


CALGARY
CLIMATE CHANGE ACTION PLAN TARGET ↓50

THE CITY OF CALGARY CORPORATE AND COMMUNITY OUTLOOK ON CLIMATE AND AIR QUALITY PROTECTION

JULY 2006

THE CITY OF
CALGARY
ENVIRONMENTAL MANAGEMENT

Contents

Acknowledgements

- Infrastructure Services
- Water Services
- Water Resources
- Waste & Recycling Services
- Calgary Transit
- Calgary Fire Department
- Corporate Studies and Economics
- Customer Service & Communication
- Fleet Services
- Land Use Planning
- Transportation Planning
- imagineCalgary
- The Mayor's Office
- The City Manager's Office

Message from the Mayor

Regardless of what our individual perspectives are on the specific provisions of the Kyoto Accord, all Canadians, and all Canadian cities, recognize the risks to residents posed by atmospheric pollution. All fossil fuels create pollution and pollution at best affects the quality of life in our communities, and at worst creates potentially significant health risks. In co-operation with the Federation of Canadian Municipalities (FCM), all major Canadian cities have developed policies and programs to conserve energy to reduce greenhouse gas (GHG) emissions and the associated pollutants resulting from the use of fossil fuels for heating and lighting buildings and powering vehicles.

Calgary is a leader in reducing the impact of corporate GHG emissions on our community. Since 1999, we have engaged in an ambitious program to reduce GHG emissions by six per cent. In fact, we were recognized earlier this year as Canada's first city to reach the fifth and final milestone of the FCM's Partners for Climate Protection program. In this update, I am very pleased to announce The City of Calgary will become the first major city in North America to announce its intention to reduce GHG emissions by 50 per cent from the 1990 level by the target year 2012. The report outlines our strategy for realizing this ambitious goal.

The principal reason The City of Calgary is able to establish such an ambitious target is Council's recent decision to enter into a long-term agreement with ENMAX Energy Corporation, our wholly owned utility. ENMAX will supply green energy to The City of Calgary, sourced by a wind energy facility that will be constructed in southern Alberta. As well, ENMAX will supplement the wind power with green energy from a variety of new technologies. I fully expect that new technologies will emerge during the next two decades that will allow the municipal government to establish even more ambitious targets to protect our citizens from the chronic effects of air pollution.

With this report, I am also challenging all Calgary households and businesses to be forward-looking and establish parallel targets to reduce their GHG and associated pollutant emissions. This report includes my vision for a community-based initiative to reduce per-capita emissions by 20 per cent by 2020 or sooner, and 50 per cent by at least 2050, even when factoring in our projected growth. It would be appropriate to use the year 2005 as a baseline for that target and to measure and report our progress.

This goal can be a key component of a broad, long-term initiative to reduce the per-capita ecological footprint of Calgarians to protect our environment and quality of life. I am encouraged that long-term sustainability strategies are being considered by Calgarians engaged in imagineCALGARY, a community-based project I launched in February 2005 that will define a 100-year vision for Calgary and suggest sustainability strategies for the first 30 years of that voyage.

Mayor Dave Bronconnier

Introduction

The burning of fossil fuels to heat our homes and buildings and to propel our vehicles constitutes 54 per cent of the Calgary community's greenhouse gas (GHG) emissions. Our total reliance on coal and natural gas to generate electricity accounts for 44 per cent of Calgary community GHG emissions. Additionally, almost all of the human-produced pollutants emitted into our air are a result of heavy reliance on these same fossil fuels. If these pollutants are allowed to increase unabated, there will be both a human and an economic cost, in terms of health impacts and decreasing quality of life, for future generations of Calgarians.

In its recent report documenting the ecological footprint of Canada's 20 largest cities, the Federation of Canadian Municipalities gave Calgary the dubious distinction of having the largest per-capita impact, requiring 9.7 hectares of land to support each Calgarian. Again, a significant portion of that footprint is the result of our dependence on fossil fuels.

From 1990 to 2003, Calgary's population and overall community emissions grew in parallel, illustrating that no reduction in per-capita emissions was achieved during that period on a community-wide basis. This is in stark contrast to The City of Calgary's corporate GHG emissions, which actually decreased by about four per cent over this same time frame, despite having to serve a significantly larger customer base.

To sustain community health while accommodating the impacts associated with growth, reducing GHG and air pollutant emissions needs to become a community priority. To succeed, action must be taken by all Calgarians: home owners, large and small businesses and public institutions alike.

This report is a discussion paper for a bold plan of action for the Corporation and the community to reduce the emissions responsible for global climate change and the deterioration of our local air quality. The report comprises two sections:

1) a plan to reduce The City's (corporate) GHG emissions to 50 per cent below the 1990 level by 2012; and
2) a discussion paper for the community, aiming to create a dialogue with the community.

The proposed community emission reduction targets are set at two long-term intervals:

1) 20 per cent below the 2005 level by 2020; and
2) 50 per cent below the 2005 level by 2050.

We hope to finalize the community targets after the conclusion of the imagineCALGARY program in the fall of 2006. The imagineCalgary program combines vast community input, Calgary's entrepreneurial spirit and bold thinking, and will result in a 100-year vision for Calgary that will guide the development of the city into the future. Through the environmental footprint program, which will start in 2006, The City will liaise with community groups and develop programming to support the community targets.

In public opinion polls, Calgarians consistently expressed the value they place on ensuring a high quality of health and environment as integral components of a high quality of life. As our community grows and prospers, we must meet the challenges of protecting our natural wealth: the quality of our air, water and land. This report, Target ↓50, Calgary's long-range plan to reduce GHG emissions, has been prepared by The City to provide a basis for productive community engagement and dialogue on the vital issues of climate change and air quality.

In May 2005, The City was recognized by the Federation of Canadian Municipalities and ICLEI: Local Governments for Sustainability, as the first municipality in Canada to reach the fifth and highest milestone in the Partners for Climate Protection program, an international program involving more than 100 cities in Canada and 600 cities globally. We will reach another milestone in 2007, when The City begins to receive electricity from a new wind power facility, constructed exclusively for us by our wholly owned utility, ENMAX Energy Corporation. This change will reduce our corporate emissions by 40 per cent. The City has achieved the majority of its corporate climate change protection goals by reducing consumption and using the cost savings to fund the implementation of new, more energy-efficient technologies.

However, The City's corporate action and leadership in combating climate change and associated air pollutant emissions represents just a fraction (three per cent) of the Calgary community's emissions. Just as we have invested considerable funds in treating wastewater to protect our rivers, we must do the same to protect our air quality and our health.

Unlike wastewater, waste air (emissions) is not collected and treated by a municipal utility. Achieving the goal of reducing emissions by 50 per cent—an ambitious and challenging goal—will require the commitment and engagement of every Calgarian. From your choice of vehicle and home heating system, to getting to and from work, all Calgarians can support this goal.

Reaching goals to reduce emissions resulting from the use of electricity will require leadership by our electricity generators and suppliers. Pursuing alternate forms of green energy—including wind, solar and biomass sources—must be a key strategy. To achieve these goals and our target to reduce emissions by 50 per cent, the active support of the Government of Canada and the Government of Alberta must be secured. We are confident that this report will assist us in securing that support and participation.

IN PUBLIC OPINION POLLS, CALGARIANS CONSISTENTLY EXPRESSED THE VALUE THEY PLACE ON ENSURING A HIGH QUALITY OF HEALTH AND ENVIRONMENT AS INTEGRAL COMPONENTS OF A HIGH QUALITY OF LIFE. AS OUR COMMUNITY GROWS AND PROSPERS, WE MUST MEET THE CHALLENGES OF PROTECTING OUR NATURAL WEALTH: THE QUALITY OF OUR AIR, WATER AND LAND.

Mandate for action on climate change

There are many justifications to support the assertion that Canadian communities must become more sustainable. Recent global climatic events, the accelerated depletion of our non-renewable resources, soaring energy prices and deteriorating air and water quality are all tangible symptoms of the unsustainability of our current lifestyle. Recent reports have indicated Canada has the world's third-largest ecological footprint and, within Canada, Calgary has the largest footprint of all the cities analyzed. It is sobering to think that it would require four more Earths to support the world's population if everyone used resources at the rate Canadians consume. As well, Canada ranked 28 out of 29 in the Organisation for Economic Co-operation and Development (OECD) countries in energy efficiency. It is simply not sustainable for Canadians to continue to consume resources at the current rate and expect to ensure a healthy environment and high quality of life for future generations.

Maintaining a high quality of life for future generations must become a top priority. However, living a more sustainable lifestyle need not necessarily equate to a drastic shift in lifestyle. In fact, there are many ways we can reduce our impact on the environment, including more efficient use of energy and an increase in emphasis on the development of clean, renewable sources of energy (both of which provide the benefit of reducing GHG and air pollutant emissions). In fact, we have barely begun to tap into the available supply of financial and technical resources that could substantially reduce our community's energy consumption and GHG emissions.

The following sections include an overview of Calgary community GHG emissions and estimates around future GHG emissions, based on forecasted population growth and current consumptive behaviour. The link between air quality and climate change and the federal funding initiatives for emission reduction will also be discussed.

RECENT GLOBAL CLIMATIC EVENTS, THE ACCELERATED DEPLETION OF OUR NON-RENEWABLE RESOURCES, SOARING ENERGY PRICES AND DETERIORATING AIR AND WATER QUALITY ARE ALL TANGIBLE SYMPTOMS OF THE UNSUSTAINABILITY OF OUR CURRENT LIFESTYLE.

Community greenhouse gas emissions overview

COMMUNITY SOURCES OF GHG EMISSIONS

It is important for a community to understand how greenhouse gases are produced and where they originate. Table 1, taken from the 2003 Calgary Community Greenhouse Gas Emissions Inventory, lists the sources of Calgary community GHG emissions and the uses and activities that generate these emissions.

TABLE 1
Sources of Calgary community GHG emissions

GHG source	Uses/activities
Electricity: in Alberta, electricity is primarily produced from the burning of fossil fuels, with coal being the dominant fuel. Coal and natural gas account for about 90 per cent of Alberta's installed generation capacity.[1]	Lighting, household appliances, indoor space heating, machinery and tools, industrial processes
Natural gas	Heating of indoor space and water, household appliances, industrial processes and equipment
Gasoline	Vehicles, outdoor equipment, generators
Diesel	Vehicles, outdoor equipment, generators
Propane	Vehicles, BBQs
Methane: produced by the anaerobic decay of organic materials, such as household garbage and sewage	Landfills (garbage dumps) and wastewater treatment plants

[1] Source: *Clean Air Strategic Alliance*, an Emissions Management Framework for the Alberta Electricity Sector Report to Stakeholders. November 2003.

COMMUNITY GHG EMISSIONS PROFILE

So how much GHG does the Calgary community produce, and what has been the trend over the last 15 years? The 2003 Calgary Community Greenhouse Gas Emissions Inventory was the first big step in determining the main sources for GHG production in the community and the amounts produced. The inventory is included in Appendix 6.

Calgary's 2003 community-wide GHG emissions were derived from energy consumption data collected from local utilities, the Government of Alberta and industry associations. Greenhouse gas emission co-efficients[1] —were used to convert energy consumption data into carbon dioxide equivalents—(CO_2e)[2], which is the standard GHG measurement unit.

The base year for monitoring Calgary community emissions is 1990. Subsequent to 1990, community GHG emissions data were tabulated for 1997 and 2000. Since 1990, Calgary community emissions have increased by over 31 per cent, from 12,462 kilotonnes (kt) to 16,370 kt. (See Table 2.)

[1] Emission co-efficient: the mass of carbon dioxide equivalents emitted per unit of a particular fossil fuel unit consumed.

[2] Carbon dioxide equivalents (CO_2e): the emissions of a gas, by mass, multiplied by its global warming potential. For example, the global warming potential of methane is 21, meaning the emission of one tonne of methane is equivalent to the emission of 21 tonnes of carbon dioxide in terms of climate change impacts.

TABLE 2
Calgary community GHG emissions 1990 to 2003 (kilotonnes)

	1990	1997	2000	2003	Absolute increase 1990–2003	Per cent increase 1990–2003
Electricity	5,435	5,989	6,825	7,153	1,718	31.6%
Natural gas	2,884	3,093	3,596	3,846	962	33.4%
Vehicles	3,849	4,129	4,265	4,941	1,092	28.4%
Waste disposal**	307	368	400	443	136	44.3%
Urban forest	-13	-13	-13	-13	0	0%
Total	**12,462***	**13,566***	**15,073***	**16,370**	**3,908**	**+31.4%**

* Source: The City of Calgary, Corporate Strategy and Economics. *Data Collection and Analysis for the Calgary Community*. December 2002.

** Source: CH2MHILL. *The City of Calgary Landfill Gas Assessment* Study, October 2002.

Figure 1 shows the sources of GHG emissions for 2003. Electricity consumption was the largest source of GHG emissions, responsible for 43.7 per cent of the Calgary community total. This ranking can be directly attributed to Alberta's relatively heavy reliance on coal as an energy source for electricity generation. At 30.2 per cent, vehicles were the second-largest source of Calgary community GHG emissions. Natural gas consumption is the other major contributor to local GHG emissions, accounting for 23.5 per cent of the Calgary total. Methane emitted from Calgary landfills is a relatively small contributor to local emissions, accounting for 2.7 per cent of the total, but still is the source of over 442 kt of GHG emissions.

Figure 1. 2003 Calgary community GHG

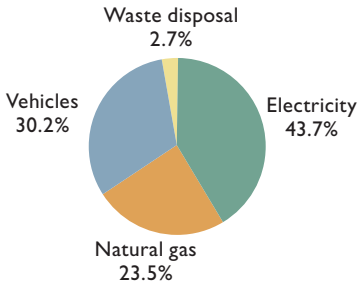


Figure 2 illustrates emissions based on community sector including residents within Calgary and Industrial, Commercial and Institutional (ICI) community members. ICI electricity emissions are the largest component in the community.

Figure 2. Community emissions for energy per main sector

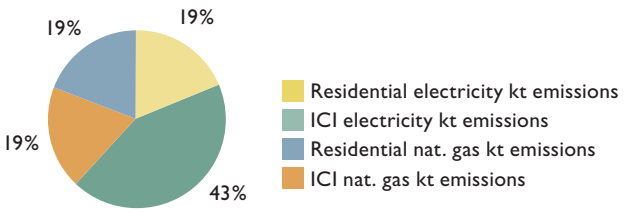
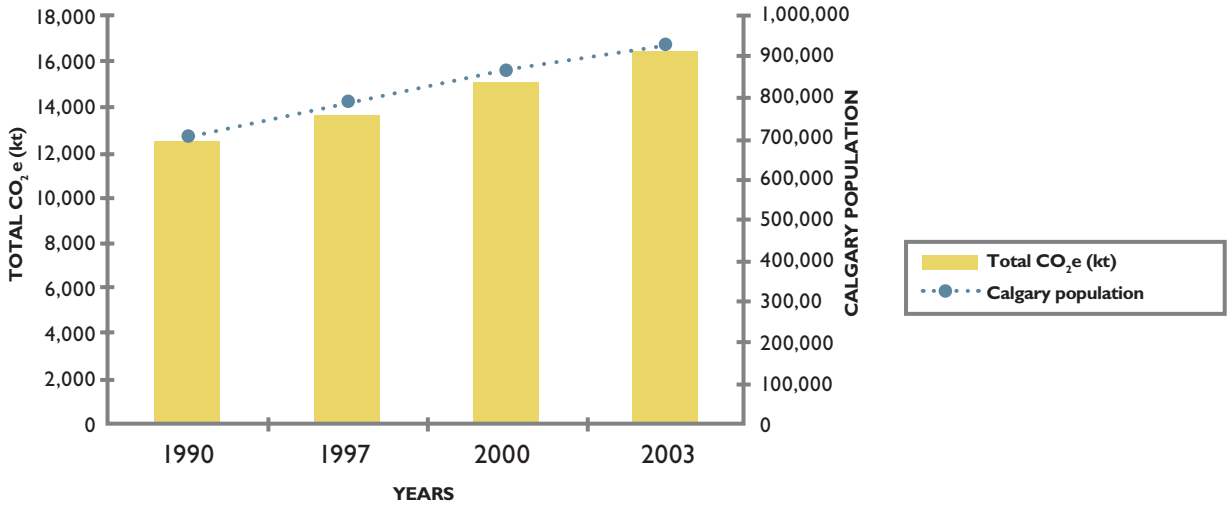


Figure 3 shows the linkage between population growth and GHG emissions. The community's GHG emission growth from 1990 to 2003 parallels Calgary's population growth. A larger population means more energy use, more fuel and more goods and services produced. Between 1990 and 2003, Calgary's population increased from 691,736 to 922,315[3], a growth rate of about 33 per cent, which correlates with the growth in GHG emissions (31 per cent) over this time frame.

[3] Source: The City of Calgary. The City of Calgary 2004 Civic Census.

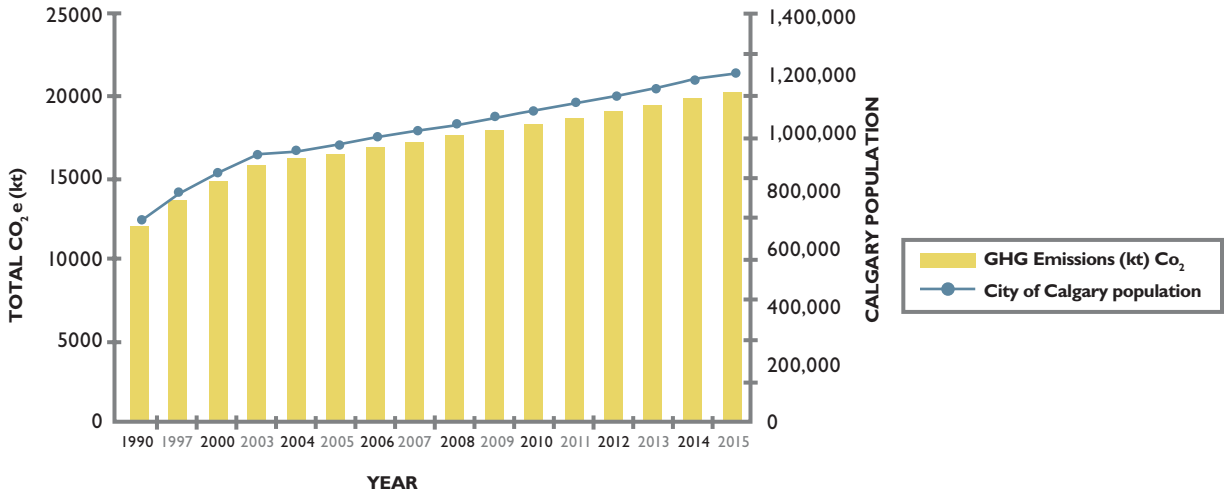
Figure 3. Correlation between Calgary's population growth and GHG emissions



How will future population growth affect our GHG emissions? The 1995 Calgary Transportation Plan (CTP)[4] forecasts a population of 1.25 million by the year 2024. Based on the correlation between Calgary's population growth and GHG emissions, if no action is taken, there would be about a 60 per cent increase of GHG emissions by 2015 from 1990.

[4] Source: The City of Calgary, Calgary Transportation Plan 1995.

Figure 4. Forecasted population growth and GHG emissions BAU (business as usual)



COMMUNITY GHG EMISSIONS REDUCTION TARGET AREAS

The short to medium-term forecast for Calgary's population growth, and its effect on GHG emissions, looks daunting. However, there are a number of successful community programs right now. The challenge is to select the actions and programs that have the greatest potential adoption rate within the community. Many of these programs not only reduce GHG emissions, but are also favourable from a financial perspective.

CLIMATE CHANGE AND AIR QUALITY

The most immediate and tangible environmental co-benefit of taking action on climate change is the maintenance and improvement of local air quality. A direct link exists between climate change and local air quality because the combustion of fossil fuels is the primary source of both GHGs and most air pollutants. GHGs and air pollutants, such as nitrogen oxides (NOx), volatile organic compounds (VOCs) and particulate matter (PM) — just to name a few — are the inevitable waste products of fossil fuel combustion. Table 3 provides a summary of the most significant sources of air pollutants in the Calgary region and the specific types of pollutants produced.

TABLE 3
Anthropogenic sources of air pollutants in Calgary

Activity	Fuel type	Major air pollutants emitted
Electricity production	Coal[1] Natural gas[2]	Mercury[3], SO_2, NOx, PM NOx, CO
Vehicle use	Gasoline Diesel	CO, NOx, VOCs, SO_2 CO, NOx, PM, PAHs, SO_2
Outdoor equipment use (generators, garden tools)	Gasoline Diesel	CO, NOx, VOCs, SO_2 CO, NOx, PM, PAHs, SO_2
Space and water heating	Natural gas	NOx, CO

[1]Coal accounts for 48.1 per cent of Alberta's installed electricity generation capacity (Alberta Energy 2003).
[2]Natural gas accounts for 42.3 per cent of Alberta's installed electricity generation capacity (Alberta Energy 2003).
[3]Coal-fired electrical generation units account for 80 per cent of anthropogenic mercury emission in Alberta (Alberta Environment 2002).

Air pollutants pose a potential health risk to all Calgarians, but particularly to our children and the elderly, whose weaker or less-developed immune systems are unable to cope with even brief exposures to a wide range of pollutants. According to Health Canada, studies show that when air pollution levels rise, there is an increase in the number of visits to doctors by people with breathing problems, as well as increases in daily respiratory admissions to hospitals. And, according to Health Canada surveys, Canadians view air pollution/air quality as our nation's most important environmental issue. (Source: http://www.hc-sc.gc.ca/ewh-semt/pubs/air/pollution/concern-inquietude_e.html) Table 4 provides a summary of the most common and significant air pollutants and the impacts they can have on human health and on our environment.

TABLE 4
Common air pollutants and impacts

Pollutant	Description	Potential health impacts[1]
PM	Particulate matter (PM) is the product of the incomplete combustion of fossil fuels, most notably diesel and coal.	Associated with a wide range of respiratory and cardiovascular health effects, including aggravated asthma, chronic bronchitis, decreased lung function and premature death.
CO	Carbon monoxide (CO) is the product of the incomplete combustion of fossil fuels. The major sources in Canada are vehicles and stationary generators. CO contributes to the formation of smog. It is colourless, odourless and poisonous.	A toxic substance that can cause dizziness and headaches, impair co-ordination and trigger respiratory problems. CO exposure is most dangerous for persons suffering from heart diseases.
NOx	The group of nitrogen compounds that react with VOCs to form ozone (O_3) and smog. Almost all NOx comes from the combustion of fossil fuels from vehicles and electrical generation facilities. In Alberta, the electricity sector is one of the larger sources, representing approximately 14 per cent of total provincial emissions[3]. When NOx combines with water vapour, acid rain is formed.	Can damage lung tissue and aggravate chronic lung diseases such as asthma and bronchitis. NOx derived acid rain damages aquatic habitat and plant tissue.
SO2	The principal sources of SO_2 are the combustion of fossil fuels by vehicles and electrical generation facilities and the processing of sour natural gas. In Alberta, coal-fired power plants account for about 21 per cent of the total sulphur dioxide emissions. SO_2 contributes to the formation of acid rain, smog and PM.	Aggravates respiratory illnesses such as asthma. Longer-term exposure can cause respiratory illness and aggravate existing heart disease. SO_2-derived acid rain damages aquatic habitats and plant tissues.
VOCs	Volatile organic compounds (VOCs) are hydrocarbons that are in gaseous form. They are called "volatile" because they rapidly evaporate into the air. They react with NOx in the air to form ozone and contribute to the formation of smog.	Irritation of lungs, headache, dizziness, nausea.
PAHs	Polycyclic aromatic hydrocarbons (PAHs) are a class of compounds with thousands of different chemicals that are formed during the incomplete combustion of fossil fuels and other organic substances.	Some PAHs are acutely toxic and can cause cancer, deform embryos or cause other mutations.
Mercury	Coal-fired power plants are the most significant source of human-generated mercury releases to the environment. In Alberta, coal-fired power plants account for approximately 80 per cent of the total human-generated mercury emissions.[3]	Mercury is a persistent, bioaccumulative and toxic substance.

