four months of operation	N/A

Project Examples for Municipal Buildings						
Description of Measure	**Community**	**Cost**	**Annual Energy Savings**	**Approx. $ Value of Energy Savings***	**GHG Reduction (t CO_2e / year)**	**Pay-back**
The Town of New Glasgow retrofitted its town hall by replacing the existing T-12 light bulb system with T-8 electronic ballasts.	Town of New Glasgow, NS	$6,440	7,420 kWh	$461.00	5	8.4 yrs
The Town of New Glasgow implemented a process to reduce energy consumption through daylight harvesting. This technique focuses on building design to maximize natural daylight.	Town of New Glasgow, NS	$375	1,606 kWh	$99.78	1	4.1 yrs
The Town of New Glasgow has insulated the town hall attic to reduce heat loss and therefore has reduced energy consumption.	Town of New Glasgow, NS	$1,800	15,663 kWh	$973.14	10	1.4 yrs
The Town of New Glasgow retrofitted its town hall by replacing existing incandescent lighting with compact fluorescent lighting.	Town of New Glasgow, NS	$106	3,087 kWh	$191.80	2	0.3 yrs
The New Glasgow fire hall and library has replaced the existing lighting system with T-8 electronic ballasts.	Town of New Glasgow, NS	$19,950	33,345 kWh	$1,239.49	21	6.7 yrs
The New Glasgow Fire hall and library implemented a process to reduce energy consumption through daylight harvesting. This technique focuses on building design to maximize natural daylight.	Town of New Glasgow, NS	$1,625	4,990 kWh	$310.03	3	5.8 yrs
The New Glasgow fire hall and library has retrofitted existing light signs to LED signs.	Town of New Glasgow, NS	$250	1,138 kWh	$70.70	1	3 yrs
The Town of Watson Lake currently operates a district heating system that uses waste heat generated at their diesel power station. In this study, the town will determine the feasibility of expanding the system to fully utilize the potential of additional waste heat.	City of Whitehorse, YT	$241,000	N/A	N/A	2,000	N/A
The Nelson Area In-door Rink replaced 40 High Intensity Discharge (HID) light fixtures with 27 8-lamp T5 fluorescent high bay lighting fixtures.	Burlington, ON	$28,410	54,758 kWh	$3,402.11	12	5 yrs
The Police Station on Queen Street converted from gas boilers to high-efficiency natural gas boilers.	City of Fredericton, NB	$16,500	N/A	N/A	55	7.9 yrs
The City of Grand Forks developed a Heat Exchange System used at a sewage lift station to heat park washrooms.	City of Grand Forks, BC	$85,000	N/A	N/A	N/A	N/A
The City of Windsor installed a solar heating system to reduce energy requirements.	City of Windsor, ON	$63,450	N/A	N/A	40	10.7 yrs
The City of Fernie retrofitted its 12,800 ft^2 city hall with energy efficient lighting.	Fernie, BC	$8,000	57,687 kWh	$3,584.09	1	2 yrs

Project Examples for Municipal Buildings						
Description of Measure	**Community**	**Cost**	**Annual Energy Savings**	**Approx. $ Value of Energy Savings***	**GHG Reduction (t CO_2e / year)**	**Pay-back**
The Public Works Yard installed a crank timer and sensor on the oil furnace at the Casting Shed to reduce energy consumption.	Nanaimo, BC	$546	1,352 L fuel oil	$1,489.90**	4	4 mos
The Historic Beban House was insulated in the attic and basement to improve energy efficiency. Chimneys were capped, and soffit vents were also added.	Nanaimo, BC	$5,599	2,680 m^3 natural gas	N/A	5	4 yrs
The Town of Marystown will conduct a detailed energy audit of municipal buildings, infrastructure and equipment. The town will also prepare an energy management plan that will identify energy saving opportunities and determine their accompanying costs, payback periods and potential for greenhouse gas (GHG) reductions.	Town of Marystown, NL	$18,662	N/A	N/A	N/A	N/A
The Whistler Sports Centre installed a combined ground source heat pump (GHX) and solar hot water (SHW) system that reduced energy consumption and natural gas costs.	Whistler, BC	$931,320	175,000 m^3 natural gas	N/A	450	6 yrs

*Based on 2011 Nova Scotia Power Municipal Tariff of 6.213 cents per kilowatt hour (http://www.nspower.ca/site-nsp/media/nspower/ExternalWebNSPITariffs-Jan1-2011.pdf)

**Based on furnace oil price March 25, 2011 of 110.2 cents per Litre (http://www.gov.ns.ca/energy/consumer-information/energy-prices/furnace-oil.asp) Sources: FCM 2008, HRM 2009, & UNSM 2011

4.2 WATER AND WASTEWATER

Municipal water and wastewater infrastructure includes lift and pumping stations, reservoirs and storage tanks, water and wastewater treatment plants and vast networks of sanitary sewers and water mains. Water and wastewater services require energy to pump, move and treat water and wastewater (Federation of Canadian Municipalities, 2010). The treatment of water and wastewater and the operation of its facilities represents 3% of Canadian municipal corporate GHG emissions (Federation of Canadian Municipalities, 2010). There are a variety of ways your municipality can reduce energy use and GHG emissions associated with water and wastewater.

What measures can our municipality implement?

To reduce the need for energy

Energy audits: Conduct energy audits of water and wastewater treatment buildings to identify possible improvements to reduce energy use. Continue to monitor energy performance at facilities following the energy audit.

To use energy more efficiently

Annual Maintenance: Undergo annual maintenance procedures and upgrade necessary equipment in treatment plants (i.e., improvements to the efficiency of the pumps and motors) to ensure facility is running properly and efficiently.

Alternative Wastewater Management: Investigate the feasibility of installing alternative wastewater management processes. For example, there is a cogeneration wastewater treatment plant (WWTP) being developed in the City of Brockville, ON, using digester gas to generate heat and electricity to meet the requirements of the WWTP.

To use energy from renewable sources

Heat Recovery: Install a heat exchange system to draw heat from raw wastewater effluent to provide heat to the facilities building.

Methane Recovery System: Install a methane recovery system to reduce GHG emissions.

What are other communities doing?

Project Examples for Municipal Water and Wastewater Services

Description of Measure	Community	Project Cost	Annual Energy Savings	Approx. $ Value of Energy Savings*	GHG Reduction (t CO_2e / year)	Pay-back
Antigonish County has purchased a mobile dewatering truck from ABCO industries in Lunenburg, which removes liquids from the waste sludge. The municipality is now dewatering sludge at its solid waste management facility, and has been able to close two lagoons.	Antigonish County, NS	Truck purchase was $475,000	N/A	N/A	N/A	N/A
In the Cape Breton Regional Municipality, emissions inventories and energy audits of municipal facilities identified the need for improvements to current energy practices. These energy management opportunities were identified during walkthrough audits of Glace Bay Water Treatment Plant, New Waterford Water Treatment Plant, Old North Sydney Water Treatment Plant, and Battery Point Sewage Treatment Plant. Energy improvements will provide cost savings and emission reductions for the municipality.	Cape Breton Regional Municipality, NS	$256,125	695,543 kWh	$43,214.09	577	3.4
Richmond County identified needed upgrades to treatment plants in Petit-de-Grat, Louisdale and Arichat, including improvements to the efficiency of the pumps and motors.	Richmond County, NS	N/A	N/A	N/A	N/A	Within 5 years
The Village of Buena Vista will conduct a feasibility study for the design of an improved community sewage system that will address the environmental issues caused by the current system of individual septic tanks and a shared lagoon.	Village of Buena Vista, SK	$166,300	N/A	N/A	N/A	N/A
The City of Edmonton will improve the wastewater filtration technology to a Fine Bubble System.	City of Edmonton, AB	$2,500,000	N/A	N/A	6,000	8.3 yrs

Project Examples for Municipal Water and Wastewater Services						
Description of Measure	**Community**	**Project Cost**	**Annual Energy Savings**	**Approx. $ Value of Energy Savings***	**GHG Reduction (t CO_2e / year)**	**Pay-back**
The City of Yellowknife currently uses a natural lagoon and wetland system to treat municipal wastewater; however, the system cannot accommodate existing and future wastewater volumes. In this study, the City will evaluate options to improve performance to comply with existing effluent discharge criteria as well as future guidelines.	City of Yellowknife, NT	$200,000	N/A	N/A	N/A	N/A
The Town of Quispamsis will develop a hydrogeological model and an aquifer protection and management plan, and it will assess future infrastructure requirements and associated costs.	Town of Quispamsis, NB	$75,000	N/A	N/A	N/A	N/A
The Town of Ste. Anne will investigate the best options for upgrading its sanitary sewer collection and treatment system to prevent both pollution and the risk of sewage and stormwater backup in buildings.	Town of Ste-Anne, MB	$71,650	N/A	N/A	N/A	N/A
The Aldergrove Water Treatment Plant installed a thermal extraction system, designed to capture renewable energy from groundwater.	Township of Langley, BC	$100,000	35,040 m3 natural gas 55,609 kWh electricity	$3,454.99 electricity	70	7 years

*Based on 2011 Nova Scotia Power Municipal Tariff of 6.213 cents per kilowatt hour (http://www.nspower.ca/site-nsp/media/nspower/ExternalWebNSPITariffs-Jan1-2011.pdf)
Sources: FCM 2008, HRM 2009, and UNSM 2011

4.3 STREETLIGHTS

Lighting operated by municipal governments can include streetlights, traffic lights and some sport and recreational area lighting. These lights generally operate for 10 to 13 hours a day, 365 days a year and represent approximately 5% of municipal GHG emissions. Options for reducing GHG emissions associated with streetlights focus on updating incandescent and mercury vapour bulbs with high pressure sodium or LED systems (Federation of Canadian Municipalities, 2010). There are a variety of ways your municipality can reduce GHG emissions associated with street and area lighting.

