

Partners for Climate Protection

National Measures Report 2011

**Demonstrating Results:
Municipal Initiatives to
Reduce Greenhouse Gas
Emissions**



Photo Credit: City of Vancouver, BC



FEDERATION
OF CANADIAN
MUNICIPALITIES

FÉDÉRATION
CANADIENNE DES
MUNICIPALITÉS



About PCP

The Partners for Climate Protection (PCP) program is a network of Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change. PCP is the Canadian component of ICLEI's Cities for Climate Protection (CCP) network, which involves more than 1,000 communities worldwide. PCP is a partnership between the Federation of Canadian Municipalities (FCM) and ICLEI—Local Governments for Sustainability.





Contents

Introduction.....	1
General Findings and Trends.....	2
Participant Profile.....	3
Quick Facts	3
Corporate Initiatives	4
Community Initiatives	5
Top 10 GHG Reductions.....	6
The Business Case.....	7
Case Studies.....	8
City of Burlington, ON.....	8
Regional District of Nanaimo, BC	9
Acknowledgements	10



Photo Credit: Municipality of Ritchot, MB

Introduction

Climate change has continued to impact Canadian communities and yet despite this stark reality emissions have continued to rise. Global atmospheric concentrations of CO₂ now stand at 392 parts per million (ppm)—well above the threshold of 350 ppm that scientists and climate experts have described as the safe upper limit for CO₂ in Earth's atmosphere.

Each order of government has a role to play, and municipalities are stepping up to take on the challenge of helping to reduce Canada's greenhouse gas (GHG) emissions. Canadian municipalities are continuing to prove that they are leaders in the field of climate change mitigation, advancing innovative solutions to reduce GHG emissions, while saving money and investing in their communities.

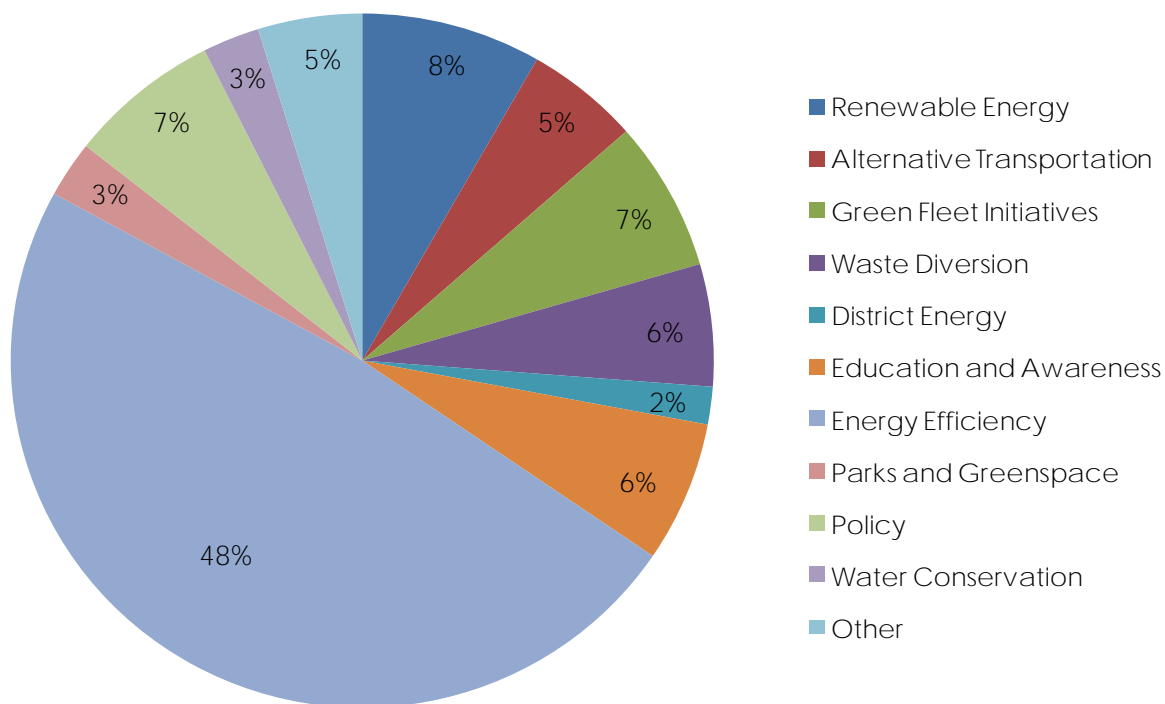
In 2011, the Federation of Canadian Municipalities (FCM) and ICLEI—Local Governments for Sustainability surveyed members of the Partners for Climate Protection (PCP) program to determine the types of GHG reductions being undertaken by local governments and the cumulative impact of these initiatives nationwide. Details on 229 projects were collected from 43 local and regional governments across Canada. Projects ranged from simple lighting upgrades and energy-efficiency retrofits at municipal facilities to large-scale investments in renewable energy, public transit and district heating systems. Together, these initiatives represent investments of nearly \$700 million in mitigation activities, and have reduced Canada's GHG emissions by approximately 200,000 tonnes—equivalent to removing 50,000 cars from the road. These and other aspects of the 2011 Measures Reporting Initiative are discussed in subsequent sections of this report. For additional information, including details on methodology, historical data, and sector-specific analyses, please visit the PCP Measures Reporting website.