TABLE 4 CONTINUED
Anthropogenic sources of air pollutants in Calgary con't

Pollutant	Description	Potential health impacts[1]
O_3	Ozone (O_3) at ground level is an irritating gas that is formed by the reaction of VOCs with NOx in the presence of sunlight.	Ozone is a powerful oxidant that can damage the respiratory tract and induce symptoms such as coughing, chest tightness, shortness of breath and worsening of asthma symptoms. Exposure to high levels of ozone leads to lung inflammation and lung tissue damage. Repeated exposure to ozone pollution may cause permanent lung damage.[2]

[1] Source: United States Environmental Protection Agency
[2] Source: American Lung Association of California
[3] Source: CASA Electricity Project Team

FEDERAL FUNDING INITIATIVES

The Government of Canada is committed to addressing climate change and making our cities and communities more sustainable. As such, it has developed several key funding initiatives to encourage and assist cities with taking action on these important environmental issues. The "New Deal for Cities and Communities" is about all orders of government working collaboratively to incorporate economic opportunity, social well-being and environmental conservation. Budget 2005 delivers long-term and stable funding as part of the Government of Canada's commitment to this New Deal.

The federal government's budget 2005 demonstrates its financial commitment to environmental sustainability by allocating over $5 billion over the next five years. About $2 billion of the total is earmarked specifically for climate change initiatives, the development of new environmental technologies and the encouragement of investment in renewable and efficient energy generation. As well, an additional $5 billion in federal fuel tax revenues will be made available to municipalities over the next five years for the purpose of funding infrastructure projects such as community energy systems.

Another key federal government funding initiative is the Green Municipal Fund (GMF), which is administered by the Federation of Canadian Municipalities (FCM). The GMF is a $550-million endowment from the Government of Canada for municipalities to promote projects that produce measurable environmental, economic and social benefits. Funding options include loans, grants or a combination of the two for capital infrastructure projects, and grants for community sustainability plans, field tests and feasibility studies. Mandatory criteria include improvement in energy efficiency or enhancements in environmental effectiveness in a variety of areas related to climate change.

As part of Moving Forward on Climate Change: A Plan to Honour Our Kyoto Commitment, the Government of Canada is building capacity to create a market for GHG emission reductions. The federal government has proposed a system, to be operating in early 2006, for a domestic offset credit system that will provide financial incentive to reduce GHG emissions and reward innovative practices. Examples within the municipal context include investing in alternative transportation modes, capturing landfill gas to generate electricity and implementing developments that include renewable energy components in their plans.

For a more detailed overview of federal funding programs, refer to Appendix 2.

Part A – Corporate Climate Change Action Plan Target ↓50
Foreword

In 2002, Calgary City Council directed the Administration to reduce corporate greenhouse gas (GHG) emissions to six per cent below the 1990 level by the year 2012. As of 2004, City GHG emissions have been reduced to nearly four per cent below the 1990 level – a major accomplishment given Calgary's unprecedented growth over this time frame.

Subsequently, in July 2005, Council approved an electricity services agreement (ESA) with ENMAX Energy Corporation. The ESA will increase The City of Calgary's green electricity commitment to 75 per cent of its total use by January 1, 2007, effectively bringing The City's GHG emissions to about 41 per cent below the 1990 level. In the spirit of continuous improvement and local environmental leadership, The City of Calgary has raised the bar on its GHG emission reduction target, to 50 per cent below the 1990 level by 2012: Target ↓50.

The *Climate Change Action Plan 2006: Target ↓ 50 (Discussion Paper)* provides an updated overall framework for The City's climate change program, with the objective of leading it toward achieving its new GHG reduction target. The action plan organizes The City's GHG emission reduction effort into six action categories, through which The City has the capacity to take action.

1. Building energy efficiency
2. Methane gas emission reduction
3. Green power
4. Greening the fleet
5. Water conservation and treatment facility efficiency
6. Innovative practices and technology deployment

Within each action area, several initiatives are listed. Some of these are completed or ongoing and approved projects, while others are conceptual and are being presented for consideration and, potentially, future implementation.

The action plan is also intended to serve as an inventory of corporate initiatives that reduce GHG emissions and provide an update on the status of projects and their achievements. Experience has indicated that a central inventory of City GHG-related initiatives and actions is required in order to facilitate corporate emission reporting to City Council and other interested organizations. Finally, the action plan provides an indication as to how far along The City is in achieving its emission reduction target.

THE CITY OF CALGARY HAS RAISED THE BAR ON ITS GHG EMISSION REDUCTION TARGET, TO 50 PER CENT BELOW THE 1990 LEVEL BY 2012: TARGET ↓50.

Significant developments since the 2004 action plan

A GREEN POWER COMMITMENT OF 75 PER CENT
The City of Calgary made an unprecedented commitment to increase its green electricity consumption to 75 per cent of total use by Jan. 1, 2007. In July 2005, The City of Calgary, and its wholly owned utility ENMAX Energy Corporation, entered into an electricity services agreement that will make The City of Calgary not only the largest municipal government purchaser of green electricity, but also the single largest consumer of green electricity in Canada. As a direct result of The City of Calgary's green electricity commitment, ENMAX will develop an 80-megawatt (MW) wind farm in southern Alberta.

A NEW GHG EMISSION REDUCTION TARGET
As a result of the success of The City's GHG reduction program and the recent commitment to increase green electricity use to 75 per cent of total consumption by 2007, the corporate GHG emission reduction target has been increased from -6 per cent to -50 per cent of the 1990 level by the end of 2012.

THE COMPLETION OF MAJOR INITIATIVES
Several large-scale energy conservation initiatives have been completed since the approval of the 2004 corporate climate change action plan, including

- the energy performance contract (EPC) program to improve building energy efficiency
- the EnviroSmart streetlight retrofit program; and
- the LED traffic signal light retrofit program.

PCP'S MILESTONE 5 ACHIEVED
In January 2005, The City of Calgary became the first municipality in Canada to achieve "Milestone 5" of the Partners for Climate Protection's five milestone framework for recognizing municipal government action on climate change. Milestone 5 requires that GHG reduction progress be routinely monitored and tracked to ensure emission reduction measures are implemented effectively and on schedule.

The Partners for Climate Protection (PCP) program is a network of more than 120 Canadian municipal governments committed to reducing greenhouse gases and acting on climate change.

MORE NEW INITIATIVES AND THE ADVANCEMENT OF EXISTING INITIATIVES
Several new projects, initiated since the approval of the 2004 climate change action plan, are included in this report: for example, a large scale biodiesel pilot project, which builds on the foundation laid by the ecofuel pilot project, and full implementation of the sustainable building policy and creation of the Energy Management Office. As well, since 2004, many existing projects have made significant progress, such as the Sheppard and East Calgary landfill methane capture projects and several fleet greening initiatives.

ANNUAL CORPORATE GHG EMISSION REPORTING
In 2004, The City of Calgary adopted an annual corporate GHG emission reporting regimen, made possible by the development of the HEAT (greenhouse gas emissions and abatement tracking) computer data collection system. HEAT was developed in-house by The City's Information Technology business unit in co-operation with Environmental Management. The first HEAT-generated report was for the 2003 GHG emission reporting year.

REVISION OF CORPORATE EMISSION DATA (1990–2003)
Corporate GHG emissions have been amended due to Environment Canada revisions to Alberta electricity GHG co-efficients (CO_2e/kilowatt-hour (kWh)) and minor changes to vehicle fuel co-efficients. The Alberta electricity grid average GHG emissions per kWh have been decreased by about 10 per cent. Environment Canada has indicated the revisions are a result of improvements in Statistics Canada's internal data quality procedures. Accordingly, City of Calgary baseline GHG emission levels have decreased, as

CITY OF CALGARY CORPORATE CLIMATE CHANGE INITIATIVES (AND RELATED INITIATIVES), ARE AS MUCH ABOUT ENCOURAGING AND PROMOTING COMMUNITY ACTION ON CLIMATE CHANGE AS THEY ARE ABOUT REACHING THE CORPORATE EMISSION TARGET.

Mandate for action on climate change

In June 2000, City Council approved the energy efficiency and climate change project report, which directed the Administration to establish a municipal climate change program. Subsequently, in January 2002, Council approved the carbon dioxide emissions abatement action plan, which committed The City of Calgary to reducing its corporate GHG emissions to six per cent below the 1990 level by 2012. In 2003, City Council affirmed its commitment to this goal in its Looking Ahead, Moving Forward document, which identified the reduction of GHG emissions from corporate operations as one of its environmental priorities. Subsequently, in 2005, as a direct result of City Council's decision to increase The City's green power commitment to 75 per cent of its electricity use by 2007, The City of Calgary is now targeting to reduce its 1990 GHG emissions to 50 per cent below the 1990 level.

Additionally, as a member of the Federation of Canadian Municipalities Partners for Climate Protection, The City has committed to reduce local GHG emissions and improve the local environment and quality of life. In this regard, The City's corporate climate change program must be viewed and pursued in the larger context of community-wide action on climate change. In other words, City of Calgary corporate climate change initiatives (and related initiatives), are as much about encouraging and promoting community action on climate change as they are about reaching the corporate emission target. Therefore, undertaking initiatives and projects that assert and display community leadership need to be a fundamental component of The City's programs.

Plan objectives and structure

The objectives of this action plan provide an overall framework to achieve Council's climate change policy directive and identify the general areas of action within which The City can launch GHG emission reductions initiatives. The plan is intended to be a living document, and as initiatives and policies are developed and evolve, the plan will be updated. Additionally, the plan serves to track and inventory GHG emission reduction initiatives, and to periodically evaluate The City's overall GHG reduction target.

The plan is organized into six broad action categories representing areas where The City has the ability to take direct action on climate change. All City climate change initiatives fall within these six action categories. Each action category is supported by a goal statement and action areas. These will remain relatively constant over the program's lifespan and are supported by several initiatives, which are the actual undertakings—including projects, programs or policies—that achieve GHG emission reductions. The initiatives subsection will be continuously amended and updated as projects and programs are developed and their status changes over time; that is, as business units move them from conceptual to initiated, to ongoing, to completed stages. This ongoing review of projects will facilitate the evaluation of The City's climate change program's status, and therefore indicate, in the spirit of continuous improvement, whether opportunity exists to upgrade The City's GHG reduction target.

This document is also intended to serve as an inventory of corporate initiatives that have and will reduce GHG emissions. Experience indicates there is a need to have a central corporate inventory of City initiatives and actions that produce climate change benefits for several reasons, including to

- facilitate corporate emission reporting to City Council and potentially to the governments of Canada and Alberta
- support the regular and timely evaluation of The City's climate change program, as well as the identification of progress, priorities, opportunities for action and gaps
- facilitate The City's ability to communicate its climate change program and accomplishments to the public and media, demonstrating its community leadership role; and
- enable corporate and public recognition of business unit successes.

It is important to acknowledge that many City GHG emission reduction initiatives are as much (if not more so) about adopting best environmental practices, implementing the EnviroSystem™, fulfilling a community environmental leadership role and achieving financial savings, as they are about addressing climate change. In this regard, many initiatives that indirectly support The City's corporate climate change objectives will be carried out under different program banners or, for example, as part of The City's commitment to improved environmental performance. Accordingly, several of the actions/programs listed in the initiatives sections of the plan are not directly climate change motivated. However, they serve to achieve GHG emission reductions from City operations and thus contribute to the realization of the corporate target and/or reduce community emissions. It is imperative that City initiatives which achieve GHG reductions are captured under the climate change program for emission accounting and reporting purposes. It should be noted that the addition of the climate change message to supportive City environmental and non-environmental programs and policy initiatives is not only of benefit to the climate change program, but may also broaden political and financial support. For example, the climate change benefit element of a project may increase the likelihood of obtaining funding approval from certain sources, such as the Government of Canada or Federation of Canadian Municipalities, for municipal facility and infrastructure improvements.

Climate change action plan and EnviroSystem

EnviroSystem is The City of Calgary's ISO-14001-registered environmental management system. It provides a framework that supports corporate environmental initiatives and activities. EnviroSystem is the structure for implementing The City of Calgary's environmental policy, which directs The City to "integrate sustainable social, economic and environmental objectives into a co-ordinated decision-making process to maintain standards of living, social harmony and environmental quality."

The City of Calgary uses EnviroSystem to manage the environmental impact of its activities through utilizing a rigorous documented approach and providing a foundation for continual improvement in environmental performance. It achieves this through setting measurable goals, monitoring and reporting. Reducing The City's GHG emissions is one of several corporate-wide operational environmental priorities that have been identified through EnviroSystem. These priorities are environmental issues that span most business units in the corporation and often are in response to Council priorities.

The climate change action plan provides the overall framework to achieve Council's climate change directive and identifies general areas of action where City operations can reduce GHG emissions. EnviroSystem provides the structure for business units to prioritize and set objectives and targets around climate change initiatives, as well as to monitor, measure and report on their progress in achieving targets.

EnviroSystem

Greenhouse gas emissions

The primary and most significant greenhouse gases are CO_2 (carbon dioxide) and CH_4 (methane). City of Calgary GHG emissions are a result of the following.

A. The direct and indirect consumption of fossil fuels and energy derived from fossil fuels, including
   - gasoline and diesel (vehicles and other outdoor equipment)
   - electricity (lighting, equipment and industrial processes); and
   - natural gas (space and water heating and industrial processes).

B. Organic waste deposited in anaerobic landfills and organic wastes in wastewater, resulting in the creation and emission of methane gas.

Current: corporate GHG emission status and profile

Between 1990 and 2004, The City's GHG emissions decreased 18.9 kilotonnes (kt), from 461.2 kt to 442.3 kt (-4.1 per cent) — a significant accomplishment, especially in light of the fact that The City of Calgary's population increased from 691,736 to 956,078 (38 per cent) over this time frame. Table 1 provides a detailed breakdown of The City's GHG emissions, by source, over the 1990 to 2004 time frame. The downward trend in The City's emissions started after 2000, which is when corporate GHG emission reduction efforts were initiated, led by the Ride-the-Wind program in late 2001.

TABLE 1
City of Calgary corporate GHG emissions by source (1990 to 2004)

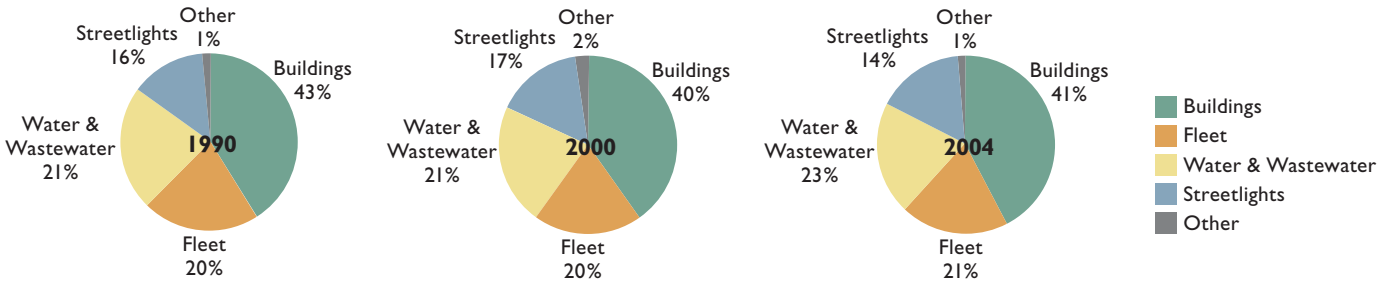
Emission source	1990 (kt)	2000 (kt)	2003 (kt)	2004 (kt)	1990-2004 change (kt)	1990-2004 change (%)
Buildings (natural gas and electricity)	196.8	201.6	185.1	181.4	-15.4	-7.8
Fleet	90.4	97.6	88.5	94.1	+3.7	+4.1
Streetlights	73.2	82.2	69.4	62.5	-10.7	-14.6
Water & Sewer operations	96.0	105.5	104.8	99.6	+3.6	+3.7
Other[1]	4.8	10.9[2]	4.9	4.7	-0.1	-2.1
TOTALS	**461.2**	**497.8**	**452.7**	**442.3**	**-18.9**	**-4.1**

[1] Includes waste generated by employees, employee travel and the urban forest sink.

[2] Includes a one-time use of diesel generators to produce electricity (7.8 kt CO_2e).

Figure 1. Corporate GHG emissions by source 1990, 2000 and 2004

Figure 1 provides a historical overview, on a proportional basis, of The City's GHG emissions by source. The most notable changes over time are the decrease in the proportion of GHG emissions from the buildings (42.7 per cent to 40.9 per cent) and streetlights (15.9 per cent to 14.1 per cent) categories. On the flip side, the proportion of City GHG emissions from the fleet (19.6 per cent to 21 per cent) and water & wastewater operations (20.8 per cent to 23 per cent) categories have increased over the 1990 to 2004 time frame.

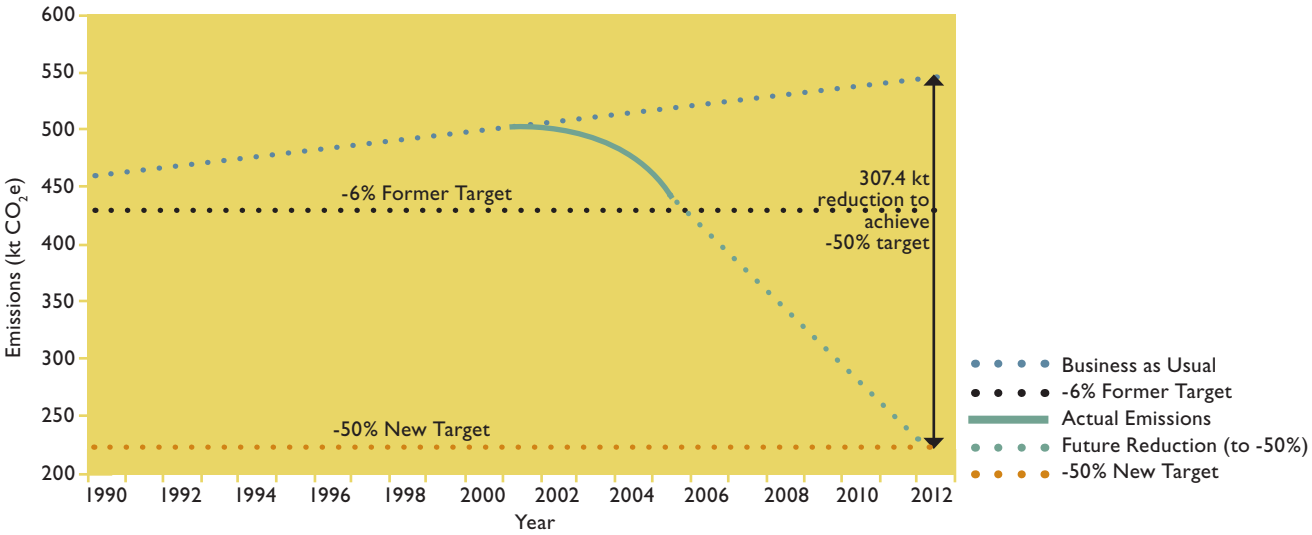


Looking forward: corporate GHG emission status

Based on The City's GHG emission growth rate over the 1990 to 2000 time frame, the projected business-as-usual (BAU) GHG emission level is estimated to be about 538 kt by 2012. This projection is based on empirical data that clearly indicates City emissions are closely linked to Calgary's population growth rate. Essentially, as the number of clients/citizens increases, so does the demand for municipal services provided by The City of Calgary. The fact is that the provision of municipal services, such as water, snow removal, police and fire protection, etcetera, consumes energy (gasoline, diesel, natural gas) creating the emission of GHGs.

Figure 2 provides a graphic depiction of City emissions and BAU emission growth to 2012. In order to reduce the 1990 emission level by 50 per cent, The City must undertake an estimated 307.4 kt of GHG emission reduction initiatives, to attain an annual emission level of 230.6 kt (-50 per cent) in 2012.

Figure 2. Projected City Business as Usual (BAU) GHG emissions to 2012



As indicated in Figure 2, The City's baseline year for GHG emission monitoring is 1990. The corporate 1990 emission level was 461.1 kt. The 2012 emission reduction target has been increased to -50 per cent (230.6 kt). For comparative reasons, the former -6 per cent target (433.4 kt) is provided. It is important to note the BAU line is not static: that is, it is dependent on the current population projection, which, as amended from year-to-year, will shift the slope of the line up or down.

Figure 3(a) provides an indication of The City's progress to date in achieving its GHG reduction target. Approved, ongoing and completed major initiatives are projected to deliver an estimated 267 kt in GHG emission reductions annually, leaving The City about 40.4 kt short of achieving the -50 per cent target. In other words, over the next seven years, The City needs to initiate and complete a suite of projects that have the potential to deliver another 40.4 kt in GHG reductions, if it is to reach the -50 per cent target. Figure 3(b) serves to illustrate why The City has revised its GHG reduction target from -6 per cent to the much more ambitious -50 per cent, as ongoing and approved initiatives have taken The City well past its former -6 per cent target to about 41 per cent below its 1990 GHG emission level (-41 per cent). The City's recent commitment to 75 per cent green electricity has essentially resulted in the obliteration of the -6 per cent target.

