
Urban Municipal Action on Climate Change Environmental Scan

September 2008

**Alberta Urban Municipalities Association
in partnership with
Alberta Environment**



TABLE OF CONTENTS

1.0 INTRODUCTION	6
1.1 Project Background	6
1.2 Context	6
1.2.1 Municipal Context	6
1.2.2 Provincial	8
Alberta’s 2008 Climate Change Strategy	8
British Columbia Climate Change Action Plan	9
British Columbia Climate Change Action Charter	9
1.2.3 Federal.....	11
Canada’s Climate Change Strategy	11
1.2 Business case for reducing emissions.....	12
1.2.1 Environment.....	12
1.2.2 Economic	13
1.2.3 Social	13
1.2.4 Culture and Governance	16
2.0 EMISSIONS	16
2.1 Emissions from Direct Municipal Operations.....	16
2.1.1 Municipal fleet	17
Emissions.....	17
Actions -Towns and Cities	17
Actions- Small Communities	18
Examples	18
2.1.2 Land Use	18
Emissions.....	18
Actions -Towns and Cities	19
Actions-Small Communities	20
2.1.3 Outdoor Lighting	21
Emissions.....	21
Actions Towns and Cities	21
Actions-Small Communities	22
Examples	23
2.1.4 Buildings	23
Emissions.....	23
Actions - Towns and Cities	23
Actions - Small Communities	27
Examples	29
2.1.5 Renewable Energy and Conservation	29
Actions- Towns and Cities	29
Actions- Small Communities	31
2.1.6 Waste.....	32
Emissions.....	32

Actions-Towns and Cities	32
Actions- Small Communities	34
Examples	36
2.1.7 Water and wastewater treatment	36
Emissions.....	36
Actions- Towns and Cities	36
Small Communities	39
Examples	41
2.2 Emissions Indirectly Controlled by Municipal Operations	42
2.2.1 Transportation.....	42
Emissions.....	42
Actions - Towns and Cities	42
Actions-Small Communities	45
Examples	45
2.2.2 Residential.....	46
Emissions.....	46
Actions- Towns and Cities	46
Actions Small Communities.....	47
Examples	48
3.0 BARRIERS AND SUPPORT	48
3.1 Implementation Barriers	48
Towns and Cities	48
Small Communities	51
3.2 Climate Change measures - Wish List of Programs.....	52
Towns and Cities	52
Small Communities	54
3.3 Support from AUMA and Alberta Environment	55
Towns and Cities	55
Small Communities	58
4.0 RECOMMENDATIONS.....	59
4.1 Municipal Climate Change Action Plan.....	59
4.2 Municipal Climate Change Action Centre.....	59
4.3 Team of Experts.....	59
4.4 Comprehensive Funding Program	60
4.5 Short Term Actions	60
5.0 REFERENCES	61
6.0 APPENDIX 1	65
6.1 Energy Efficient Lighting	65
6.1.1 Light Emitting Diodes	65
City of Austin, Texas	65
City of Arbour, Michigan	65
City of Raleigh, North Carolina.....	66
City of Toronto, Ontario	66
6.1.2 Other Options.....	66

City of Calgary, Alberta.....	66
City of Prince George, British Columbia.....	66
6.2 Climate Change Workshop	67
6.2.1 Background.....	67
6.2.2 Key Points.....	67
Climate Change Central.....	67
Alberta Municipal Affairs	68
Alberta Association of Municipal Districts and Counties.....	68
Natural Resources Canada	68
Natural Resources Canada has the following related programs	69
Clean Air Strategic Alliance	69
Pembina Institute.....	69
Alberta Environment.....	70
6.2.3 Conclusions.....	70

1.0 INTRODUCTION

1.1 Project Background

AUMA and Alberta Environment have a Protocol of Cooperation guiding work together on a number of initiatives towards safeguarding the environment. They have recently initiated a project to develop a Municipal Climate Change Action Plan. The goal of this plan is to further enable Municipalities to contribute to greater reductions in greenhouse gas emissions. However, before an Action Plan could be created, the Association and Department felt they needed to gain a better understanding of the current situation.

Therefore, AUMA and Alberta Environment hired a research assistant to conduct an environmental scan. The purpose of the environmental scan is to identify sources of greenhouse gases (GHG) from municipalities, identify barriers and opportunities, and finally to develop recommendations to aid municipalities in reducing GHG emissions. This project is a precursor to the development of a formal Municipal Climate Change Action Plan.

The first step of the environmental scan was to compile an interview contact list. The interview contact list was created with the goal of achieving a representative sample of AUMA members. In other words, a proportional representation of villages, towns, cities, and M.D.s that covered North/South/West and Eastern Alberta was sought. Two separate questionnaires were developed. One questionnaire was tailored for small communities (smaller than 2,500) and the other for town and cities. Using these questionnaires, 53 municipalities were interviewed, the majority being represented by Chief Administrative Officers and Town Managers. The municipalities that were interviewed consisted of 12 villages, 27 towns, 11 cities, one county, and two municipal districts. After all interviews were completed, the results were organized and grouped based upon similarities and frequency of responses. The responses along with some examples identified through the interview process are discussed in subsequent sections.

In addition to the interviews the Researcher reviewed websites, existing literature, and reviewed government and nongovernmental organization documents.

1.2 Context

1.2.1 Municipal Context

It is important to examine the roles that municipalities must play in combating climate change because municipalities generate large amounts of greenhouse gas emissions, both directly and indirectly. For instance, according to the Government of Canada (2001), municipalities directly control approximately 6 percent of Canada's greenhouse gas emissions. In addition, municipalities have indirect control over 'general emissions' through their regulatory and

planning roles in the community. In total, municipalities have direct and indirect control over 50 percent of the national GHG inventory (Government of Canada 2001). Municipal governments have influence over management and distribution of services such as waste management, water treatment, municipal fleets, street lighting, transportation systems, and land use practices (FCM 2006). They have indirect influence over other elements such as private transportation, residential, commercial, and industrial practices (FCM 2006).

Through the research and interviews that went into this environmental scan it has become evident that there is a growing consensus that municipalities have a key role to play as part of the solution to climate change as well as being a contributor to the problem. Therefore, the importance of taking decisive and comprehensive action is well understood by the majority of mayors in many countries (Michalowska 2007). Issues linked with climate change are often integrated in local urban policies (Michalowska 2007). Boulder Colorado, St. Paul Minnesota, Seattle Washington, and Portland Oregon have all taken action in regard to climate change. For instance, Portland's Local Action Plan on Global Warming includes key components such as energy efficiency targets for buildings, meeting all growth in electricity demand through renewables, improving solid waste management and recycling, and encouraging research and development and public education (Roberts 2008).

Municipalities also play an important role as economic drivers, acting as centres for concentrated industrial production and providing homes to a majority of the nation's citizens, making forward planning increasingly important to anticipate and prevent problems that may threaten urban sustainability (Mcbean and Henstra 2003). Natural hazards, such as extreme weather events, pose a significant threat to urban areas, carrying the potential to disrupt economic and social activities, cause substantial damage to property, and even kill people (Mcbean and Henstra 2003). With this in mind, it is necessary for municipal governments to improve their understanding and respond appropriately/effectively to current and future risks (FCM 2006).

In addition, action to reduce municipal emissions will yield significant social and economic results for municipalities (FCM 2006). The initial capital investment in upgrades, retrofits, renewable energy, and energy efficient equipment is typically large in the short run. However, in the long run, savings from reduced energy costs (fuel and utility costs) often result in significant returns on investments.

Municipal governments can be effective delivery agents (in partnership with other levels of government) for programs promoting energy efficiency and reducing waste and GHG emissions (Government of Canada 2001).

1.2.2 Provincial

Alberta's 2008 Climate Change Strategy

The 2008 Alberta Climate Change Strategy builds upon Alberta's 2002 Climate Change Action Plan. The 2008 Climate Change Strategy has three main targets, which include:

- By 2010, emissions reductions of 20 megatonnes: Meet the intensity target established in the 2002 Plan.
- By 2020, emissions reductions of 50 megatonnes: Stabilize greenhouse gas emissions and begin reductions.
- By 2050, emissions reduction of 200 megatonnes: Emissions reduced by 50 percent below business as usual and 14 percent below 2005 levels while maintaining economic growth.

To meet these targets, the Climate Change Strategy is divided into a three themes: implementing carbon capture and storage, conservation and energy efficiency, and greening energy production. The three themes focus on actions to produce reductions in greenhouse gas emissions.

Energy conservation and Efficiency

Energy conservation and efficiency will be responsible for 12 percent of Alberta's greenhouse gas emissions reductions by 2050, with a 24 megatonne reduction target. Municipalities have a central role to play in meeting and even exceeding the goals of this prong of the strategy. According to the Strategy, the Government of Alberta will include actions that impact municipalities such as:

- Develop an Energy Efficiency Act.
- Provide incentives for energy efficiency (appliance and home improvements).
- Provide information resources to Albertans to reduce emissions.
- Provide support to municipalities and other groups in finding new methods of reducing emissions.
- Implement energy efficiency standards in building codes for homes and commercial buildings.
- Establish a team to raise public awareness of energy efficiency and conservation.
- Provide government leadership in updating/introducing energy efficiency standards for government buildings, purchasing more energy efficient vehicles.

British Columbia Climate Change Action Plan

The following paragraphs outline British Columbia's Climate Change Action Plan (Phase 1) which places an emphasis on local government action. The partnership between the Province and municipal governments in B.C. provide useful examples for AUMA and Alberta Environment to explore as an Alberta Municipal Climate Change Action Plan is developed.

Climate action legislation recently passed in British Columbia

- *Local Government (Green Communities) Statutes Amendment Act (2008)* to encourage the development of more sustainable, healthy communities.

Creating Green Communities

This program supports smart urban planning with compact communities (that help to reduce energy use, reduce the costs of servicing, increase opportunities to walk and cycle to work, and minimize GHG emissions), energy efficient buildings, and cleaner transportation alternatives.

- Includes a new Green Building Code with some of the highest energy efficiency standards in Canada
- A \$14-billion Provincial Transit Plan to build infrastructure and double ridership across B.C. by 2020
- Support for all communities to have anti-idling policies in place by 2012 to reduce GHG emissions and local air pollution

Live Smart B.C. (2008)

This program provides new incentives to reward smart choices that save energy, water, fuel, time, and money. Live Smart B.C. will help contain sprawl and reward development that creates affordable housing, new green spaces and more people friendly neighbourhoods.

British Columbia Climate Change Action Charter

British Columbia has also developed a Climate Change Action Charter that is particularly relevant for municipalities. The following paragraphs highlight key points from the British Columbia Charter between the Province of British Columbia (the Province) and the Union of British Columbia Municipalities (UBCM) and signatory local governments (the Parties). This charter is important for municipalities in their GHG emission reduction goals.

- I. The Parties share the common understanding that:
 - a) Reducing GHG emissions will generate environmental and health benefits for individuals, families, and communities.
 - b) Governments urgently need to implement effective measures to reduce GHG emissions and anticipate and prepare for climate change impacts.