What measures can our municipality implement?

To reduce need for energy

Reduce the Number of Streetlights: Develop an inventory of existing streetlights and determine if all are required, remove or replace existing lighting as necessary, and/or reduce wattage, where appropriate. Review decorative lighting options and remove bulbs or replace with energy efficient bulbs, where appropriate.

To use energy more efficiently

LED Lighting: Replace existing streetlights and traffic lights with high efficient LED lights.

What are other communities doing?

Project Examples for Municipal Streetlights

Description of Measure	Community	Project Cost	Annual Energy Savings	Approx. $ Value of Energy Savings*	GHG Reduction (t CO_2e / year)	Pay-back
The Town of Antigonish underwent the conversion of 100 roadway lights to energy efficient LED lighting.	Town of Antigonish, NS	$99,000	N/A	N/A	N/A	N/A
The Town of Berwick underwent the conversion of 234 roadway lights to energy efficient lighting.	Town of Berwick, NS	$235,969	N/A	N/A	N/A	N/A
The Town of Bridgewater replaced 60 streetlights with LED lights, supplied by LED Roadway Lighting. This program was successful, and the town hopes to replace more street lights in the near future.	Town of Bridgewater, NS	N/A	17,000kWh	N/A	14.5	N/A
Cape Breton Regional Municipality accessed the economic potential that could be gained by converting approximately 16,630 conventional street lights to light emitting diodes (LED).	Cape Breton Regional Municipality, NS	$12,819,040	6,813,378 kWh	$423,315.17	5,488	11.8 yrs
The Municipality has replaced the conventional traffic lights at 137 intersections with LED lights, and installed 31 new systems.	Halifax Regional Municipality, NS	$700,000	N/A	$150,000	N/A	4.7 yrs
The Halifax Regional Municipality replaced 2,100 existing street light fixtures with LED technology throughout the Halifax Regional Municipality. The LED lights are replacing existing 70 watt, 100 watt, 150 watt and 250 watt HPS (High Pressure Sodium) fixtures and are expected to reduce energy consumption by more than 1 million kWh each year. HRM will realize savings through reduced maintenance costs for the new fixtures over an anticipated 20 year life. This recent installation is Phase II of a 2009 pilot project that saw 285 energy-efficient, light-emitting diode (LED) streetlights installed in HRM.	Halifax Regional Municipality, NS	$1,837,613	N/A	N/A	N/A	N/A
The Town of Lockeport installed energy efficient LED lighting along the Seacaps Memorial Park trail.	Town of Lockeport, NS	$24,045	N/A	N/A	N/A	N/A
The Town of Lunenburg converted 532 roadway lights to energy efficient LED lighting.	Town of Lunenburg, NS	$356,536	N/A	N/A	N/A	N/A
The Town of Mahone Bay Converted 44 roadway lights to energy efficient LED lighting.	Town of Mahone Bay, NS	$33,678	N/A	N/A	N/A	N/A

*Based on 2011 Nova Scotia Power Municipal Tariff of 6.213 cents per kilowatt hour (http://www.nspower.ca/site-nsp/media/nspower/ExternalWebNSPITariffs-Jan1-2011.pdf)

Sources: FCM 2008, HRM 2009, and UNSM 2011

4.4 VEHICLE FLEET

Fleet vehicles generally include light, medium and heavy duty trucks, passenger vehicles, police and fire equipment, sanitation and street vehicles, construction and grounds-keeping machinery and aircraft vehicles. Fleet vehicles represent 30% of municipal GHG emissions (Federation of Canadian Municipalities, 2010). There are many opportunities to reduce GHG emissions related to fleet vehicles.

What measures can our municipality implement?

To reduce the need for energy

Develop an idle-free program: Reduce unnecessary idling of municipal fleet vehicles by providing idle-reduction training for drivers, and incentive programs to encourage drivers to reduce idling time. For more information on developing a municipal idle-free program, refer to UNSM's Municipal Sustainability Office' idle-free toolkits and resources (www.sustainability-unsm.ca).

Driver training (i.e., "Green Driving"): Ensure fleet vehicle drivers have completed a "Green Driving" program to reduce fuel consumption and maintenance costs. More information regarding fuel-efficiency driving programs can be found on the Natural Resources Canada website (http://fleetsmart.nrcan.gc.ca/index.cfm?fuseaction=fleetsmart.smartdriver).

To use energy more efficiently

Maintenance: Regular maintenance will ensure vehicles work efficiently and extend the life of the vehicle.

Fuel Efficient Vehicles: Develop an inventory of existing fleet vehicles and the age of each. Replace vehicles with fuel efficient options, such as hybrid and electric vehicles, where appropriate.

Vehicle 'Rightsizing': Review and develop policies to identify fleet vehicles that can be downsized based on the service the vehicle provides and its level of usage (i.e., if a larger vehicle can be downsized it will reduce GHG emissions, save fuel, and ultimately save money).

To use energy from renewable sources

Alternative Fuels: Investigate the feasibility of using low carbon fuels.

What are other communities doing?

Project Examples for Municipal Fleet Vehicles

Description of Measure	Community	Project Cost	Annual Energy Savings	Approx. $ Value of Energy Savings*	GHG Reduction (t CO_2e / year)	Payback
The Town of Annapolis Royal implemented a no idling policy of internal combustion engines for Town residents, visitors and employees.	Annapolis Royal, NS	$1,500	10,000 L gasoline	$13,000	23	1 yr
The Town of Chester implemented the use of a hybrid vehicle at the Kaizer Meadow Solid Waste facility.	Chester, NS	$38,500	N/A	N/A	N/A	N/A
In Halifax, Fleet Transportation Initiatives were completed by installing Cooling Systems on Buses that serve to improve the energy performance of the buses and overall air quality.	Halifax Regional Municipality, NS	$565,960	N/A	N/A	N/A	N/A

Project Examples for Municipal Fleet Vehicles						
Description of Measure	**Community**	**Project Cost**	**Annual Energy Savings**	**Approx. $ Value of Energy Savings***	**GHG Reduction (t CO_2e / year)**	**Pay-back**
The City of Edmonton's mobile equipment services branch will develop a Sustainable Fleet Management Plan (SFMP) to link its ISO 14001 environmental management framework to the city's other sustainability plans and policies.	Edmonton, AB	$200,000.00	N/A	N/A	80,000	N/A
The City of Saint- Jérôme piloted the integration of 20 low-speed electric vehicles in the City of Saint-Jérôme, incorporated into the fleets of local participating employers (including major partners such as Hydro-Quebec, the City of Saint-Jérôme, le ministère des Transports du Québec) who will make them available to their staff for business travel and other uses.	City of Saint-Jérôme, QC	$920,000	N/A	N/A	N/A	N/A
The City of Waterloo tested B20 (20 per cent biodiesel, 80 per cent conventional diesel) and B50 (50 per cent biodiesel, 50 per cent conventional diesel) fuel blends on one heavy duty and one light duty City vehicle. This project involved three 2-week testing periods on each vehicle, (baseline, B20 and B50) with both biodiesel fuels undergoing a 2-week conditioning period prior to testing to assess the difference in vehicle performance, emissions and costs for each fuel.	City of Waterloo, ON	$55,000.00	N/A	N/A	N/A	N/A

*Based on 130 cents per litre (http://www.gov.ns.ca/energy/consumer-information/energy-prices/gas-diesel.asp)

Sources: FCM 2008, HRM 2009, and UNSM 2011

4.5 SOLID WASTE MANAGEMENT

Solid waste management generally include activities such as collecting and transporting waste, sorting waste, overseeing compost and recycling, and managing landfills. However, it is not unusual for municipalities to contract these services or deposit waste at a facility in another municipality. Solid waste services represent 5% of municipal GHG emissions. There are many opportunities to reduce GHG emissions associated with solid waste management; however, a municipality's ability to implement or influence policy at a solid waste facility outside of its jurisdiction may impact their ability to reduce emissions in this sector (Federation of Canadian Municipalities, 2010).

What measures can our municipality implement?

To reduce the need for energy

Reduce Consumption: Identify opportunities to reduce consumption of materials such as paper, or plastic.