Figure 3.
Approved and ongoing initiatives versus the BAU gap

FIGURE 3A NEW -50 PER CENT SCENARIO
APPROVED & ONGOING MAJOR INITIATIVES VS. BAU GAP

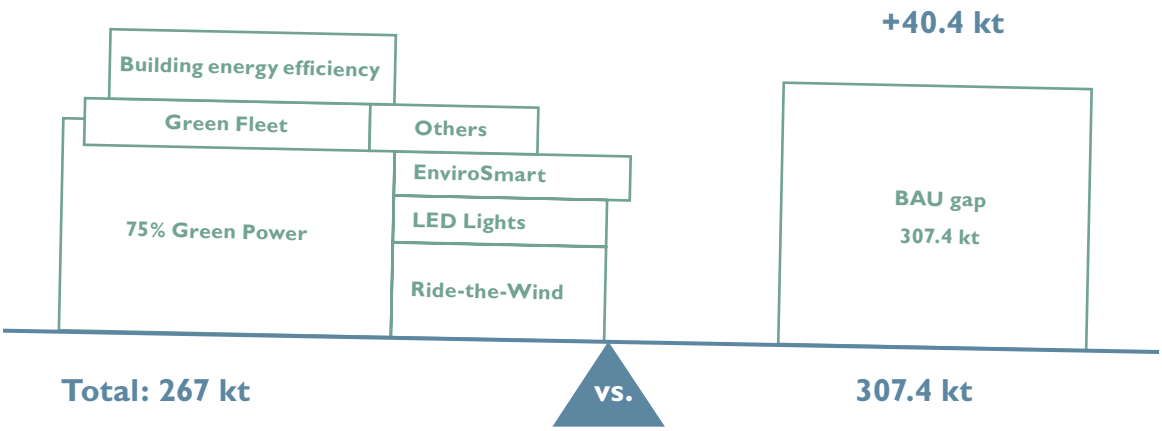
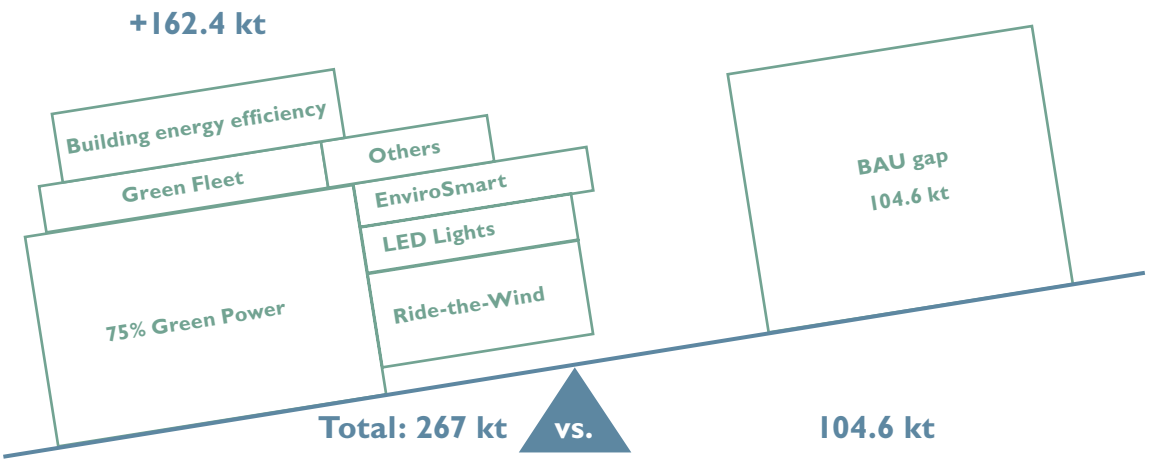


FIGURE 3B NEW -6 PER CENT SCENARIO
APPROVED & ONGOING MAJOR INITIATIVES VS. BAU GAP



THE ROAD TO -50 PER CENT: ADDITIONAL SOURCES OF GHG REDUCTIONS

As already stated, in order to achieve the -50 per cent target, The City must initiate an additional 40.4 kt of GHG emission reduction projects. Several potential areas of opportunity include the following.

- Green power of 90 per cent: The City/ENMAX electricity servicing agreement (ESA) includes the provision to increase The City's green electricity commitment to 90 per cent by 2012. It is estimated that this initiative alone would further reduce City GHG emissions by about 42 kt

- Additional building energy efficiency upgrades: Further opportunity exists to undertake building energy efficiency upgrades, as a significant segment of The City's facilities was not included in the energy performance contract (EPC) program, nor has been subject to a rigorous energy efficiency analysis

- Hybrid transit buses: Hybrid buses are an emerging technology that can reduce fuel consumption and air pollutants by up to 50 per cent. However, at present they are expensive, costing 50 per cent more than conventionally powered buses. In the near term, the mass introduction of hybrid buses to municipal fleets could become a reality with the financial support of the Government of Canada's Climate Fund

- Biofuels for City fleet vehicles: Biofuels, such as biodiesel, can significantly reduce GHG and air pollutant emissions from vehicles. However, at present, cost and supply constraints are key hurdles. Once again, the Government of Canada has the ability to influence and promote the expanded use of biofuels through tax policies and the provision of direct funding support to producers and consumers

- Water treatment facility energy efficiency upgrades: Further opportunity exists to improve the energy efficiency of The City's water treatment facilities through the introduction of new technologies and the upgrade or replacement of aging equipment

- Civic partners building upgrades and green power commitment: The City, through the newly formed Energy Management Office (EMO), can provide its expertise to civic partners (organizations partially funded by The City) to improve the energy efficiency of their facilities and potentially facilitate the purchase of green electricity; and

- New technology deployment: With the establishment of EMO, The City's capacity and ability to move forward on projects that improve energy efficiency, specifically initiatives that utilize new and emerging technologies, will be greatly enhanced. It is anticipated that EMO will stimulate and accelerate the implementation of new green energy and energy conservation initiatives.

THE CITY'S MEMBERSHIP AND COMMITMENT TO FCM-PCP BESTOWS THE RESPONSIBILITY TO REDUCE LOCAL GHG EMISSIONS AND IMPROVE THE LOCAL ENVIRONMENT AND QUALITY OF LIFE.

Emissions from City-operated landfills

It is important to note there has been a change in The City's GHG accounting protocol procedure with regard to landfill gas (LFG) emissions emanating from City-owned waste facilities. In previous reports on The City's corporate GHG emissions, all emissions from City waste facilities were charged to its corporate GHG emission account rather than to the Calgary community's GHG emission account. GHG accounting protocol produced by the Federation of Canadian Municipalities Partners for Climate Protection (FCM-PCP) indicates that emissions from waste generated by the residents, businesses and industries within municipal boundaries should be included in the community GHG emission inventory[1].

In this regard, The City of Calgary is now following the FCMPCP reporting standard for LFG emissions. This change in accounting protocol enables The City to provide a more accurate assessment of its efforts to reduce corporate-generated GHG emissions, to more accurately evaluate its program in relation to what other Canadian municipalities have achieved and to align it with the national reporting standard. It should also be noted that the shift of municipal landfill emissions to the community emission account in no way releases The City from its present commitment and responsibility to reduce GHG emissions from its waste facilities. The reality is that The City is the only entity capable of taking action to reduce emissions from its landfill sites. Additionally, The City's membership and commitment to FCMPCP bestows the responsibility to reduce local GHG emissions and improve the local environment and quality of life.

[1] Federation of Canadian Municipalities Partners for Climate Protection. FAQs Measures. 2002.

SUSTAINABLE BUILDING POLICY

Background

In 2004, the sustainable building policy was raised from pilot status to fully adopted status. The purpose of the policy is to ensure that City facilities are designed, developed and operated in a way that provides leadership in the conservation, protection, improvement and sustainability of the environment for the benefit of Calgarians.

What is a sustainable building?

A sustainable building integrates materials and methods that promote environmental quality, economic vitality and social benefits through the design, construction and operation of the built environment.

The policy

All new occupied facilities in excess of 500m^2 meet or exceed the silver level of the LEED rating system, including such buildings undergoing major retrofits.

What is the LEED rating system?

Leadership in Energy and Environmental Design (LEED) is a green building rating system that evaluates the environmental performance of commercial and institutional buildings. There are four rating levels — certified, silver, gold and platinum — with each level requiring a greater incorporation of sustainable elements.

Accomplishments to date

The City of Calgary has completed the construction of two sustainable facilities: Crowfoot Library and Cardel Place. The City is also developing two major facilities under the policy: the Water Centre and the Country Hills Multi-service Centre.

GHG reduction action areas

To achieve its GHG reduction target, The City can undertake initiatives in several areas of its operations. This action plan identifies a wide variety of initiatives that can directly reduce corporate GHG emissions. The key action categories in which The City can target its GHG reduction efforts are as follows.

1. Building energy efficiency
2. Methane gas emission reduction
3. Green power (electricity from renewables)
4. Greening the fleet
5. Water conservation and treatment facility efficiency
6. Innovative practice and technology deployment/demonstration

Each of the six action categories includes one or more action areas and several initiatives, including those that are completed, ongoing, initiated, pending and conceptual.

ACTION CATEGORIES

1. Building energy efficiency
2. Methane gas emission reduction
3. Green power
4. Greening the fleet
5. Water conservation and treatment facility efficiency
6. Innovative practice and technology deployment/demonstration

1. BUILDING ENERGY EFFICIENCY

Background

Building emissions are a result of the consumption of natural gas for space- and water-heating and electricity for lighting and equipment operation. In 2004, City buildings and facilities were the source of 181.4 kt (41 per cent) of corporate GHG emissions.

In the last couple of years, The City has made tremendous progress in the area of building energy efficiency. In 2004, The City completed a building energy efficiency retrofit initiative, using energy performance contracting (EPC) services. The financial success of The City's experience with EPC, and energy efficiency retrofits in general, provides a model for other local corporate entities (and other municipalities) to emulate. Goal: Reduce energy consumption and GHG emissions from The City's buildings and facilities.

Action areas

- Improve the energy efficiency of The City's existing buildings and facilities.
- Design and construct new buildings and facilities to achieve maximum feasible energy efficiency.

Initiative	Lead group	Partner(s)	Status
Energy performance contract (EPC) program: retrofit/upgrade of all existing City buildings and facilities	Infrastructure Services		completed
Sustainable building policy pilot program	Infrastructure Services	All BUs	completed
Olympic Plaza energy-efficient light retrofit: metal halide bulb installation	Parks		completed
Green procurement policy for office equipment (Energy Star® products, etcetera)	Information Technology		ongoing
Sustainable building policy adoption of the Leadership in Energy and Environmental Design™ (LEED) rating system • meet or exceed the silver level rating for all new facilities (>500 m2)	Infrastructure Services	All BUs	ongoing
Calgary Fire Department (CFD) energy challenge	CFD		completed
LCD computer monitor replacement project	Information Technology	All BUs	ongoing

ENERGY PERFORMANCE CONTRACTING

What is it?

Energy performance contracting (EPC) is an innovative partnership with private energy service firms that will improve the energy efficiency of City buildings at a zero net cost to The City of Calgary. This is achieved by taking the financial savings achieved from using less energy and using it to repay the energy service company over a 10-year contract term.

What's been done?

The energy efficiency of various building components were improved, including

- lighting systems
- heating, ventilation and air conditioning equipment
- building controls; and
- energy supply systems.

These improvements significantly reduced the amounts of electricity and natural gas required to heat and light City buildings.

The project was completed in 2004 and the following City building groups were improved:

- the Calgary Fire Department
- Manchester Yards
- Transportation facilities
- the ENMAX/Alberta Trade Centre; and
- the Corporate Properties Group and Waste & Recycling Services buildings.

It is estimated that the EPC program continues to deliver about 30 kt in annual GHG emission reductions.

2. METHANE GAS EMISSION REDUCTION

Background

Methane gas is a waste product produced by the anaerobic decomposition of organic materials. Methane is a significant issue as it is an extremely potent greenhouse gas, with 21 times the global warming potential of CO_2. However, it is important to note that methane is also a valuable resource, being it is the primary constituent of natural gas. In this regard, waste methane has the potential to provide significant amounts of energy to produce electricity or be directly used as a heating fuel. Additionally, because methane produced via biological processes is considered green energy, it is a GHG neutral fuel and thus has a premium value in the marketplace (i.e. combustion results in net zero GHG emissions).

As previously stated, methane emissions from City-operated landfills are not charged to The City's corporate GHG emission account, but rather to the Calgary community account. However, managing methane emissions is still considered a key component of The City's corporate climate change program for several reasons, including

- The City's interest in seeing overall local GHG emissions decline
- The City's desire to realize its commitment to the FCM's Partners for Climate Protection; and
- the recognition that The City is the only entity that can practically address the issue at its landfill and wastewater treatment facilities.

In recognition of the above identified statements, methane from The City's landfills and wastewater treatment plants must remain a corporate priority and responsibility, despite the fact that it is not included in The City's corporate GHG emission account.

City of Calgary landfill and wastewater treatment facility operations result in the production and emission of methane gas. Table 2 provides a summary of the amount of methane produced and emitted in 2003 by The City's wastewater and landfill facilities.

TABLE 2
Methane emissions from City wastewater and landfill facilities (2003)

Methane (CH_4) source	Amount captured (kt)	Amount escaped (kt)
Wastewater operations: CH_4 flared	3.8[1]	-
Wastewater operations: CH_4 utilized	8.8[1]	-
Landfill operations	-	11.5[2]
TOTALS	**12.6**	**11.5**

[1] Derived from data provided by City of Calgary, Water Resources.
[2] Source: City of Calgary, Waste & Recycling Services, Greenhouse Gas Reporting for 2003.

As Table 2 indicates, methane produced by The City's wastewater treatment facilities is captured: that is, it is not emitted to the atmosphere. Wastewater-plant-generated methane is either flared or utilized to generate both electricity and heat at the Bonnybrook Wastewater Treatment Plant (see sidebar). In fact, about 70 per cent (8.8 kt) of the methane generated by wastewater treatment plants is used to produce energy.

In contrast, all methane generated by The City's landfill operations, via anaerobic decay of organic refuse, presently escapes into the atmosphere. In 2003, it is estimated that about 11.5 kt of methane — the equivalent of about 241.5 kt of CO_2, in terms of global warming potential — was emitted into the atmosphere by The City's three landfills.

The City's Waste & Recycling Services business unit has several landfill gas capture initiatives underway that significantly reduce future landfill methane emissions (see the initiatives section).

Goal: Reduce methane emissions from City operations to as low a level as technologically and economically feasible.

Action areas

- Increase the amount of methane capture and utilization from The City's landfills.
- Increase the amount of methane utilization from The City's wastewater treatment facilities.
- Reduce the amount of organic waste deposited in landfills (anaerobic storage).
- Maximize the utilization of methane generated from City facilities for green power production.

Initiative	Lead group	Partner(s)	Status
Capture of wastewater treatment methane gas for power generation (Bonnybrook Wastewater Treatment Plant)	Water Services		ongoing
Organic waste diversion pilot project (waste to compost program) as a means of reducing future methane emissions from City landfills (commercial composting)	W&RS		completed
Bioreactor pilot project at Sheppard landfill (300 kW production target)	W&RS		ongoing
Methane capture and green electricity production at Sheppard (380 kW) and East Calgary (70 kW) landfill sites (Phase 1)	W&RS		initiated
Expansion of methane capture and green electricity production at Sheppard and East Calgary landfill sites (3 MW) (Phase 2)	W&RS	ENMAX	proposed
Biocap pilot project at East Calgary landfill (biological oxidation of landfill gas, targeted at landfills where capture is not technically or economically feasible)	W&RS	University of Calgary	ongoing
Organic waste diversion on a City-wide scale (waste to compost program)	W&RS		proposed

RIDE-THE-WIND

What is it?

In 2001, Calgary Transit launched the Ride-the-Wind program, committing The City to operate its Light rail transit (LRT) trains exclusively on electricity generated from wind power. As a result of Ride-the-Wind, 12 windmills were constructed in southern Alberta to provide electricity for Calgary's CTrains.

Environmental benefits

Because the electricity used by CTrains is produced exclusively by wind power, The City is preventing the emission of about 26 kt of GHGs from entering our air. Calgary's LRT system is the first public light rail-transit system in North America to power its train fleet with wind-generated electricity.

External recognition

Since the implementation of the Ride-the-Wind initiative, Calgary Transit has been the proud recipient of two prestigious awards

- the Federation of Canadian Municipalities CH2M HILL Sustainable Community Award for leadership in renewable energy; and
- the Canadian Council of Ministers of the Environment's Pollution Prevention Award in the innovations category.

THE DOWNWARD TREND IN THE CITY'S EMISSIONS STARTED AFTER 2000, WHICH IS WHEN CORPORATE GHG EMISSION REDUCTION EFFORTS WERE INITIATED, LED BY THE RIDE-THE-WIND PROGRAM IN LATE 2001.

3. GREEN POWER

Background

In Alberta, electricity production is a significant source of GHG emissions due to the province's power generators' heavy reliance on fossil fuels, especially coal. Green power is electricity which is essentially GHG-neutral: that is, it is produced from renewable forms of energy that do not result in net additions of GHGs into the atmosphere (e.g. wind, biomass, solar, small hydro, etcetera).

The City purchases about 370 million kWh of electricity annually (of which currently about 30 million kWh is green), resulting in the emission of roughly 280 kt of GHGs: about 60 per cent of total City GHG emissions. Presently, about 11 per cent of the electricity The City consumes is derived from green power and most of it is used to power The City's CTrains (Ride-the-Wind program). Additionally, The City's Bonnybrook Waste Treatment Plant produces a significant amount of green electricity (about 11 million kWh) from waste methane gas, which is used on site to power the plant[1].

[1]. Source: 2004 Waterworks & Wastewater Annual Report.

Beginning in 2007, The City of Calgary will be increasing its green power commitment to 75 per cent of its total electricity use. This equates to about 260 million kWh annually, the single largest green electricity contract in North America to date. The electricity services agreement between The City of Calgary and its electricity supplier ENMAX Power Corporation allows for the opportunity to increase The City's green electricity commitment to greater than 90 per cent by 2012. In this regard, The City and ENMAX have committed to work together over the next several years to identify and pursue cost-effective projects that could move The City toward the 90 per cent level.

Table 3 provides a general overview that serves to demonstrate the impact varying levels of green electricity consumption will have on The City of Calgary's GHG emissions. For example, a 75 per cent commitment to green power has the effect of reducing GHG emissions attributable to electricity consumption to 77 kt; in other words, about 230 kt in GHG emissions are prevented from being emitted into our air. The 90 per cent green power commitment scenario results in the prevention of 276 kt of GHG emissions.

TABLE 3
The impact of varying green electricity commitment levels on City GHG emissions

Green electricity use		Approximate GHG emissions (kt)	Change/GHG reduction (kt)
%	mm kWh		
0	0	307	n.a.
75	277	77	-230
90	333	31	-276

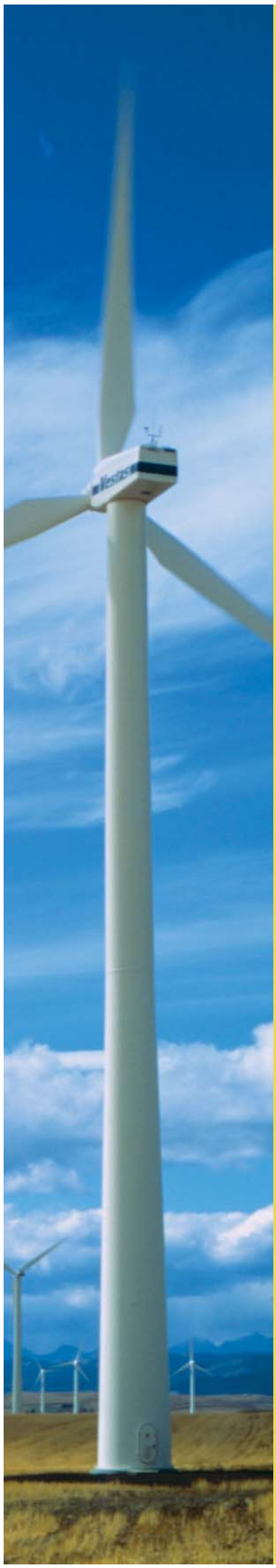
An additional benefit of increasing The City's green power commitment is that it demonstrates local environmental leadership. The City cannot realistically encourage and promote the increased community consumption of green power if it is not leading by example. At the community level, electricity consumption accounts for about 43 per cent of local GHG emissions. Clearly, if community emissions are to be reduced, electricity consumption either has to decrease (unlikely given Calgary's growth rate) or be greened: that is, green power's market share in Calgary will have to increase. For example, if green power achieved only a modest 10 per cent market share of the Calgary community's electricity consumption, local GHG emissions would decrease by about 650 kt: almost 1.5 times The City's total 2004 GHG emissions.

Goal: Increase the green power component of The City's total electricity consumption.

Action areas

- Increase the green power component of The City's electricity consumption.
- Support the expansion of the green power market share in Calgary.
- Exploit opportunities to generate green power from City facilities (landfills, waste treatment plants, rooftops for solar arrays, etcetera).

Initiative	Lead group	Partner(s)	Status
Ride-the-Wind program – Light rail transit (LRT) powered 100 per cent by green power	Calgary Transit		ongoing
Green power purchase contract (3.7 million kWh/ year)	Infrastructure Services, Finance, Supply Services		ongoing
Green power production from biologically produced methane: Bonnybrook Wastewater Treatment Plant [see initiatives p. 20]	Water Resources		ongoing
Green power production from biologically produced methane: City landfills [see initiatives p. 20]	W&RS		initiated
Form an inter-business-unit green power team to pursue The City's green power strategy	Infrastructure Services, EM, Finance, Supply Services		completed
75 per cent green power commitment (starting in 2007): electricity services agreement	Infrastructure Services, EM, Finance, SupplyServices	ENMAX	completed
90 per cent green power commitment (by 2012)	Infrastructure Services, EM, Finance, Supply Services	ENMAX	initiated
Promote green power use to the Calgary community (communications/marketing campaign)	Infrastructure Services (EMO), EM, ENMAX		initiated



GREEN POWER COMMITMENT

What is green power?

Green power is electricity produced from renewable energy sources that result in little or no net addition of GHGs to the atmosphere. In Alberta, the dominant source of green power is wind energy.

Background

In July 2005, The City of Calgary and ENMAX Power Corporation entered into an electricity service agreement, through which The City will increase its green power commitment to 75 per cent of its total electricity consumption by Jan. 1, 2007. Upon implementation of the agreement, The City of Calgary will be consuming about 260 million kWhs of green electricity annually, making it the single largest green electricity supporter in North America.

Environmental benefits

As a result of the agreement, ENMAX will be moving forward on the development of an 80 MW wind farm in the municipal district of Taber, Alberta, which will supply a significant portion of The City of Calgary's electricity requirements. It is estimated that The City's 75 per cent commitment to green power will result in the reduction of about 215 kt of GHGs annually.

BONNYBROOK WASTEWATER TREATMENT PLANT

What's being done?

The Bonnybrook Wastewater Treatment Plant serves over 580,000 citizens and processes over 380,000 m3 of sewage per day. In covered anaerobic digesters, anaerobic bacteria digest sewage sludge. The bacteria break down complex organic materials into simple and stable substances such as methane, which is an extremely potent greenhouse gas (21 times more so than CO_2).

Significant amounts of methane generated by the sewage sludge treatment process is captured and used to generate electricity in the plant's reciprocating engines.

Environmental benefits

Annually, the Bonnybrook plant generates about 11 million kWh of electricity and recovers about 15 million kWh of heat energy, which is used on-site to power the facility. Effectively, the Bonnybrook plant is a generator of green electricity. The plant's methane capture and power production has two significant climate change benefits.

- It nullifies the need to purchase and consume 11 million kWh of electricity from the Alberta grid, therefore preventing the emission of about nine million kt of GHGs per year. As well, heat recovery reduces the facility's natural gas consumption.
- It prevents the escape of methane, a highly potent GHG, into the atmosphere.