General Findings and Trends

During the 2011 round of measures reporting, a total of 229 projects were added to the National PCP Measures Database. These projects ranged from simple lighting upgrades and boiler replacements to large-scale investments in renewable energy, public transit and district heating systems. Results from the 2011 survey were remarkably consistent with findings from previous rounds of data collection. For example, most of the measures reported in 2011 were actions or initiatives targeting municipal operations. Measures undertaken at corporate facilities were by far the most common type of initiative reported by PCP members, accounting for 68 per cent of corporate initiatives and 51 per cent of all measures received. The vast majority of these initiatives were energy-efficiency retrofits, such as lighting upgrades, building automation systems, and improvements to heating, ventilation and air-conditioning (HVAC) systems.

Renewable energy projects were the second most popular type of initiative reported by PCP members in 2011. These projects ranged from solar hot water systems at pools and recreation facilities to advanced geothermal energy-storage systems. Solar photovoltaic (PV) systems were particularly popular among municipalities in Ontario. These projects are a direct result of the provincial Feed-in Tariff (FIT) program, which provides guaranteed pricing and long-term contracts for renewable electricity production.

Figure 1: Percentage breakdown of measures by type

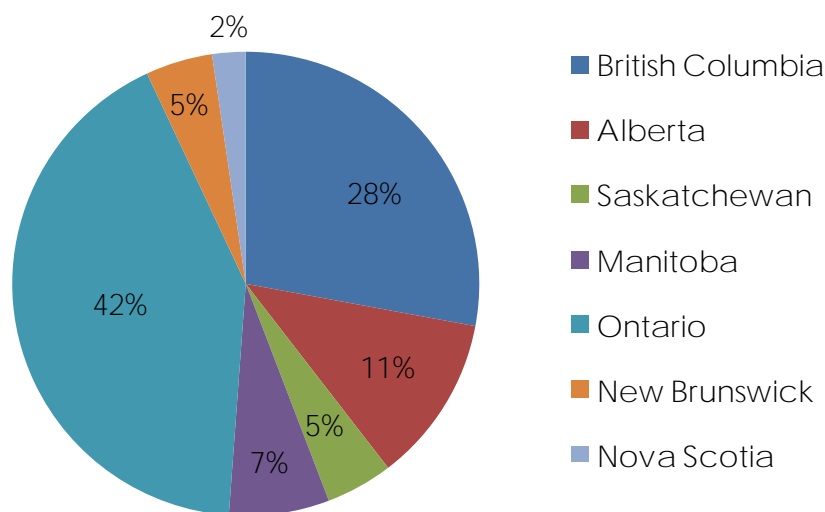


Taken together, the initiatives reported in 2011 represent an investment of nearly \$700 million in mitigation activities. Their aggregate GHG reduction is roughly 200,000 tonnes—equivalent to removing 50,000 cars from the road!