To use energy from renewable sources

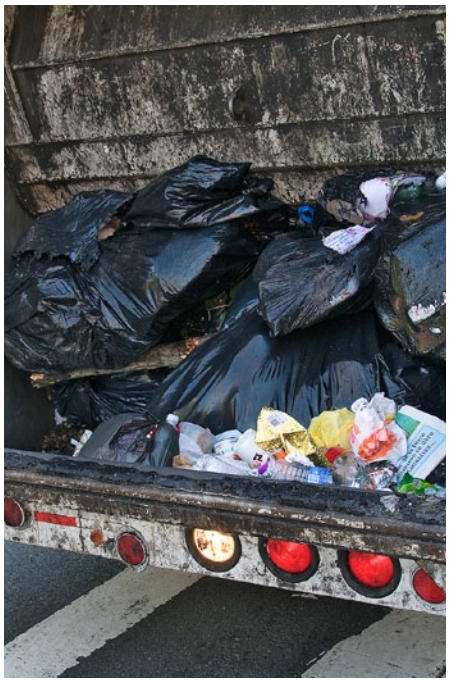
Energy Recovery: Investigate the feasibility of landfill gas (LFG) recovery systems for energy production. LFG systems require the availability of organic material to decompose under anaerobic conditions; therefore, the feasibility of this energy source may be limited due to compost diversion programs in Nova Scotia. However, methane gas recovery is currently underway in the Sackville Landfill site. Additional information on LFG recovery can be found on the Environment Canada website: http://www.ec.gc.ca/publications/88317157-BE0B-4741-B33E-8A9EC3E9FACB/GuidanceDocumentForLandfillGasManagement.pdf

What are other communities doing?

Project Examples for Municipal Solid Waste Facilities

Description of Measure	Community	Project Cost	Annual Energy Savings	Approx. $ Value of Energy Savings*	GHG Reduction (t CO_2e / year)	Pay-back
The Cape Breton Regional Municipality has completed annual machinery maintenance and developed waste management practices.	Cape Breton Regional Municipality, NS	$186,620	404,851 kWh	$25,153.39	160	4.9 yrs
Highland Energy is running a very successful methane gas recovery system from the former Sackville Landfill site that supplies two megawatts of electricity to the provincial power grid.	Halifax Regional Municipality, NS	$6.8 million	N/A	N/A	100,000	N/A
The City of Chibougamau will evaluate potential local renewable energy sources capable of meeting the long-term energy requirements of a new engineered landfill site. The feasibility study will determine the new facility's energy needs over the next 25 years and evaluate several options, including wind, solar, landfill gas (LFG) recovery and the reuse of residual combustible materials such as cooking oils.	City of Chibougamau, QC	$22,670	N/A	N/A	5,026	N/A
The County of Brant will field test a number of waste diversion alternatives to find the best way to increase its waste diversion rate to the Province of Ontario's target of 60 percent.	County of Brant, ON	$75,000	N/A	N/A	140	N/A

*Based on 2011 Nova Scotia Power Municipal Tariff of 6.213 cents per kilowatt hour (http://www.nspower.ca/site-nsp/media/nspower/ExternalWebNSPITariffs-Jan1-2011.pdf)
Sources: FCM 2008, HRM 2009, and UNSM 2011



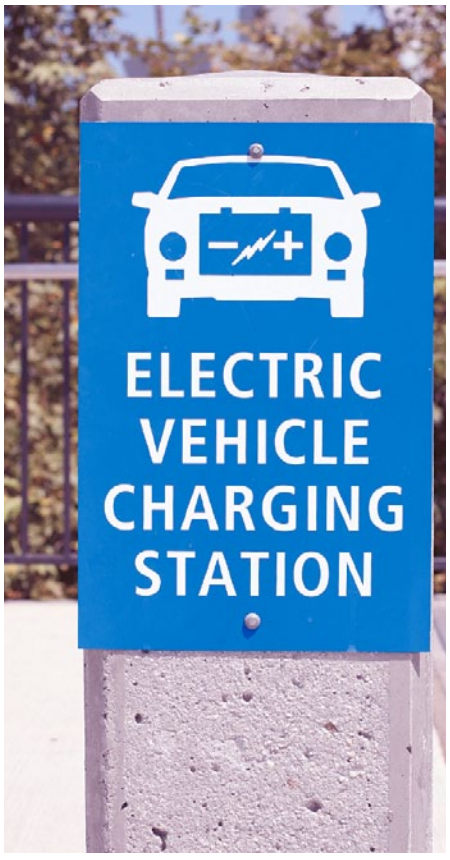
4.6 OTHER INITIATIVES

There are various other initiatives that your municipality can complete in order to reduce GHG emissions and energy use, and save money. These initiatives include, but not limited to; the purchase of hybrid buses, development of sustainability strategies and heat recovery systems in municipal arenas.

What are other communities doing?

Other Project Examples						
Description of Measure	**Community**	**Project Cost**	**Annual Energy Savings**	**Approx. $ Value of Energy Savings***	**GHG Reduction (t CO_2e / year)**	**Pay-back**
The City of Ottawa began purchasing hybrid-electric transit buses in 2008. In all, more than 175 such buses will be on Ottawa's roads by the end of 2010.	City of Ottawa	$197.648M	N/A	N/A	5,000	16.8 yrs
An innovative waste heat recovery system, which extracts waste heat from hot ammonia refrigerant used in rink ice-making, was installed at Iceland Arena.	Mississauga, ON	$178,000	51,000 m^3 natural gas 13,000 kWh electricity	$801.69	102	7 years
An ice plant heat recovery system, designed to capture and reuse waste heat, was installed at the Multiplex Arena.	Yellowknife, NT	$313,000	40% reduction in heating oil	N/A	250	2 years

*Based on 2011 Nova Scotia Power Municipal Tariff of 6.213 cents per kilowatt hour (http://www.nspower.ca/site-nsp/media/nspower/ExternalWebNSPITariffs-Jan1-2011.pdf)
Sources: FCM 2008, HRM 2009, and UNSM 2011



4.7 PREPARING A BUSINESS CASE FOR A MUNICIPAL PROJECT

Upon completing your municipal climate change mitigation plan, you may be presented with the opportunity to build a business case for municipal projects to reduce energy consumption and GHG emissions in municipal operations.

Although there are a variety of ways to make a case for a single municipal energy and GHG reduction project depending on your audience, the following is offered as guidance. Your business case may take the form of a report, a presentation, or a discussion. Whatever the form, it is important to do the following:

1. Identify all relevant stakeholders
2. Explain the challenge addressed by the project
3. Note the project features
4. Articulate the project benefits, financial value, and cost
5. Assess and respond to risk

How to Build a Business Case for a Municipal Energy Use and GHG Project

4.7.1 Identify all Relevant Stakeholders

Identify the relevant stakeholders interested in or potentially impacted by the project, and determine who the key decision makers are. Stakeholders interested in your project may include municipal staff, citizens, elected officials, and other groups. Engage these groups early on as partners and explore the potential benefits and challenges associated with your project.

4.7.2 Explain the Challenges Addressed by the Project

Briefly introduce the project, and frame it up as an initiative that addresses an existing municipal challenge, or one that links to an existing municipal commitment. This may mean linking the project with prudent fiscal management, commitments made within your municipal plan, or commitments made in other municipal documentation, such as your integrated community sustainability plan.

4.7.3 Note the Project Features

A detailed project description should be offered to provide the context required for stakeholder understanding of the project. Depending on the audience, it may be beneficial to avoid complex descriptions of technologies, or possible GHG reductions, opting instead to explain projects at a conceptual level, using plain language. Some audiences however, may prefer more detail.

In cases where the audience requires more detail, other documentation can be provided, including:

- Information on mapping, if relevant to the project.
- Current energy performance measurements.
- Data analysis, including an analysis of historical data to show energy and GHG emission results over multiple years.

4.7.4 Articulate the Project Benefits and Cost

After introducing the municipal issue addressed by your project and explaining the project to stakeholders, the benefits and costs associated with investing municipal resources should be articulated. Explaining the benefits will provide stakeholders with the rationale for investing municipal financial and human resources.

If possible, articulate the potential cost associated with the project, and link this cost with economic, environmental, social, and cultural enhancements. For example, a capital intensive energy efficiency project may have a payback period of four years, may also fulfill a stated municipal commitment to conservation, and can improve air quality for residents through reduced GHG emissions.

A common way to calculate the monetary value of your project is to calculate the simple payback of municipal energy and GHG reduction projects. Simply divide the total cost of the project by the annual energy savings after implementing the project to find the number of years it will take for investment cost recovery.

Calculating the Financial Value of the Project

There are a variety of other ways to determine and show the financial value of your project. Methods vary in complexity, and in some cases may require assistance from experienced municipal staff, or accounting personnel.

Valuation Techniques for Municipal Energy and GHG Projects

Valuation Technique	Explanation*
Annualized Savings	Convert capital costs of an energy consumption and GHG reduction project to an annual value, over the expected useful life of the equipment and add these to the annual operating costs. Compare this total with the estimated annual savings.
Life-Cycle Cost Analysis	Calculating the life cycle costs includes considering all costs associated with a project, over the useful life of the associated equipment. Under this method, capital, operating, maintenance, and financing costs would be considered, as well as salvage value of any equipment. The life cycle costs of existing equipment and projects can be compared to the projects life cycle costs.
Internal Rate of Return	Although commonly used to evaluate investments, this method is challenging for those without financial experience. Using this technique, the rate of return that would make the present value of future cash flows plus the final market value of an investment equal to the current market price of the investment is found.