- c) Protecting the environment can be done in ways that promote economic prosperity.
 - d) It is important to take action and to work together to share best practices, to reduce GHG emissions and address the impacts of climate change.
- II. The Parties acknowledge that each has an important role in addressing climate change that:
- a) Local governments have taken action on climate change, including planning liveable, sustainable communities, encouraging green developments and transit oriented development, and implementing innovative infrastructure technologies.
 - b) These actions create the foundation for the parties to be leaders in affecting climate change.
- III. The Parties share the common goal of:
- a) Removing legislative, regulatory, policy, and other barriers to taking action on climate change.
 - b) Implementing programs, policies, or legislative actions within their respective jurisdictions that facilitate reduced GHG emissions where appropriate.
 - c) Encouraging communities that are complete and compact and socially responsive.
 - d) Encouraging infrastructure and a built environment that supports the economic and social needs of the community, while minimizing its environmental impact.
- IV. In order to contribute to reducing GHG emissions:
- a) Measuring and reporting on their community's GHG emission profile.
 - b) Creating complete, compact, more energy efficient rural and urban communities (e.g. foster a built environment that supports a reduction in car dependency and energy use, establish policies and processes that support fast tracking of green development projects, adopt zoning practices that encourage land use patterns that increase density and reduce sprawl).
- V. The Parties agree that this commitment to working together towards reducing GHG emissions will be implemented with the following purposes:
- a) Develop a range of actions and initiatives that can affect climate change.
 - b) Build local capacity to plan and implement climate change initiatives.
 - c) Share information and explore additional opportunities to support climate change activities.

1.2.3 Federal

Canada's Climate Change Strategy

Brief history

Canada's greenhouse gas emissions are more than 25 percent higher than 1990 levels, which is more than 35 percent above its Kyoto target. In order to tackle climate change, the government of Canada has taken numerous actions:

- October, 2006: Development of an approach to regulate industrial greenhouse gas and pollutant emissions
- April, 2007: Unveiling of *Turning the Corner: An Action Plan to Reduce Greenhouse Gases and Air Pollution*
- December 2007: Government of Canada requires industry to provide information about their emissions of air pollutants and greenhouse gases.
- March 10, 2008: The Government of Canada releases additional details on the *Turning the Corner* plan.

Turning the Corner

The Turning the Corner Plan moves away from voluntary compliance and moves towards mandatory enforcement (Roberts 2008). The government of Canada set a national target of an absolute 20 percent reduction in GHGs from 2006 levels by 2020, which translates to reduction of 330 megatonnes from projected levels. The action plan also includes a mandate to cut industrial air pollution such as nitrogen oxide (NO_x), sulphur oxide (SO_x) and volatile organic compounds (VOCs) by 50 percent by 2015 (Roberts 2008). By 2050, 60 to 70 percent emission reductions are targeted. The national targets require action by the federal government, provinces, municipalities, industry, and individual citizens. The Turning the Corner Plan includes the following components of interest to municipalities:

Vehicle and building emissions

By 2020, GHG emissions will be reduced by 65 megatonnes from projected levels. This is the equivalent to taking 16 million cars off the road. In order to accomplish this, the Government of Canada will take the following actions:

- Mandatory renewable fuel content in gasoline, diesel, and heating oil
- Development of mandatory fuel efficiency standards for cars, light trucks, and sport utility vehicles by 2011. In addition, actions to reduce emissions from rail, marine, aviation sectors, and from on-road and off-road vehicles and actions
- New energy efficiency requirements for commercial and consumer products
- Development of new energy performance standards for numerous products that consume electricity, including banning incandescent light bulbs.

- Launch of ecoAction programs designed to complement regulatory initiatives and stimulate the growth of renewable energy and fuels, energy efficient homes and buildings, increased fuel efficiency in vehicles, and increased public transit infrastructure.

Clean electricity

Emissions from electricity generation are the largest sources of greenhouse gases in Canada. By 2020 GHG emissions will be reduced by 230 megatonnes from projected levels.

- Setting up clean electricity task force to work with provinces and industry to meet this goal
- If required, Federal regulatory powers may be used to meet the reductions.

1.2 Business case for reducing emissions

1.2.1 Environment

Sauchyn and Kulshreshtha's (2008) report From Impacts to Adaptation: Canada in a Changing Climate from the Government of Canada, carried out a study that focused on the recent trends and future projections of climate change effects on Prairie Provinces. They found that climate change will have a number of environmental impacts on Alberta and its municipalities. The primary climate impacts for municipalities are extreme weather events, disease, heat stress, and the gradual ecological transformation of urban greenspace (Sauchyn & Kulshreshtha 2008). In addition, projections of future climate conditions include more frequent drought, but also increased precipitation in the form of rain and higher probability of severe flooding (Sauchyn & Kulshreshtha 2008). There will be extra water in spring, but there will be drier summers. Both drought and wet years will occur with more severity and place emphasis on water efficiency initiatives (Sauchyn & Kulshreshtha 2008). Water scarcity is a constraint on all sectors and communities, and may limit the rapid economic and population growth in Alberta municipalities (Sauchyn & Kulshreshtha 2008).

Flood control may be the most significant climate related concern for urban areas. Cities have not historically planned for flood prevention. Existing water management infrastructure (i.e. storage and drainage systems) may not be well suited to future changes in precipitation and snow melt (Sauchyn & Kulshreshtha 2008).

Heat stress associated with increasing temperatures is more severe in municipalities due to urban heat island effects (Sauchyn & Kulshreshtha 2008). Long term shifts in average temperatures and precipitation make existing plant species in green spaces poorly suited to drought, which can place plant and wildlife under extreme stress. For example, the City of

Edmonton lost approximately 23,000 trees since 2002 as a result of drought (Sauchyn & Kulshreshtha 2008).

1.2.2 Economic

The following municipal operations will be affected by climate change: transportation, parks and recreation, energy use, solid waste management, pest control, construction, municipal buildings, public safety, water and wastewater treatment, horticulture, snow and ice control, building codes, land use planning (Climate Change Connection 2008).

Municipalities are faced with significant risks to facilities and infrastructure and may encounter considerable liability as a result of climate change (FCM 2006). Municipal governments recognize that facilities, infrastructure, land and water resources will be vulnerable to the predicted effects of climate change (FCM 2006). There will be higher costs, including costs for insurance and post clean up and restoration, associated with extreme weather events. There will be challenges to critical infrastructure, including pipelines and transportation networks, many of which are vulnerable to flooding (Government of British Columbia 2008).

Climate change will place immense strain on public sector budgets. The cost of infrastructure maintenance and replacement will likely increase, while economic losses will likely translate into reduced tax revenues. Due to this, public officials may need to increase taxes, cut services, or a combination of the two (Ruth et al. 2007). In addition, there is the potential for significant energy savings by taking GHG reduction actions.

The rising price of energy and the threat of peak oil (the point at which global oil production begins to decline) are growing concerns. The maintenance of sprawled, automobile oriented communities is going to become increasingly expensive as energy prices rise. Therefore, taking measures towards decreasing vehicle dependence and increasing energy efficiency is not just about combating climate change; it is about ensuring that our communities are economically viable well into the future.

1.2.3 Social

Burning fossil fuels not only contributes to climate change, but also releases chemicals that are detrimental to human health. One of the most important benefits of taking action on climate change and at the same time improving air quality is the impact on human health (FCM 2006). In its annual report, Transportation Canada (2006) stated that “roughly 80 percent of people who live and/or work in urban areas feel air pollution emissions are a significant environmental and health issue.” The major pollutants created from the combustion of fossil fuels are SO₂,

NO_x, ground-level ozone (O₃), particulate matter (PM_{2.5} and PM₁₀), carbon monoxide (CO), carbon dioxide (CO₂) and VOCs which are responsible for urban smog. (Health Canada 2008). All of these chemicals are harmful to human health; the list of ailments caused by air pollution cannot be ignored. Ailments include short term and chronic respiratory illnesses, impaired lung function, various forms of cardio-vascular diseases, aggravated asthma and other respiratory symptoms, respiratory tract infections and increased risk of cancer. (Health Canada 2008).

The Government of Canada's Environmental Sustainability Indicator measures the quality or health of our environment and states that the health of Canadians and their social and economic well-being are highly dependent on the quality of the environment. The World Health Organization also states that air pollution is the most important environmental health problem in developed countries. In 2006, Health Canada estimated that more than 5,000 Canadians die prematurely each year because of air pollution and thousands more become unnecessarily ill. In 2005, the Ontario Medical Association estimated that air pollution in Ontario alone is responsible for 17,000 hospital admission, 60,000 emergency room visits and 47 million minor illnesses each year. Combined health care and lost productivity costs in Ontario are estimated to reach \$1 billion in 2005 (Health Canada 2008).

Global warming in itself will cause changes in local weather patterns and environmental conditions that will affect human health and wellbeing. Vulnerable population groups and regions must be examined in order to assess their ability to adapt to climate change. Factors that determine the vulnerability of population groups to changes in climate depend on population density, level of economic development, local environmental conditions, pre-existing health status, social stability and the availability of public health care. Certain demographics are more susceptible to disease and injury. These include children, older people, people with low incomes, pregnant women, people with compromised health status and populations living in Canada's north.

In addition, climate change can increase risks to human health by contributing to a rise in cases of heat stress, respiratory illnesses and the transmission of insect and waterborne diseases. These increased risks place additional pressures on health and social support systems if significant adaptation measures are not put in place. Health Canada (2008) also predicts that contamination of drinking and recreation water by run-off from heavy rainfall may cause outbreaks of toxin producing strains of bacteria such as E. coli, Giardia, and Ameobia. Health risks associated with climate change are summarized in Table 1.

Table 1: The Health Impacts of Climate Change (Health Canada 2008)

Health Impact Categories	Climate-related Causes	Typical Health Effects
Temperature extremes	<ul style="list-style-type: none"> • More frequent and severe heat waves • Colder weather in some areas • Warmer weather in some areas 	<ul style="list-style-type: none"> • Cold and heat related illnesses and death • Increased occupational health risks • Respiratory and cardiovascular disorders
Health impacts of extreme weather/natural disasters	<ul style="list-style-type: none"> • More frequent and violent thunderstorms, hurricanes, tornadoes, other severe weather • Heavy rains causing mudslides and floods • Increased drought affecting water supplies, agricultural production and forest fires 	<ul style="list-style-type: none"> • Death, injury and illness from violent storms, floods • Illnesses related to drinking water contamination • Indirect health impacts from ecological changes and damage to community health and public health infrastructure
Health effects related to air quality	<ul style="list-style-type: none"> • Increased air pollution, smog, acid rain, and airborne soot and dust (including smoke and particulates from forest fires) 	<ul style="list-style-type: none"> • Respiratory diseases including asthma • Heart attack, stroke, other cardiovascular diseases and certain types of cancer
Health effects related to the contamination of food and water	<ul style="list-style-type: none"> • Contamination of drinking and recreational water by run-off from heavy rainfall • Changes in marine environments that result in algal blooms and higher levels of toxins in seafood 	<ul style="list-style-type: none"> • Outbreaks of toxin-producing strains of bacteria such as E. coli, Giardia, and Ameobia • Diarrhoea and other intestinal diseases
Social and economic impacts on community health and well being	<ul style="list-style-type: none"> • Climate-induced socio-economic disruption 	<ul style="list-style-type: none"> • Various physical and psychological health effects • Loss of productivity and income • Diminished quality of life
Health effects of stratospheric ozone depletion	<ul style="list-style-type: none"> • Depletion of stratospheric ozone by GHGs 	<ul style="list-style-type: none"> • More cases of sunburn, skin cancers, cataracts

Due to the all of the potential health effects of climate change, the entire population would benefit from reducing greenhouse gas and associated emissions. Benefits include improved population health, lower health care costs, reduced exposure to toxic air contaminants, and enjoyment of a healthier environment (Health Canada 2008).