Participant Profile

Participants in the 2011 survey varied in size (population), organization and geography. Most of the participating municipalities were located in British Columbia and Ontario, with large clusters in the Vancouver Island and Lower Mainland area in British Columbia and the Greater Toronto-Hamilton Area in Ontario (see Figure 2). Participants ranged from small rural municipalities with less than 5,000 inhabitants to some of the largest urban centres in Canada. These small, medium and large municipalities were represented fairly evenly among survey participants, demonstrating that municipalities of all sizes are taking action on climate change.

Figure 2: 2011 Participants by Province



Quick Facts

- Most of the reported measures targeted municipal operations. In total, these projects accounted for 75 per cent of all measures received.
- Measures targeting municipal buildings formed the largest subsector, accounting for 68 per cent of the corporate measures and 51 per cent of all measures received.
- Energy-efficiency projects were the most popular type of initiative, representing nearly half of reported projects.
- This year, as in previous years, projects to collect and utilize landfill gas outperformed other initiatives in terms of GHG reductions. The City of Hamilton's Landfill Gas to Energy Project, implemented at the Glanbrook Landfill, was the top GHG reduction initiative reported in 2011. This project has reduced GHG emissions by more than 100,000 tonnes annually.
- Project investments ranged from \$310 to over \$197 million, demonstrating the myriad ways in which municipalities can reduce local GHG emissions.



Photo Credit: City of Hamilton, ON

Corporate Initiatives

Of the 229 measures collected in 2011, approximately 75 per cent were actions or initiatives targeting municipal operations. This is likely due to the fact that municipalities exert greater influence over their own operations than they do in the community at large. As a result, many PCP members prefer to develop corporate GHG inventories and corporate action plans before tackling emissions from the broader community. This type of approach can also have strategic benefits. For example, by greening their own operations, municipal governments may find that they are better positioned to advocate change in their communities.

Municipal initiatives to reduce GHG emissions have focused to a large extent on improving energy efficiency at corporate facilities. Measures targeting the corporate building stock were the most common type of initiative reported by PCP members in 2011, accounting for 68 per cent of corporate initiatives and 51 per cent of all measures received. Projects in this category include lighting retrofits, upgrades to heating, ventilation and air-conditioning (HVAC) systems, building automation systems, renewable energy installations and green building standards for new facilities. Energy-efficiency retrofits were the most common type of initiative reported in this sector, accounting for 80 per cent of corporate building initiatives. Renewable energy projects, such as rooftop solar arrays and geothermal heating systems, formed the second-largest subsector, accounting for just under 10 per cent of the corporate building initiatives. Projects that combined renewable energy systems with efficiency retrofits accounted for a further 6 per cent of the measures in this sector.

In terms of absolute GHG reductions, the most notable corporate measures were initiatives undertaken at municipal landfills and wastewater treatment facilities. The benefits of methane recovery, when flared or used productively, are substantial. Other corporate initiatives undertaken by PCP members include upgrades to streetlights and traffic signals, green fleet initiatives, tree planting and improvements to water and wastewater infrastructure.