*(National Framework, 2010)

When articulating the project benefits, and cost, it is also important to note any potential financial support for the initiative, which can be retrieved from the provincial and federal governments, or other programs outside of municipality. Reducing project costs and increasing the payback period is paramount to building a solid business case.

4.7.5 Assess and Respond to Risk

In addition to showing benefits and costs, it's also beneficial to be clear about the potential risks associated with energy and GHG reduction projects, and how your municipality can mitigate those risks to ensure that the promised benefits are realized. Risks can be classified in six ways, as follows (IFC, 2007):

- Design and Construction Risk: posed by difficulty in establishing baseline measurements, completion risks, or possible delays in construction.
- Performance Risk: posed by the chance that equipment installed does not perform adequately, longevity of energy savings, accuracy of savings estimates, possible difficulty monitoring and verifying performance information, and operational changes that negate any efficiency gains.
- Financial, Economic, and Regulatory Risk: posed by possible initial and operating cost overruns, interest rate risk, foreign exchange risk, regulatory risk, financial risk, and credit risk.
- Market Risk: posed by fluctuations in energy prices.
- Environmental Risk: posed by environmental hazards or accidents
- Legal Risk: posed by new environmental standards

Ensure that you identify the potential risks, provide a reason for the risk, and recommend a risk mitigation measure. This will help build support for your project, and show that the team building the business case has completed their due diligence.

How is the simple payback of our energy and GHG reduction projects calculated? By simply dividing the total cost of the project by the annual energy savings after implementing the project:

Total Cost of the Project ($)

Annual Energy Savings ($)

5.0 IMPLEMENTATION PLAN

This section of your climate change mitigation plan should include:

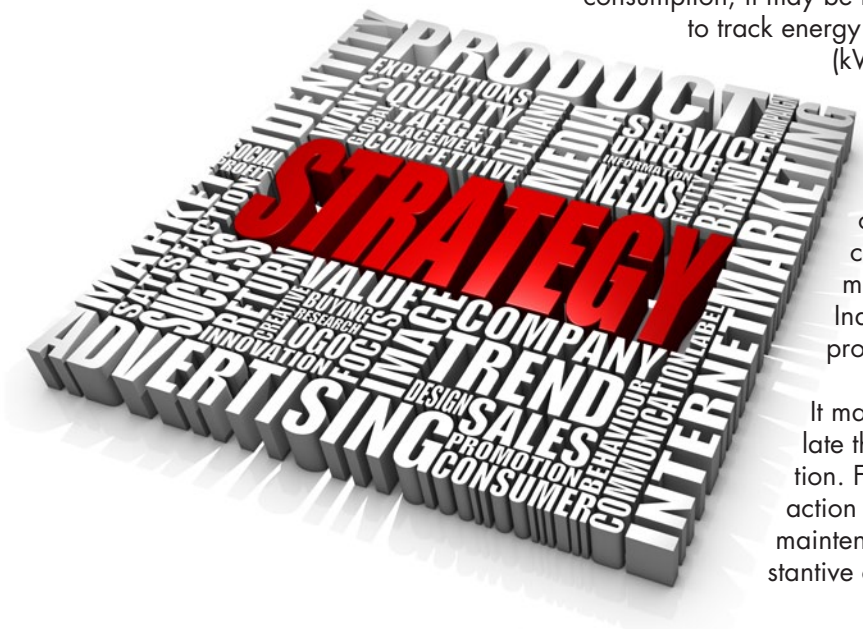
- Goal and action statements associated with a specific time frame, responsibility, and where possible, cost.
- Performance indicators to measure success relative to goals and actions.
- Contextual notes on specific actions if required to fully understand implementation.

The implementation plan is considered the roadmap for the climate change mitigation plan. It is produced using all of the knowledge gained during the climate change mitigation planning exercises and is a complete compilation of relevant goals and actions identified. The actions identified are associated with a specific time frame, responsibility, and where possible, cost. Typically, the implementation plan is viewed as the 'living' element of the climate change mitigation plan, and is updated, adjusted and adapted as circumstances change within the municipality.

The following definitions and examples are given to provide clarity on how each element of the implementation plan can be defined:

- **Goals:** Precise and realistic articulation of the desired end state.
  Example: Improved energy efficiency and annual cost savings in municipal building stock.
- **Actions:** Specific priority items which must be achieved to fully realize the stated goals
  Example: Complete a detailed energy audit on town hall and the municipal garage.
- **Time frame**: Articulation of the timing of a specific action. This could involve grouping actions into short-, medium-, and long-term actions, or other classification as desired. You municipality should decide how short-, medium-, and long-term are defined. The key is to link actions to completion dates.
  Short-term (year 1 and year 2) / medium-term (year 3 and year 4) / long-term (year 5 and beyond)
- **Responsibility**: The identification of individuals or groups responsible for implementation of the action. These groups will be held accountable for the success of the action.
  Responsibility may be given to committees of council, town operations personnel, community groups, and other relevant stakeholders.
- **Cost**: If possible, articulate capital, maintenance and operations, and other costs. This can be challenging for municipalities, as some costs may not be known immediately. To the extent possible, the implementation plan should be populated with available costing information.

Your municipality may wish to identify performance indicators, which can help define or note the success of the measures implemented to achieve a particular action or goal. For example, to reduce building energy consumption, it may be beneficial for a municipality to track energy consumption in kilowatt hours (kWh) for each municipal building. If electricity consumption is on the rise, it is an indication that the measures to reduce energy consumption are ineffective, or other energy consumption increases may have negated implemented conservation measures. Indicators should be used as appropriate, but are not necessary.



It may also be beneficial to articulate the impact of a particular action. For example, if executing an action leads to reduced operation and maintenance costs, or requires substantive capital, this could be noted.

5.1.1 Goals

This section of your climate change mitigation plan should include:

- A summary of the goals established for the plan (i.e., retrieve 10% more energy from geothermal resources); and
- Any contextual notes required for understanding goals.

To set goals, engagement approaches as noted in Section 4.1.2 of this plan can be employed. Establishing relevant goals require engagement of a multitude of stakeholders, including any steering committees formed through focus groups, large meetings, individual meetings, or a combination of these methods.

5.1.2 Actions

This section of your climate change mitigation plan should include:

- A summary of the actions established for the plan and an indication of the associated goals for each action; and
- Any contextual notes required for understanding actions.

Identifying actions associated with goals is a more detail oriented exercise than establishing goals. Your municipality may wish to engage steering committees and municipal operations primarily, using focus groups and meetings to validate and modify the actions proposed.

5.1.3 Accountability and Timing

This section of your climate change mitigation plan should include:

- The time frame, responsibility, and cost information associated with each action linked to a goal; and
- Any contextual notes required for understanding this content.

When identifying your municipality's actions, it will be important for your municipality, where possible, to set time frames, determine action responsibility, and estimate costs should also be defined where possible. As noted, municipalities may wish to engage a succinct group of stakeholders to identify these detailed plan elements.

The following table can be used to consolidate information in your implementation plan. In some cases, you may wish to streamline your mitigation plan by using the implementation plan table to summarize the plan elements noted in Section 5.0.

Sample Implementation Plan Table

Goal	Action	Time Frame	Responsibility	Cost	Performance Indicators	Impacts

6.0 MONITORING PLAN

This section of the plan should include:

- Methods for evaluating the implementation of actions identified in the previous section; and
- Methods to identify potential new actions, deleting projects deemed inappropriate with changing circumstances, affirming remaining proposed projects and adding new projects to respond to changing conditions.

Several tools can be used for monitoring the implementation plan and associated activities including:

- Annual Progress Reporting: This is the most critical element of the monitoring and evaluation process. A report is a key way to provide information regarding what is working, what needs to be improved, and how the community can move forward.
- Annual Meeting: An annual meeting with municipal staff and the steering committee can be held to present implementation plan progress, relevant reports and the status of implementation.
- Plan Review: In the initial years following adoption, the climate change mitigation plan may require significant refinement; over the longer term the plan should be thoroughly reviewed, updated as appropriate, and revised in a similar manner to a municipal planning strategy.

7.0 REFERENCES

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APPENDIX A
PROJECT CASE STUDIES

Project Case Studies for Municipal Buildings

Halifax Regional Municipality

Halifax District Energy Study Phase 2

The Halifax Regional Municipality recognizes potential for a district energy system in the urban areas of the Halifax Peninsula and the waterfront area of Dartmouth. Phase 1 of the Halifax District Energy Project investigated converting or upgrading existing boiler plants at major sites on the Halifax peninsula, or building new natural gas–fired cogeneration plants. This would balance the potential to generate electricity with the market for waste heat. There are also opportunities for cooling using absorption chillers or a harbor–water–based cooling loop. Phase 2 expands on the most favorable approach developed in Phase 1 and assesses its technical and economic potential. This study will develop a business model for a partnership among the principal stakeholders, recommend a management structure to develop and operate a system, and suggest a financial strategy to underwrite the project. Phase 2 will also consider regulatory issues associated with the generation of electrical power and the distribution of thermal energy.