Reducing air pollution is not the only health related co-benefit to action on climate change. Johnson and Marko's (2007) report Designing Healthy Places: Land Use Planning and Public Health from Capital Health, examined the impact of land use planning on public health. The researchers found consistent association between access to infrastructure that supports physical activity (e.g. bike paths) and increased rates of physical activity (Johnson and Marko 2007). Physical activity has been shown to reduce the risk of heart disease, stroke, some

cancers, and improve mental health, lower blood pressure, and facilitate weight loss (Johnson and Marko 2007). There are consistent correlations between physical activity and land use planning such as high population density, mixed land use, and street and urban form connectivity (Johnson and Marko 2007). Sustainable land use planning will be discussed later in the report as a policy tool to reduce GHG emissions.

1.2.4 Culture and Governance

The cultural and governance aspects of climate change are closely connected. Cultural change is essential to the behavioural changes that are required to reduce emissions, from living in more compact transit oriented communities to reducing water use. Cultural change will not happen on its own, but requires strong leadership. Municipalities are the level of government often cited as being closest to the people. They have jurisdiction over aspects of everyday life such as land use and the provision of water. They can also provide leadership through example by improving their own operations.

Municipalities' role in policy as well as the ability to lead by example makes them key partners in helping the provincial and federal levels of government meet climate change targets. Cooperation between levels of government will improve the efficiency and accessibility of climate change plans and programs. Citizens do not necessarily understand or care about the individual jurisdictions of the different orders of government; they simply expect to see leadership and action.

2.0 EMISSIONS

2.1 Emissions from Direct Municipal Operations

The following section will explore the sources of GHG emission that are under direct control of municipal operations. Based upon interview responses, the following paragraphs also outline actions that towns, cities, and small communities have taken to achieve emissions reductions in each area. Even though municipalities are taking ongoing actions in regard to reducing GHG emissions, these interviews were completed in May and June 2008 and are a snapshot of actions taken.

2.1.1 Municipal fleet

Emissions

Municipally owned vehicles account for an average of 15 percent of corporate greenhouse GHG emissions (FCM 2003¹).

Actions -Towns and Cities

Fleet efficiency

Seven municipalities are exploring purchasing hybrid vehicles while others are replacing their municipal vehicles with hybrids as they can. A few municipalities have completed reviews on hybrids and concluded that they are not an economically viable option. Six municipalities have purchased hybrids in the past year. The Town of Jasper and Drayton Valley have plans to purchase electric vehicles for use in grounds maintenance.

Some municipalities are exploring the feasibility of using biodiesel in their municipal fleet. For instance, the City of Calgary has had a pilot project for biodiesel buses since 2005, where approximately 150 buses and all of the City's waste management trucks run on biodiesel. Ten municipalities regularly consider fuel efficiency in their municipal fleet. For instance, the City of Edmonton is currently working on a Sustainable Fleet Program which examines all vehicles within the fleet and purchases appropriately sized vehicles. Some municipalities have fleet efficiency programs, such as Drive Smart Programs, putting automatic vehicle location (AVL) trackers on vehicles to optimize routes, or sending fleet managers on courses to educate on fleet efficiency. Seven municipalities have an anti-idling policy for their municipal fleet. One municipality responded that it is not feasible to increase fuel efficiency on certain heavy use vehicles due to the significant increase in maintenance costs.

Barrier: One municipality states that they would like to purchase E85 vehicles (85 percent ethanol/ 15 percent gasoline fuel mixture) but are unable to do so due to a lack of E85 refuelling stations.

¹ The 2003 version of the [Quick Action Guide: Municipal Action on Climate Protection](#) is the most current version. It will likely be updated in spring 2009.

Table 1: Fleet efficiency interview results-towns and cities

Response	Frequency
Potential for hybrid vehicles	7
Anti-idling policy for municipal fleet	7
Have hybrids in fleet	6
Potential to incorporate biodiesel in fleet	3
Use biodiesel in fleet	3
Consider fuel efficiency in fleet	10
Would like to use electric vehicles in fleet	3
Have fleet efficiency programs	4
Not feasible to increase efficiency	1
Other	4

Actions- Small Communities

Fleet efficiency was not considered applicable for small communities.

Examples

Implement an anti-idling program to reduce emissions from municipal fleet vehicles

GHG reductions can be achieved through providing information on climate friendly actions in municipal driver instruction courses and by encouraging employees to use alternative transport. For example, the City of Mississauga partnered with Natural Resources Canada to deliver a pilot anti-idling program (<http://oee.nrcan.gc.ca>) (FCM 2003).

Purchase alternative fuel for corporate fleets

Alternative fuels such as ethanol, biofuel, or natural gas can be used in existing engines with little or no mechanical modifications, where emission reduction and associated costs depends on the fuel type. For example, ethanol from biomass (wood or agricultural waste) would result in a six to eight percent reduction in GHG emissions compared to gasoline. The cost of alternative fuels is typically competitive with traditional fuel types. For instance, the City of Guelph Ontario and the Halifax Regional Municipality use of mix of 20 percent biodiesel for their transit vehicles, resulting in a 20 percent reduction in GHG emissions (FCM 2003).

2.1.2 Land Use

Emissions

Sustainable land use planning is an important policy tool to reduce greenhouse gas emissions and mitigate the impact of climate change on human activities (Government of Quebec 2005).

Issues linked with climate change are often integrated in urban land use policies (Michalowska 2007). It is hard to determine the exact emissions reductions that can be attributed to land use planning because the reductions occur in a variety of areas including, transportation, reduced demand for materials for infrastructure and building development, and reduced water use.

Actions -Towns and Cities

Sustainable land use planning

Ten municipalities have considered sustainable land use planning in their Municipal Sustainability Plan, some of which consider sustainability as a whole. The City of Edmonton mentioned that their municipal development plan includes the goal of integrating compact urban form, but that there is no concrete policy behind the goal. In terms of municipal land use planning, a number of municipalities (16) mentioned that low impact development, density, and transit oriented development were common desires.

A notable example of sustainable use planning is the County of Strathcona's Emerald Hills, a community-based urban village. Emerald Hills is a pilot project funded by Natural Resources Canada that incorporates additional greenspace, xeriscaping², and does not allow automobile access. When The County of Strathcona developed Emerald Hills, 12 elements of sustainability were examined: land, natural habitat, reducing carbon, water, transport, food, materials, waste, economy, wellbeing, equity, and culture.

Walkability

What does walkability mean to municipalities? From large cities to villages, walking is seen as an affordable transportation alternative to driving. In larger municipalities, it is also linked to transit, as riders often connect with transit via pedestrian routes. A large number of municipalities (18) have considered walkability in their land use plans, either by promoting walking, incorporating trail systems, or having plans to develop walking trail systems. A number of respondents have plans to increase the number of walking paths in their municipalities, incorporate walkability and trail systems into new developments, and ensure that developments are connected by trails.

Landscaping

Four municipalities have taken actions in regard to land use planning, by planting trees as a carbon offset, naturalizing boulevards to reduce need for irrigation, enhancing riparian area

² Xeriscaping is a sustainable landscape technique that conserves water and is based on surrounding horticultural practices. The word xeriscaped was derived from the Greek word for dry to describe low water-use practices (City of Calgary 2007).

health to reduce erosion and runoff into waterways, and implementing a state-of-the-art pesticide management program.

Table 2: Land use planning interview results-towns and cities

Response	Frequency
Considered in Municipal Sustainability Plan	10
Working on plan	6
Land Use Plan	16
Walkability	18
Land Use Bylaw rejected	1
Sustainable land use planning is requirement for new developments	8
Municipality is aware of sustainable land use	6
Green landscaping	4

Actions-Small Communities

Sustainable land use plan

In terms of small communities taking action towards land use planning, a few municipalities are currently considering sustainable land use planning, while six are currently working on a sustainable land use plan. Approximately half of the small communities interviewed have sustainable land use planning as part of their municipal plan. For example, numerous municipalities include walkability within their land use plans. One interesting example of incorporating land use planning is within the Town of Picture Butte which has planned three new subdivisions that are close to elementary and high schools, which promotes walkability. One other interesting example is from the Town of Brooks, where council wants all new subdivisions to be linked with pathways.

Three municipalities consider themselves as too small to consider sustainable land use planning, stating that residents can already walk wherever they want or that the community is not growing enough to consider it.

Green landscaping

According to the FCM (2003), trees provide shade for buildings and streets. They also cool the air with moisture, reducing the amount of energy required to cool buildings. Five small communities are involved in green landscaping. For instance, the Town of Trochu is looking into planting trees and plants that need minimal water and fertilizer. Other communities are planting additional trees or putting back plants/trees that were previously removed.

Table 3: Land use planning interview results-small communities

Response	Frequency
Considered sustainable land use planning	2
Currently working on sustainable land use planning	6
Sustainable land use is already part of development plan	9
Too small to consider	3
Green landscaping	5

2.1.3 Outdoor Lighting

Emissions

Streetlights account for an average 15 percent of GHG emission from the corporate sector, with traffic lights accounting for approximately 10-25 percent of the total energy used for lighting (FCM 2003).

Actions Towns and Cities

Light emitting diode (LED) traffic signals

LEDs are 80-90 percent more efficient and last ten times longer than traditional light fixtures. They reduce energy costs, maintenance, and labour costs while reducing GHG emissions. Eight municipalities are currently installing LED traffic signals. For example, the Town of Blackfalds is currently installing its first LED traffic signal in the community.

Six municipalities have already replaced a number of their traffic signals with LEDs, while four municipalities have replaced all traffic signals with LEDs. One municipality funded the replacement using the Energy Management Revolving Fund. Two municipalities have considered replacing their traffic signals and four municipalities have not upgraded their signals because their traffic signals are owned by Alberta Infrastructure.

Table 4: LED traffic signal interview results-towns and cities

Response	Frequency
Currently installing LED traffic signals	7
Some signals replaced with LEDs	6
All signals replaced with LEDs	4
Considered replacement/will replace	3
Signals under provincial jurisdiction	4

Energy efficient streetlights

Eleven towns and cities have upgraded their streetlights to higher efficiency models. Five of these municipalities upgraded their high pressure sodium (HPS) lamps from 250 watt bulbs to more efficient 150 watt bulbs that reduce energy consumption and light pollution.