4. GREENING THE FLEET

Background

The City's fleet comprises about 4,120 vehicles, consisting of 2,200 general-use vehicles, 800 Police Services vehicles, 950 Transit vehicles and buses and 170 Calgary Fire department vehicles. In 2004, the fleet was the source of 95.2 kt of GHG emissions (21.5 per cent of The City's total GHG emissions). Over the 1990 to 2004 time frame, the fleet was the fastest-growing source of corporate GHG emissions, increasing by about 5.3 per cent (see Table 1). The population growth within the city of Calgary during the 1990 to 2004 time frame was about 38 per cent, considerably greater than The City fleet's GHG emission growth rate. Despite this fact, considerable opportunity exists to reduce fleet emissions, ranging from a green procurement/purchase policy, to alternative fuel use, to modification of driver behaviour.

The greening of the corporate fleet will serve to enhance The City's ability to influence and motivate the Calgary community, including other local corporate fleets, to take similar actions to reduce vehicle-sourced GHG emissions, which account for over one quarter of community GHG emissions.

Goal: Reduce the GHG emissions of The City's vehicle fleet.

- Short-term: Stabilize The City fleet's fuel consumption at the 'year-2000' level.
- Long-term: Stabilize fleet GHG emissions at the 'year-2000' level by 2012.

Action areas

- Improve the fleet's overall fuel efficiency.
- Increase the use of renewable, green fuels and cleaner fossil fuels.
- Implement new practices and technologies that reduce fuel consumption.
- Encourage staff to choose alternative forms of transportation.

GREEN FLEET HAS BEEN RESPONSIBLE FOR INTRODUCING EIGHT HYBRID VEHICLES INTO THE CITY'S VEHICLE FLEET.

Initiative	Lead group	Partner(s)	Status
Vehicle use optimization: route planning efficiencies	W&RS		completed
Installation of automatic engine shut-off devices for heavy-duty diesel vehicles	Fleet Services		ongoing
Utilize the latest technologies to reduce vehicle emissions	Fleet Services	All BUs	ongoing
Establish a corporate best-in-class vehicle acquisition policy that includes a right-sizing vehicle needs assessment element	Fleet Services	All BUs	ongoing
Improve driver education with regard to more fuel efficient use of vehicles	Fleet Services	All BUs	ongoing
Installed 12 diesel engine pre-heat systems to reduce engine idling	Fleet Services Water Services, Roads		completed
Incorporated Transport Canada's fuel consumption ratings into the vehicle tendering process	Fleet Services	All BUs	completed
Green fleet working committee to lead a corporate-wide effort to reduce fleet GHG emissions	Fleet Services	All BUs	completed
Vehicle idling reduction educational video	Roads	All BUs	completed
Vehicle idling reduction policy	EM	All BUs	completed
Employee commuter options survey	Transportation Planning	Calgary Transit, HR	completed
Heavy-duty vehicle diesel/electric hybrid and hydraulic assist technology for refuse trucks	Fleet, W&RS		initiated
Installation of halo spark plugs (to improve fuel economy)	Fleet Services	Water Services	ongoing
Develop an external networking group comprising several municipalities to utilize and test green fleet initiatives	Fleet Services	Other Canadian municipalities	completed
New vehicle maintenance protocol to maximize fuel efficiency	Fleet Services	All BUs	conceptual
Increase the hybrid vehicle component of the fleet	Fleet Services	All BUs	ongoing
Staff transportation mode change: transit ticket sign-out for work travel	Transportation Planning		completed
Employee trip reduction program	Transportation Planning	Calgary Transit, HR	conceptual
Biodiesel pilot project: phase 2 (larger scale)	Fleet Services,	ENMAX W&RS, CFD, Calgro	ongoing

BIODIESEL PILOT PROJECT

Background

In early 2004, The City of Calgary launched the ecofuel demonstration project, which saw the Calgary Fire Department (CFD) and Waste & Recycling Services operate three vehicles on biodiesel (B20 blend). The ecofuel project was the first use of biodiesel by a commercial fleet in Alberta.

What's next?

The success of the ecofuel demonstration project has resulted in an expanded effort led by The City's Fleet Services business unit, which is co-ordinating a multi-departmental biodiesel project including Waste & Recycling Services, CFD, Wastewater (Calgro), Supply Management and ENMAX. This phase 2 pilot project, initiated in April 2005, is scheduled to run for six months and includes 65 City of Calgary vehicles.

What is biodiesel?

Biodiesel is a renewable biofuel produced from oil seed crops and waste cooking oils. It can be blended at any proportion with petroleum diesel, but the 20/80 (B20) blend is the most widely used formula.

Environmental benefits

- The B20 blend reduces GHG emissions by about 15 per cent in comparison to petroleum diesel.
- Biodiesel exhaust has lower levels of air pollutants — such as particulate matter, sulfur oxides and carbon monoxide — than petroleum diesel.
- Biodiesel is safer to work with as it is non-toxic, emits fewer toxic combustion emissions and is less flammable: that is, it has a much higher flash point than petroleum diesel.
- If spilled, it is less harmful to the environment, as it biodegrades relatively quickly.
- Biodiesel use does not require any engine retrofit: that is, it can be used in any diesel-powered engine.

GREEN FLEET INITIATIVE

Background

In late 2003, the green fleet working committee was formed to promote a cleaner, more fuel-efficient municipal fleet. The committee is lead by the Fleet Services business unit and includes membership from several City of Calgary business units.

Areas of focus

The green fleet working committee's key areas of focus are to

- review current vehicle technology advancements, including alternative fuels, hybrid vehicles, etcetera, with the objective to identify potential application within The City's fleet
- review the current composition of the fleet, with a goal to reduce vehicle size, reduce the quantity of vehicles, etcetera
- communicate the experiences of various business units on activities and tests in progress, including benefits and costs
- review vehicle emission reduction projects undertaken by private sector fleets and other municipalities; and
- evaluate energy saving and environmentally friendly fleet products and inform all business units about these products.

Accomplishments to date

A significant outcome of the green fleet's activities has been the acceleration of the introduction of hybrid vehicles into The City's vehicle fleet. Thus far, eight hybrid vehicles are in use, including five pickup trucks. Additionally, a diesel SMART car has been acquired. Another key initiative being led by the green fleet team is the biodiesel pilot project, which has successfully developed solutions to overcome the procurement, delivery and storage issues related to biodiesel.

5. WATER CONSERVATION AND TREATMENT FACILITY EFFICIENCY

Background

The production, treatment and transportation of potable water and wastewater require tremendous amounts of energy inputs derived from electricity and natural gas. For every one million litres of potable water produced by The City, about 325 kg of GHGs are emitted, and for every one million litres of wastewater treated, about 285 kg of GHGs are emitted. In 2003, The City's water and sewer operations were responsible for the emission of about 105 kt of GHGs (over 23 per cent of total corporate GHG emissions).

Additionally, climate change is forecasted to have a negative impact on the water supply in southern Alberta. The forecasted decrease in the regional water supply will require Calgarians to reduce their per-capita water consumption, essentially requiring an adaptation to climate-change-instigated environmental change.

The impact of climate change on local water resources — in combination with the increasing demand associated with projected population growth, new developments and new water quality standards — indicates there is clearly more than one reason for The City to encourage water conservation. As well, reductions in water consumption can provide significant financial benefits for Calgarians and permits The City to maximize its use of the investment in our water treatment facilities.

The City's water conservation plan and programs are focused on best industry standard practices that provide the largest water savings for customers. Reductions in water demand are accomplished by finding efficiencies in The City's operations, encouraging the use of water-efficient technology, educating Calgarians on wise-water use behaviours, aligning policy with conservation and helping businesses realize the value and opportunities of water conservation.

Goal: Reduce the amount of GHG emissions produced from the production and treatment of potable water and wastewater.

Action areas

- Reduce the amount of water consumed by City operations.
- Reduce Calgarians' per-capita water consumption.
- Reduce the amount of energy required to produce, clean and transport water.
- Optimize the efficiency of the water utility infrastructure system.

THE CITY'S WATER CONSERVATION PLAN AND PROGRAMS ARE FOCUSED ON BEST INDUSTRY STANDARD PRACTICES THAT PROVIDE THE LARGEST WATER SAVINGS FOR CUSTOMERS.

Initiative	Lead group	Partner(s)	Status
Universal metering program	Water Resources	Water Services	ongoing
Water main replacement	Water Services		ongoing
System leak detection program	Water Resources	Water Services	ongoing
Treatment process efficiency improvements	Water Resources	Water Services	ongoing
Bonnybrook WWTP HVAC Headworks heat recovery system	Waste Services		initiated
Water audit pilots (for commercial, industrial and institutional consumers)	Water Resources		ongoing
Residential indoor and outdoor water saver kits	Water Resources	Clean Calgary Association	ongoing
Residential toilet rebate program	Water Resources		ongoing
Residential rain barrel sale	Clean Calgary Association	Water Resources	ongoing
Bus wash recycling (Spring Garden Garage)	Calgary Transit		ongoing
Residential education campaigns - summer watering - indoor water use - leak detection	Water Resources		ongoing
Water-managed sites certification program	Parks, Water Resources		ongoing
Youth education programs and partnerships	Water Resources	Parks, EM, various not-for-profit organizations	ongoing
Parks water management strategy	Parks	Water Resources	initiated
Water Utility Bylaw: low-water-use fixtures	Water Resources	Bylaw Services	ongoing
Multi-family retrofit pilots	Water Resources	Cal Homes	initiated
Multi-family toilet rebate program	Water Resources		initiated
Washing machine rebate pilot program	Water Resources, Climate Change Central		initiated
Commercial kitchen spray valve replacement program	Water Resources		initiated

RESIDENTIAL WATER CONSERVATION

Background

The City's Water Resources business unit is committed to promoting a progressive water conservation program enabling Calgarians to conserve water. The central focus of The City's water conservation program is to reduce overall water use and achieve more sustainable management of Calgary's water resources.

The goal

The City's goal is to accommodate Calgary's future population growth with the same amount of water used today. To achieve this objective, per-capita water consumption must drop at a rate that corresponds to the rate of population growth.

Key initiatives

Water saver kits: In 2004, water saver kits continued to be sold at cost to Calgarians. Kits consist of water-saving devices for use in and outside the home. Kits were available at City cashiers, the Clean Calgary Association store and The City's online store. In 2004, 350 outdoor kits and 535 indoor kits were sold.

Expanded toilet rebate replacement program: The program was expanded in the fall of 2004 to allow residential metered customers to receive up to three $50 rebates when they replaced their existing 13- or 20-litre toilets with more water-efficient six-litre toilets. In 2004, 1,697 rebate applications were received.

Public education: An on-call water efficiency educator was hired, allowing Water Resources to be present at many events and personally reach over 3,000 Calgarians.

Water utility bylaw: In August 2005, The City of Calgary mandated the use of water-saving plumbing features in all new homes, commercial buildings and renovation projects requiring permits. The new regulations will help The City meet its no-net-gain water usage goal.

THE CITY'S WATER CONSERVATION PROGRAM IS TO REDUCE OVERALL WATER USE AND ACHIEVE MORE SUSTAINABLE MANAGEMENT OF CALGARY'S WATER RESOURCES.

6. INNOVATIVE PRACTICE AND TECHNOLOGY DEPLOYMENT/DEMONSTRATION

Background

Emerging technologies, from fuel-cell-distributed power units to solar panels, hold the promise of a significant reduction in the consumption of carbon-intensive fuels and a reduction of GHG emissions, as do innovative applications of existing technologies, such as district heating systems.

The City, being an environmental leader and role model for the community, has a key role to play in the early adoption and demonstration of new and innovative GHG-reducing technologies. The demonstration and utilization of new technologies is a key leadership role The City can undertake to promote community action on climate change. By taking the role of an early adopter of new environmental technologies and practices, The City can assist in

- making new technologies and practices better known to the public and local business community
- reducing the risk associated with adopting new and often locally unknown technologies or practices by undertaking pilot projects and sharing the results with the community; and
- providing an opportunity for local (and convenient) access to new technologies facilitating assessment and stimulating early adoption by local businesses; an example of this showpiece role is the combined heat and power turbine unit at SAIT, which can be viewed by appointment.

Some projects pursued under this action category will be as much, if not more, to do with demonstrating community leadership than with reducing corporate GHG emissions or reducing costs. And, in some instances, projects pursued under this banner will not be driven by economics (i.e. they have very long payback periods or no payback at all). In this regard, partnerships with and/or funding support from senior levels of government is critical.

It is crucial that demonstration projects be accompanied by a strong communications effort, as the ultimate objective is to increase public and corporate awareness of the availability and effectiveness of new technologies. Only through increased awareness and confidence in effectiveness (risk reduction) can the community be expected to widely adopt innovative GHG emission reduction technologies and practices.

Goal: The City will take a local leadership role in demonstrating and adopting new GHG reduction technologies and practices.

Action areas

- Establish partnerships with other levels of government, local educational institutions, Climate Change Central and the private sector to jointly pursue the deployment of new and innovative technologies.
- Pursue funding opportunities/programs that will support new technology demonstration/pilot projects.
- Deploy new and innovative technologies and practices as part of City operations and develop/construct projects (e.g. district heating, geothermal, new building materials, solar panels, alternative fuels, hydrogen fuel cells, etcetera).
- Encourage community (primarily business) adoption of technologies and/or practices that have proven successful through co-ordinated communication and promotional efforts.

Initiative	Lead group	Partner(s)	Status
Solar walls (installed at Calgary Transit garages)	Infrastructure Services, Calgary Transit		completed
Replacement of traffic light signals with LED lighting technology	Roads		completed
EnviroSmart program: residential streetlight retrofit with lower-wattage bulbs	Roads		completed
CFD biodiesel demonstration project	CFD	EM, W&RS, Government of Alberta	completed
Urban transit hydrogen fuel cell study	Government of Canada	Calgary Transit	initiated
District heating system	Infrastructure Services	ENMAX	proposed
Co-generation microturbines at Spring Garden Garage 4: 60kW units	Infrastructure Services, Calgary Transit		completed
Traffic signal priority for transit buses: Centre Street N, Bow Trail, Elbow Drive	Calgary Transit	Transport Canada	ongoing
Energy Management Office	Infrastructure Services	ENMAX	initiated
Solar air heater demonstration project: Sheppard Landfill	Infrastructure Services, U of C, W&RS		initiated
Major arterial roads streetlight retrofit feasibility study: lower-wattage lights	Roads		initiated

ENVIROSMART STREETLIGHT RETROFIT

What is EnviroSmart?

EnviroSmart was an initiative of the Roads business unit that reduces streetlight electricity consumption in Calgary's residential areas. Starting in 2003, about 37,000 residential streetlights were retrofitted with lower-wattage lamps. Specifically, streetlight lamp wattage was reduced from 200 watts to 100 watts on residential local roads and from 250 watts to 150 watts on collector roads. The project was completed in early 2005.

Benefits

The project has produced significant environmental and financial benefits. It is estimated that The City will save about $2 million a year in electricity costs, reduce GHG emissions associated with the production of electricity and significantly reduce light pollution.

Since the development of the StreetSmart program, Calgary Roads has been the proud recipient of several awards and nominations.

- Royal Astronomical Society of Canada (RASC): Calgary Chapter Certificate of Merit (2001)
- Royal Astronomical Society of Canada (RASC): Calgary Chapter Responsible Lighting Award (2003)
- Alberta Emerald Foundation for Environmental Excellence: Climate Change Award: Finalist (2003)
- American Public Works Association: Alberta Chapter: Technical Innovation Award: Transportation (2003)
- Royal Astronomical Society of Canada (RASC): National Office: Light Pollution Abatement Award (2003)
- Office of Energy Efficiency, Natural Resources Canada: Canada's Energy Efficiency Awards: Honourable Mention (2004)

LED TRAFFIC LIGHT INSTALLATION

What is an LED light?

An LED traffic signal uses light-emitting diode technology instead of incandescent bulbs. The LED traffic signals use less energy, which reduces The City's electricity costs. LED lamps are more efficient than incandescent bulbs because

- energy is not wasted as heat; unlike incandescent lamps, LED lamps do not create light through the production of heat
- energy is not wasted through filtering; since incandescent lamps produce white light, filters are needed to block all light energy except for the colour required, while LEDs create coloured light directly.

What's being done?

The replacement of incandescent traffic lights with the new LED technology began in 2003 and was completed in 2005. In total, 730 intersections were retrofitted with LED traffic signal displays.

Environmental benefits

LED lights use 80 per cent less energy than conventional incandescent bulbs, thereby saving money and reducing GHG emissions. They are also brighter and more visible under all driving conditions and last five times longer. The LED retrofit project has reduced The City's annual electricity consumption by about 8.6 million kWh.

DISTRICT ENERGY

What is it?

District energy (DE) provides buildings with heating or cooling energy produced and distributed by a central plant. A network of underground pipes connects the central plant to individual buildings. Thermal energy is distributed to the buildings and returns via the pipes to the central plant to be heated or cooled again.

What's being planned?

The City, in partnership with ENMAX, has developed a DE development plan and feasibility analysis. The proposed DE system would serve 14 publicly owned and funded buildings with over 5.2 million ft2 of floor space in downtown Calgary, including The City of Calgary's 900,000 ft2 Municipal Building complex.

Environmental benefits of the DE system

DE provides improved energy efficiency, resulting in GHG reductions and supports The City's sustainable building development goals. The added benefit of the proposed DE system is that it would function as a co-generation, or combined heat and power unit. This means both heat and electricity will be produced. Co-generation improves the overall energy efficiency of DE plants. It is estimated that the project has the potential to reduce GHG emissions by up to 28 kt per year.

THE CITY WILL TAKE A LOCAL LEADERSHIP ROLE IN DEMONSTRATING AND ADOPTING NEW GHG REDUCTION TECHNOLOGIES AND PRACTICES.

Part 2
Calgary community climate change strategy: discussion paper

Currently there is no existing community climate change plan for The City of Calgary. The completion of the imagineCALGARY initiative in 2006 will be the starting point for such a plan. This two-year initiative aims to define a long-term vision and plan for Calgary, a vision that focuses on maintaining and enhancing the quality of life for all in our community. The proposed targets in this section will be finalized after the conclusion of the imagineCALGARY initiative in the fall of 2006. Please refer to Appendix 3 for an overview of this initiative.

BACKGROUND

This document initiates dialogue with, and in, the community to set targets for greenhouse gas emission reductions. In facilitating dialogue around what the community can do, this section provides a pragmatic overview of current and future actions and programs that can contribute to the reduction of GHGs and air pollutants in the Calgary region.

Through its membership in the Federation of Canadian Municipalities' Partners for Climate Protection (PCP), The City of Calgary has committed to reduce local greenhouse gas emissions and improve the local environment and quality of life. By successfully leading the way in reducing its own corporate emissions over the last two years, The City now wants to encourage and empower the Calgary community to address climate change.

The City of Calgary is not the only party involved in promoting community-wide action on climate change. Other organizations involved within the Calgary region include: Climate Change Central (3C), the Government of Canada, CMHC, the Government of Alberta, ENMAX, the Clean Calgary Association, Sustainable Calgary, Sierra Club and other local environmental non-government organizations (ENGOs). Furthermore, there are various private sector initiatives that have made significant progress, such as Built Green™ Calgary, a program initiated by the Calgary Region Home Builders Association (CRHBA). This program aims to reduce the use of resources (materials and energy/water) during construction, and after owners take possession of their new homes. In this document you will find listings of more programs and actions in the Calgary community.

OVERVIEW

This document starts with setting community GHG emission reductions in the context of proposed community performance targets. In conjunction with renewing its corporate GHG emission reductions target, The City of Calgary intends to create a dialogue with the Calgary community by proposing potential community performance targets. Secondly, the document provides a set of programs and actions — some realized or planned, some proposed or envisioned — that support the reduction of GHG emissions over the short, medium and long term. The programs and actions have been categorized as follows

1. transportation
2. residential energy use/commercial energy use
3. renewable energy
4. water; and
5. waste.

Finally, the document gives an overview of existing community targets established by other major cities in Canada and two leading US cities. It is hoped that this document be the foundation for a community dialogue and provide new ideas and directions for the Calgary community as well as inspire other communities to take action on climate change.

Depending on the final targets a community adopts and the time frame within which the targets are to be realized, programs and actions might differ in approach and need for funding. Without bylaws or legislation, social behaviour may be hard to change; on the other hand, effective engagement and appropriate incentives have proven to be successful tools in moving citizens towards more sustainable practices at home and in their community.

PERFORMANCE TARGETS

With its Corporate Climate Change Action Plan, The City of Calgary has established a model for environmental stewardship in the community. Acknowledged for its bold direction and successes, The City can contribute to supporting the community in setting and achieving GHG emission reduction performance targets. However, given the financial and constitutional limitations of municipal government, The City needs support in engaging the community and delivering programs.

The City of Calgary has renewed its commitment by proposing a reduction of its corporate emissions to 50 per cent below 1990 levels by 2012. The City of Calgary would like to start the community dialogue on performance targets as well, even though more specific future targets are to be developed through the engagement process of imagineCALGARY and the environmental footprint program.

The proposed base year for establishing community emissions is the year 2005. Future performance targets will be set at a per cent reduction rate from the 2005 base year. Based mainly on the expected implementation of clean coal technologies, the first performance target for emission reductions could be set at 20 per cent below 2005 levels by 2020. With expected urban infrastructure and development, as well as transportation innovations, a second performance target for emission reductions of 50 per cent below 2005 levels by 2050 might be achievable.

[1] The environmental footprint program responds to Calgary City Council Priorities 2006-2008, specifically Council Priority 1.2: Reduce our environmental footprint and become a city known for its clean air, land stewardship, clean water and energy conservation and Council Priority 4.1: Be a catalyst and enabler for reducing the environmental per-capita footprint of our community.

POTENTIAL PERFORMANCE TARGET SCENARIOS FOR THE CALGARY COMMUNITY	
2005	Base year for Calgary community emissions
2020	20 per cent reduction in Calgary community emissions
2050	50 per cent reduction in Calgary community emissions

COMMUNITY GHG EMISSION TARGET AREAS AND ACTION STRATEGY

This section is divided into the target areas of

- transportation
- residential energy use/commercial energy use
- renewable energy
- water and waste.

For each target area, relevant community programs currently operating in Calgary are listed first. Then anticipated and potential future programs are listed, increasing in scope and impact over time. A more extensive list of anticipated and potential future programs has been attached to this document in Annex 1.

In an attempt to set incremental actions on a timeline, we have established the following intervals: short-term (five-10 years), mid-term (10-20 years) and long-term (20 years and beyond). These terms are suggested for the Calgary community only.

IN CALGARY, VEHICLES ARE THE SECOND LARGEST LOCAL SOURCE OF AIR POLLUTION AND GREENHOUSE GASES. THEY ARE RESPONSIBLE FOR 30.2 PER CENT OF THE TOTAL GHG EMISSIONS PRODUCED BY THE CALGARY COMMUNITY.

Transportation

Background

Vehicles are one of the major contributors to the production of community GHG emissions, whether they are used for personal or commercial use. The following is adapted from the 1995 Calgary Transportation Plan.

"By any North American benchmark, the citizens of Calgary have enjoyed high-quality, modern, efficient transportation infrastructure. While there are clearly benefits to maintaining a high level of mobility, automobile use and ownership trends in Calgary point to consequences that are becoming irreversible in many cities as they grow larger: air pollution, destruction of the environment and arable lands, degeneration of community quality, higher cost for declining mobility."