Project Cost: $41,000
GHG Reduction: N/A
Full Report: HRM. 2004. HRM Community Energy Project. Available online: http://gmf.fcm.ca/Search/PDF/GMEF2915_Rep_e.pdf

City of Guelph, ON

Feasibility Study for a District Energy System

The City of Guelph will conduct a feasibility study of a district energy system architecture in three major sites: the University of Guelph, Guelph General Hospital and the downtown core. Options for combined heat and power (CHP) using various sources of renewable energy (solar and wind power generation, solar heating, ground source heating and cooling) as well as the use of an upgraded refuse-derived fuel in the form of pellets from landfills will be examined. The study will also explore other options for increasing energy sustainability, such as improved power demand management by enhancing the cooling system, and using a life-cycle analysis to evaluate and compare the environmental and social impacts of each option. The final proposal will include draft designs, preliminary cost estimates, implementation schedules and required regulatory approvals. The implementation of a district energy system for CHP is expected to reduce overall energy system costs, reduce carbon emissions by more than 50 per cent, improve local air quality, create local employment, attract green businesses and eliminate line loss of electricity over distance. It would also reduce the need to import less clean and more expensive electricity during peak demand. As there is currently no other CHP installation of this scale in Canada, this project could become a model for other mid-sized urban centres.

Project Cost: $306,000.00
GHG Reduction: Approximately 50%
Source: Federation for Canadian Municipalities. 2011. Green Municipal Fund Approved Project Database. Accessed March 15, 2011. Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

City of Coquitlam, BC

Sustainable Community Energy Supply Options

The City of Coquitlam is planning a new mixed-use community to accommodate a population of 24,000 in the northeast part of the municipality. This study will explore sustainable community energy options for the Village Core of the new community. The Village Core will encompass approximately 66 hectares (ha) of land and will take the form of a mixed-use neighbourhood incorporating transit and pedestrian orientation. It will house approximately 2,200 dwelling units and 19,000 square metres (m2) of commercial floor space. The feasibility study will identify technically and financially viable energy supply and distribution options, including a district energy system (DES) for the space and water heating of the buildings planned for the new Village Core. Building a sustainable community would result in annual base reductions of 570 tonnes of carbon monoxide (CO), and 5,636 tonnes of carbon dioxide (CO_2) as well as an annual base energy reduction of approximately 30,000,000 equivalent kilowatt hours (ekWh). With a DES, energy consumption in the target buildings could decrease by up to 60 per cent from the baseline. Reductions in nitrogen oxides (NOx) and sulphur oxides (SOx) are also anticipated.

Project Cost: $83,350.00
GHG Reduction: Annual base reductions of 570 tonnes of carbon monoxide (CO), and 5,636 tonnes of carbon dioxide (CO_2) as well as an annual base energy reduction of approximately 30,000,000 equivalent kilowatt hours (ekWh).
Full Report: Stantec Consulting, resource Rethinking Building and Earthvoice Strategies. 2007. Northeast Coquitlam District Energy Options Study. Prepared for The City of Coquitlam. Accessed March 21, 2011. Available online: http://fmv.fcm.ca/Search/PDF/GMEF7126_Rep_e.PDF

City of Timmins, ON

City of Timmins Energy/Performance Contracting Project

Detailed energy audits will be conducted on 82 City facilities. The information from the audits will be used to identify potential retrofits and technologies, as well as determine the technical and economic feasibility of potential efficiency upgrades. The feasibility study will establish a baseline for energy and water consumption for each building; evaluate the current building envelope condition, performance of electrical and mechanical equipment and operating procedures for each building; identify potential improvements including improved monitoring, on-site electric generation, geothermal heating, high efficiency lighting and heat pumps, water-efficient fixtures and awareness programs; develop an estimation of retrofit costs and payback periods; calculate final energy and water savings and operating benefits using computer simulation, modeling or other methods; and identify up to 20 high priority opportunities for building performance improvements. Once efficiency measures are in place, the buildings are estimated to reduce greenhouse gas (GHG) emissions by 1,292 tonnes/year or 13 per cent. The amount of water reduced by efficiency measures will be determined as part of the study.

Project Cost: $128,000.00
GHG Reduction: 1,292 tonnes/year or 13 per cent
Full Report Siemens Building Technologies Ltd. 2005. Energy Feasibility Study. City of Timmins Energy Management Program. Accessed March 21, 2011. Available online: http://fmv.fcm.ca/Search/PDF/GMF-7215.pdf

Toronto Region Conservation Authority, ON

Reducing Energy Use in Single Pad and Under Performing Multi-Pad Arenas

The Mayors' Megawatt Challenge (MMC) is an initiative of the Toronto Region Conservation Authority (TRCA) bringing Greater Toronto Area municipalities together to achieve the collective goal of one-megawatt energy reduction. The MMC has identified the need to determine retrofit and demand management opportunities in order to significantly reduce energy use in 19 single pad arenas and older multi-pad arenas in the six municipalities participating in this systems-based solution study. Operational improvements to the energy and water systems will be given the same level of importance in the study as the determination of energy reductions expected from retrofit opportunities. A final implementation plan will outline combined efforts, strategies for dealing with municipal Councils, potential joint implementation ventures, implementation timelines, and performance tracking and reporting. A directory of best retrofit and operational practices for arena facilities will be developed. The TRCA estimates that an average savings of approximately 130,000 KWh annually can be achieved for many of the arena facilities, saving participating municipalities collectively over $350,000 annually at 2005 energy costs. The TRCA expects that for all 19 arenas involved in the study, a reduction of approximately 2,300 tonnes per year of GHG emissions is achievable.

Project Cost: $332,000.00
GHG Reduction: 2,300 tonnes per year
Full Report: Toronto Hydro Energy Services. 2007. Feasibility Study – Ennismore Community Centre. Accessed March 21, 2011. Available online: http://fmv.fcm.ca/Search/PDF/GMEF7224_Rep_e.pdf

City of Summerside, PE

City of Summerside Wind Farm Environmental Assessment

The City of Summerside owns and operates its electric utility, servicing approximately 6,600 residences and businesses. Currently, the City's electricity requirements are purchased from out-of-Province sources and are primarily fossil fuels. To comply with the Province of Prince Edward Island's Renewable Energy Act requiring all electric utilities to have at least 15 per cent of its electrical energy requirements supplied from renewable energy sources by 2010, the City plans to develop a 12.5 MW wind farm that would produce 38.33 GWh of electricity annually to the municipality. This equates to 100 per cent of the electrical power requirements of the City's residential sector. A preliminary study demonstrated favourable results for the proposed wind farm project. This project is the next step towards implementation. The City will conduct an environmental assessment, as required under the Canadian Environmental Assessment Act. In addition, a geotechnical survey will be performed on the site to obtain data for designing the foundations for wind turbines. The City estimates that the proposed wind farm would result in 33.6 per cent of the City's electricity being generated by renewable energy with emission reductions of 9,581 tonnes of CO_2 annually, 157.5 tonnes of SO_2 and 105 tonnes of NOx.

Project Cost: $51,076.00
GHG Reduction: Emission reductions of 9,581 tonnes of CO_2 annually, 157.5 tonnes of SO_2 and 105 tonnes of NOx.

Full Report: The City of Summerside. 2009. The City of Summerside Wind Farm Environmental Assessment. Accessed March 21, 2011. Available online: http://fmv.fcm.ca/Search/PDF/GMF9043_Rep_e.pdf

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Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

Project Case Studies for Municipal Water and Wastewater Services

Municipality of the District of Argyle, NS

Sustainable Water Supply Infrastructure & Management Practices for the Nakile Home for Special Care

The Municipality of the District of Argyle will study alternatives for implementing a sustainable water supply system at the Nakile Home for Special Care. A detailed feasibility study to identify the preferred water supply system will be followed by a field test of alternative technologies and system design work and cost/benefit analysis in relation to implementing preferred technologies into both current and future plans of the facility. In addition, an educational manual for Home staff will be developed that will incorporate "best practice" strategies for reducing water use, aquifer impacts, chemical and energy consumption in the Home and for managing water demand. It is estimated that the replacement of standard fixtures with low flow fixtures will reduce total daily domestic water demand by 3,529 L/day or 54 per cent; supplementing industrial water use with rain water will reduce groundwater demand for industrial purposes by 1,785 L/day or 37 per cent, and; resizing the Home's water supply system pumps to account for lower water demand will reduce GHG emissions in the form of CO_2e by approximately 1,141 kg/yr or 70 per cent.