Photo Credit: City of Ottawa, ON

Community Initiatives

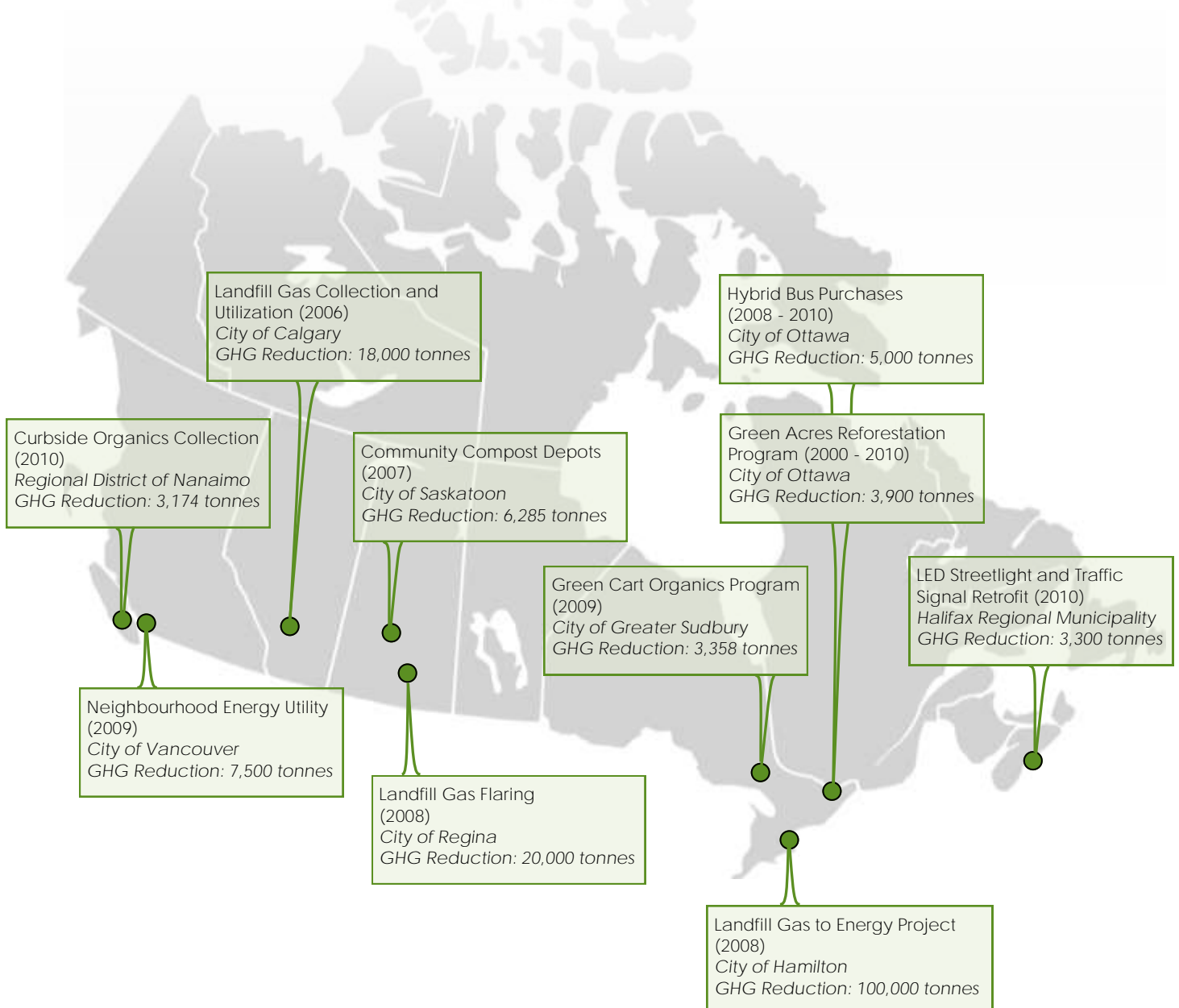
Municipal governments looking to reduce community GHG emissions have a variety of mechanisms at their disposal. Through smart urban planning, regulation, outreach and leadership, municipalities can steer resident behaviour and community development toward low-carbon alternatives. Dedicated cycling infrastructure and investments in public transit systems can encourage residents to reduce single-occupancy vehicle usage and adopt more sustainable forms of transportation. Green building standards and energy rebates for homeowners can promote energy efficiency in residential dwellings, while curbside collection of organics can reduce emissions associated with solid waste management. Although these types of initiatives can be difficult to quantify in terms of GHG reductions, their impact is tangible and significant. Large-scale district energy systems, for example, can transform a community's heating and cooling infrastructure, resulting in substantial GHG reductions and, in many cases, cost savings.