The majority of towns and cities interviewed are exploring other lighting options. Notable examples include the Town of Coaldale which is currently implementing a pilot project exploring the use of solar power LED streetlights. In addition, the City of Loydminster and Town of Jasper are also exploring LED street lighting, but responded that there are not any appropriate LED lamps commercially available yet.

The Town of Olds is exploring options to reduce overall lumens emitted by streetlights and what standards streetlights have to meet. Industry illumination standards might be an issue, where current LEDs do not meet the current standards.

The City of Calgary retrofitted 37,000 streetlights with low energy flat lens fixtures. The City reports energy savings of 25,000 megawatt hour (MWh), generating electricity savings of \$1.7 million a year and 16,000 tonnes of GHG reduction. By 2011 or 2012, the City estimates that it will regain the cost of installing the new fixtures from energy savings.

Table 5: Energy efficient streetlight interview results-towns and cities

Response	Frequency
Have upgraded streetlights to more efficient models	11
Utility company deals with streetlights	6
Exploring options	10

Actions-Small Communities

Energy efficient streetlights

Two municipalities have plans to upgrade municipal streetlights. One noteworthy example is the Village of Beiseker, which is planning on installing an energy efficient light post in front of each residence. Consequently, the Village is only installing new streetlights along major roadways of new developments.

Four municipalities are not able to upgrade municipal streetlights because the streetlights are owned by either Fortis or ATCO.

Table 6: Energy efficient streetlight interview results- small communities

Response	Frequency
Utility company deals with streetlights	4
Council has looked into it	2
Completing upgrade	4
Other initiative	2
No plan to upgrade	2

Examples

Change traffic lights to light emitting diode (LED) fixtures

According to the United States Department of Energy, 22 percent of electricity consumed in the United States powers lighting. Rapid adoption of LED lighting in the next 20 years can reduce electricity demands from lighting by approximately 60 percent, eliminating 258 million metric tons of GHG emissions and saving \$155 billion or more. Since lighting accounts for an average of 15 percent of GHG emissions from corporate sector, there are significant financial and environmental benefits from installing energy efficient streetlights.

Please see Appendix 1 for a more detailed description of LED streetlights and examples of pilot projects.

2.1.4 Buildings

Emissions

Municipal buildings account for an average of 48 percent of the GHG emissions released by municipalities (FCM 2003).

Actions - Towns and Cities

Retrofits to municipal buildings and recreation facilities

Sixteen towns and cities have retrofitted recreation facilities, including pools, arenas, and curling rinks. Upgrades and retrofits include replacement of old boilers, upgrading lighting and ice plant, and replacing old furnaces with high efficiency furnaces. Notable retrofits include the Town of Cochrane using heat from the arena ice plant to heat the building (i.e. cogeneration). The Towns of Rocky Mountain House and St. Paul upgraded their arenas by installing computer monitored temperature controls.

A handful of towns and cities are planning on building new recreation facilities that incorporate such things as energy efficient lighting.

Twelve municipalities are currently retrofitting or have retrofitted their municipal buildings. One noteworthy example is the City of Wetaskiwin which recently (2007) purchased an old courthouse, retrofitted the building and installed geothermal heating and cooling. The old courthouse is now used as the City of Wetaskiwin’s new town hall. A similar example can be found in Drayton Valley, where the town office is in an old arena which has had an energy efficiency retrofits

Three municipalities are looking at constructing a new municipal office. For instance, the Town of Claresholm is looking at building a new municipal office that incorporates solar, geothermal, and wind energy. Four municipalities are currently building new municipal buildings. The Town of Slave Lake is building a new municipal building and library that are LEED silver and the County of Stratcona is building a community centre that will be LEED gold.

Two municipalities have plans for retrofits to municipal buildings, such as installing new windows and doors. Two municipalities have formal plans regarding retrofits, including the Town of Whitecourt with a Facility Management Plan, listing a number of options for retrofits. Another example is the Town of Pincher Creek with a Facilities Master Plan, aiming at reducing maintenance and operating costs.

Table 7: Retrofits interview results- towns and cities

Response	Frequency
Pilot project in place	1
Have retrofitted recreation facilities	16
Looking at retrofitting recreation facilities	2
Currently constructing new recreation facilities	3
Currently retrofitting/have retrofitted municipal buildings	13
Looking at constructing new municipal buildings	3
Constructing new municipal building	4
Plans for retrofits to municipal buildings	2
Energy management plan for buildings	2
Municipal buildings need to be replaced	1

Completed energy audits on municipal buildings and recreation facilities

Fourteen municipalities responded that energy audits were completed on the majority of their municipal and recreation buildings. Six municipalities have completed energy audits solely on their recreation facilities. Audits were performed on arenas, pools, and activity centres. One

notable example is the Town of Coaldale, where an energy study was completed on the local pool exploring the use of solar energy.

Four municipalities have completed energy audits solely on their municipal buildings. For instance, the Town of Jasper completed a heat loss survey on all of their municipal buildings in order to locate areas where energy efficiency could be improved.

Table 8: Energy audits on municipal buildings and recreation facilities -towns and cities

Response	Frequency
Energy audits done on recreation facilities	6
Energy audits done on municipal buildings	4
Energy audits completed on all buildings	14
No point	1

Green standard/energy efficiency standard

Ten municipalities have a formal LEED policy in place, where all new municipal buildings are required to be LEED certified. One interesting example is from the Town of Okotoks, where official LEED certification is not required, but the Town has what is referred to as “LEED shadow” policy. The Town of Okotoks council believed that it was too costly to get formal LEED certification, but still built to LEED equivalent standards. Another noteworthy example is the City of Spruce Grove’s Green Buildings Policy, which stipulates that all major renovations and new constructions of City owned Facilities will meet LEED standards.

Six municipalities have informal energy efficiency guidelines, where energy efficiency is considered but not a formal requirement.

Six municipalities are currently exploring the option of a LEED policy. For example, the Town of Cochrane is currently working on a policy to ensure that all municipal buildings are LEED certified. The Town of Slave Lake is currently exploring options and estimating the cost of implementing a LEED policy. Three municipalities consider implementing a LEED standard as unrealistic due to the cost of getting LEED certification.

Table 9: Green standard interview results- towns and cities

Response	Frequency
LEED policy for municipal buildings	10
Informal energy efficient standard	6
Certain facilities meet LEED	5
Currently exploring policy	6
LEED standard is unrealistic	3
Ideas	1

Municipal district heating system

District heating, which uses hot water or steam to generate power in one central location, distributes energy through underground pipes to a network of buildings that are connected to the central system. The district heating can be used to heat space, water and to power cooling systems (Roberts and Bollinger 2008). Advantages of district heating include increased energy efficiency, GHG reductions, and being more economical than conventional individual heating systems (Roberts and Bollinger 2008).

Three towns and cities have a district heating system. The Town of Okotoks is the first Town in North America which has built a solar powered district heating system. In 2006, Strathcona County replaced existing heating units in all municipal buildings with pipes linked to a district heating system. The City of Calgary is currently developing a district heating system in the east downtown core.

Four municipalities have explored the implementation of a district heating system. For example, the Town of Jasper is exploring a district heating system for recreation centres. Two other municipalities are planning a district heating system.

Table 10: Municipal district heating system interview results -towns and cities.

Response	Frequency
Proposals	4
Planning for one	2
Currently have a district heating system	3
Cogeneration	2
Currently impractical	1

Encourage replacement of indoor lights with energy efficient models

Fifteen municipalities upgraded lights in their municipal and recreation facilities. For example, the Town of Cochrane and Turner Valley have installed motion detectors for lighting systems in all municipal buildings. The Town of High Level has placed all of its buildings and mechanical systems on timers.

Table 11: Replacement of indoor light bulbs interview results- towns and cities.

Response	Frequency
Upgraded lights in municipal/recreation buildings	19
As light bulbs fail	2

Actions - Small Communities

Retrofits to municipal buildings and recreation facilities

Eight small communities have performed retrofits to municipal buildings. Examples of retrofits include installing high efficiency siding, energy efficient lighting, upgrading windows and installing new low maintenance roofing. One interesting retrofit is from the Town of Picture Butte, which installed new insulated doors in the fire/ambulance hall and arena that close automatically.

Two small communities have built new municipal buildings. The Village of Breton is currently constructing a new LEED certified municipal building with help from the FCM's Green Municipal Fund. The Town of Sundre was planning on constructing a new community centre as green as possible, but when considering the overall return, the Town decided that it did not pay off to meet LEED or Built Green Standard.

Five small communities are planning on replacing their village/town office. For instance, the Town of Trochu is currently working on a plan for new town office in 2011 which will meet both LEED and Built Green standards.

Three small communities are planning to construct a new recreation facility, where the Town of Trochu is working on a plan for a new arena in 2010, incorporating both LEED and built green standards. The Town of Sundre is planning on building a new green arena in 2012.

Eleven small communities have completed retrofits on their recreation facilities. For instance, the Village of Edgerton has recently performed a major energy retrofit on their arena that incorporates energy efficient systems. One interesting example is a shared project between the Town of Trochu and Three Hills. This project involves sharing staff, where the Town of Three Hills is working on Trochu's swimming pool and the Town of Trochu is working on the Three Hills arena.

Table 12: Retrofits to municipal buildings and recreation facilities interview results- small communities

Response	Frequency
Retrofits to municipal buildings	10
Future plans to retrofit municipal buildings	4
Plans for construction of new recreation facility	2
Recreation facility retrofits completed	11

Completed energy audits on municipal buildings

Eleven municipalities have performed energy audits on their municipal buildings and recreation buildings. For instance, the Village of Nampa identified problem areas in their municipal buildings, which is why the Village is currently retrofitting its municipal buildings.

Table 13: Energy audits on municipal buildings interview results -small communities

Response	Frequency
Performed energy audits	11

Policy to ensure new municipal buildings reach minimum green standard

Seven small communities are considering a policy to ensure all new municipal buildings reach a minimum green standard. The Village of Nampa understands that higher standards need to be met and are therefore considering a green standard policy. Similarly, the Village of Warner aims to increase energy efficiency, but there is no formal policy in place. For example, Warner’s new Athletic Centre has low flow toilets.

Three small communities responded that creating a policy to ensure a minimum green standard or energy efficiency standard is currently unfeasible due to financial limitations.

Table 14: Minimum green standard policy interview results -small communities

Response	Frequency
Considering putting policy in place	7
No plans/not feasible	3

Encourage replacement of indoor lights with energy efficient models

Nine small communities have replaced a number of lights in their municipal buildings. The majority of these communities replaced all their lights with fluorescent bulbs. The Town of Provost has installed timers for the lights in their recreation facility to increase energy efficiency.

Table 15: Replacement of indoor lights interview results -small communities

Response	Frequency
Replaced lights in municipal buildings	9

Examples

Building retrofits

The City of Drummondville Quebec has invested in the remote management of its main buildings in order to reduce GHG emissions and save energy and money. The retrofits that Drummondville implemented include remote management system of controls, the management of set points, shutdown of the ventilation system during periods when the building is not used, temperature control when equipment is in use, the control of an engine block heater for heavy and light machinery and the replacement of older equipment with high-efficiency units. Since 2000, the City has invested \$125,000 in building retrofits, resulting in 1,747 tonnes of GHG reductions and \$450,000 in savings.