Project Cost: $39,000.00
GHG Reduction: reduce GHG emissions in the form of CO_2e by approximately 1,141 kg/yr or 70 per cent
Source: Green Municipal Fund. 2009. Conservation key to water supply at seniors' home. Green Municipal Fund Case Study. Accessed March 21, 2011. Available online: http://gmf.fcm.ca/Search/PDF/GMEF7115_CS_e.pdf

Municipality of the County of Inverness, NS

Cap Lemoine, St. Joseph du Moine and Grand Etang On-site and Small Scale Wastewater Management

This study provides an opportunity to demonstrate an innovative approach to wastewater management in Nova Scotia that will be applicable to other rural communities across Canada. The study will produce a sewage management strategy, which will eliminate all raw sewage discharges in a prioritized and phased approach. The strategy will transfer all homeowner responsibilities related to septic systems to a formalized management structure, ensuring proper design, construction, operation and maintenance of individual on-site septic systems. Components such as water quality monitoring, water conservation and wastewater treatment, as well as reuse, will be evaluated. In addition, the study will assess alternative septage treatment and beneficial biosolids reuse applications appropriate for rural communities. With assistance from the local planning/development agency, land use and zoning guidelines will be developed to promote natural wastewater treatment and disposal methods.

Project Cost: $80,000.00
GHG Reduction: N/A
Full Report: C.J. MacLellan and Associates Inc. Consulting Engineers and Planners and ABL Environmental Consultants Limited. 2004. Cap Lemoine, St. Joseph du Moine and Grand Etang On-Site and Small Scale Wastewater Management District Study. Prepared for Municipality of the County of Inverness. Accessed March 21, 2011. Available online: http://gmf.fcm.ca/Search/PDF/GMF%205479.pdf

Town of Quispamsis, NB

Comprehensive Groundwater Resource Model and Electronic Database

Ninety-seven per cent of potable water for the Town of Quispamsis is supplied through private wells. Approximately 20 per cent of the private wells have had issues with water quality or insufficient yields. Due to its dependency on groundwater, the Town will develop a hydrogeological model and an aquifer protection and management plan, and it will assess future infrastructure requirements and associated costs. This will allow the town to protect its water source, implement a water conservation plan, and eventually supply treated potable water to areas currently served by private wells. Deliverables will include an electronic groundwater resources database, a 3D groundwater flow model of the Quispamsis groundwater resource recharge area, an assessment of groundwater quality and treatment requirements, identification of potential future groundwater development areas, recommendations respecting associated infrastructure planning costs, recommendations for sustainable groundwater resource development, management and protection, and finally identification of potential funding sources to implement the process. The Municipal Development Plan will be revised to include the results of this planning study.

Project Cost: $75,000.00
GHG Reduction: N/A
Source: Federation for Canadian Municipalities. 2011.
Green Municipal Fund Approved Project Database.
Accessed March 15, 2011.
Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

City of Weyburn, SK

City of Weyburn Feasibility Study for Municipal Wastewater Treatment

As part of its pro-active commitment to sustainability and environmental stewardship, the City of Weyburn will consider wastewater treatment upgrade strategies to improve its lagoon effluent quality to meet more stringent future regulations for nitrogen (N), phosphorous (P), ammonia (NH3), biochemical oxygen demand (BOD), total suspended solids (TSS) and total dissolved solids (TDS). The wastewater treatment upgrade options that will be examined include, but are not limited to, constructed wetlands, effluent irrigation, and wetlands and effluent irrigation in combination. Two potential wastewater disposal end uses are the irrigation of a neighbouring tree nursery and/or the irrigation of forage crop fields, if not detrimental to soil conditions. The potential use of biomass as fuel source may also be examined. Potential modifications to the existing system such as an increase in retention time in the storage cells during the summer months and the segregating of the primary lagoon into two separate cells are also being considered. The study will also provide an opportunity for public awareness and education with respect to water conservation. Some proposed water conservation strategy initiatives include information brochures and financial incentives for installing low flow toilets and shower heads.

Project Cost: $200,000.00
GHG Reduction: N/A
Full Report: Stantec Consulting. 2006.
City of Weyburn Wastewater Treatment Plant Upgrade-
Conceptual Design Report.
Accessed March 21, 2011.
Available online: http://fmv.fcm.ca/Search/PDF/GMEF7227_Rep_e.pdf

City of Brockville, ON

Small Population COGEN from Wastewater Treatment

The City of Brockville's population is less than what is usually required (30,000) to make cogeneration economically feasible in a municipal setting. This small population cogeneration project study will take advantage of the secondary wastewater treatment process and local septage to generate heat and electricity at its new wastewater treatment plant (WWTP), currently at the planning stage. By using digester gas to generate heat and electricity to meet the requirements of the WWTP, the cogeneration system will reduce or eliminate the WWTP's need for energy produced from fossil fuels. Cogeneration technology alternatives will be evaluated based on criteria including efficiency, workability, payback period, capital costs, standby capability and peaking capability. The acceptance of septage would add also additional methane that could help make the cogeneration system economically viable. The cogeneration system will reduce direct emissions from the methane produced by the wastewater sludge and septage; indirect emissions will be reduced from the displacement of a fossil fuel based energy source. Additionally, local septage receiving capabilities would eliminate the need for septage transportation to municipal treatment facilities in the Cities of Ottawa and Kingston, drastically reducing greenhouse gas (GHG) emissions associated with transportation.

Project Cost: $25,500.00
GHG Reduction: N/A
Full Report: CH2M Hill. 2007. City of Brockville Water Pollution Control Centre Cogeneration Feasibility Assessment. Accessed March 21, 2011. Available online: http://fmv.fcm.ca/Search/PDF/GMEF7280_Rep_e.pdf

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Case Study Profiles: Federation for Canadian Municipalities. 2011.
Green Municipal Fund Approved Project Database. Accessed March 15, 2011.
Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

Project Case Studies for Municipal Fleet Vehicles

Toronto, ON

The first sustainability plan for the City of Toronto, Green Fleet Transition Plan 2004 to 2007, was released in 2004. It presented a sustainable and cost-effective plan to reduce the negative environmental impacts of the City's fleet operations. The plan began the transition of the City's vehicles and equipment to lower impact alternatives, including biodiesel, natural gas, and hybrid electric vehicles (HEVs).

Through the plan, the City of Toronto reduced the CO_2 emissions of its fleet by an estimated 5,000 tonnes (a reduction of 4 percent), and increased its green vehicle fleet by 100 percent to a total of 283 green vehicles. As part of the plan, Toronto conducted tests of biodiesel and implemented a plan to buy B100 and blend it in optimal concentrations depending on the season of the year.

The City of Toronto approved Phase 2 in March 2008. The Green Fleet Plan 2008 to 2011 outlines the green vehicles, fuels, and activities the City will use to reduce the fleet's environmental impact. It will focus on the City's centrally managed fleet of approximately 4,700 centrally managed vehicles and equipment.

The City will reduce vehicle miles traveled, purchase fuel-efficient vehicles, and right-size the fleet to meet its current needs. The purchase of green vehicles will become standard practice, with a minimum of 520 green vehicles purchased by 2011. Finally, the City will pilot test advanced powertrain technologies to assist in the acceleration of large scale adoption of the vehicles in Canada. At this time, Toronto is partnering with Fiba Canning, Inc to develop a hydraulic hybrid garbage packer that will run on 100-percent biodiesel.

The City will continue to evaluate the use of biofuels in all on- and off-highway vehicles by expanding the delivery of the fuel to all City departments. The City will advocate sustainable electricity in Ontario, including the phase-out of coal-fired electricity.

The City of Toronto is promoting Natural Resources Canada's "Idle-Free" campaign among City staff. The campaign encourages operators not to idle their vehicles for more than 10 seconds. The City will also study the feasibility of making green pool vehicles available to staff for work-related transportation.

Project Cost:	N/A
GHG Reduction:	reduce emissions of CO_2 by approximately 15,000 tonnes, an 11-percent reduction
Full Report	City of Edmonton. 2009. Towards Sustainability: Strategies for the City of Edmonton Fleet Operations. Accessed March 21, 2011. Available online: http://gmf.fcm.ca/Search/PDF/GMF9724_Rep_e.pdf

Vancouver, BC

The City of Vancouver released its first sustainability plan in 1997. In the original plan, sustainability efforts were extended throughout the city. The plan limited overall road capacity, provided more biking and walking environments, increased provision and use of transit, enacted traffic calming measures, and maintained an efficient network for the movement of goods within the city. Over the 10 years of implementation, the original fleet sustainability plan limited GHG emissions to 11 percent of the levels in 1990, with a vehicle growth of 21 percent. The reduction was met by maximizing the blend biodiesel and right-sizing the City's fleet.

In June 2007, the council adopted new sustainability targets to reduce the community's GHG emissions to 33 percent below the 2007 levels by 2020 and 80 percent below the 1990 levels by 2050. Vancouver's fleet is maintained by Equipment Services (EQS), which maintains 4,000 vehicles for the City. EQS has begun to address the City's financial, social, and environmental goals through a biodiesel fuel project, participating in Natural Resources Canada's "Idle-Free" campaign and implementing a driver training program. In addition, it has outlined future opportunities for reducing the City fleet's environmental impact.

The use of biodiesel will be increased to the maximum percentage allowed by warranty.

In 2008, a contract was established with Co-operative Auto Network (CAN), a local car-sharing program. CAN will provide low-emission vehicles at City Hall for car-sharing purposes. During working hours, the cars will be used exclusively by city employees for work-related travel, replacing a number of City-owned vehicles. After working hours, the CAN vehicles will become publicly available for rent.