In Calgary, vehicles are the second largest local source of air pollution and greenhouse gases. As indicated in Figure 1, they are responsible for 30.2 per cent of the total GHG emissions produced by the Calgary community. Gasoline and diesel produce air pollutant emissions, such as particulate matter, unburned hydrocarbons, oxides of nitrogen (NOx) and carbon monoxide (CO). Even though community electricity use accounts for 43.7 per cent of community GHG emissions, most of these emissions are created by large coal-fired electrical plants located outside the Calgary region. Mandating particulate matter filters for diesel fleets and ultra-low sulfur diesel fuel, as well as encouraging the use of biofuels, can have a large impact on reducing these harmful emissions both locally and within the Calgary region.

Transit-oriented urban design and the increase of transit capacity and accessibility will have a major impact on the reduction of commuter vehicle traffic. One of the most successful public transportation programs is Ride-the-Wind; Calgary's Light rail transit (LRT) program is 100 per cent wind powered. Future expansions of the LRT are expected to be 100 per cent emission-free.

Below is an overview of current community-oriented transportation programs in Calgary, as well as potential high-impact actions for the future. A more extensive overview of anticipated and proposed transportation community-oriented programs in Calgary is included in Annex 1.

Current transportation community-oriented programs in Calgary

Program	Partners
Ride-the-Wind: The Calgary Light rail transit system has been 100 per cent wind-powered and emission-free since 2001	The City of Calgary, ENMAX, Vision Quest (TransAlta)
Car Heaven: Recycle your old car and receive a six-month transit pass and/or $1,000 towards a new vehicle	Climate Change Central
Reduce idling program	Government of Alberta, Climate Change Central
Transportation infrastructure projects that increase mobility and reduce idling at major interchanges (short-term relief of GHG emissions)	The City of Calgary
Transit users get a discount when renting at Hertz	The City of Calgary, Hertz
Expansion of LRT and bus service and capacity	The City of Calgary
Universal pass program: Students of Calgary educational institutions qualify for discounted transit passes	SAIT, University of Calgary, The City of Calgary

Anticipated and proposed transportation community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Light rail transit system: Calgary-specific	40 additional LRT cars will be available	Extend the LRT lines to three additional corridors	Transit service level is competitive with auto travel
Stop to road expansion	No further road expansions downtown	Limit road expansions into suburbs	Infrastructure budget is equally split between Roads and Transit
Biofuels and particulate matter (PM) filters for commercial fleets	All diesel trucks equipped with PM filters. Increased use of B5	20 per cent of commercial diesel trucks fueled by B20	50 per cent of commercial diesel trucks fueled by B20

[1] B5 and B20 indicate the level of Biodiesel-blend. B5 is diesel mixed with 5% biofuel.

Residential and Commercial Energy Use

Background

Residential and commercial energy use in homes and buildings is the largest contributor to the production of GHG by the community. The relatively high proportion of pollutants and GHG emissions produced by electricity consumption as part of the overall community emissions is caused by the following.

- The City of Calgary is currently the fastest-growing city in Canada. This affects all aspects of our thriving economy and consequently increases the resources needed to support the community.

- About 90 per cent of Alberta's installed electricity generation capacity uses non-renewable energy as a fuel: coal (48 per cent) and natural gas (42 per cent). As indicated in the previous section, coal-fueled generators produce the most pollutants, followed by natural gas generators.

So the Calgary community inherently will produce a higher proportion of emissions due to Alberta's predominant fuel source for electricity generation. The major future solution to decrease emissions from electricity consumption is clean coal technology.

With clean coal technology, coal-powered electricity generation will produce relatively no emissions. A clean coal demonstration plant is planned to be in operation by 2010 and will be designed to remove CO_2 and all other emissions of concern (Canadian Clean Power Coalition).

The most effective way to reduce electricity emissions currently and in the future is energy conservation. Federal programs like the One Tonne Challenge, EnerGuide for homes and Energy Star rebate programs focus on the homeowner and renter and are geared toward energy conservation in the home. Even higher energy savings can be achieved by looking at newly constructed homes, where homes can be designed from the onset to reduce GHG by about one, two or even three tonnes of CO_2 per year.

For the last 10 to 15 years, the community's incremental energy use has been proportionate to the incremental growth of the Calgary population. There are, however, efforts to reduce energy use and increase efficiencies in operating commercial buildings, as well as at home. Furthermore, energy costs are a main component of the overall production costs for various goods and services. It is worthwhile from both a financial and environmental perspective to reduce the overall use of electricity, natural gas and other fossil fuels.

Current residential-energy-use community-oriented programs in Calgary

Program	Partners
EnergySense: ATCO program for home energy audits	ATCO Energy
Energy Star furnace replacement program	Climate Change Central
Energy Star washer rebate program	Climate Change Central, The City of Calgary
Built Green Alberta/Calgary	Calgary Region Home Builders Association
Low-flow toilet replacement programs/bylaw	The City of Calgary
Indoor and outdoor water kits	The City of Calgary, Clean Calgary
Climate change newsletters and "Climate Change and You" info sheet set	The City of Calgary
Home efficiency workshops	The City of Calgary

Anticipated and proposed residential-energy-use community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
GHG reduction targets for new homes	Minimum of one-tonne GHG reductions per year for all newly built homes	Minimum of two-tonne GHG reductions per year for new and one-tonne for renovated homes	Minimum of 2.5-tonne GHG reductions per year for new and two-tonne for renovated homes
Hot water systems	Initiate shift from hot water tanks to demand hot water systems; demand hot water systems can be integrated with demand heating systems and domestic solar hot water systems	50 per cent of new homes have demand hot water and heating systems	All new and renovated homes have demand hot water and heating systems
Appliances	Energy-efficient appliances are an integral part of 40 per cent of new homes; expand rebate programs for renovations	Energy-efficient appliances will be the only appliances available; stimulate the replacement of non-energy-efficient appliances	All homes have energy-efficient appliances

Current commercial-energy-use community-oriented programs in Calgary

Program	Partners
Sustainable building policy for new and renovated buildings	The City of Calgary
BOMA Go Green program	Building Owners and Managers Association
Commercial building incentive program	Federal program, Alberta promotion through Climate Change Central

Anticipated and proposed commercial-energy-use community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Green building standards for commercial buildings	20 per cent of all new and renovated buildings within The City of Calgary should attain a LEED silver accreditation or similar	80 per cent of all new and renovated buildings within The City of Calgary should attain a LEED silver accreditation or similar	All new and renovated buildings within The City of Calgary should attain a LEED silver accreditation or similar
Environmental management systems	20 per cent of the SMEs (small and medium enterprises) and 80 per cent of the large businesses are ISO-14001-registered or compliant with a comparable system	50 per cent of the SMEs and all of the large businesses are ISO-14001-registered or compliant with a comparable system	All of the SMEs and the large businesses are ISO-14001-registered or compliant with a comparable system
Business synergies	Establish the first eco-business park in the community	50 per cent of new business centres are eco-business parks	All of the new and 50 per cent of the existing business parks are eco-business parks

Renewable Energy

Background

Calgary-based ENMAX was the first North American energy company to implement a wind power consumer program (Greenmax). In 2001, the Calgary Light rail transit system (LRT) became the first public transit system in North America to be 100 per cent powered by renewable wind energy.

In the late 1990s, the wind power industry was established in Alberta and it has been growing ever since. The federal and provincial governments committed to purchasing green power in the 90s as well. Also in the last two years, several private sector firms in Calgary have committed to using wind power. They include a fast-food chain, a group of major property management companies and a well-known European furniture store.

The public is interested in renewable energy; however, perceived high costs and technical limitations slow the adoption rate of several applications. A great example of a successful renewable energy project is found close to Calgary. The town of Okotoks, south of Calgary, has successfully dealt with some of the technical and financial perceptions of renewable energy with its 57-home geothermal and solar-thermal project. Partners for the project include local, provincial and federal governments, as well as local businesses and energy companies.

Current renewable energy community-oriented programs in Calgary

Program	Partners
Green power: The City of Calgary's electricity use will be 75 per cent wind-powered by 2007	ENMAX, The City of Calgary
Landfill gas: Two landfill sites are being considered for LFG; currently an equivalent of 442 kt of CO_2 are being produced by Calgary's landfill sites	ENMAX, The City of Calgary
There are three green power programs available in the community: Greenmax by ENMAX, green energy tags by Vision Quest and green certificates by the Pembina Institute	ENMAX, TransAlta, Pembina Institute

Anticipated and proposed renewable energy community-oriented programs in Calgary			
Action area	**Short term**	**Mid-term**	**Long term**
Wind power	Stimulate green power programs and green certification adoption for all sectors	Green-built homes use 100 per cent green power; LEED commercial buildings use 25 per cent green power	Green built homes use 100 per cent green power; LEED commercial buildings use 50 per cent green power
Geothermal and solar-thermal	Realize one sustainable community with 1,000 homes; stimulate the adoption of solar domestic hot water systems	New communities will adopt 50 per cent geo-solar-thermal capacity; 25 per cent of existing communities will adopt solar hot water systems	New communities will adopt 80 per cent geo-solar-thermal capacity; 50 per cent of existing communities will adopt solar hot water systems
Photo-voltaic solar	1,250 panels on homes; also stimulate proportionate commercial use	5,000 panels on homes; also stimulate proportionate commercial use	7,500 panels on homes; also stimulate proportionate commercial use

Water

Background

The consumption, treatment and distribution of water requires energy-intensive processes and facilities. Reducing domestic tap water consumption and water use for irrigation purposes will limit the need for additional water treatment capacity and infrastructure and reduces the strain on our water resource. Industry, commercial businesses and institutions, of course, create another major strain on our water resources and infrastructure. The City of Calgary supports ICI facilities in performing audits and implementing efficiencies.

Current water conservation community-oriented programs in Calgary

Program	Partners
Indoor and outdoor water saver kits	The City of Calgary, Clean Calgary
By 2014 all Calgary homes will have water meters	The City of Calgary
All new homes have low-flow toilets: water utility bylaw	The City of Calgary
Toilet rebate replacement program	The City of Calgary
Energy Star washer program	Climate Change Central, The City of Calgary

Anticipated and proposed water conservation community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Water metering	Work up to the 2014 target of installing water meters in all homes	100 per cent metering of all residential customers by Dec. 31, 2014	Peak and off-peak meters allow for different water rates
Water conservation residential	Indoor and outdoor water-saving kits for homes; rain barrel promotions; low-flow toilets bylaw since August 1, 2005	Further develop green roofing, support for grey water use in the home, xeriscaping	Calgary residents adopt water-efficient appliances and water flow restrictive devices

Waste

Background

The production of waste increases in step with population growth. Calgary's land-filled waste stream comprises 44 per cent ICI waste, 36 per cent residential waste and 20 per cent construction, renovation and demolition waste. Currently, the focus is on waste diversion from landfills in order to reduce methane production and limit the need for expanding current landfill sites. The overall residential target is to divert 80 per cent of the current waste stream by 2020 (80/20 program). A permanent curbside recycling program is considered for implementation by 2009.

[1] Source: Recycling Pilot Summary Report 2004/2005

Current waste diversion community-oriented programs in Calgary

Program	Partners
Pumpkin composting program	The City of Calgary
Leaf composting program	The City of Calgary
Christmas tree mulching program	The City of Calgary
Electronics recycling program: three depots	The City of Calgary, CompuSmart
Household hazardous waste drop-off programs	The City of Calgary
Curbside recycling pilot 2004/2005	The City of Calgary
Backyard composter program	The City of Calgary, Clean Calgary
Telephone book recycling	The City of Calgary

Anticipated and proposed waste diversion community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Residential waste diversion	Curbside recycling including organics; seasonal programs include leaves, pumpkins, Christmas trees	By 2020, 80 per cent of all waste will be diverted from landfills: Calgary-specific	
Thermal conversion technology		20 per cent of waste diverted from landfills proposed to be incinerated	

Targets and objectives of major Canadian cities

Below is an overview of current targets and objectives of major Canadian and two leading North American cities.

City	Target	Community involvement
Vancouver	20 per cent reduction from 1990 levels for the Corporation by 2010, six per cent for the community as a whole by 2012	Cool Vancouver Task Force
Edmonton	Reduce GHGs from city operations by 16 per cent from 1990 levels by 2010; community targets: 2010, reduce community GHGs six per cent below 1990 level; 2020, overall reduction of 20 per cent below 1990 level	CO_2RE (a community-based think tank)
Ottawa	Community Climate Change Action Plan: community 20 per cent reduction of GHGs by 2012 (2000); Corporate achieved a 19 per cent reduction in GHGs from 1990 levels; corporate target is 20 per cent GHG reduction from 1990 levels by 2007	Taskforce on the Atmosphere Action Plan
Calgary	Corporate Climate Change Action Plan: proposed 50 per cent below 1990 level by 2012	imagineCALGARY (two-year community vision initiative)
Halifax	Halifax Regional Municipality has set a corporate target of a 20 per cent emission reduction of 2002 levels by 2012; a major community energy plan is currently being developed	Climate SMART program, regional partnership with public and private partners
Winnipeg	In 1998, the City of Winnipeg became a member of the Partners for Climate Protection Program (PCP) and has completed the first stage of the organization's five-stage program (2003-04); climate change action plan being implemented	
Toronto	20/20 The Way to Clean Air campaign encourages an individual and community-wide 20 per cent reduction in vehicle and home energy use; initial target was to reduce GHG emission 20 per cent below 1990 levels in 2005	Through 20/20 programming; different programs have multiple stakeholder inputs
Sudbury	Reduce community's energy dependence by 50 per cent through renewable energy	Earthcare Sudbury created the Local Action Plan
Montreal	Montreal's First Strategic Plan for Sustainable Development contains a key target to improve air quality and reduce greenhouse gas emissions	
San Francisco	The climate action plan for San Francisco, September 2004; target of 20 per cent below 1990 levels by 2012, 2010 waste diversion goal 75 per cent, 2020 zero waste	The Sustainability plan for the City of San Francisco approved in 1997 (350 stakeholders involved)
Portland	The combined City and County's total GHG emissions to 10 per cent below 1990 levels by 2010	

Annex 1:
Proposed and anticipated community-oriented programs in Calgary

Annex 1 to the community climate change strategy: discussion paper

TRANSPORTATION

1A Current transportation community-oriented programs in Calgary

Program	Partners
Ride-the-Wind: The Calgary Light rail transit system has been 100 per cent wind-powered and emission-free since 2001	The City of Calgary, ENMAX, Vision Quest (TransAlta)
Car Heaven: Recycle your old car and receive a six-month transit pass and/or $1,000 towards a new vehicle	Climate Change Central
Reduce idling program	Government of Alberta, Climate Change Central
Transportation infrastructure projects that increase mobility and reduce idling at major interchanges (short-term relief of GHG emissions)	The City of Calgary
Transit users get a discount when renting at Hertz	The City of Calgary, Hertz
Expansion of LRT and bus service and capacity	The City of Calgary
Universal pass program: Students of Calgary educational institutions qualify for discounted transit passes	SAIT, University of Calgary, The City of Calgary

TRANSPORTATION

1B Anticipated and proposed transportation community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Light rail transit system (LRT)	40 additional LRT cars will be available	Extend the LRT lines to three additional corridors	Transit service level is competitive with auto travel
Transit ridership	45 per cent of downtown commuters take transit	50 per cent of downtown commuters take transit	Over 21 per cent of all travel within the city is done by transit
Downtown parking	Stop expansion of downtown parking	Modal split for downtown parking and transit is 50 per cent	Further reduce parking capacity downtown
Use pay/fuel tax	Introduction of fuel tax at two cents per litre	Fuel tax 10 cents per litre	Proportionate increase of fuel tax to the actual costs of the road infrastructure
Transit technology	Expand automatic vehicle tracking system and traffic signal priority; savings on one route of 22 tonnes per year	Further apply technology and preferred routing of transit to increase service and frequency	Further apply technology and preferred routing of transit to increase service and frequency
Decrease single occupant vehicles	Build carpool meeting places around perimeter	Carpoolers can use a specific commuter lane on all major routes into the city; commuter tax benefit program: carpool/transit expenses are tax-deductible	Only commuter cars with two or more occupants are assigned permanent downtown parking space
Stop to road expansion	No further road expansions downtown	Limit road expansions into suburbs	Infrastructure budget is equally split between Roads and Transit
Flexible work arrangements	Increase in flexible work times as well as schedules	More work opportunities closer to communities	A sizeable amount of the employee base telecommutes
Use pay/fuel tax	Introduction of fuel tax at two cents per litre	Fuel tax 10 cents per litre	Proportionate increase of fuel tax to the actual costs of the road infrastructure
Biofuels and particulate matter filters on commercial fleets	All diesel trucks equipped with PM filters	20 per cent of commercial diesel trucks fueled by B20	50 per cent of commercial diesel trucks fueled by B20
Increase alternate transportation like biking or walking	Further expand walking and bike paths into the downtown core	Build bike facilities and storage areas; better bike access on transit	Sustainable communities are based on non-car use for transportation

RESIDENTIAL ENERGY USE

2A Current residential-energy-use community-oriented programs in Calgary

Program	Partners
EnergySense: ATCO program for home energy audits	ATCO Energy
Energy Star furnace replacement program	Climate Change Central
Energy Star washer rebate program	Climate Change Central, The City of Calgary
Built Green Alberta/Calgary	Calgary Region Home Builders Association
Low-flow toilet replacement programs/bylaw	The City of Calgary
Indoor and outdoor water kits	The City of Calgary, Clean Calgary
Climate change newsletters and "Climate Change and You" info sheet set	The City of Calgary
Home efficiency workshops	The City of Calgary

2B Anticipated and proposed residential-energy-use community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
GHG reduction targets for new homes	Minimum of one-tonne GHG reductions per year for all newly built homes	Minimum of two-tonne GHG reductions per year for new and one-tonne for renovated homes	Minimum of 2.5-tonne GHG reductions per year for new and two-tonne for renovated homes
Home durability	Increase home durability by 15 per cent	Increase home durability by 25 per cent	Increase home durability by 40 per cent
HVAC	Furnaces in new homes should be all high-efficient; 25 per cent of replaced furnaces are mid/high-efficient	Only high-efficient furnaces are installed for both new and renovated homes; 50 per cent of new homes have integrated demand heating and hot water systems	All new and renovated homes have integrated demand heating and hot water systems
Hot water systems	Initiate shift from hot water tanks to demand hot water systems; demand hot water systems can be integrated with demand heating systems and domestic solar hot water systems	50 per cent of new homes have demand hot water and heating systems	All new and renovated homes have demand hot water and heating systems
Appliances	Energy-efficient appliances are an integral part of 40 per cent of new homes; expand rebate programs for renovations	Energy-efficient appliances will be the only appliances available; stimulate the replacement of non-energy-efficient appliances	All homes have energy-efficient appliances

COMMERCIAL ENERGY USE

2A Current commercial-energy-use community-oriented programs in Calgary

Program	Partners
Sustainable building policy for new and renovated buildings	The City of Calgary
BOMA Go Green program	Building Owners and Managers Association
Commercial building incentive program	Federal program, Alberta promotion through Climate Change Central

2B Anticipated and proposed commercial-energy-use community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Green building standards for commercial buildings	20 per cent of all new and renovated buildings within The City of Calgary should attain a LEED silver accreditation or similar	80 per cent of all new and renovated buildings within The City of Calgary should attain a LEED silver accreditation or similar	All new and renovated buildings within The City of Calgary should attain a LEED silver accreditation or similar
Energy performance	Energy audits performed on 60 per cent of all commercial buildings; 50 per cent will employ 80 per cent of the recommendations	Energy audits performed on 100 per cent of all commercial buildings; 80 per cent will employ 80 per cent of the recommendations	
Environmental management systems	20 per cent of the SMEs (small and medium enterprises) and 80 per cent of the large businesses are ISO-14001-registered or compliant with a comparable system	50 per cent of the SMEs and all of the large businesses are ISO-14001-registered or compliant with a comparable system	All of the SMEs and the large businesses are ISO-14001-registered or compliant with a comparable system
Business synergies	Establish the first eco-business park in the community	50 per cent of new business centres are eco-business parks	All of the new and 50 per cent of the existing business parks are eco-business parks

RENEWABLE ENERGY

3A Current renewable energy community-oriented programs in Calgary

Program	Partners
Green power: The City of Calgary's electricity use will be 75 per cent wind-powered by 2007	ENMAX, The City of Calgary
Landfill gas: Two landfill sites are being considered for LFG; currently an equivalent of 442 kt of CO_2 are being produced by Calgary's landfill sites	ENMAX, The City of Calgary
There are three green power programs available in the community: Greenmax by ENMAX, green energy tags by Vision Quest and green certificates by the Pembina Institute	ENMAX, TransAlta, Pembina Institute

3B Anticipated and proposed renewable energy community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Wind power	Stimulate green power programs and green certification adoption for all sectors	Green-built homes use 100 per cent green power; LEED commercial buildings use 25 per cent green power	Green built homes use 100 per cent green power; LEED commercial buildings use 50 per cent green power
Geothermal and solar-thermal	Realize one sustainable community with 1,000 homes; stimulate the adoption of solar domestic hot water systems	New communities will adopt 50 per cent geo-solar-thermal capacity; 25 per cent of existing communities will adopt solar hot water systems	New communities will adopt 80 per cent geo-solar-thermal capacity; 50 per cent of existing communities will adopt solar hot water systems
Photo-voltaic solar	1,250 panels on homes; also stimulate proportionate commercial use	5,000 panels on homes; also stimulate proportionate commercial use	7,500 panels on homes; also stimulate proportionate commercial use
Landfill gas	Optimize the use of LFG where appropriate		
Biomass	Identify biomass opportunities		

WATER

4A Current water conservation community-oriented programs in Calgary

Program	Partners
Indoor and outdoor water saver kits	The City of Calgary, Clean Calgary
By 2014 all Calgary homes will have water meters	The City of Calgary
All new homes have low-flow toilets: water utility bylaw	The City of Calgary
Toilet rebate replacement program	The City of Calgary
Energy Star washer program	Climate Change Central, The City of Calgary

4B Anticipated and proposed water conservation community-oriented programs in Calgary

Action area	Short term	Mid-term	Long term
Water metering	Work up to the 2014 target of installing water meters in all homes	100 per cent metering of all residential customers by Dec. 31, 2014	Peak and off-peak meters allow for different water rates
Water conservation residential	Indoor and outdoor water-saving kits for homes; rain barrel promotions; low-flow toilets bylaw since Aug. 1, 2005	Further develop green roofing, support for grey water use in the home, xeriscaping	Calgary residents adopt water-efficient appliances and water flow restrictive devices
Water conservation ICI	Adoption of dual flush and low-flow toilets; water audits for ICI customers to conserve and recycle water	Peak and off-peak meters allow for different water rates	Large water clients will be mandated to employ water-efficient technologies at their sites
Limit tap water use for non-consumptive use	50 per cent of irrigation water is non-tap water	70 per cent of irrigation water is non-tap water	100 per cent of irrigation water is non-tap water
Limit storm water runoff through storm water system	Initiate green (vegetation) roofs; increase permeable settled surfaces to 40 per cent	5 per cent of all new homes have green roofs; increase permeable settled surfaces to 60 per cent	15 per cent of all new homes have green roofs; increase permeable settled surfaces to 80 per cent

WASTE

5A Current waste diversion community-oriented programs in Calgary

Program	Partners
Pumpkin composting program	The City of Calgary
Leaf composting program	The City of Calgary
Christmas tree mulching program	The City of Calgary
Electronics recycling program: three depots	The City of Calgary, CompuSmart
Household hazardous waste drop-off programs	The City of Calgary
Curbside recycling pilot 2004/2005	The City of Calgary
Backyard composter program	The City of Calgary, Clean Calgary
Telephone book recycling	The City of Calgary

5B Anticipated and proposed waste diversion community-oriented programs in Calgary

Action area	Short term	Mid-term	Long Term
Residential waste diversion	Curbside recycling including organics; seasonal programs include leaves, pumpkins and Christmas trees	By 2020, 80 per cent of all waste will be diverted from landfills: Calgary-specific	
Thermal conversion technology		20 per cent of waste diverted from landfills will be incinerated	
Building materials	Current Built Green program aims at reducing each home's construction waste and increase recycled content in building materials; targets in the program for construction waste diversion are 25/50 per cent	Increase recycled content in materials; waste diversion to 50 per cent for all homes	
Commercial/ industrial waste	Initiate better accounting system for companies' waste streams	True cost accounting for waste disposal and waste life cycle emissions and land/water pollution	Eco-business parks will divert 80 per cent of their waste by reusing, reducing and recycling

Appendix 1: GHG emission co-efficients

GHG Source	Co-efficients used to calculate GHG emissions
Methane	1.86 kg/m3
Methane global warming potential	21
Diesel: vehicle fuel	2.757 kg/litre
Gasoline: vehicle fuel	2.479 kg/litre
Heavy diesel: vehicle fuel	3.09 kg/litre
Natural gas: vehicle fuel	1.88 kg/m3
Propane: vehicle fuel	1.52 kg/litre
Green electricity	0 kg/kWh
Natural gas: stationary combustion source	49.95 kg/GJ
Alberta electricity: 1990	0.926 kg/kWh
Alberta electricity: 2000	0.882kg/kWh
Alberta electricity: 2003*	0.830 kg/kWh
Alberta electricity: 2004*	0.780 kg/kWh

Source: Government of Canada, *Canada's 2002 Greenhouse Gas Inventory* 1990-2002, 2004.
*Source: EDC Associates Ltd., *Electricity Price, Energy Production and Emissions Impact* (prepared for CASA EPT GHG Sub-group) 2004.