2.1.5 Renewable Energy and Conservation

Actions- Towns and Cities

Purchase renewable energy

Renewable energy is electricity that is produced generating no GHG emissions. Local energy providers often sell green power in blocks of energy to interested consumers. Examples of green power include wind turbines, photovoltaic cells, and small hydroelectric generators. Municipalities can commit to meeting a portion of their energy consumption with green power in order to reduce GHG emissions. For instance, the City of Calgary committed to purchasing wind energy to run its trains, representing an 18 percent of the city's energy use.

Thirteen municipalities belong to the AMSC energy aggregation program, where the majority of these municipalities did not know what percentage of renewable energy they purchase. Four municipalities are looking into the AMSC's new energy aggregation program. The Town of Banff recently signed on to purchase 100 percent renewable energy through the AMSC Aggregation Program.

Out of their total energy load, six municipalities purchase 10 percent or lower renewable energy, while nine municipalities purchase twenty percent or greater. Notable examples include the Town of Pincher Creek and Town of Okotoks which purchased 40 percent and 80 percent renewable energy, respectively. In addition, the Town of Turner Valley has a 50 percent renewable energy goal for their 2009 contract.

Table 16: Purchase renewable energy interview results- towns and cities

Response	Frequency
Part of AMSC aggregation program	13
Purchase ≤ 10 percent renewable	6
Purchase ≥ 20 percent renewable	9
Municipality unaware of available options	1
Looking into aggregation program	3
Cost issue	1

Renewable energy projects

Ten municipalities are researching the use of solar power for municipal buildings and recreation facilities. Examples include the Town of Jasper which has a solar demonstration project, the Town of Pincher Creek which has a solar power demo unit on its municipal building, the Town of Olds which is reviewing the use of solar power for aquatic centres, and the Town of High Level which is looking at solar streetlights for town parks. One other notable example includes the Town of Okotoks which has the Drake Landing Solar Community. The Solar community aims to supply 90 percent of home’s energy through solar power.

Three municipalities are exploring wind power options. For instance, the Town of Claresholm is exploring the use of wind power on its municipal buildings and the City of Lethbridge is looking into small, localized wind energy generation.

Five municipalities are exploring the use of geothermal energy in their municipal and recreation facilities. One noteworthy example is the use of geothermal energy to heat the Town of Rocky Mountain House’s pool. The Town of Turner Valley is exploring the use of old wells for geothermal energy.

Four municipalities are exploring other green options. One interesting example is a heat recovery system for a multiplex facility in the City of Lloydminster.

Table 17: Renewable energy projects interview results -towns and cities

Response	Frequency
Solar project	10
Wind project	2
Geothermal project	5
Exploring green options project	4

Energy conservation programs

Five municipalities have started an energy conservation program. For example, the City of Edmonton started CO₂RE, Edmonton’s Greenhouse Gas Reduction and Energy Strategy, in 1999. CO₂RE focuses on reducing GHG emissions from the residential, commercial, and industrial sectors. Between 2004 and 2007, CO₂RE program focused on helping residents improve energy efficiency through education and financial incentives. For information, please visit <http://www.co2re.ca/about.html>.

Informal energy conservation programs were started by five municipalities. These include internal energy conservation programs for municipal staff.

Three municipalities are currently exploring energy conservation programs by looking at ways to reduce consumption.

Table 17: Energy conservation programs interview results -towns and cities

Response	Frequency
Looking at energy conservation program	3
Informal programs	3
Formal programs	5

Actions- Small Communities

Purchase renewable energy

Six small communities are part of the AMSC aggregation program, which indicated that these municipalities purchase a minimum 20 percent renewable energy during the last contract period. Two small communities purchase renewable energy from another vendor.

Table 18: Purchase renewable energy interview results -small communities

Response	Frequency
Part of AMSC aggregation program	6
Purchase renewable energy from other vendor	2
Planning on joining AMSC aggregation program	2

Renewable energy projects

Two municipalities have explored using solar power. The Village of Warner explored using solar energy to power their arena. However, the Town performed a cost-benefit study and decided that the cost savings were insignificant. The Town of Mayerthorpe recently installed solar lights for highway markers.

Table 19: Renewable energy projects interview results- small communities

Researched	Frequency
Researched	2
Installed	1

2.1.6 Waste

Emissions

Waste disposal on land represents 1.1 percent of Alberta’ emissions profile (Environment Canada 2006).

Actions-Towns and Cities

Community wide composting and recycling

Six municipalities have a curbside recycling program. For instance, the City of Edmonton has a blue bag recycling program in place that diverts 30 percent of waste from the landfill. The rest of the waste goes to a separation facility where organic material is separated from the rest of the waste and is shipped to a composting facility. This results in a 60 percent landfill diversion rate.

The Town of Taber will soon have a curbside recycling program that will be operated by a private firm. The reason for this move is due to growing financial costs of transferring waste to Lethbridge. The majority (23) of municipalities interviewed have depot recycling.

The Town of Whitecourt, the Town of Stony Plain, the Town of Olds, and Strathcona County mentioned that they have curbside composting programs.

The Regional Municipality of Wood Buffalo (RMWB) has recently approved a solid waste master plan, which aims to increase the number of recycling depots, institute curbside recycling by 2010, and construct a recycling facility by 2009. The RMWB, in partnership with Suncor, started a recycling awareness program in 2005.

Four municipalities had recycling programs that were unsuccessful, or were unable to create a recycling program. For instance, the Town of High Level has tried to start a recycling program, but found that it was cost-prohibitive. In addition, the Town of High Level cannot entice companies to transport recyclables out of the Town. The City of Lloydminster had a composting program and provided composters and workshops, but the program was minimally successful. Two municipalities are currently looking at a composting program. For example, the Town of Turner Valley is exploring options in order to get a composting program but currently does not possess the land required to hold organic material.

Table 20: Community wide composting and recycling interview results- towns and cities

Response	Frequency
Curb side recycling program	6
Curb side composting program	5
Looking at composting program	2
Depot recycling	23
Depot composting	16
Other recycling	3
Unsuccessful recycling program	4
Plans for improving recycling program	1

Financial disincentive to reduce waste

Thirteen municipalities currently have a bag limit to reduce the size of the waste stream entering the landfill. One notable example is from the Town of Coaldale, where the Town is implementing an automated garbage system in 2009 that will restrict households to one container. The Town of Coaldale outlined three reasons for implementing this type of system: reducing the number of injuries to workers from lifting cans, reducing landfill tipping fees, and reducing the total waste stream entering the landfill.

The City of Lethbridge uses a cart system to reduce the waste stream entering the landfill. Residents can either purchase three bag or five bag carts, where the carts are priced to reduce waste. The City of Wetaskiwin has a similar system that was recently introduced, where residents can purchase three types of containers (three, four, or five bags), and waste management does not pick up anything outside of the containers.

One interesting example is from the Town of Drumheller, which currently has a limit of three bags. However, the Town says that the bag limit is unsuccessful at reducing the waste stream since the waste management contractor still picks everything up, even if it is beyond the limit.

Table 21: Disincentive to reduce waste interview results -towns and cities

Response	Frequency
Bag limit proposed	6
Have bag limit	12
Pricing system/disincentives	6

Upgraded waste management facility to employ methane capture

Four municipal landfills have methane capture systems in place, which reduces methane emissions (a potent GHG) and can be used to generate electricity. For example, the City of

Edmonton’s Cloverbar landfill generates 10-15 percent of Edmonton’s electricity from methane gas. Five municipalities are planning on implementing a methane capture system. For instance, the RM of Wood Buffalo is completing a landfill project that will see methane capture system. Phase two of the project is underway, which is construction of the facility that will capture methane. The City of Lloydminster is following the technologies of other cities, stating that methane capture is just down the road. Lethbridge is currently exploring a methane capture system for the municipal landfill.

Table 22: Methane capture interview results- towns and cities

Response	Frequency
Other upgrades to landfill	4
Looking into methane capture	2
Landfill has methane capture	4
Planning on implementing methane capture system	5

Other Waste Reduction Initiatives

The following illustrates other waste reduction measures that towns and cities have taken that do not fit into the above categories. For example, the Town of Blackfalds and Town of Trochu are working with the Central Alberta Waste Commission, examining a proposal to generate electricity through the gasification of waste. These Towns believe that the gasification of waste will reduce the carbon footprint of the entire region.

The Town of Okotoks has set a goal of zero net waste by the year 2015. Similarly, the Town of Stony Plain has set a goal of land filling zero waste from town events.

One other interesting example is from the Town of Turner Valley, which will ban the sale of Styrofoam by the end of the year. The Town is implementing education campaigns for schools and businesses to reduce Styrofoam use.

Actions- Small Communities

Community wide composting or recycling program

The Village of Breton and Beiseker are the only small communities interviewed that have a comprehensive curbside recycling program (2006). The Town of Picture Butte offers curbside cardboard recycling.

The majority of small communities (16) have a depot recycling program for the last five to ten years. The Village of Barnwell has a community recycling depot and will start a curbside program by the end of July 2008.

Thirteen communities have a depot composting program, which on average, have all been started within the last few years.

A few communities are looking into starting a recycling program. For example, the Village of Hythe is currently exploring the feasibility of initiating curbside recycling by 2009, and the Town of Trochu is working with Three Hills to get a recycling program.

A few communities had composting programs, but due to lack of support the programs are now discontinued.

Table 23: Community wide composting or recycling program interview results -small communities

Response	Frequency
Curbside recycling	3
Depot recycling	16
Depot composting	13
Not anymore	3
Looking into recycling program	3
Looking into composting program	5

Financial disincentives to reduce waste

Six communities have bag limits in place which range from two to four bags. The Town of Swan Hills is reducing the current bag limit from six to four bags and will begin operation of a new waste management vehicle that uses a tool to pick up special bins that can only hold the bag limit. The Village of Boyle has a four bag limit but is implementing a bag-tag program that will encourage recycling. Four small communities are planning on implementing a bag limit to reduce the waste stream entering the landfill.

Table 24: Financial disincentives to reduce waste interview results- small communities

Response	Frequency
Bag limit	6
Bag limit being explored	4

Examples

Start community-wide composting program

The Halifax Regional Municipality started an organic green cart composting program, where every household was provided with a green cart for food and organic waste that is collected every second week. Within the first year of the program (1999/2000), the program managed to divert 36,000 tonnes of organic waste from the landfill, reducing GHG emissions by approximately 502,755 tonnes for the community (FCM 2003).

Use financial incentives to reduce waste

By using financial incentives to encourage community members to reduce waste, the amount of methane and other GHG emissions released by landfills can be decreased. For instance, the households of Markham, Ontario are limited to three bags of garbage each collection day. Residents must purchase tags to put out more garbage, as they are only given 12 free tags a year. Other programs include special taxes or advanced disposal fees on items that are packaged in non-recyclable materials. All these methods send a message aimed at changing personal behaviour (FCM 2003).