The City has agreed to purchase alternative fuel vehicles to minimize GHG emissions. A Toyota PHEV was added to the fleet in November 2008.

The City has modified certain vehicles to reduce energy consumption, including speed limiters, timed engine shut-downs, low-power lighting systems, and engine-off auxiliary heaters. In addition, the temperate climate has allowed the ordering of new vehicles without air-conditioning unless there is an operational requirement.

Initiated by the Fraser Basin Council, a group of community associations and civic leaders within British Columbia's Fraser Basin, the E3 Rating System is a points-based system that grades whole vehicle fleets on their overall energy, emissions, and financial performance. The program is expected to help at least 600,000 fleet vehicles across Canada reduce their GHG emissions.

Project Cost: N/A
GHG Reduction: N/A
Full Report City of Edmonton. 2009.
Towards Sustainability: Strategies for the City of Edmonton Fleet Operations.
Accessed March 21, 2011.
Available online: http://gmf.fcm.ca/Search/PDF/GMF9724_Rep_e.pdf

Edmonton, AB

The City of Edmonton in 2009 developed Sustainable Fleet Management Plan (SFMP) to reduce dependence on fossil fuels, reduced carbon dioxide (CO_2) emissions and reduce energy costs by reducing fleet emissions by at least 20 percent in 2017. Alternative fuels and/or advanced vehicle technologies such as hybrid electric vehicles, plug-in hybrid vehicles, electric vehicles, and compressed natural gas vehicles were examined to implement into the City's fleets.

Project Cost:	Incremental vehicle procurement costs - $74 million Fuel Monitoring System - $ 2.5 million Vehicle Tracking System - $0.7 million Refueling Infrastructure Modifications - $5.0 million Total - $82.2 million
GHG Reduction:	A total of about 30,680 tonnes of GHG emissions would be eliminated by 2017 and 41,078 tonnes by 2025 if the plan were to be implemented.
Full Report:	City of Edmonton. 2009. Towards Sustainability: Strategies for the City of Edmonton Fleet Operations. Accessed March 21, 2011. Available online: http://gmf.fcm.ca/Search/PDF/GMF9724_Rep_e.pdf

City of Sudbury, ON

City of Sudbury Hybrid Cars

Over the course of 2008 and 2009, the City of Greater Sudbury replaced a number of its fleet vehicles with fuel efficient hybrids. In total, 22 Toyota Prius hybrids were purchased to replace the City's Ford Crown Victorias and Chevrolet Impalas. The City also bought 9 Ford Escape hybrids to replace its larger pick-up trucks. The total implementation cost of this initiative was $960,000. However, the new vehicles provide annual cost savings of $93,000, and are likely to pay for themselves in approximately 10 years. Each of the hybrid vehicles boasts nominal maintenance costs—with many requiring less maintenance than their conventional counterparts.

In addition to these financial savings, the new hybrids are helping to reduce energy consumption and the production of harmful emissions. The 22 Toyota Prius vehicles are achieving up to 62 mpg (4.6 L/100km), a fuel economy that is roughly three times better than the other cars in Sudbury's fleet. The Ford sport utility vehicles are also proving to be an improvement on those they replaced, boasting a fuel economy as high as 42 mpg (6.7 L/100km). Altogether, these vehicles are expected to save 62,000 L of gasoline annually—roughly 2,000 L of fuel per unit. With an annual GHG reduction of 146 tonnes, Sudbury's investment in hybrid technology makes both environmental and economic sense.

Project Cost:	$960,000.00
GHG Reduction:	146 tonnes
Full Report:	Federation of Canadian Municipalities (FCM) / ICLEI Local Government for Sustainability. 2010. Partners for Climate Protection National Measures Report 2010. Demonstrating Results: Municipal Initiatives to Reduce Greenhouse Gases. Accessed March 21, 2011. Available online: http://fmv.fcm.ca/files/Capacity_Building_-_PCP/PCP_Resources/Measures_Report_2010_English_Final.pdf

Quebec, Montreal, and several other Canadian Cities

Quebec, Montreal, and several other Canadian cities have established sustainable development plans for their respective cities. Although these plans do not directly address the modification of the city's fleet composition to reduce GHG emissions, they do outline methods for individuals and businesses to reduce GHG emissions through the use of transit, car sharing, bicycling, etc. In the future, these plans may be further developed within the city to address the municipal fleet.

Full Report: City of Edmonton. 2009.
Towards Sustainability: Strategies for the City of Edmonton Fleet Operations.
Accessed March 21, 2011.
Available online: http://gmf.fcm.ca/Search/PDF/GMF9724_Rep_e.pdf

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Accessed March 15, 2011.
Available online: http://fmv.fcm.ca/files/About_us/Annual_Reports/2007-2008-GMF-AR-e.pdf

Project Case Studies for Municipal Solid Waste Facilities

City of Calgary, AB

Energy Recovery from Landfills

Calgary's Solid Waste Services and ENMAX Corporation are jointly studying the feasibility of recovering energy from landfill sites. ENMAX is the City of Calgary's wholly owned Subsidiary Corporation. The study will assess the possibility of capturing biogas generated by landfills for power production. Options for use will include emerging technologies such as micro-turbines. PanCanadian Petroleum Ltd. is also an equal partner in this project, contributing $75,000 to the budget. The results of this study will be applicable to other landfills across Canada. ENMAX is committed to the increased use of renewable energy and will use the landfill site for the demonstration and testing of other renewable energy technologies such as wind turbines and solar panels. The combination of biogas use with other renewable energy technologies will create a high profile renewable energy centre.

Project Cost: $325,000.00
GHG Reduction: N/A
Full Report: Phoenix Engineering Inc. 2003.
Spy Hill Solar and Wind Resource Assessment.
Accessed March 21, 2011.
Available online: http://fmv.fcm.ca/Search/PDF/GMEF%200233_P1.pdf

Calgary Regional Partnership, AB / Municipal District of Rocky View No. 44, AB

Calgary Regional Partnership Organics Waste Management Feasibility Study

The Calgary Regional Partnership (CRP) will conduct a feasibility study to determine the regional organic waste flow and potential scope, location(s), appropriate technology, and business case implications associated with a regional organic waste recovery system. Three options will be evaluated - multiple regional organic waste processing facilities, a single material recovery facility, and smaller scale municipal waste processing facilities. An implementation strategy for the preferred option will also be established. Baseline GHG emissions from landfills will be determined and a preliminary evaluation of energy from biomass options conducted. Currently, at least 90 per cent of organics are not being diverted. By weight, this represents 40 per cent of the overall waste stream. The CRP estimates that over a 10-year period, an organic waste recovery system could achieve a 60 per cent organics diversion rate, diverting 406,909 tonnes of organic waste per year from landfills by 2017, with an ultimate goal of 'zero disposal' of organic materials in landfills. This would result in a 60 per cent reduction in future GHG emissions from landfills and a decrease in GHG emissions associated with the creation of transportation synergies. The diversion of organics would also reduce leachate production and extend the life of regional landfills.

Project Cost: $270,000.00
GHG Reduction: 60% reduction in GHG emissions
Full Report: CH2MHill. 2006. Regional Organics and Paper Waste Recovery System and Processing Facility Study.
Accessed March 21, 2011.
Available online: http://fmv.fcm.ca/Search/PDF/GMEF7225_Rep_e.pdf

City of Edmonton, AB

Gasification of Edmonton's Municipal Solid Waste (MSW) Residuals

This field test, based on the results of the previous study (GMF 2667), will assess the technical and economical feasibility of using Enerkem's fluidized bed gasification technology to dispose of the City's municipal solid waste residuals (the waste remaining after recycling and composting). The process will generate synthetic gas (Syngas), a mixture of hydrogen and carbon monoxide, for the production of steam and/or electricity. Gasification pilot trials will be carried out at Enerkem's Pilot Gasification Facility in Sherbrooke, QC. A critical component of the field test will be the development of detailed cost estimates for the operation of a full-scale facility. The implementation of an advanced thermal recovery system would result in waste processing and disposal becoming a net energy producer and GHG reducer. The GHG emissions reduction potential is estimated at 54,400 tonnes per year and the energy value of the residual waste stream is estimated to have the potential to provide approximately 10 MW of electricity. The thermal treatment of the residuals from composting and materials recovery would also conserve landfill capacity due to the fact that only 10 to 15 per cent of the City's collected MSW would require landfill disposal after the institution of a gasification process. This would result in an estimated reduction of 67,500 tonnes per year in waste destined for landfill.