Appendix 2:
Federal Government Funding for Climate Change

Federal Government funding for climate change initiatives				
Program	Program description	Available funding	Municipal opportunities for funding	Environmental benefits
The Partnership Fund	This fund will maximize potential partnerships with provinces and territories. Governments will identify mutual priorities and share in the undertaking of major investments in technologies and infrastructure development. The Government will invest in technologies and infrastructure development that are important to both orders of government, such as clean coal technology. Other strategic investments could include CO_2 capture and storage pipeline, cellulosic ethanol plants, east-west electricity and transmissions grids.	$250 million	Indirect opportunities through increasing the availability and affordability of renewable forms of energy for example biodiesel, ethanol, and green energy sources.	Reduction of GHG emissions and regional air pollutants.
Climate Fund (previously called the Clean Fund)	Purpose of the Climate Fund is to encourage cost-effective projects and actions to reduce GHG emissions. This fund will create a permanent institution for the purchase of emissions reduction and removal credits on behalf of the Government of Canada, which will be one of the primary tools for Canada's approach to climate change. The Climate Fund will be results-based, with a focus on real and verifiable emission reductions. Opportunities for reduction and sequestration will be available across the economy.	$1 billion	• Alternative transportation modes; • Landfill gas extraction and power generation; • New electricity generation projects; • Corporate TDM (Transportation Demand Management) activities.	Reduction of GHG emissions and regional air pollutants.
Wind Power Production Incentive (WPPI)	Intended to stimulate the use of wind power. The target for new wind generating capacity is 4000 megawatts (MW), or the amount of power needed annually by approximately 1 million average Canadian homes.	$200 million over five years	Indirect, it will positively impact the $/MWh price for consumers. Overall, it affects the economies of scale for green power production and increases product availability for consumers.	Reduction of GHG emissions and regional air pollutants.

Federal Government funding for climate change initiatives

Program	Program description	Available funding	Municipal opportunities for funding	Environmental benefits
Renewable Power Production Incentive (RPPI)	Established to support other renewable energy sources including small hydro, solar power, biomass, and tidal power. RPPI builds on the successful WPPI program and is targeted to lead to 1500 megawatts (MW) of capacity.	$97 million over five years	Indirectly, it will positively impact the $/MWh price for consumers. Overall, it affects the economies of scale for green power production and increases product availability for consumers. If a municipality owns and operates the power installation, they may be eligible for funding from this program.	Reduction of GHG emissions and regional air pollutants.
Environmental Tax Incentives for Efficient and Renewable Energy Generation	Tax incentives for efficient and renewable energy generation. Increased capital cost allowance from 30 per cent to 50 per cent for highly efficient cogeneration equipment and the full range of renewable energy generation equipment currently included in Class 43.1 of the Income Tax Act (including wind turbines, small hydro facilities, active solar heating equipment, photovoltaic and geothermal energy equipment).	$300 million	Indirectly, it will positively impact the $/MWh price for consumers. Overall, it affects the economies of scale for green power production and increases product availability for consumers. If a municipality owns and operates the power installation, they may be eligible for this Tax incentive	Reduction of GHG emissions and regional air pollutants.
Biodiesel Initiative	This initiative supports research and provides incentives for industrial-scale biodiesel pilot plants, and support demonstrations of its effectiveness to encourage broader use of this cleaner-burning alternative to conventional diesel.	$11.9 million	Indirectly, it will positively impact the price/liter for consumers. Overall it affects the economies of scale for biodiesel production and increases the market size.	Reduction in GHG emissions and local air pollutants.
New Deal for Cities and Communities - GST Rebate	The Federal Budget 2004 provided all municipalities with a 100 per cent GST rebate providing them with $7 billion in funding over the next ten years. For Alberta this translates into $ 476.9 mm (2005-2010).	$7 billion over the next ten years	TBD by municipality.	Dependent on programs/ initiatives pursued.
New Deal for Cities and Communities —Gas Tax Rebate	Supports Environmental Sustainable Municipal Infrastructure (ESMI). It will complement — and not replace—existing federal Infrastructure programs. Each province and territory will work with its cities and communities to identify their priorities, and by doing so, will work toward a broader, national objective of sustainability.	$5 billion over five years, starting in 2005	Funds from the gas tax will be directed toward environmentally sustainable municipal infrastructure initiatives, such as public transit, water and wastewater systems, community energy systems, and solid waste management, rehabilitation of roads and bridges, and capacity building.	Reduction in GHG emissions and regional air pollutants. Improved water quality, improved waste management practices.

Federal Government funding for climate change initiatives

Program	Program description	Available funding	Municipal opportunities for funding	Environmental benefits
Renewable Energy Deployment Initiative (REDI)	Promotes the development of a sustainable renewable energy industry in Canada. The division promotes investments in renewable energy systems. Renewable energy includes solar, wind, water, earth and biomass power, and energy from waste.	51 million over nine years	REDI for Business, Industry and Institutions Under REDI, NRCan undertakes market development activities and provides an incentive to encourage the private sector, federal departments and public institutions to gain experience with active solar and efficient biomass combustion systems. Corporations are eligible for a refund of 25 per cent of the purchase, installation and certain other costs of a qualifying system, to a maximum refund of $80,000 per installation and a maximum of $250,000 per corporate entity. Some incentives are also provided on a pilot project basis. New REDI Pilot Demonstration Projects Solar Energy Utilities Pilot - to provide solar energy at competitive rates without the cost of solar equipment purchase; and Residential Solar Domestic Hot Water Demonstration - delivered by utilities, developers, and community environmental groups. Investments in renewable energy applications and outreach.	Reduction of GHG emissions and regional air pollutants.

Federal Government funding for climate change initiatives

Program	Program description	Available funding	Municipal opportunities for funding	Environmental benefits
Moving On Sustainable Transportation (MOST) Program	Transport Canada program to support increased education and awareness of sustainable transportation. The MOST Program will provide funding to help support projects that • Provide Canadians with practical information and tools to better understand sustainable transportation issues • Encourage the creation of innovative ways to promote sustainable transportation; and • Achieve quantifiable environmental and sustainable-development benefits.		Categories • Studies or analyses on sustainable transportation issues • Development of new and innovative sustainable transportation tools and practices • Pilot projects • Workshops and information sessions; and • Education and outreach programs.	Reduction of GHG emissions and regional air pollutants.
EcoAction Program	The EcoAction Community Funding Program is an Environment Canada program that providing financial support to community groups for projects with measurable, positive impacts on the environment. EcoAction encourages projects that protect, rehabilitate or enhance the natural environment and builds the capacity of communities to sustain these activities into the future.	Half of EcoAction's annual budget is reserved for One-Tonne Challenge. The maximum amount available per- project is $100,000.	Open to community groups and non-profit environmental organizations. Note municipal government is NOT eligible to apply. Priority funding is given to projects that will achieve results in the following areas: Clean Air, Climate Change, Clean Water and Nature. Projects require matching funds or in-kind support from other sources.	Reduction of GHG emissions and regional air pollutants.

Federal Government funding for climate change initiatives				
Program	Program description	Available funding	Municipal opportunities for funding	Environmental benefits
Federation of Canadian Municipalities - The Green Fund	The Green Municipal Fund (GMF) is set up to stimulate environmental projects by municipal governments and their partners that generate measurable environmental, economic, and social benefits. The Fund supports a range of activities leading up to and including the physical implementation of an environmental infrastructure project. The funding options available to applicants for capital implementation projects are loans, grants, or a combination of the two and the funding option available to applicants for feasibility studies, field tests and sustainable community plans is a grant.	$550-million endowment	• Energy and energy services: energy-efficient building retrofits; community energy systems; landfill gas; renewable energy • Water: watershed management; water conservation; wastewater treatment; water distribution upgrades: storm water run-off management (wetlands, green roofs) • Solid waste management : waste diversion from landfill and incineration by 50 per cent or more; landfill gas management; and separation and recovery of toxic or hazardous wastes before going to the landfill or incineration sites • Sustainable transportation services and technologies: public transit or municipal fleet conversion to more energy efficient or innovative green technologies (except conversions to natural gas, or hybrid vehicles); system-wide projects to optimize routes and enhance service; integrated and alternative transportation systems (except bicycle paths); and transportation demand systems (car sharing, changing parking pricing and supply) • Sustainable community planning and development: integrated planning (land use, transportation, energy); community and corporate greenhouse gas reduction plans; brown fields redevelopment.	Reduction of GHG emissions and regional pollutants. Improved water quality and water conservation. Improved waste management practices. Improved soil quality and reclamation of contaminated land.

Appendix 3: imagineCALGARY

A. WHAT IS IMAGINECALGARY?

In January 2004, The City of Calgary joined the +30 Network, a growing network of global cities and regions committed to long-term quality of life. The purpose of the +30 Network is to foster urban sustainability by providing a venue for at least 30 like-minded cities to share their experiences, tools and talents. Participants will create long-term plans that integrate economic, ecological and social well-being and build community resilience. The shared commitment within the +30 Network is for member cities to present their 100-year strategies and lessons learned at the 2006 United Nations Habitat conference to be held in Vancouver.

imagineCALGARY is The City of Calgary's commitment to creating a 100-year vision to ensure quality of life remains high for future generations. It is a City-led, community-owned initiative that engages public, business community and government stakeholders in a broad-based dialogue. imagineCALGARY is the first project of its kind in Canada and only one of a few in the world to have such a broad scope and include as many people.

Why look ahead 100 years?

Thinking ahead 100 years instead of the usual 20 or 30 years allows us the freedom of very creative thinking. If we think in the nearer term, we will be inclined to focus on fixing today's problems, which in turn limits us from seeing tomorrow's possibilities. Thinking about 100 years from now lets us think freely, because we're forced to look beyond politics and the other constraints we face today.

The process

Many traditional planning exercises undertaken by communities are based on the problem-solving approach. Problems are identified and then solutions are proposed that will solve them. These solutions are often structured within specific "silos" or topics. Transportation plans, energy plans, housing plans: are all single-topic responses to issues or problems. The problem-solving approach has difficulty responding to the need for integrated solutions — a necessity in sustainability planning.

In response to the challenge of complexity and the challenge of sustainability, imagineCALGARY will use a systems-based approach. The project will employ a methodology that incorporates five key community systems: social, economic, natural environment, built environment and governance. The premise of the methodology is that these five systems are in place to help us meet basic human needs. Basic needs include a sense of community, health care, equity, access, meaningful work, economic security, housing, transportation, energy, water, food, etcetera.

Vision, targets and strategies

So what are the main components of a 100-year sustainability plan? There are three elements: the 100-year vision, the 100-year end-state goals and the 30-year targets and strategies.

The 100-year vision is arrived at by listening to what Calgarians value through asking five open-ended questions.

- What do you value about Calgary?
- What is it like for you to live here?
- What changes would you most like to see?
- What are your hopes and dreams for Calgary in 100 years?
- How could you help make this happen?

The 100-year end-state goals (ESGs) provide tangible markers for knowing that the city is where it should be relative to the vision.

The targets and strategies provide a 30-year road map toward our 100-year destination. Building on existing assets within the community, targets and strategies will be developed to work toward the 100-year vision.

Appendix 4: Other cities' climate change programs

VANCOUVER

Objectives, plans and targets

- Vancouver's Climate Change Action Plans were developed in partnership with the Cool Vancouver Task Force, representing a wide diversity of public and private stakeholders.
- The Corporate Climate Change Action Plan, establishing a 20 per cent reduction in GHG emissions from 1990 levels by 2010, was approved in December 2003. To implement the plan, The City has two dedicated staff as well as existing departmental support and action.
- The Community Climate Change Action Plan, establishing a six per cent reduction in GHG emissions from 1990 levels by 2012 (a 450,000 tonne reduction versus business as usual), was approved in March 2005; to be implemented by six dedicated City staff as well as existing departmental support and action.

Transportation

City of Vancouver corporate plan

- Develop and enforce vehicle "right-sizing" policy.
- Use the highest bio-diesel blend allowed under engine warranty in all diesel vehicles.
- Train vehicle operators how to drive so as to reduce fuel consumption — include anti-idling policy and tire inflation messaging.
- Explore fleet-pooling opportunities to increase utilization rates and make highly efficient vehicles and alternatives economically sound.

Community plan

- Increased funding for cycling and pedestrian infrastructure including publicly accessible end-of-trip facilities.
- Improved pedestrian and cyclist safety through training and traffic enforcement.
- Facilitate the movement of transit through lane allocations, all-door bus loading and traffic signal priority measures.
- Comprehensive parking strategy to incentivise highly efficient vehicles and alternatives to single-occupant vehicles.
- Active and safe trips-to-school program.
- Support rapid growth of car sharing.
- Promote efficient vehicle purchases and operations including idle-free bylaw and tire inflation awareness.
- Business case development for best fleet operating practices including the use of biodiesel.

Waste

- Expand award-winning landfill gas recovery and cogeneration system.

Energy efficiency: residential

Community plan

- Technical and business case feasibility study for neighbourhood-scale district energy system anchored by the Olympic Village that would utilize and enable clean energy technologies.

Energy efficiency: commercial/municipal

City of Vancouver corporate plan

- Retrofit all existing civic facilities to reduce

overall energy use by 20 per cent.
- Build all new civic facilities to LEED gold standard.
- Green tags for 10 per cent of electricity consumption by City Hall.
- Implement energy-efficient street and traffic lighting as technologies emerge.

Community plan
- Bylaw enacted requiring all new large commercial, institutional and residential buildings to comply with 2001 version of ASHRAE 90.1, reducing energy use by 13 per cent.
- Green building strategy for all new large commercial and residential buildings constructed equivalent to CBIP performance levels (further 12 per cent reduction below 2001 ASHRAE90.1).
- Develop centralized information and resource tool to facilitate residential retrofits and build partnership of public and private entities to harmonize energy efficiency marketing.
- Energy efficiency operator training and building energy performance recognition for commercial buildings.

Other

Community plan: community engagement
- Values and behaviour research, promote co-benefits of action such as health and economic savings, engage grassroots, support community leaders with grants, conduct media campaigns and partnerships.

EDMONTON

Objectives, plans and targets
- Executive summary of the greenhouse gas emissions reduction plan update for City operations (2003); Changing the Climate on Global Warming (2001); Third report on environmental performance overview, City of Edmonton, March 2004.
- Reduce GHG from City operations by 16 per cent from 1990 levels by 2010. Community targets: 2010, reduce community GHG six per cent below 1990 level; 2020, overall reduction of 20 per cent below 1990 level, complete the long-term transition toward sustainable energy use. Drainage Services Branch received ISO 14001 registration and implementing ENVISO to other branches.

Transportation
- Solar power bus stop tested for six months in 2005.
- Three diesel fuel buses were equipped with a particle filter device.
- High Speed Transit Corridor Strategic Plan.
- Involved in the vehicle scrappage project with Climate Change Central; gave out 250 transit (six-month) passes in 2003.
- Fuel sense program was launched in 2001 with a result of an average efficiency gain of 12 per cent.
- 95 per cent LED traffic signals in operation.
- Light rail transit expanding to south Edmonton.
- Purchasing 24 articulating buses and six hybrid buses by spring 2006.

Waste
- Curbside recycling since 1988. Eco-stations for household hazardous waste.
- By 2000, 50 per cent of the waste was diverted from landfill sites; between 1998 and 2002, the amount of residential waste diverted increased from 14 per cent to 58 per cent.
- Waste gasification project proceeding.

Energy efficiency: residential
- CO_2Re Home$avers booklets (nine), home energy evaluations, fall 2005 Energy Smarts-discount program on Energy Star and other energy-efficient and clean air products for the home.

Energy efficiency: commercial/municipal

- The borrowing capacity of the Energy Management Revolving Fund was increased to $30 million. Enhanced to include other City facilities and operations as well as full-building retrofits. Renewable energy.
- Co-generation study at Kinsmen Recreation Centre.
- Specifying energy performance on RFPs for new buildings and retrofits.

Water conservation and wastewater treatment

- Conversion of Gold Bar's aeration system to fine bubble GHG annual reduction 6,000 tonnes.

Other

- Parks: Continue the development of a tree inventory to manage GHG sequestration.
- Creation of a land drainage utility to help fund drainage and environmental projects.
- Upgrade quality of air filtration for City-owned offices.
- Policy C-467 "Conservation of Natural Areas in Edmonton: inventory of conserved natural areas." Edmonton has more green spaces than any other city in Canada.
- Pest management policy under development.
- Establishment of the CO_2RE group, a community-based think tank charged with the GHG reduction plan for the community.
- Phase 2 of the urban land intensification study, Smart Choices for Developing our Community.

WINNIPEG

Objectives, plans and targets

- In 1998, the City of Winnipeg became a member of the Partners for Climate Protection Program (PCP) and has completed the first stage of the organization's five-stage program (2003-04).
- Climate Change Action Plan: Objectives are to develop a comprehensive greenhouse gas emission reduction strategy for the municipal operations of the City of Winnipeg and to circulate the municipal plan throughout the community to encourage the private sector and the public at large in Winnipeg to take operational measures and personal actions to reduce greenhouse gas emissions.
- The City will proceed with a three-phased program that concentrates on developing a municipal action plan and a community outreach program.
- Phase 1: The City will update the existing greenhouse gas emissions inventory and forecast with specific emphasis on municipal operations but also including community-wide data.
- Phase 2: The City will, through internal and external consultations, establish an emissions reduction target for municipal operations and develop a comprehensive greenhouse gas emissions reduction strategy to meet those targets.
- Phase 3: The City will undertake an outreach program to circulate the municipal plan and promote the need for community-wide action to address the key issues associated with climate change.

Transportation

- Hydrogen electric hybrid being tested by the Province of Manitoba in co-operation with Winnipeg Transit (2005).
- Winnipeg Transit eco-pass program subsidizes transit passes for employees of participating companies.
- In partnership with Transport Canada and the Province of Manitoba on the Urban Transportation Showcase Program, Winnipeg has developed the WinSmart project. WinSmart is a package of thirteen initiatives designed to reduce GHG emissions from urban transportation. The projects include the construction of an active transportation path from downtown to the University of Manitoba, an innovate social-marketing program designed to encourage use of alternative transportation measures, the purchase of two diesel-electric hybrid buses for use along the Pembina Corridor and a number of initiatives to enhance the efficiency of Winnipeg Transit.

Waste

- Residential curbside recycling program. In August 2005, Council task force examined curbside collection of organic waste for centralized composting.
- The City has partnered with a local company to offer vermicomposting services for household and commercial waste at the Brady Road landfill site.

Energy efficiency: commercial/municipal

- The City has a revolving fund used for energy efficiency initiatives in City operations. SW strategy considers demand-side management energy reduction programs, energy efficiency standards in the construction and retrofitting of civic buildings. Currently, the Administration Building in the City Hall complex is undergoing a PowerSmart retrofit.

Renewable energy

- 2005 demonstration project: a solar-powered lighting system installed at the bus shelter.
- Completed a feasibility analysis for capturing methane from landfill for conversion to electricity.
- Community: working with Manitoba Hydro to provide sustainable power alternatives to Winnipeg residents.

Water conservation and wastewater treatment

- The City recovers bio-gas at one of its wastewater treatment plants and converts this to heat for sewage treatment.

SUDBURY

Objectives, plans and targets

- City of Greater Sudbury: committed to Environment and Sustainable Community Planning, presented by Paul Graham and the Earthcare Sudbury Local Action Plan 2003 (multi-sectoral focus: municipal/ ICI/residential).
- Earthcare Sudbury was established in 2000. Community Energy Planning: reduce energy uses through efficiencies with targeted savings of at least $5 million annually, reduce the community's dependence on the outside marketplace by 50 per cent through local generation of green energy, manage energy use in the communities day-to-day operations. Through Earthcare, a local action plan (LAP) has been developed, including a monitoring plan. Sudbury's goal is to become the most energy-wise community in Canada.

Transportation

- Anti-idling campaign for corporate fleet, community at large and schools.
- Biodiesel fleet and alternative fuel vehicles.

Waste

- Blue box curbside, bag limit to three per household, considering organic waste diversion.

Energy efficiency: commercial/municipal

- Main focus is municipal retrofits.

Renewable energy

- From 1995-2003, saved 30 per cent of annual energy costs, a 26 per cent reduction in GHGs. Saved 0.9 million annually. Intend to build 150 MW capacity wind power, 500 small-scale systems additionally, small-scale hydro (10 MW) and LFG 1 MW. Solar hot water program.