Measures targeting community emissions accounted for 25 per cent of the measures collected in 2011. These projects spanned a variety of community sectors, including residential dwellings, industrial, commercial and institutional (ICI) activities, on-road transportation and community solid waste. The most common types of initiatives reported in this category were education and awareness campaigns, such as energy-awareness training for local businesses, commuter challenges, "eco-days" and exhibitions, as well as interactive climate-themed websites. Composting initiatives were the second most common type of community measure, followed closely by municipal policies (e.g. bylaws) and alternative transportation initiatives. District energy systems were responsible for the largest reductions in community GHG emissions, followed by centralized composting programs and community tree-planting initiatives.

Top 10 GHG Reductions

Historically, the largest GHG reductions reported by PCP municipalities have come from initiatives implemented at municipal landfill sites, and this year is no exception. The largest GHG reduction initiative reported in 2011 was a landfill gas-to-energy project undertaken by the City of Hamilton, Ontario. Through a combination of methane flaring and productive utilization, the City has reduced its annual GHG emissions by more than 100,000 tonnes! Landfill gas collection systems were also installed at municipal landfill sites in Calgary and Regina, reducing GHG emissions by 18,000 tonnes and 20,000 tonnes respectively. Other notable projects in this year's Top 10 list include a district energy system undertaken by the City of Vancouver, a series of diesel-electric hybrid buses purchased by the City of Ottawa, upgrades to streetlights and traffic signals in the Halifax Regional Municipality, and community composting initiatives in the City of Saskatoon, City of Greater Sudbury and the Regional District of Nanaimo.

Figure 3: Top 10 GHG Reductions Reported in 2011



The Business Case

Whether it's upgrading outdoor public lighting or encouraging residents to use public transit, investing in GHG reductions can generate a variety of social, economic and environmental benefits. These range from improvements in municipal service delivery and employee morale to reductions in local air pollutants, improved community transportation, and opportunities for local job creation—to name a few. One of the most compelling cases for municipal action on climate change is the business case: in addition to reducing global concentrations of carbon dioxide and other greenhouse gases, many emission-reduction initiatives generate energy and operational cost savings that exceed initial project costs. These types of initiatives are often regarded as “no-regrets” solutions to climate change because they can be undertaken at negative net costs, and are profitable regardless of one's position on climate change. A sampling of these cost-effective measures is provided in the table below.

Project	Cost	Annual Energy Savings	Annual Cost Savings	GHG Reduction (t/yr)	Payback
Computer program installed at City facilities to turn off computers left on at end of day (<i>Thunder Bay, ON</i>)	Minimal	102,768 kWh Electricity	\$10,332	10	Immediate
Digital building management system that controls the ice plant for two ice rinks and implements unoccupied-mode setbacks on air and ice temperatures (<i>Saskatoon, SK</i>)	\$26,000	85,775 kWh Electricity 19,500 m ³ Natural Gas	\$10,797	97	2.4 years (Immediate payback after grants)
A variable frequency drive was installed on the brine pump at the Sports Centre refrigeration plant (<i>Kamloops, BC</i>)	\$18,400	157,000 kWh Electricity	\$10,500	4	1.8 years (0.7 years after grants)
Conversion of traffic signals from incandescent bulbs to LEDs (<i>Moncton, NB</i>)	\$200,000	715,000 kWh Electricity	\$87,000	393	2.3 years
Mini-Hybrid Thermal Systems for engine cooling installed on 12 public transit buses (<i>Halifax, NS</i>)	\$308,050	37,200 L Diesel	\$54,000	100	5.7 years (3.8 years after grants)
High-efficiency boiler installed at Memorial Arena (<i>Kamloops, BC</i>)	\$57,000	12,756 m ³ Natural Gas	\$14,000	25	4.1 years
Metal-halide lighting replaced with T5 high-bay lighting at three city arenas and one pool (<i>Burlington, ON</i>)	\$123,000	200,000 kWh Electricity	\$20,000	20	6.2 years (5.6 years after grants)