Project Cost: $900,863.00
GHG Reduction: 54,400 tonnes per year
Full Report: City of Edmonton. 2009.
Gasification of Edmonton's MSW Residuals.
Accessed March 21, 2011.
Available online: http://gmf.fcm.ca/Search/PDF/GMEF7257_Rep_e.pdf

City of Saskatoon, SK

Retrofitting Rapid Stabilization and Gas Collection in Older Landfills

The goal of this field test is to enhance landfill gas (LFG) production and collection at the City of Saskatoon Landfill by adding moisture to the landfill to stabilize the existing waste mass. Gas wells and monitoring systems, moisture probes, gas headers, water lines, condensate traps and wellhead assemblies will be installed over a portion of the landfill during the first five months of the project. The initial testing and trial operation of the LFG extraction system will follow in the next two months. Actual testing over the next 18 months will evaluate gas flow, gas composition, moisture addition rates, moisture movement in the waste and stabilization rates. Evaluation will be done also of well spacing, well sizes and moisture addition rates on LFG production and leachate quantity and quality. A full scale LFG project will be considered if it is proven that water addition will not pose a significant increase in risk to water resources such as the South Saskatchewan River, and that gas generation rates can be increased enough to justify a collection system. Once operational, a new LFG utilization facility would have the capacity to utilize 1,800,000 m3/yr of LFG. Net emission reductions are forecast to be in the order of 12,300 tonnes/year of CO_2 and 2,230 tonnes/year of methane.

Project Cost: $525,000.00
GHG Reduction: 12,300 tonnes/year of CO_2 and 2,230 tonnes/year of methane
Full Report: University of Saskatchewan. 2009.
Evaluation of Retrofitting Rapid Stabilization and Gas Collection in Older Landfills.
Accessed March 21, 2011.
Available online: http://gmf.fcm.ca/Search/PDF/GMF7270_Rep_e.pdf

City of St. John's, NL

Methane Gas Study - Robin Hood Bay Landfill

The City of St. John's is developing a plan to capture methane gas from the Robin Hood Bay Sanitary Landfill as a potential source of revenue or energy. The landfill, with an anticipated life of 41 years, is not equipped with a gas collection system. The study will determine the gas generation potential and utilization and assess its quantity and quality. Potential uses, including the production of electricity, and environmental benefits such as greenhouse gas emission reductions will be evaluated. The study is a first for the province in terms of investigating the potential for capture and utilization of methane gas from a landfill. In addition, the city is working with a local company to establish a pilot leachate treatment system at the landfill.

Project Cost: $30,000.00
GHG Reduction: N/A
Full Report: Gartner Lee Limited. 2003.
Reduction of Greenhouse Gas Emissions: Methane Gas Study
for Robin Hood Bay Landfill. Prepared for the City of St. John's.
Available online: http://gmf.fcm.ca/Search/PDF/GMEF%203274.pdf

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Case Study Profiles: Federation for Canadian Municipalities. 2011. Green Municipal Fund Approved Project Database. Accessed March 15, 2011. Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

Project Case Studies for Other Infrastructure

City of Saskatoon, SK

Greenhouse Gas Emissions Audit and Corporate Environmental Management System

The City of Saskatoon will complete the Partners for Climate Protection (PCP) Milestone 1 by creating a greenhouse gas (GHG) emissions inventory and forecast that will assess how to best reduce emissions from City and community operations. This will include corporate vehicle fuel consumption, facility energy usage, the transit system, landfill, and water and wastewater treatment. PCP Milestone 2 will be completed also by setting an emission reduction plan in relation to all of the noted sources. The results will be incorporated into a corporate Environmental Management System that will serve as a system to track and evaluate the City's environmental impact and performance. The reduction of GHG in the community will improve air quality and reduce the City's contribution to climate change. Based on a modest estimate of 20 per cent greenhouse gas reduction, a savings of 801,700 tonnes of CO_2e could be realized if PCP Milestone 3, the Local Action Plan, is implemented. The City is using the ISO 14001 standards as a guideline for the development of the corporate Environmental Management System.

Project Cost: $74,000.00
GHG Reduction: 801,700 tonnes of CO_2e
Source: Federation for Canadian Municipalities. 2011. Green Municipal Fund Approved Project Database. Accessed March 15, 2011. Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

City of Regina, SK

Eco-Industrial Networking Opportunities for Ross Industrial Park

Ross Industrial Park, the City of Regina's largest, consists of more than 400 businesses ranging from large refineries to non-retail commercial operations and small distribution facilities. The Regina Eco-Industrial Network Association (REINA) will work with the City of Regina and use the Eco-Industrial Networking approach to develop an integrated strategy focusing on environmental, economic, and social sustainability in relation to transportation infrastructure and activities within the Park. A Geographic Information System will be used to map data and inform decision making. Findings from the study will feed directly into the City's Long Range Land Use Plan for Northeast Regina. The City, also a member of the Partners for Climate Protection program, anticipates that several Eco-Industrial Networking opportunities identified in the study will be energy-related and will feed directly into its community energy planning process. Regina Eco-Industrial Network Association expects that environmental benefits from the implementation of transportation-related opportunities will result in a more efficient use of natural resources, less congestion, fewer GHG emissions, improved natural habitats, reduced exposure to pollutants, and improved storm water quality. A 30 per cent reduction in overall energy consumption by businesses will reduce GHG emissions by 176,700 tonnes CO_2e per year.

Project Cost: $213,017.00
GHG Reduction: 176,700 tonnes CO_2e per year.
Full Report: City of Regina, Regina Eco-Industrial Network Association and Eco-Industrial Solutions, Ltd. 2009. ECO-INDUSTRIAL NETWORKING OPPORTUNITIES FOR ROSS ECO-INDUSTRIAL PARK. Accessed March 22, 2011. Available online: http://fmv.fcm.ca/Search/PDF/GMEF7145_Rep_e.pdf

City of Port Coquitlam, BC

Energy and Greenhouse Gas Emissions Inventory and Action Plan

The City of Port Coquitlam, a member of the Partners for Climate Protection (PCP) program since 2001, will complete PCP milestones 1, 2 and 3 through this study. In addition to the creation of corporate and community-wide greenhouse gas (GHG) emissions inventories, corporate and community-wide emission reduction targets will be established. The resulting local action plan (LAP) will outline specific strategies to meet the reduction targets established and a process for their implementation. The LAP for municipal operations and the community-at-large will address land use planning, procurement, building retrofits, decisions regarding solid waste management, water conservation, etc. The action planning process includes a capacity building component that will provide City staff with operational policies and guidance for their day-to-day operations. For the LAP to be successfully implemented, public consultations will be held and support from the community will be sought. It is estimated that corporate GHG reductions of 1,000 tonnes of CO_2e and community GHG reductions of 17,400 tonnes of CO_2e could be realized as a result of the implementation of the LAP.

Project Cost: $50,000.00
GHG Reduction: corporate GHG reductions of 1,000 tonnes of CO_2e and community GHG reductions of 17,400 tonnes of CO_2e
Source: Federation for Canadian Municipalities. 2011. Green Municipal Fund Approved Project Database. Accessed March 15, 2011. Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

Town of Banff, AB

Hybridizing Public Transit in the Town of Banff

The Town of Banff will acquire a new municipal transit fleet of four NOVA 40-foot diesel hybrid-electric buses to replace the current 1985 standard diesel engine fleet in an effort to meet both the town's and national park's environmental targets. The town, located in a world-famous national park and World Heritage Site, has high levels of tourism and automobile dependency resulting in higher-than-average levels of greenhouse gas (GHG) emissions for a town of its size. The new fleet will also offer bicycle and ski racks, as well as enhanced access for seniors and people with disabilities. These new buses, and the marketing and programming associated with them, are expected to increase ridership by at least 25 per cent and achieve a variety of social, economic and environmental benefits. The benefits include reduced GHG emissions; lower costs for fuel, maintenance and repair; helping to attract the young, transit-dependent workforce that Banff needs to meet seasonal tourist needs; improved access and functionality for residents and visitors; and the health and quality-of-life benefits that result from decreased automobile dependency.

Project Cost: $4,129,639
GHG Reduction: N/A
Source: Federation for Canadian Municipalities. 2011. Green Municipal Fund Approved Project Database. Accessed March 15, 2011. Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

City of Saskatoon, SK

City of Saskatoon: Local Action Plan for GHG Reduction

The City of Saskatoon - a member of FCM's Partners for Climate Protection (PCP) program since December 2004 - will develop a local action plan (LAP) that will outline a range of projects to achieve the targets set to reduce municipal greenhouse gas (GHG) emissions 10 per cent below 1990 levels by 2013, and community GHG emissions six per cent below 1990 levels by 2013. To determine suitability for inclusion in the LAP, each proposed project will be evaluated using The Natural Step decision model and other selected criteria. A multi-sectoral, community-wide consultation in sustainable community planning and implementation will stimulate learning amongst City residents and businesses on climate change issues. Completion of Milestone 3 will lay the framework to achieve PCP's Milestones 4 and 5: the implementation of the LAP and measurement and reporting on progress. Once selected projects are implemented, the City of Saskatoon expects to reduce municipal and community greenhouse gas emissions by 4,200 tonnes and 153,455 tonnes per year, respectively.

Project Cost: $278,200.00
GHG Reduction: 4,200 tonnes and 153,455 tonnes per year
Full Report: City of Saskatoon. 2007.
Energy and Greenhouse Gas Management Plan.
Accessed March 21, 2011.
Available online: http://fmv.fcm.ca/Search/PDF/GMEF%207245_Rep_e.pdf

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Case Study Profiles: Federation for Canadian Municipalities. 2011. Green Municipal Fund Approved Project Database. Accessed March 15, 2011. Available online: http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e

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