2.1.7 Water and wastewater treatment

Emissions

Water conservation is another effective method of reducing municipal GHG emissions given that water and sewage treatment account for an average 21 percent of corporate GHG emissions (FCM 2003). For example, for every one million litres of water The City of Calgary treats, approximately 375kg of GHGs are released (The Natural Step Canada 2008).

Actions- Towns and Cities

Full cost accounting for water and sewer

Full cost accounting for water and sewer refers to a method of accounting that captures all the costs (both monetary and non-monetary) relating to the provision of water services. It includes all operating and maintenance expenses, depreciation on assets, and provision for the replacement of capital assets employed in providing water services. Sustainable cost recovery is critical to providing a financial framework for funding water resources. As systems age, capital investments are required to renew existing water systems and to build new infrastructure. Costs of upgrading can too easily be deferred unless capital costs are built into infrastructure budgets (Alberta Environment 2008).

Eighteen municipalities have employed full cost accounting. Six of these municipalities have employed full cost accounting over the last 10 years or longer. Others have implemented full

cost accounting more recently. The Town of Drumheller has built full cost accounting into their Tangible Capital Assessment Program. In 2008, the RM of Wood Buffalo approved a “self sustainable support rate strategy” for their utilities.

Fourteen municipalities are close to full cost accounting (approximately 80 percent full cost accounting). A number of towns and cities are trying to achieve full cost accounting, although many responded that it is a slow process.

In order to achieve full cost accounting, twelve municipalities are adjusting the utilities rate structure. For example, the Town of Okotoks is moving away from a 50/50 split (50 percent of utility bill is a flat rate and 50 percent of bill is consumption) and working towards a 10/90 split. The Town of Okotoks believes that it is necessary to create a utility structure to encourage reduced consumptions.

Table 25: Full cost accounting interview results -towns and cities

Response	Frequency
Adjusting rate structure	12
Employed full cost accounting	17
Partial full cost accounting	14

Residential/ commercial water conservation programs

Seventeen municipalities currently have water conservation awareness campaigns in place. Awareness campaigns range from website advertisements, campaigns, open houses, water conservation kits, and newsletters. One interesting example is from the Town of Camrose, which has a “Conserve Water Today: Don’t be a Drip” campaign that lists benefits of reducing water use, watershed protection, reduced utility bills, and extending the life of the water treatment plant. One other notable example is the Town of Stony Plain which sells water conservation kits, including low-flow shower heads and xeriscaping supplies.

Four municipalities have water conservation programs in place. For instance, the Town of Cochrane has had a water conservation plan in place for a number of years, which it continually builds upon in order to deal with droughts. Three municipalities are developing a water conservation plan. For instance, the City of Spruce Grove is considering a motion to investigate water savings measures.

Ten municipalities have mandatory water restrictions that can be implemented when required. Water restrictions include lawn watering schedules and bylaws that limit water use in order to maintain reservoir levels.

Five municipalities have rebate programs in place to encourage water conservation. Common rebate programs include rebates for low-flow devices (e.g. toilet rebate program) and giving away low-flow devices.

Eleven municipalities require developers to use low-flow devices in new developments. One noteworthy example is the Town of Turner Valley which requires all new municipal buildings to have two water systems (one gray water and one sanitary). Through a revised water bylaw, the City of Edmonton requires low-flow water devices for all new construction and renovations which require plumbing permits. Similarly, the Town of Wetaskiwin recently passed a water bylaw which requires all new buildings and retrofitted buildings to use low-flow devices.

Table 26: Water conservation program interview results- towns and cities

Response	Frequency
Rebate program	7
Low flow water fixtures required	5
Education campaigns	13
Development of water conservation program	3
Water restrictions	10
Water conservation programs in place	4
Developers need to use low flow devices	11

Sell rain barrels at reduced prices

Seven municipalities sell rain barrels at reduced prices to encourage water conservation. Three municipalities are considering doing this. For example, The Town of Claresholm is in negotiations with a manufacturer to supply rain barrels.

Table 27: Sell rain barrels interview results- small communities

Response	Frequency
Currently sell rain barrels	8
Considering	3

Wastewater/water treatment plan upgrades

Six municipalities have completed upgrades to the municipality’s water treatment plant. For instance, the City of Red Deer has completed a \$50 million upgrade to the water treatment plant and the Town of Claresholm is installing solar panels on the water treatment plant. The Municipal District (MD) of Crowsnest Pass plans to avoid having lift stations, trying to ensure

gravity flow for new developments. Two other municipalities are planning to upgrade their wastewater treatment plant.

Eighteen municipalities are completing upgrades or have recently completed upgrades to their wastewater treatment plant. For instance, the City of Edmonton is installing tertiary treatment which will use UV disinfection on effluent released into the river. The RMWB has a LEED silver certified biological nutrient removal plant for their wastewater treatment plant. The City of Red Deer employs methane capture in their wastewater treatment plant to produce heat that ‘runs’ the plant. The Town of Okotoks recently completed a major expansion of their plant in 2006. The new plant is state of the art and uses highly efficient technology.

Five municipalities have completed upgrades to their wastewater lagoon. In 2002, the City of Lethbridge installed a methane collection system on their sewage lagoon that produces electricity. The Town of Drumheller uses solar power aerators that help circulate water in wastewater lagoons. The Town of Taber only activates its variable speed pumps in off-hours, where the energy is cheaper than during peak hours.

One interesting example of water infrastructure upgrades is from the Town of Turner Valley. The Town thought that it had to build a new water treatment plant to provide water for the community, but discovered that 42 percent of water was lost through leaks in the water infrastructure. Consequently, the Town repaired leaks in the water works and no longer requires a new water treatment plant.

Table 28: Water/wastewater treatment plant upgrades interview results-towns and cities

Response	Frequency
Upgrades completed to water treatment plant	6
Building new wastewater treatment plant	1
Planned upgrades to wastewater treatment plant	2
Upgrades completed to wastewater lagoon	8
Looking at upgrading lagoon	1
Completing upgrades to wastewater treatment plant or have recently completed	18
Others	5

Small Communities

Full cost accounting for water and sewer

Four municipalities employ full cost accounting and three municipalities are just starting to do so. One notable example is the Town of Sundre, where the sewer and water utilities are run

like a business and maintain a reserve for depreciation. In 2006, the Town of Picture Butte started a three year program towards full cost accounting. The program has been largely successful and is in its third year.

The Town of Swan Hills employs full cost accounting only for operational expenditures and does not include capital expenses.

Two municipalities are looking into full cost accounting. For example, the Village of Hines Creek is exploring full cost accounting through the Town’s Tangible Capital Assets program.

Seven municipalities have recently implemented water metering. After starting to meter water, the Village of Chauvin noticed a reduction in water consumption, especially lawn watering.

Table 29: Full cost accounting interview results-small communities

Response	Frequency
Water metering	7
Full cost accounting	5
Just starting to full cost account	3
Looking into it	2

Residential/ commercial water conservation programs

Four municipalities have implemented water restriction policy within the last five years. Four municipalities have public awareness campaigns to encourage water conservation. Public awareness campaigns include providing low-flow devices to residents, newsletters, and information booklets. For instance, over the last couple of years, the Town of Mayerthorpe has given out household guides to water efficiency, describing ways to reduce water use.

One noteworthy example of the importance of water conservation is from the Village of Boyle. In 2008, the Town was given an enforcement order to discontinue use of Skeleton Lake water due to excessive consumption. The Town is in the process of doing leak detection for its water infrastructure and has begun a water conservation program that aims to educate the public.

One municipality does not have a water conservation program in place because it has decided not to implement a program until water shortages are experienced.

Table 30: Water conservation program interview responses-small communities

Response	Frequency
Policy for watering	4
Water conservation bylaws	4
Cost is enough to encourage conservation	2
Looking into water conservation plan	1
Public awareness	4
Do not have water conservation program	3

Sell rain barrels at reduced prices

Although no small communities currently have a rain barrel program, a number of small communities responded this would be an effective way of educating the public of the importance of water conservation.

Wastewater/water treatment plant upgrades

Ten municipalities have completed major upgrades to their wastewater treatment plant. Upgrades range from new lift stations, variable frequency motors, and upgraded water pumps. In 2007, the Village of Warner installed variable frequency drive motors on water pumps significantly reducing energy consumption. The Village of Barnwell has also recently built a new water treatment plant.

Seven municipalities have major upgrades planned. The majority of these upgrades are in response to more stringent water quality standards. For example, the Village of Hythe is planning to upgrade aeration equipment in the town’s sewage lagoon because it must reduce ammonia levels in the lagoon by 2009.

Table 31: Wastewater/water treatment plant upgrades interview results-small communities

Response	Frequency
New water treatment plant	1
Major upgrades completed	10
Major upgrades planned	7
No upgrades required	2

Examples

Start a water conservation program

The development of a water conservation strategy can result in emissions reductions, better water quality, and financial savings. For example, the City of Kamloops started the Water Smart

conservation program (1991) in response to high water use and demand on utilities during summer months. With this conservation program, the City has achieved a 21 percent decrease in water use during summer months through a combination of public education and improved water treatment technology (FCM 2003).

Sell rain barrels at reduced price

The City of Vancouver manufactures and sells rain barrels at 50 percent of their cost. Rain barrels not only serve the practical purpose of rainwater collection for use in the garden, but they are also instrumental in raising public awareness of wasteful irrigation practices. By using collected rain barrel water, residents are better able to conserve potable water for drinking and other household uses. In addition, less water pumped means fewer GHG emissions.

Launch an Awareness program on the importance of clean water

Municipalities can implement water awareness and outreach program initiative called the Yellow Fish Road Program (<http://www.yellowfishroad.org>) to promote water conservation. Working with volunteer organizations such as Girl Guides of Canada, municipalities can coordinate this education program designed to raise the importance of clean water, the water supply process, and the need to protect water sources by keeping toxic substances out of storm water sewer systems. Volunteers use a stencil to paint yellow fish beside storm sewer drains and hand out pamphlets to remind people not to dump chemicals down the storm sewer. Through education, residents can be taught the importance of protecting and conserving clean water

2.2 Emissions Indirectly Controlled by Municipal Operations

2.2.1 Transportation

Emissions

The transportation sector is the single largest source of GHG emissions in Canada (FCM 2007). In fact, the transportation sector is typically responsible for an average of 28 percent of GHG emissions from communities (Partners for Climate Change Protection 2000).

Actions - Towns and Cities

Public transportation initiatives

Eleven municipalities have a public transit system. For instance, Hinton just recently introduced a transit system, proclaiming that it is the smallest community in Alberta to have one. A number of municipalities, such as Medicine Hat and Spruce Grove, have inter-municipality commuter buses. Turner Valley has a small bus line that runs to Calgary. Unfortunately the

town has found that the system is largely unsuccessful since it is difficult to entice its citizens away from the perceived convenience of car use.