Case Studies

City of Burlington: Fire Station No. 8

In 2011, the City of Burlington, Ontario unveiled its newest fire hall, a state-of-the-art facility that was designed with both the community and the environment in mind. Built to meet the needs of a growing population, Fire Station No. 8 also has the distinction of being the city's first fire hall to achieve LEED® (Leadership in Energy and Environmental Design) Silver certification. The building's innovative design combines water- and energy-efficient features with renewable energy systems that significantly reduce the facility's carbon footprint. Electricity and space-heating needs are generated onsite using a combination of solar photovoltaic (PV) and solar thermal technology. These renewable energy systems are projected to reduce GHG emissions by approximately 7 tonnes per year, demonstrating the city's commitment to reduce corporate emissions by 20 per cent on a per capita basis from 1994 levels by 2012.

The City of Burlington partnered with the local utility, Burlington Hydro, to install a 10 kW solar array system on the roof of the building. The system consists of two 5 kW PV panels equipped with dual-axis tracking technology that allows the panels to move and align with the sun. By moving panels both vertically and horizontally, dual axis tracking systems are able to maximize solar energy levels and significantly increase the output of the solar array. The system is expected to generate approximately 17,000 kWh of renewable electricity per year, which will be sold to the Ontario grid through the provincial Feed-in Tariff program.



Photo Credit: City of Burlington, ON

The new fire station also incorporates SolarWall® air-heating technology to heat and ventilate the facility. Incoming air is pre-heated using a system of specially perforated solar collector panels located several inches from the exterior of the building. Ventilation fans create negative pressure that draws the solar-heated air through the panel perforations and into the ducting system of the facility. To enhance system efficiency, the solar air-heating technology was paired with a waste heat recovery system that transfers wasted energy back into 100 per cent fresh air supply. The result is a high-efficiency heating system that is projected to offset approximately 2,500 m³ in annual natural gas consumption.

The total cost of the solar PV and SolarWall® systems, including consulting, equipment and staff time, was approximately \$108,000. The project benefited from several external funding opportunities, including financial incentives offered through the High Performance New Construction Program and contributions from the local electricity provider, Burlington Electricity Services Inc. The renewable energy systems are expected to generate \$14,279 in annual cost savings and revenue, leading to a simple project payback of approximately 7.6 years. Municipalities interested in undertaking similar initiatives should first consider doing research on the contractor's previous experience with the proposed measures to ensure good design and installation. A key factor in the successful implementation and sustainability of any energy-saving measures is having the appropriate technical experience for the ongoing operation and maintenance of the systems.

Case Studies

Regional District of Nanaimo: Pollution Control Centre

Operational since 1975, the Greater Nanaimo Pollution Control Centre (GNPCC) is a mid-sized wastewater treatment facility serving approximately 85,600 residents in the Regional District of Nanaimo, British Columbia. Like many wastewater treatment plants, the GNPCC relies on a biological process known as anaerobic digestion to break down and stabilize the organic material (sludge) in residential wastewater. One of the advantages of treating wastewater sludge anaerobically (in the absence of oxygen) is that it produces a biogas composed primarily of methane, which can be used as a sustainable fuel source. The Regional District of Nanaimo (RDN) has been using a portion of this biogas to fuel boilers and heat buildings at the site since the plant first became operational. However, up to 60 per cent of the biogas generated at the wastewater facility is flared—a routine practice that reduces GHG emissions but squanders the energy-generation potential of wastewater treatment facilities.