TORONTO

Objectives, plans and targets

- 20/20 The Way to Clean Air campaign to encourage community-wide 20 per cent reduction in vehicle and home energy use by 2020.
- City of Toronto Environmental Plan (2000).
- Green Fleet Transition Plan (2004-07).
- Clean Air Partnership: A Model for Clean Air Plan for the Living City: a report prepared for the GTA Clean Air Council (2005).
- Corporate Smog Alert Response Plan.
- Comprehensive Air Quality Strategy (June 2006).
- Toronto Atmospheric Fund (TAF): municipal climate agency dedicated to stabilizing GHG concentrations in the atmosphere. Mandate is to improve energy efficiency, improve local air quality, educate the public, facilitate science and technology development, foster community, government and academic partnerships. The City helped found ICLEI Cities for Climate Protection.

Transportation

Fleet

- The City will use 300,000 litres of biodiesel in 2005.
- Purchase test fleet of 100 hybrid electric buses plus 130 clean diesel buses in 2006; in 2002, 109 natural gas vehicles, four hybrids.
- City's Green Fleet Transition Plan proposes to replace 84 per cent of new, light-duty car and pickup planned vehicle replacements with hybrid-electric vehicles; estimated emissions reduction of 23 per cent by 2007.
- Alternative transportation projects: The Active and Safe Routes to School (ASRTS); City of Toronto Electric Bike Project; Black Creek Transportation Management Area.

Transit

- Negotiated $600 million extra from the provincial and federal governments for the Toronto Transit Commission (TTC) over next five years.
- Buying 330 low-polluting buses in 2005-2006; these use one-third less fuel than conventional buses.
- The TTC has had an anti-idling policy since 1993. TTC uses low-sulphur diesel fuel.
- Anti-idling bylaw enacted by City Council in 1998.

Waste

- Curbside recycling pickup for residential customers. Aims to divert 60 per cent of household waste from landfills by the end of 2006 and 100 per cent by 2010.
- Green bin program: curbside organics collection.

Energy efficiency: residential

- Toronto Hydro "Bright Idea" campaign providing two free compact fluorescent light bulbs to every household in Toronto. Program in partnership with Home Depot.
- The Green$aver "Home Rewards" cash incentive program for Toronto residents.
- Keep Cool, a pilot air conditioner buyback program (TAF).
- The City has replaced over half the appliances in community housing units with energy-efficient stoves and refrigerators.
- The Clean Air Consumer Guide provides consumers with information on energy-efficient products and services.

Energy efficiency: commercial/municipal

- Toronto is a North American leader in retrofitting our buildings to improve energy efficiency.
- Retrofitted most civic centres, fire halls and water treatment plants.
- City's Better Building Partnership partnered with the private sector to retrofit hundreds of buildings over the past decade.
- The Cool Shops pilot program, an energy efficiency retrofit initiative for small neighbourhood businesses (TAF).
- Drafting new green development standards that will make energy efficiency a major consideration in new developments.
- Toronto's LED conversion program for traffic signal lamps started in 2004. Accelerated replacement of regular traffic signals with signals that use only one-fifth the energy. (LED: light-emitting diode technology).
- Lighting retrofit feasibility study at Ashbridges Bay Treatment Plant.
- Solar Wall Demonstration Project.

- Cool Schools: evaluate and recognize the efforts and achievements of students, teachers and school staff to conserve energy and reduce waste (TAF).

Renewable energy

- In 2003, a 660-kilowatt wind turbine located on Toronto's waterfront at Exhibition Place. Produces 1,800,000 kWh. Solar and fuel cell demonstration projects at Exhibition Place.
- The City captures methane from three landfill sites and converts it into approximately 44 MW of electricity each year. Feasibility study for biomass cogeneration for the City and the Toronto Zoo.
- The City has a target to purchase 25 per cent of the City's electricity requirements from Green Power sources by 2005.
- Sustainable Energy Plan: Integrated Energy Concept for Central Waterfront: deep lake water cooling, district and distributed energy, high energy efficiency buildings. Metro Hall is being connected to the Deep Lake Water Cooling grid.
- Aim to have over 350 transit shelters lit by solar power by the end of 2005.
- Renewable energy action plan coming January 2006.

Water conservation and wastewater treatment

- Feasibility study for co-generation and process efficiency at wastewater treatment plant.

Other

- Toronto's Official Plan supports the integration of land use and transportation.
- Tree Advocacy Planting Program, 41,200 trees and shrubs, 17,000 native plants were planted in 2002.
- Currently developing a new green roofs policy. Twenty-five City buildings due for re-roofing have been identified as being suitable for green roofs.

OTTAWA

Objectives, plans and targets

- City Council approved an environmental strategy for the City in 2003 as part of its overall Ottawa 20/20 Growth Management Strategy; the environmental strategy lists six environmental commitments, including management of greenhouse gas emissions to meet 20 per cent corporate and community reduction targets, relative to 1990 levels, as established by former municipalities.
- The amalgamated City of Ottawa confirmed former City of Ottawa and regional greenhouse gas reduction targets with Council adoption of its Air Quality and Climate Change Management Plan in January 2005.
- Corporately, the majority of the 20 per cent GHG reduction target has been met with confirmation of the current status underway to revise for amalgamation impacts. Corporate reduction target is 20 per cent GHG reduction, relative to 1990 emission levels, to be achieved by 2007.
- The action plan to meet the community's 20 per cent reduction of GHG by 2012, relative to 1990 levels, includes integration of efforts by all levels of government. Key City initiatives in the action plan include facilitation of alternative energy source development, improvements in waste diversion, promotion of alternative transportation modes to single-occupancy vehicles, promotion of alternative fuels, promotion of building and home energy efficiency, partnering with the federal government on initiatives such as the One-tonne Challenge and improvement of local commercial fleets.

Transportation

- City's corporate fleet has progressively reduced its GHG emissions and has a formal Fleet Emissions Reduction Strategy that targets both air quality contaminants and its GHG from all fleet vehicles, but with particular emphasis on its buses. Plans underway to establish over 20 per cent of the bus fleet as hybrid vehicles with new buses being added in 2007.

- Commuter Challenge participant.
- Transportation Master Plan, approved by Council in 2003, has a 30 per cent modal share target for transit by the year 2020; current transit modal share is around 17 per cent. Investments in the transit system, including current environmental assessment for an east/west and a north/south light rail service contribute to the overall package of attracting new customers.

Waste

- Curbside blue box recycling. Curbside compost collection pilot, Compost Plus, will be expanded to city-wide residential compost collection by 2008 as one of the main methods of achieving a 60 per cent waste diversion target.

Energy efficiency: residential

- Increased uptake for EnerGuide for houses. Energy efficiency: commercial/municipal
- Commercial building efficiency partnership achieved an 18 per cent reduction in energy use for City facilities. Promotion of green buildings.
- Achieved a $360,000 cost reduction in street lighting through retrofits.
- Proposed district energy project; feasibility study has been completed with potential for multi-partner implementation for a district energy system in downtown Ottawa.

Renewable energy

- Convert landfill gas into electricity at the Trail Road landfill (5 MW), cutting annual greenhouse gas emissions by as much as 1.3 million tonnes compared with 1990 levels (2004 Council approval); cogeneration facility is expected to be operational in 2006.
- Use of methane gas from biosolids (sewage sludge) digesters at the R.O. Pickard Environmental Centre (sewage treatment plant) to generate electricity. Heat and electricity from the digestion process are used to heat onsite buildings and other treatment process stages.

Other

- Other plans underway that contribute to managing greenhouse gas emissions include a green space master plan to establish an integrated green space network that meets ecological and community use needs of the City and a forest strategy that identifies measures to accomplish a 30 per cent forest cover target within the city.
- U of O, the City and some federal government departments offer an Eco-pass (Transit) to employees through payroll deduction.
- Community outreach activities on smog and air quality and health included a Council-approved smog response plan (2004). “Burn It Smart” campaign to educate the public on effective use of wood-burning fireplaces and stoves.
- The City encourages compact mixed-use development and maintenance of a firm urban boundary through its official plan policies. These polices help reduce the need for transportation trips by providing opportunities for people to live closer to work, shopping and recreational facilities.

MONTREAL

Objectives, plans and targets

- Montreal's First Strategic Plan for Sustainable Development contains a series of actions that the City of Montreal plans to carry out. The plan will be implemented over a five-year period (2005-2009). The start-up phase (2005-2006) consists of actions that will be carried out over the short term.
- One of the key targets is to improve air quality and reduce greenhouse gas emissions. Objectives include: 1. Reduce atmospheric emissions generated by industries, businesses and institutions in Montreal; 2. Reduce atmospheric emissions generated by Montreal households; 3. Reduce the impact of emissions by light and heavy vehicles in Montreal; and 4. Encourage the development of alternative modes of transportation.
- Action: Draft an action plan and start applying measures in January 2006 to reduce greenhouse gases generated by municipal activities.

Transportation

Strategic plan

- Plan a reduced-vehicle-idling campaign directed at municipal employees and the public beginning in fall 2005. Amend the bylaws governing unnecessary vehicle idling on the island of Montreal to facilitate their application by summer 2005.
- City of Montreal will replace all of its subcompact automobiles (500) with energy-efficient vehicles by 2011. Double the acquisition of vans with four-cylinder gas engines instead of six-cylinder engines (increase the van fleet from 106 to 212) by 2011.
- In 2005, conduct a feasibility study on the use of biodiesel (B20) and ethanol (E5 or E10) in all gas stations managed by the Direction de l'approvisionnement.
- The City seeks to minimize automobile traffic through the increase of bicycle trails, encouraging alternative transportation.
- BIOBUS: 155 municipal buses used biodiesel B5 and B20 blends for a one-year pilot (02/03). Reduced CO_2e emissions by around 1,300 tonnes.

Waste

- Strategic plan aims to offer collection of recyclable materials to all Montreal residents by summer 2006. Offer collection of leaves, Christmas trees and green waste (gardens and clippings) to all Montreal residents by summer 2006. Offer collection of organics to residences with eight units or less by 2008.
- Commit to putting in place measures to reduce, reuse, recover and reclaim waste generated in municipal buildings. Extend the waste reduction and recovery measures to all corporate municipal buildings by late 2006.
- The City manages a composting centre for organic matter at the landfill; the pilot composting facility for organic wastes sorted at source. Plant capacity: 2000 tonnes/year from residential, commercial, institutional and industrial sectors

Energy efficiency: commercial/municipal

- Strategic plan: continue projects aimed at boosting energy efficiency by launching at least four projects in municipal buildings by late 2005.
- Continue to offer financial aid for each project developed as part of the Solidarité 5,000 logements program that abides by Novoclimat Logements standards.
- Agence d'efficacité énergétique du Québec: Volet municipal.

Renewable energy

- Montreal's decommissioned landfill site located in a densely populated area of the City provides the provincial grid with green power produced from landfill gas.

Water conservation and wastewater treatment

- Strategic Plan: Develop and implement a municipal water conservation program as of summer 2005.
- Launch a unit to control illicit water use by 2005.
- A fund dedicated to renew Montreal water distribution infrastructure systems (plants and distribution network) was created in 2004 as part of a multi-year project to deal with water issues. Wastewater treatment plant improvements will also be implemented in the very near future.

Other

- Implement an environmental management system in at least five administrative units (departments and boroughs) by late 2006. Ensure ecological management of at least one municipal building in 2005 and evaluate the exporting of solutions to other municipal buildings for 2006.

HALIFAX

Objectives, plans and targets

- Halifax Regional Municipality's (HRM) Sustainable Environment Strategy, an integrated approach to clean air, land, water and energy use, has recently been presented with the 2005 InNOVAward, the top award presented to a municipal unit from the provincial government.
- HRM is a member of the FCM Partners for Climate Protection Program and ClimAdapt Network. HRM has set a corporate target of a 20-per cent emission reduction of 2002 levels by 2012. A community energy plan is currently being developed.
- A corporate sustainability analysis, using a version of the Natural Step, was completed in 2004. Two recommendations were brought forth related to climate change: 1. Overall Clean Air Strategy, a framework to guide HRM toward clean air for all of its residents; and 2. Climate SMART, a collaborative partnership involving the public and private sectors aimed at an integrated approach to climate change mitigation and adaptation. Includes the Corporate and Community Mitigation Plan (Milestones 1-5 of PCP).
- Climate SMART won the 2005 FCM Sustainable Community Award for Sustainable Planning and will be presented at COP11.

Transportation

- Integrated bus rapid transit project has established two bus rapid transit (BRT) corridors to downtown Halifax (2004).
- Halifax Regional Municipality has switched its entire transit bus fleet and ferries to biodiesel fuel. The biodiesel product, 20 per cent biofuel and 80 per cent regular diesel, is a by-product of the production of Omega-3 oil, which is refined from fish oil.
- Commuter trip reduction program underway.
- Community and corporate reduced-idling program in place; major partners include NRCan, NS Energy and the Climate Change Centre.

Waste

- Advanced solid waste management program with one of the highest at-source diversion rates in North America.
- Blue bag recyclables, fibre recyclables and organic material are unacceptable for landfill disposal. Halifax has achieved a 61.5 per cent reduction in the amount of waste per person sent to landfills between 1989 and fiscal year 1999/2000. Halifax's new landfill is expected to be "virtually methane-free." Each completed cell will be equipped with a gas collection system.
- Large-scale methane capture to electrical generation at decommissioned landfill site.
- Ten per cent Challenge Program: 2005 Award.

Energy efficiency: residential

- Major community energy plan being developed.

Energy efficiency: commercial/municipal

- Memoradums of understandings now signed with major universities, hospitals, utilities and others for a district energy project for peninsula Halifax that would see thermal electrical generation with the waste heat redistributed for building heating and cooling.
- Energy performance contracts underway.

Renewable energy

- Wind power energy plan to be developed.
- Solar energy plan to be developed as well over the next few months.

Water conservation and wastewater treatment

- Adopted the International Water Association (IWA) methodology, an integrated approach to water loss control. Between 1998 and 2004, the HRWC had reduced water leakages in the systems by 27 million litres of water a day, a cost savings of $500,000 annually.
- Water loss retention program won a 2005 FCM Sustainable Community Award in the water category.

Other

- Sustainable community (green) reserve established. This reserve was created through preferred interest rates borrowing for the Halifax Harbour Solutions Project from the FCM Municipal Investment Fund. The interest differential (approx. 3.5-3.9 million over 10 years) is being reinvested in priority green projects, including climate change.
- Fully integrated clean air/land/water/energy use website, including specific sites on GHGs climate change mitigation and adaptation.
- The 25-year land use planning document includes sections on climate change mitigation and adaptation.

PORTLAND, OREGON

Objectives, plans and targets

- City of Portland Office of Sustainable Development and Multnohah County Department of Sustainable Community Development (2001).
- Reduce the combined City and county's total GHG emissions to 10 per cent below 1990 levels by 2010 (City/county not separated from community: across-the-board target).

Transportation

- Objective: 1. Improve public transit and raise awareness of SOV alternatives, optimize all major streets and roads for vehicles, bicycles and pedestrians; 2. Make private cost of driving reflect full costs to society; 3. Support the use of fuel-efficient and alternative fuel vehicles; and 4. Change pattern of urban development to be more compact and more bicycle and pedestrian friendly.

Waste

- Achieve overall 60 per cent recycling rate by 2005.
- Achieve solid waste recovery of 60 per cent at City landfill facilities.
- Improve and expand curbside recycling and other recycling services.
- Assist 150 businesses in developing and implementing improved waste management practices and expand commercial recycling programs and food waste collection.
- Promote continued development of local building deconstruction and material salvage industries.
- Implement a commercial food waste collection program.
- Promote the reuse and recovery of electronic devices.

Energy efficiency: residential

- Weatherize 250 homes occupied by low-income households through Block-by-Block program.
- Facilitate installation of energy conservation measures in 3,500 multifamily homes.
- Implement neighbourhood-based outreach efforts to increase sustainability.
- Require green building and Energy Star appliances in City-funded affordable housing.
- Provide green building design assistance to developers, home builders and residents.
- Work with NW Energy Efficiency Alliance to promote local access to household energy resource efficiency products. Work with state to offer financing for the purchase of high-efficiency furnaces, heat pumps, appliances, etcetera.

Energy efficiency: commercial/municipal

- Promote heat recovery cogeneration development opportunities to industry.
- Promote implementation of local industrial/commercial programs funded through electricity system benefits. Work with 100 largest local businesses to establish and meet energy efficiency targets.
- Provide green building assistance and technical resources to developers and builders.
- Facilitate use of EPC.
- Reduce heating and cooling loads by promoting light-coloured roofs and green roofs.
- Support changes to state tax code to encourage green building practices.
- Sliding-scale building permit fees with rebates for high performance green buildings.
- Help small business gain access to energy efficiency services, conservation programs through new agreements in utility franchises.
- Lobby for strengthening of state building code to include energy efficiency measures.

Renewable energy

- Encourage residents and businesses to buy at least 10 per cent of their electricity from renewable sources by promoting green power.
- Support the deployment of small-scale renewable energy systems in mobile applications.
- Provide technical assistance to builders and developers to include solar water heaters and PVs and building-integrated systems.
- Support legislation requiring 20 per cent of all power sold to rate-regulated customers be from new renewable resources.
- Support code revisions that facilitate low-cost interconnection of PV and other renewable electricity systems.

Other

Urban forests

- Support efforts to reforest 50,000 acres of Oregon timberland.
- Plant 3,000 acres of trees.
- Improve development practices to limit tree destruction and encourage new planting.
- Expand urban forest and improve forest performance by maintaining trees carefully.

Community communications

- Inform local community leaders and media about the causes and impacts of global warming.
- Compile and distribute information on GHG reduction technologies, programs and policies.
- Provide educational materials on global warming.
- Encourage residents and businesses to invest in GHG-reducing projects to offset their personal or corporate emissions.

Community programs

- Implement and support education and outreach programs to improve community understanding of global warming; inform residents about how their actions affect GHG emissions; encourage reduction of GHG emissions.
- Provide tools to local residents and businesses to estimate their GHG emissions and reductions.
- Establish a hotline for businesses and residents on energy conservation.

Strategic partnerships

- Forge partnerships with community co-ops to organize tree-planting and maintenance events.

SAN FRANCISCO, CALIFORNIA

Objectives, plans and targets

- The Sustainability Plan for the City of San Francisco (community involved in the plan, 350 parties) approved in 1997. The Climate Action Plan for San Francisco: September 2004.
- GHG 20 per cent below 1990 levels by 2012; 2010, waste diversion goal 75 per cent; 2020, zero waste.

Transportation

- 11 per cent (600) of SF fleet vehicles are alternative vehicles (2003).

Waste

- 75 per cent of the LFG is recovered through flaring and power generation.

Energy efficiency: residential

- Residential Energy Conservation Ordinance.

Energy efficiency: commercial/municipal

- Municipal buildings subject to green building (LEED silver) ordinance. MECA financing mechanism for municipal buildings e-efficiency measures.
- 2002 Electricity Resource Plan, which includes energy efficiency plan and renewables deployment. The State of California has a Renewable Portfolio Standard; in 2003, 11 per cent of the energy came from renewables. Many programs on e-efficiency are led by PG&E. There is a Power Savers program for small businesses administered through the municipality; 4,000 SB's reduced their energy use for lighting.

Water conservation and wastewater treatment

- 2 MW Bio-gas Plant through the Water Treatment Control Plant.

Appendix 5: Climate change glossary

Anaerobic decomposition: the biological breakdown of organic matter in the absence of oxygen, resulting in the emission of methane gas (CH_4).

Baseline emissions year: the year used to determine assigned amount of GHG emissions in relation to a target. For The City's purposes, the base year is 1990, which is the standard base year used internationally.

Biodiesel: a cleaner-burning fuel produced from renewable sources such as oil seed crops (generally canola or soy) or waste cooking oils blended with petroleum diesel.

Business as usual (BAU): GHG emission levels and activities that would occur in the absence of climate change mitigation actions.

Carbon dioxide (CO_2): the most abundant greenhouse gas, primarily produced by the combustion of fossil fuels.

Carbon dioxide equivalents (CO_2e): emissions of a gas, by weight, multiplied by its global warming potential (see definition): for example, the global warming potential of methane is 21, meaning the emission of one tonne of methane is equivalent to the emission of 21 tonnes of carbon dioxide in terms of climate change impacts.

Carbon intensity: the amount of carbon emitted per unit of energy produced. A higher carbon intensity number indicates more carbon dioxide is released per unit of energy produced.

Climate change: changes in long-term trends in the average climate, such as changes in average temperatures. According to the United Nations Framework Convention on Climate Change (UNFCCC), climate change is a change in climate that is attributable directly or indirectly to human activity that alters atmospheric composition.

Composting: the process whereby micro-organisms break down organic material. The incorporation of compost improves soil conditions and plant health. Commercial composting: a professionally operated commercial operation where composting is carried out under aerobic (with oxygen) conditions and therefore does not result in the emission of methane (CH_4).

Emission: a release of substances (e.g. greenhouse gases) into the atmosphere.

Emission co-efficient: the mass of carbon dioxide equivalents (CO_2e) emitted per unit of a particular fossil fuel or energy unit consumed.

Energy performance contracting (EPC): the arrangement whereby an energy service company is contracted to improve a building or facility's energy efficiency. The contracted company, which typically assumes responsibility for financing the project, retains the energy cost savings (for a pre-specified number of years) as payment for its services.

EnviroSystem™: The City of Calgary's term for its ISO 14001 program. EnviroSystem is an environmental management system that identifies all potential impacts for every area of City operations and outlines procedures to manage and evaluate environmental performance.

Fossil fuels: non-renewable forms of energy produced by the decay of plant and animal matter; examples include fuels such as oil, gasoline, coal and natural gas. The combustion of fossil fuels results in the release of greenhouse gases into the atmosphere.

Global warming: the progressive gradual rise of the Earth's average surface temperature, thought to be caused in part by increased concentrations of greenhouse gases in the atmosphere.

Global warming potential (GWP): a relative scale that compares a particular greenhouse gas to that of the same mass of carbon dioxide. All greenhouse gases contribute to climate change to varying degrees, based on their particular ability to trap radiation and their atmospheric lifespans. Carbon dioxide's GWP is equal to one. The GWP of methane (CH_4) is 21 times that of carbon dioxide, and the GWP of nitrous oxide (N2O) is 310 times that of carbon dioxide.

Greenhouse gas (GHG) emissions: the atmospheric release of gases such as nitrous oxide (N2O), methane (CH_4), chlorofluorocarbons (CFCs) and carbon dioxide (CO_2). The combustion of fossil fuels is the primary source of these gases; however, they are also released by natural biological processes and by a range of industrial activities.

Green energy: energy (electricity or heat) produced from sustainable energy sources such as wind, solar, small hydropower, geothermal and landfill gas, which result in little to no net addition of GHG to the atmosphere.

Green procurement: the commitment to buy supplies or services that take environmental impacts into account. An example of green procurement includes buying Energy Star® certified computers and appliances and recycled products.

Hybrid vehicle: a vehicle that combines a gasoline- or diesel-powered engine with an electric motor to provide an improvement in fuel economy and lower emissions of pollutants and greenhouse gases.

Kilotonne (kt): one thousand metric tonnes (1,000 tonnes) or one million kilograms (1,000,000 kilograms).

Landfill gas (LFG) emissions: a product of the decomposition of organic wastes deposited in landfills. It generally comprises approximately 50 per cent carbon dioxide (CO_2) and 50 per cent methane (CH_4).