A number of municipalities are currently improving their transit systems. For instance, some municipalities are considering biodiesel buses, but have concerns regarding storage for biodiesel. Others are currently replacing older buses with hybrids and clean diesel buses. Apart from upgrades to buses, municipalities can also consider improvements to the operation of their transit systems. The County of Strathcona is reformulating bus routes to improve transit times. This may reduce the amount of fuel used and improve the attractiveness of taking transit.

Four municipalities are planning a public transit system. Other respondents indicate that a transit system is not feasible in their community due to size or prohibitive operating cost. Five towns and cities have a handibus transit system for the elderly and disabled. The Town of Rocky Mountain House is planning to develop a major recreational facility and is exploring the option of providing transit service to the facility in order to increase access. Nine other municipalities are developing a transit plan.

Table 32: Public transit initiatives interview results-towns and cities

Response	Frequency
Seniors/handicap transit system	5
Transit system not feasible	3
Transit system is being planned	4
Have transit plan	9
Transit system currently in place	11
Currently improving transit system	8

Carpooling

A few municipalities have incentives for carpooling. Examples of carpooling incentives can be found in the City of Red Deer, where the City increased the parking rates downtown and provides special parking for carpoolers at City Hall. Six municipalities have joined an online carpooling program (<http://www.carpool.ca/welcome.asp>) which provides information on carpooling and connects individuals looking for a carpool. Three municipalities encourage carpooling on municipal websites and through local colleges.

A few municipalities responded that it is not feasible to have a carpooling program due to the size of their community.

Table 33: Carpooling interview results-towns and cities

Response	Frequency
Have incentives for carpooling	2
Have carpooling program	6
Need to work on carpooling program	1
Community is too small	3
Encourage carpooling	3

Anti-idling bylaw

Five municipalities have an anti-idling bylaw, all passed within the last couple years. Some municipalities have informal policies to encourage staff to limit idling times.

A number of municipalities are exploring the possibility of an anti-idling bylaw due to air quality issues. Other municipalities have explored the possibility but it is very unlikely a bylaw will be passed due to factors such as lack of political support and enforcement issues.

Table 34: Anti-idling bylaw interview results- towns and cities

Response	Frequency
Have an anti-idling bylaw	5
Looking into it (will likely get passed)	6
Looked into it (won't likely get passed)	6
Informally discourage idling	2

Increase number of bike paths

Six municipalities have increased the number of bike paths/walking trails. Examples include creation of a Trail Master Plan to identify key areas that need to be worked on and adding trails regularly. One notable example is the City of Calgary which is working on bi-ways and on development of on-street bike paths. Since 1978, the City of Lloydminster incorporated a Walking Linkage Study Plan that aimed at interconnecting all areas of city by a trail system, which was emphasized to developers.

The majority of towns and cities interviewed are looking at increasing the number of bike/walking trails. One interesting example is a walking path being planned between the Town of Turner Valley and the Town of Black Diamond

Table 35: Increasing number of bike paths/walking trails interview results-towns and ciites

Response	Frequency
Increasing the number of bike paths/walking trails	6
Exploring options to increase number of bike paths	7

Actions-Small Communities

Increase walkability of communities and number of bike paths

Ten municipalities are looking at increasing the number of bike paths/walking trails within communities. For instance, Beiseker is looking at developing an entire bike path system next year. Two municipalities are currently increasing the number of trails and two municipalities have no formal plan. The Village of Warner is a bedroom community and is currently working on promoting carpooling.

Table 36: Increase walkability interview results-small communities

Response	Frequency
Looking at increasing number of bike/walking trails	11
Currently increasing number of bike/walking trails	2
Encourage walking	2
No formal plan	2
Working on carpooling	2

Examples

Provide parking incentive to carpoolers

For example, the Town of Markham Ontario provides preferential parking to carpoolers at municipal buildings. Incentives can also be created for individuals who drive hybrid vehicles or those that meet a higher fuel economy standard. These programs are easy and inexpensive to implement in communities where employees pay for parking at work and where there is an interest in carpooling. Other effective ways of promoting carpooling include providing parking incentives for vehicles with two or more passengers and waiving parking fees for vehicles with four passengers (FCM 2003).

Create incentives for public transit use

Provide transit passes at discounted prices to encourage high school, college, and university students to use public transit. Edmonton Transit implemented the U-pass program in winter 2008 in partnership with municipalities, post-secondary institutions and their student groups. The U-pass is a transit fare program that gives U of A undergraduate and graduate and fulltime MacEwan students' unlimited access to transit. The U-pass programs can facilitate transit

service improvements to the institution, reduce traffic congestion around the campus and local community, help reduce GHG emissions, and reduce demand for parking facilities (City of Edmonton 2007). Victoria implemented a similar U-Pass for college and university students in September 1999, decreasing car traffic on campus by 15-20 percent (FCM 2003).

Develop and maintain bike-friendly infrastructure

Bike lanes, trails and racks make cycling a safer, more attractive option for travel and community. Municipalities can encourage employers to provide bicycles for employees to travel to local meetings. The City of Fredericton has given priority to the continued expansion and development of trails in its Capital City Municipal Plan, committing to development of a city wide trail network that will enhance the recreation and commuting options of its residents (FCM 2003).

Initiate a commuter challenge, bike to work week or car-free day in your community

The commuter challenge encourages as many people as possible to use sustainable and active modes of transportation. Community registration is easy and completed online at <http://www.commuterchallenge.ca>. The event is promoted through municipal transportation departments and often partner with local non-profit groups to increase the awareness of the program and participation. More than 97 communities participated in the 2004 Commuter Challenge, reducing GHG emissions by more than 600 tonnes (FCM 2003).

2.2.2 Residential

Emissions

The residential sector is responsible for an average 23 percent of municipal GHG emissions (Partners for Climate Protection).

Actions- Towns and Cities

Guidelines or incentives for developers to build green

There are incentives for developers to build green in six municipalities. For instance, developers in the Town of Jasper do not have to pay offsite levies if they can show that they have built green. Similarly, Strathcona County and the City of Calgary offer building permit rebates for developers which build green. In two municipalities, there are informal build green guidelines such as recommending to developers to build as green as possible.

Three municipalities are considering guidelines for developers to build green. For instance, the Town of Slave Lake has been discussing over the last couple of months how developer

guidelines can be realized. Two municipalities responded that they hope that build green guidelines for developers will be addressed in their sustainability plan.

Table 37: Guidelines/incentives for developers to build green interview results-towns and cities

Response	Frequency
Would like developers to build green	3
Developers use low flow devices	6
Incentives	6
Informal	3
Will be addressed in sustainability plan	2

Encourage replacement of indoor light bulbs with energy efficient models

Twelve municipalities have participated in Phase I of Project Porchlight, which was held in spring 2008. From the Project Porchlight website: “Changing one light bulb is the gateway to broad public participation in climate change action and responsible energy use.” Phase II of Project Porchlight will be delivered to Edmonton and Calgary in the fall of 2008.

Actions Small Communities

Guidelines or incentives for developers to build green

Two small communities have informal guidelines or incentives for developers to build green. For instance, building green may be a condition of development in the Town of Mayerthorpe. As an example, if a developer wanted to construct a building, they would have to install low-flow devices. The Village of Boyle negotiates utility rates and offsite levies with developers if they build to a green standard. The Town of Picture Butte has had formal guidelines in place since 2007. The Town implemented a water bylaw which requires new subdivisions to have low-flow devices. One municipality is trying to informally encourage developers to take better care when developing by recycling asphalt for new roads.

Table 38: Guidelines/incentives for developers to build green interview results-small communities

Response	Frequency
Municipality has informal guidelines	2
Formal guidelines in place	1

Encourage replacement of indoor light bulbs with energy efficient models

Eight small communities participated in Project Porchlight.

Examples

Support and Encourage local residential energy efficiency initiatives

Residential audits of waste, water, and energy use are available under Natural Resource Canada's EnerGuide for House Programs. Staff provide residents with recommendations for infrastructure and lifestyle changes they can make to generate financial savings and reduce GHG emissions (FCM 2003).

Support community gardening

Surplus municipal land can be allotted to community groups interested in gardening. The plants in these gardens sequester carbon, offsetting a portion of community GHG emissions and improving air quality. The City of Vancouver's Parks Board allows non-profit groups to establish gardens on unused parkland. The City provides the lands, clears the grass and adds compost. Community groups establish education programs for school and children. To learn more about urban gardening, visit www.cityfarmer.org (FCM 2003).

Create guidelines for green buildings and sites

By increasing the energy efficiency of municipal buildings with the development of guidelines for green sites and building design, GHG emissions can be reduced. For example, the City of Montreal has developed a clean power energy system to power its Rivière-des-Prairie Eco-centre. Most of the Eco-centre's power needs are met by solar panels and by a wind turbine. The system reduces energy consumption by 20 percent, representing a three tonnes per year reduction in GHG emissions (FCM 2003).

3.0 BARRIERS AND SUPPORT

3.1 Implementation Barriers

The following paragraphs outline barriers that prevent or make it difficult for municipalities to implement climate change plans and programs.

Towns and Cities

Financial limitations/cost

Twenty-six municipalities responded that cost was the primary barrier that prevents or makes it difficult to implement climate change plans and programs. The Town of Brooks responded that there is an understanding that climate change programs (i.e. energy efficiency investments) will save money in the long run, but the high upfront costs limit options.

Other responses include: many technologies do not make it beyond demonstration projects because they are not cost-effective; limited financial capacity of the municipality.

Human resource limitations

Sixteen towns and cities responded that human resource limitations are a significant barrier to implementing plans or programs. A few responses from municipalities are listed below:

- “Council is committed to do their best to reduce their community’s carbon footprint, but there is not enough staff to research and implement programs.”
- “There is a lack of adequate staff time and attention to focus on specific climate change programs.”
- “Smaller towns and cities are just dealing with the most important issues that come up.”

Indifference and lack of awareness

Public indifference and lack of awareness are large barriers to the proactive implementation of climate change programs by municipal governments. Fifteen municipalities responded that there is a lack of awareness by residents. Respondents provided examples of negative attitudes towards taking action:

- “There is lots of landfill space, so there is no point in changing personal habits and generating less waste.”
- “We’ve done things this way forever, why would we change our habits?”
- “Water conservation will be a difficult one to sell because Cold Lake is so deep.”

One other issue is the public’s reluctance to accept tax increases for “frivolous things.” Other issues in regard to indifference and lack of awareness include: lack of personal incentives, gaining public buy-in, and individual perceptions of immediacy.

Political barriers

Eight municipalities responded that political barriers are a significant barrier. Common concerns were that there is a lack of commitment from local politicians and the provincial level and that there are political issues at the municipal level. For instance, municipal councils are re-elected every three years and councils can have different priorities after the election. This is a significant issue for proactive planning of climate change programs.

Policy

There is a lack of supporting municipal and provincial policies that are conducive to reducing greenhouse gas emissions. For example, certain land use bylaws could be amended. In the City of Edmonton sprawl is an issue when trying to cut municipal GHG emissions. One factor contributing to sprawl in Edmonton is the fact that it is less expensive for developers to develop a greenfield than redevelop a brownfield. This is not only a problem in the City of Edmonton.