The RDN determined that, rather than flaring the excess methane, these waste gases could be used in a combined heat and power (CHP) application to generate both heat and electricity. In 2010, the RDN decided to construct a 330 kW cogeneration facility that will use nearly all of the biogas generated at the GNPCC for productive purposes. Once commissioned, the new system will be the first of its size at a wastewater treatment facility in British Columbia, and will provide enough energy to meet the heating demands of the wastewater facility. The system is expected to produce approximately 2,000,000 kWh of electricity per year, which could generate roughly \$200,000 in annual cost savings and reduce annual GHG emissions by 50 tonnes. These electricity savings will also help to provide for the electricity demand on Vancouver Island, prolonging the life of the aging submarine transmission cables that bring electricity to the island and contributing to aspirations for local energy self-sufficiency.

The cogeneration project's original budget was approximately \$2.95 million to implement, and was funded using a combination of grants, Gas Tax Revenues, and funds from the district's operational budget. When completed, the project will receive \$2.3 million in Gas Tax funding from the Union of British Columbia Municipalities, as well as a \$350,000 grant from the Federation of Canadian Municipalities. The remaining \$300,000 will be funded from the RDN's Wastewater Services operational budget.



As can be expected with an innovative project, the RDN has encountered several challenges during implementation of the cogeneration facility. Municipalities undertaking a similar project are advised to undertake extensive research at the conceptual stage to ensure all costs of the project have been considered, and to build an appropriate contingency fund into the project budget to ensure adequate funds are available to address the inevitable obstacles and delays. Thoroughly research all requirements of the project from construction to commissioning to operation and maintenance. Ensure that all parties are clear on the requirements associated with each stage of the project as well as the costs associated with meeting these requirements. Preparing this research at the front end will make determining the cost effectiveness of the project more accurate.

Acknowledgements

The 2011 Measures Report was made possible through the dedication and hard work of participating municipal governments. Participants invested considerable time and resources collecting the required information and completing the data collection forms. This commitment from municipal staff was essential, and provided a solid foundation on which to build the report.

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- Town of Banff
- City of Burlington
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- Municipal Corporation of Delta
- Region of Durham
- City of Edmonton
- City of Fredericton
- City of Guelph
- Halifax Regional Municipality
- Town of Halton Hills
- City of Hamilton
- City of Kamloops
- City of London
- Town of Markham
- District of Mission
- City of Mississauga
- City of Moncton
- City of Nanaimo
- Regional District of Nanaimo
- City of Nelson
- City of New Westminster
- City of North Vancouver
- Town of Okotoks
- City of Oshawa
- City of Ottawa
- Region of Peel
- City of Pickering
- City of Regina
- Municipality of Ritchot
- District of Saanich
- City of Saskatoon
- District of Squamish
- Rural Municipality of Stanley
- Strathcona County
- City of Greater Sudbury
- City of Surrey
- Town of The Blue Mountains
- City of Thompson
- City of Thunder Bay
- City of Toronto
- City of Vancouver
- City of Vaughan
- Region of Waterloo

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All across the country, municipal governments are implementing innovative solutions to reduce GHG emissions and mitigate the effects of global climate change. These efforts are commendable, and should be recognized, shared, and celebrated in order to encourage continued action toward climate change mitigation. It is our sincere hope that the 2011 Measures Report will give credit where credit is due, and provide Canadian municipal governments with the information and motivation required to achieve deep and lasting GHG reductions.

For more information on the PCP Measures Reporting Initiative, please visit our website at: <http://www.fcm.ca/home/programs/partners-for-climate-protection/national-measures-report.htm>.

Since 2008, PCP members have reported more than 1.7 million tonnes in GHG reductions—equivalent to removing 425,000 cars from the road!