Leadership in Energy and Environmental Design™ (LEED): a self-assessing system designed for rating new and existing commercial, institutional and high-rise residential buildings. It evaluates environmental performance from a whole-building perspective over a building's life cycle, providing a standard for what constitutes a green building.

Methane (CH_4): the second-most-abundant anthropologically produced greenhouse gas. Atmospheric CH_4 is produced by natural processes, but there are also substantial emissions from human activities such as landfills, livestock and livestock wastes, natural gas and petroleum systems, coal mines, rice fields and wastewater treatment. Methane is also the primary constituent of natural gas. Although total methane emissions are much lower than carbon dioxide emissions, it is a far more potent greenhouse gas, with 21 times the global warming potential of CO_2.

Mitigate/mitigation: reduction in negative impacts of climate change through actions to reduce GHG emissions.

Organic waste: waste containing carbon compounds, such as food, fibre and plant waste, from residential and commercial sources. When stored under anaerobic conditions, such as a covered landfill, it results in the emission of methane gas.

Sink: any naturally occurring item, like forests or certain kinds of agricultural activity, that can be grown or created specifically to help absorb more CO_2 from the atmosphere.

2003 Calgary Community Greenhouse Gas Emissions Inventory

2004-1623

THE CITY OF
CALGARY
ENVIRONMENTAL
MANAGEMENT

Table of Contents

Executive Summary

- The City of Calgary is one of 118 Canadian communities participating in the Partners for Climate Protection (PCP) Program. As part of its participation in the PCP Program, The City has committed to monitor and report on the Calgary community's greenhouse gas (GHG) emissions.
- For the purposes of this report, the Calgary community includes all residences and commercial, industrial and institutional facilities located within The City of Calgary's municipal boundaries.
- The most significant greenhouse gases emitted by human activities are carbon dioxide (CO_2), methane (CH_4) and nitrous oxides (N_20).
- In Calgary, as is the case in most other urban communities, the consumption of energy derived from fossil fuels is the dominant source of greenhouse gas emissions.
- Total Calgary community GHG emissions for 2003 were approximately 16,370 kilotonnes (kt).
- Electricity consumption was the largest source of local GHG emissions, responsible for 43.7 per cent of the Calgary community total. This ranking can be directly attributed to Alberta's relatively heavy reliance on coal as an energy source for electricity generation. At 30.2 per cent, vehicles were the second largest source of Calgary community GHG emissions. Methane from Calgary's landfills is a relatively small contributor to local emissions accounting for 2.7 per cent of the total, but still are the source of over 442 kt of GHG emissions.
- Since 1990, Calgary community emissions have increased by 3,908 kt, or over 31 per cent from 12,462 kt to 16,370 kt. This equates to an average annual rate of increase of approximately 2.3 per cent. Between 1990 and 2003, significant increases in emissions occurred in all four source categories. The largest absolute increase occurred in the Electricity category, with emissions increasing by 1,718 kt (31.6 per cent).
- The data suggests there is a direct correlation between community GHG emissions and population growth. Between 1990 and 2003, Calgary's population increased from 691,736 to 922,315—a growth rate of about 33 per cent—which essentially mirrors the growth in GHG emissions (31 per cent) over this timeframe. This relationship should not be surprising as more people inevitably translates into more vehicles traveling more miles, and more homes and businesses requiring energy for heating, lighting and machinery operation.
- Green power is electricity produced from renewable sources, and whose consumption essentially does not result in the emission of greenhouse gases to the atmosphere. In 2003, total Calgary community green power consumption was 59,215,000 kWh—about 0.75 per cent of total community electricity consumption.

Foreword

The City of Calgary is one of 118 Canadian communities participating in the Partners for Climate Protection (PCP) Program, which is jointly administered by the Federation of Canadian Municipalities (FCM) and ICLEI—Local Governments for Sustainability. The objective of the PCP program is to support municipal governments actively pursuing greenhouse gas (GHG) emission reductions. As part of its PCP membership commitment, The City of Calgary has agreed to monitor and report on the Calgary community's GHG emissions. This report fulfills this commitment; providing a full accounting of 2003 Calgary community GHG emissions.

The Calgary community includes all residences and commercial, industrial and institutional facilities located within the City of Calgary's boundaries. Commencing with this 2003 emission report, The City of Calgary will be reporting on community emissions on a biennial basis.

The City of Calgary Environmental Management business unit would like to thank the organizations listed below, who generously provided the data that forms the basis of this report. Without the co-operation of these organizations, this report would have been impossible:

- Alberta Energy and Utility Board (AEUB)
- ATCO Gas Ltd.
- ENMAX
- Government of Alberta (Department of Transportation)
- Parks Business Unit, The City of Calgary
- Pembina Institute for Sustainable Development
- Propane Gas Association of Canada
- Waste and Recycling Business Unit, The City of Calgary

Introduction to climate change

There is a strong consensus among scientists that climate change is occurring and that human activity is contributing to it. While uncertainties exist about the timing and rate of climate change, the United Nations International Panel on Climate Change (IPCC)—an international body comprised of over 2,000 of the world's leading climate scientists—estimate the average global surface temperature is likely to increase by between 1.4 and 5.8° celsius by 2100. While these changes may appear modest, even small changes in global average temperatures can have a dramatic impact on our climate. For example, the last time the earth's average temperature was 5° colder Canada was covered by 3 kilometers of ice.

Scientists have concluded that changes consistent with global warming are already occurring in different parts of the world. Mountain glaciers are retreating and climate zones are shifting. The 20th century was the warmest century of the last millennium, and the 1990s were the warmest decade of the last century. Because scientists believe that northern countries will be more affected by climate change than those closer to the equator, Canada is particularly vulnerable.

What are greenhouse gases?

Greenhouse gases are collectively gases that absorb and essentially trap heat that is emitted as radiation by the earth's surface.

The most significant greenhouse gases emitted by human activities are:

Carbon dioxide (CO_2): Is the most abundant persistent greenhouse gas in the atmosphere. An increasing amount of CO_2 is being released by the burning of fossil fuels (coal, oil, natural gas). Over the last 200 years CO_2 levels in the atmosphere have increased dramatically from about 280 parts per million (ppm) to about 380 ppm.

Methane (CH_4): Is the second most abundant persistent greenhouse gas in the atmosphere. An increasing amount of CH_4 is being released from landfills, oil and gas development and transportation and the agricultural sector. Over the last 200 years CH_4 levels in the atmosphere have increased from about 0.7 ppm to about 1.7 ppm.

Nitrous oxide (N_2O): Is the third most abundant persistent greenhouse gas in the atmosphere. An increasing amount of N_2O is being emitted into the atmosphere through the use of chemical fertilizers and the burning of fossil fuels. Over the last 200 years N_2O levels in the atmosphere have increased from about 280 parts per billion (ppb) to about 310 ppb.

Sources of Calgary community greenhouse gas emissions

In Calgary, as is the case in most other urban communities, the consumption of energy derived from fossil fuels is the dominant source of greenhouse gas emissions. Generally, the energy we consume to light and heat our homes and businesses, and power our vehicles—that is our consumption of electricity, natural gas, gasoline, diesel and propane—is the primary source of community generated greenhouse gas emissions. The sources of Calgary community greenhouse gas emissions, and the uses and activities that generate these emissions, are summarized in **Table 1**.

Table 1: Sources of GHG emissions

GHG Source	uses/activities
Electricity—in Alberta electricity is primarily produced from the burning of fossil fuels, with coal being the dominant fuel. Coal and natural gas account for about 90 per cent of Alberta's installed generation capacity[1]	Lighting, Household Appliances, Indoor Space Heating, Machinery and Tools, Industrial Processes
Natural gas	Heating of Indoor Space & Water, Household Appliances, Industrial Processes and Equipment
Gasoline	Vehicles, Outdoor Equipment, Generators
Diesel	Vehicles, Outdoor Equipment, Generators
Propane	Vehicles, BBQs
Methane—produced by anaerobic decay of organic materials, such as household garbage and sewage	Landfills (garbage dumps) and Wastewater Treatment Plants

The GHG inventory presented in this report includes GHG emissions associated with energy consumed and landfills located within The City of Calgary's municipal boundaries[2]. Additionally, due to data limitations, all vehicle fuel purchased within The City of Calgary is included in the inventory, despite the fact that not all of it is consumed in Calgary. Correspondingly, vehicle fuel consumed in Calgary, but purchased elsewhere is not included in the inventory.

2003 Calgary community GHG emissions

Calgary's 2003 community-wide GHG emissions were derived from energy consumption data collected from local utilities, the Government of Alberta and industry associations. Greenhouse gas **emission co-efficients**[3] were used to convert energy consumption data into **carbon dioxide equivalents**[4] (CO_2e), which is the standard greenhouse gas measurement unit. The emission co-efficients used in this report are provided in **Appendix 1**.

Total Calgary community GHG emissions for 2003 were approximately 16,370 kilotonnes (kt). **Table 2** provides a breakdown of 2003 emissions by source.

[1] Source: Clean Air Strategic Alliance, An Emissions Management Framework for the Alberta Electricity Sector Report to Stakeholders. November 2003.

[2] Note: Emissions associated with electricity consumed in Calgary is included in the total, even though most of this electricity is produced elsewhere in Alberta. This accounting procedure is in accordance with Partners for Climate Protection (PCP) protocol.

[3] Emission co-efficient–mass of carbon dioxide equivalents emitted per unit of a particular fossil fuel unit consumed.

[4] Carbon dioxide equivalents (CO2e)–emissions of a gas, by mass, multiplied by its global warming potential. For example, the global warming potential of methane is 21—meaning the emission of one tonne of methane is equivalent to the emission of 21 tonnes of carbon dioxide, in terms of climate change impacts.

Table 2: 2003 Calgary community GHG emissions

Emission Source	GHG Emissions (kt of CO_2e)	% of Total
Electricity	7,153.0	43.7%
Natural gas	3,846.1	23.5%
Vehicles	4,941.2	30.2%
Waste disposal	442.7	2.7%
Urban forest	(13.0)	n.a.
Total	**16,370.0**	

Electricity consumption was the largest source of local GHG emissions, responsible for 43.7 per cent of the Calgary community total. This ranking can be directly attributed to Alberta's relatively heavy reliance on coal as an energy source for electricity generation. At 30.2 per cent, vehicles were the second largest source of Calgary community GHG emissions. Natural gas consumption is the other major contributor to local GHG emissions, accounting for 23.5 per cent of the Calgary total. Methane from Calgary's landfills is a relatively small contributor to local emissions accounting for 2.7 per cent of the total, but still are the source of over 442 kt of GHG emissions. Finally, Calgary's urban forest acts as a *carbon sink*, that is it serves to remove CO_2 from the atmosphere through photosynthesis. It is estimated that Calgary's trees remove about 13 kt of GHGs from the atmosphere annually.

For more information on the specific amounts of energy consumed by the Calgary community during 2003, please see **Appendix 2** of this document.

Calgary community emissions 1990 to 2003

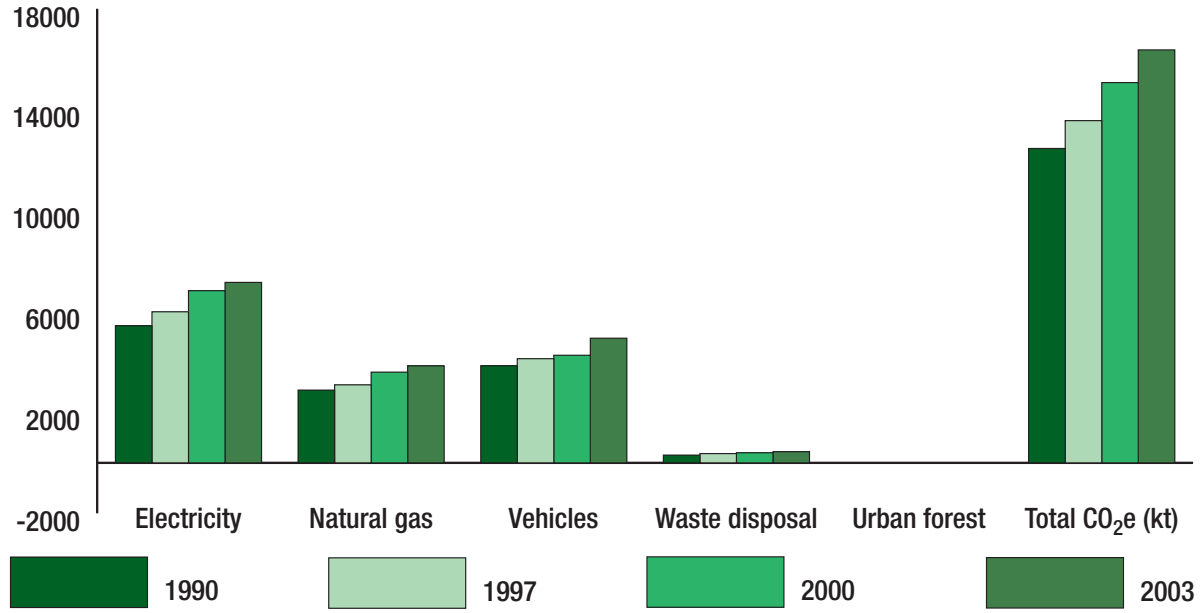
The base year for monitoring Calgary community emissions is 1990. Subsequent to 1990, community GHG emissions data was tabulated for 1997 and 2000. Since 1990, Calgary community emissions have increased by over 31 per cent, from 12,462 kt to 16,370 kt (see **Table 3**). **Figure 1** provides a graphical presentation of emission increases between 1990 and 2003 by GHG source. The 1990 to 2003 GHG emission increase equates to an average annual rate of increase of approximately 2.3 per cent.

Table 3: Calgary community GHG emissions 1990 to 2003

CO_2e Emissions (kt)						
	1990	1997	2000	2003	Absolute Increase 1990-2003	Per cent Increase 1990-2003
Electricity	5,435	5,989	6,825	7,153	1,718	31.6%
Natural gas	2,884	3,093	3,596	3,846	962	33.4%
Vehicles	3,849	4,129	4,265	4,941	1,092	28.4%
Waste disposal**	307	368	400	443	136	44.3%
Urban forest	-13	-13	-13	-13	0	0%
Total	**12,462***	**13,566***	**15,073***	**16,370**	**3,908**	**+31.4%**

*Source: The City of Calgary, Corporate Strategy & Economics. Data Collection & Analysis for the Calgary Community, December 2002.
**Source: CH2MHILL. The City of Calgary Landfill Gas Assessment Study, October 2002.

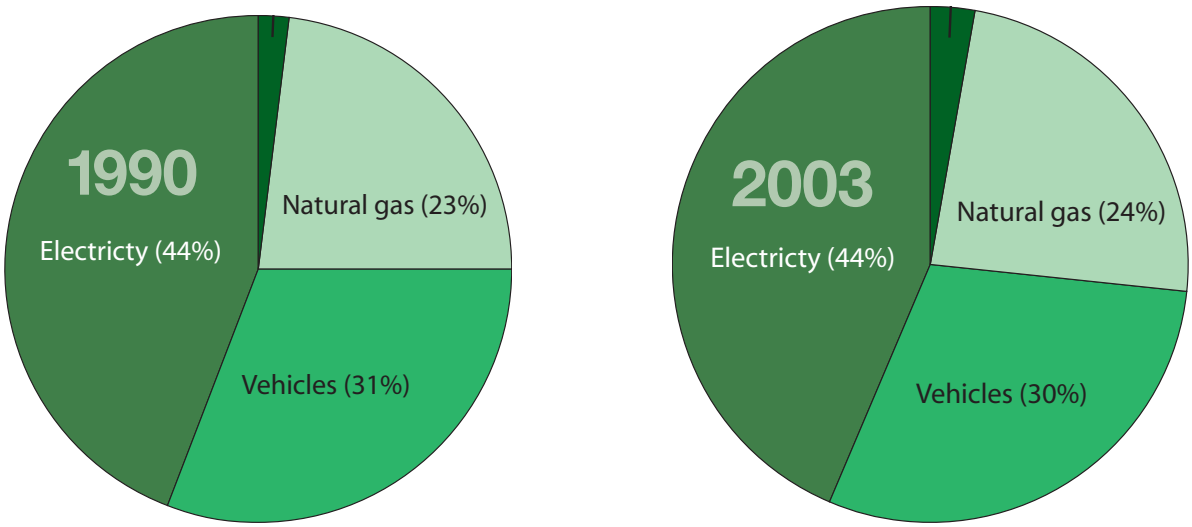
Figure 1: Calgary community GHG emissions by source 1990–2003



As indicated by **Table 3** and **Figure 1**, between 1990 and 2003 significant increases in emissions occurred in all four source categories. The largest absolute increase occurred in the Electricity category, with emissions increasing by 1,718 kt (31.6 per cent). However, the fastest growing source of GHG emission, on a percentage basis, was The City's waste disposal facilities (landfills) at 44.3 per cent.

Over the 1990 to 2003 period, the proportional composition of community GHG emissions by source remained virtually static (see **Figure 2**).

Figure 2: Calgary community greenhouse gas emissions by source 1990 and 2003

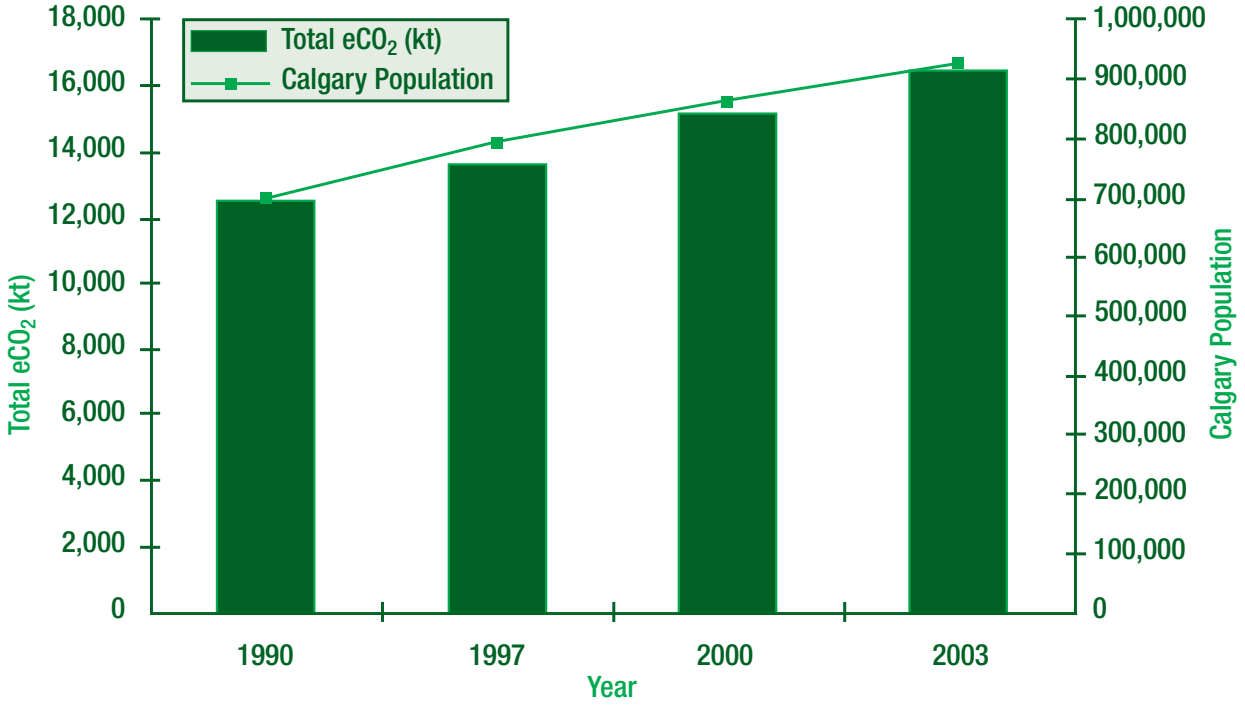


Link between population growth and GHG emissions

The Calgary community's rapid GHG emission growth over the 1990 to 2003 period cannot be viewed in isolation from the city's considerable population growth over this time frame, as more people inevitably means more vehicles traveling more miles, and more homes and businesses requiring energy for heating, lighting and machinery operation. Between 1990 and 2003, Calgary's population increased from 691,736 to 922,315[5]—a growth rate of about 33 per cent—which essentially mirrors the growth in GHG emissions (31per cent) over this timeframe. **Figure 3** graphically portrays the relationship between Calgary's population and community GHG emissions between 1990 and 2003.

[5] Source: The City of Calgary. The City of Calgary 2004 Civic Census.

Figure 3: Change in Calgary's population and GHG emissions in 1990, 1997, 2000 and 2003



Community green power consumption

Commencing with this 2003 report, Calgary *green power* consumption will be reported. Green power is electricity produced from renewable sources, and whose consumption essentially does not result in the emission of greenhouse gases to the atmosphere. In the Alberta context, wind derived electricity is the dominant source of green power. In fact, Alberta is the leading producer of wind derived electricity in Canada, with an installed capacity of about 269 MW, accounting for about 61 per cent of Canada's total wind power capacity[6].

In 2003, total Calgary community green power consumption was 59,215,000 kWh—about 0.75 per cent of total community electricity consumption. The municipal government of The City of Calgary was the leading user of green power in Calgary, consuming about 29 million kWh, approximately 49 per cent of the community total.

[6] Source: Canadian Wind Energy Association (CanWEA).

Appendix 1 – 2003 GHG emission co-efficients	
Fuel Type	**Co-efficient**
Gasoline	2.479 kg/litre[7]
Diesel	2.757 kg/litre[8]
Propane	1.52 kg/litre[9]
Natural gas	49.95 kg/GJ[10]
Electricity	0.909 kg/kWh[11]
Green electricity	nil

[7] Source: Government of Canada. Climate Change Technology Early Action Measures (TEAM)–System of Measurement and Reporting to TEAM, December 2002.

[8] Source: Government of Canada. Climate Change Technology Early Action Measures (TEAM)–System of Measurement and Reporting to TEAM, December 2002.

[9] Source: Government of Canada. Climate Change Technology Early Action Measures (TEAM)–System of Measurement and Reporting to TEAM, December 2002.

[10] Source: Government of Canada. Climate Change Technology Early Action Measures (TEAM)–System of Measurement and Reporting to TEAM, December 2002.

[11] Source: Torrie Smith Associates Inc. Cities for Climate Protection ICLEI–Local Governments for Sustainability Software.

Appendix 2 – Calgary community 2003 energy consumption	
Electricity	7,869,085,000 kWh[12]
Green electricity	59,215,000 kWh[13]
Total electricity	7,928,300,000 kWh[14]
Natural gas	77,000,000 GJ[15]
Gasoline	1,372,929,000 litres[16]
Diesel	415,132,000 litres[17]
Propane	196,272,503 litres[18]
Natural gas (vehicles)	319,323 litres[19]

[12] Sources: Alberta Energy and Utility Board (AEUB).

[13] Sources: ENMAX and Pembina Institute for Sustainability.

[14] Source: Alberta Energy and Utility Board (AEUB).

[15] Source: ATCO Gas Ltd.

[16] Source: Government of Alberta, Department of Transportation.

[17] Source: Government of Alberta, Department of Transportation.

[18] Source: Propane Gas Association of Canadian.

[19] Source: ATCO Gas Ltd.

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