There may be the need to change the tax structure so that greenfield development becomes more expensive. With a change in the tax structure, developers would be charged for the true cost of development (i.e. all of the externalities).

Some municipalities also responded that there is a lack of supporting provincial and federal policies for climate change programs. One municipality responded that “building codes aren’t keeping up, fuel efficiency standards aren’t keeping up, and municipalities need help with that to reduce emissions.”

One municipality responded that they do not have an overriding policy adopted to reduce emissions (corporate or residential) so there is no incentive to meet a GHG reduction goal.

Geography

Geographical layout of the city is often a barrier to implementing plans and programs. A good example of this is in the Town of Peace River. “Peace River has a huge challenge with geographic layout in terms of development. There are vast tracks of land between population nodes, strange layout, high operating budget, which creates a considerable challenge; taxation capacity is limited compared with other similarly sized communities. To try and make things happen without increasing taxes is difficult. The Town could use user fees or grants or incentives to help out.”

One other barrier to implementing climate change programs is the location of municipalities. For instance, the distance from other communities can limit options for recycling and composting because there is such a large distance to travel with recyclables to get processed.

Table 39: Implementation barriers interview results-towns and cities

Response	Frequency
Financial limitations	26
Human resource limitations	16
Lack of awareness by concerned citizen groups	8
Indifference	7
Political barriers	8
Policy barriers	4
Supplier issue	1
No formal policy to reduce emissions	1
Geography	2

Small Communities

Financial

Fifteen small communities responded that cost was the major barrier in implementing climate change plans or programs. High feasibility study costs and high upfront costs were common responses.

Human resources

Nine small communities responded that human resource limitations were the major barrier in implementing climate change plans or programs. Municipalities responded that lack of qualified staff that is the largest barrier. One respondent explains: "Small communities have very little staff but still have to comply with the same (environmental) mandates. There is only one person in charge of everything and it's too much. Environment issues take last place."

Four small communities responded that time was the largest barrier in implementing climate change plans and programs. For instance, the Village of Hythe responded that "between staff municipal administration and public works, there is barely enough time to get everything done." Small communities are often uninformed of climate change issues and programs because they do not have the time.

Size of community

Five small communities responded that the size of community and the community's location is the largest barrier to implementing plans and programs. For example, the Town of Trochu said that in order for a waste gasification project to be feasible, other communities must work together due to their small size. Economies of scale are needed.

One other good example is from the Village of Chauvin: "With electronics round up, we couldn't access funding because the scale of the project wasn't large enough."

Have not considered it

Four small communities have not considered climate change plans or programs. The following responses illustrate this:

"Our community has never really considered climate change plans. Our community tries to keep energy efficient buildings, but has no other goals."

Table 40: Implementation barriers interview results-small communities

Response	Frequency
Financial limitations	16
Human resources	9
Feasibility of requests	3
Size of community/location	5
Have not considered climate change	4

3.2 Climate Change measures - Wish List of Programs

The following paragraphs list examples of what municipalities would like to see in terms of climate change plans and programs if resources and different issues were not limiting factors.

Towns and Cities

Enhanced recycling, composting and waste reduction programs

Ten municipalities would like to see improved recycling and composting programs, more options to reduce waste stream, and expansion of existing programs. For instance, the City of Spruce Grove would like to see more innovative methods of waste management.

Water conservation

Thirteen municipalities would like to see more water conservation initiatives. These initiatives include: additional education campaigns, more alternatives for residences such as providing low-flow water devices, restrictions for new water licences, and multi-tiered water billing.

Policy

Four municipalities would like template policies and standards to follow. For example, there is strong political and public support for green initiatives in the Town of Slave Lake, but the Town believes that it would be beneficial to have a policy framework to guide implementation.

Renewable energy projects

Eleven municipalities would like to see additional renewable energy projects. Renewable energy showcases on municipal buildings increase energy awareness throughout the community. If residents see that a renewable energy systems work (such as geothermal or solar power) and that they provide significant benefits, there is a greater chance that residents will want to apply it to their home. It would be valuable if there was an ongoing program to encourage/fund municipal building pilot projects that showcase renewable energy.

Energy efficiency improvements for buildings

Fourteen municipalities would like to see additional programs that would increase the energy efficiency of municipal buildings. A few municipalities would like to see full implementation of LEED standards and more research on how to incorporate energy efficiency into municipal buildings and municipal operations.

Four municipalities would like to see more retrofits done on municipal buildings, recreation facilities, and homes. One notable example is from the Town of Claresholm. This Town would like to see the creation of multi-use buildings that contain more than one municipal service.

Municipal Fleet

Three municipalities would like to purchase more efficient vehicles.

Public education

Three municipalities would like to implement public awareness campaigns. For instance, the Town of Hinton would like to implement a community-wide education campaign and develop more non-vehicle solutions. Another interesting education campaign is educating contractors and individuals about the true cost savings of green buildings to encourage green building.

Public transit

Three municipalities would like to see increased public transit initiatives in communities. Responses range from increased number of buses, increasing parking fees, broader support for public transit, and inter-community transit. The Town of Lacombe would like to have transit that goes between municipalities in the region. This is largely because there are few employment opportunities within the Town of Lacombe and as a result there is a large amount of commuting to nearby municipalities.

Human resources/specialists

Three municipalities would like to have a person in charge of performing research and carrying out climate change programs.

Table 41: Climate change measures interview results-towns and cities

Response	Frequency
Enhanced recycling, composting, waste programs	10
Water conservation programs	13
New policies	4
Renewable energy projects	18
Energy efficiency improvements for buildings	13
More efficient fleet vehicles	3
Sustainability plans	4
Increased walkability	5
Increased public transit	3
Human resources/specialists	3

Small Communities

Retrofits

Seven municipalities would like to see additional building upgrades and retrofits to municipal buildings and recreation facilities. The Town of Swan Hills believes “energy efficient buildings would be a plus and would like to see more information and options.”

Lighting upgrades

One municipality would like to see all streetlights replaced with energy efficient fixtures “since they are a large cost to the village and streetlights do not provide any measurable benefits”.

Conservation programs

Ten small communities would like to see improved waste reduction and conservation programs. The Town of McLennan would like to see energy and water programs. Some small communities would like to see more comprehensive recycling programs, water recycling, and studies on best practices to conserve energy.

Research on feasibility of renewable energy projects

Four small communities would like to study the feasibility of renewable energy projects. A notable example is the Town of Trochu. There is a wind farm being constructed just outside of the Town, and the Town is interested in tapping into the wind farm grid. A few small communities would like to use solar panel and geothermal to power and heat municipal buildings.

Table 42: Climate change measures interview results- small communities

Response	Frequency
Retrofits	7
Additional lighting upgrades	1
Improved waste reduction/conservation programs	10
Research on renewable energy projects	4

3.3 Support from AUMA and Alberta Environment

Towns and Cities

The following are responses from towns and cities that were given without being prompted and were categorized based upon similarity.

Public awareness campaigns

Four towns and cities would like to see more public awareness campaigns on the importance of energy efficiency, water conservation, and the effects of climate change. For instance, one municipality would like to see province-wide information sessions to encourage individual actions towards energy conservation.

Technical assistance

Three towns and cities would like to see more technical assistance from the AUMA and Alberta Environment (AENV). A noteworthy suggestion is for specialists to come out to towns and cities. It would be very valuable to municipalities have specialist come out on site and assess what needs to be done, give advice, and help set projects up.

One municipality responded that “FCM has good programs, but you need an engineer to understand and implement the programs.” Therefore, it is important to put all of the info together in an understandable fashion.

Inventory of best practices

Five municipalities would like to see an inventory of best practices:

- Inventory of all programs, examples of success stories.
- Let communities know what is available in short descriptions.
- It would be useful to know whether all municipalities share the same needs.

Information

Five municipalities would like to have ready access to information on climate change and energy efficiency. Municipalities responded that they would like to see:

- Guidelines, training, workshops, online information, downloadable brochures, and education on new programs.
- An easy way of finding what is available, where it is available, cost, grants available, and individuals able to lead the project.

Assistance from the AUMA

Thirteen municipalities would like to see additional assistance from the AUMA. Examples of assistance include:

- Toolkits and templates outlining how communities can start environment committees, AUMA can draft up policies since it is hard to reinvent the wheel.
- AUMA can help with commercialization/aggregation/access/purchase of new technologies.
- AUMA/AENV can strategically position themselves to educate municipalities and apply social marketing. For example, there is an education program that explains benefits of mulching grass instead of bagging it, reducing the amount of grass entering the waste stream.
- Assistance in getting programs up and running.
- AUMA can organize hands-on seminars.
- AUMA can further test and endorse new technologies and processes that provide significant benefits.
- Communicating to government for support and making sure programs are beneficial to all partners

Assistance from AENV

Four municipalities would like to see additional assistance from AENV. Examples of assistance include:

- AENV can bring expertise to people since municipalities often lack organization, education, and expertise.
- AENV could be enabling agents, testing new technologies to verify whether the technology/methods are viable.
- AENV could assist in encouraging industry to partner with municipalities.

Current AUMA initiatives

Eight towns and cities discussed their approval of current AUMA initiatives:

- AUMA's annual resolution process is good because municipalities are able to bring their needs forward.
- AUMA brings leadership and develops useful templates.

- AUMA has realistic plans and recognizes municipal limitations, going after common interests of municipalities.
- AUMA showcases technologies. Most municipalities do not want to be first out of the gate with new technologies.
- AUMA has been creating lots of programs for renewables.
- AUMA’s lobbying for programs and funds.
- Advocacy –united front when proposing something

Financial assistance

Nine towns and cities would like to see more financial assistance such as incentives to initiate programs, subsidies, and grants. A notable example is from the Town of Peace River, “The recyclables market is very volatile so some form of incentive to subsidize the volatility would be beneficial to the recycling program”.

Policy

Four municipalities would like to see changes in policy to allow for climate change/energy efficiency plans to be easier implementable. For instance:

- Remove legislation barriers that restrict micro generation/ cogeneration.
 - Al-Pac wants to produce/promote cogeneration, but there is legislation preventing it.
- AENV create regulatory environment
 - Ban grass from entering landfill

Table 43: Support for action interview results-towns and cities

Response	Frequency
Public awareness campaigns	4
Technical assistance	4
Inventory of best practices	5
Information	5
Assistance from AUMA	17
Assistance from AENV	4
Current AUMA initiatives	10
Financial assistance	9
Policy changes	4

Small Communities

How AENV can support

The following outlines examples of processes that small communities believe AENV could alter to serve them better.

- Environmental mandates/changes need to be accompanied with funding for municipalities to be able to properly implement programs.
- AENV grant applications are difficult to understand and should be retooled.
- Large delay between announcement of eligibility and funding should be shortened.
- AENV should provide small communities with support for recycling programs.

Information

Twelve small communities would like to have easy access to information. The following are examples of what small communities would like to see:

- The AUMA could advertise new technologies, programs, and funding that is available .
- One pager provided by AUMA that has condensed info on programs and grants that helps manage reading time “so they do not have to do a full week’s reading to get relevant info.”
- Small communities would like to know what programs other small communities have implemented.
- Advertise the resources that AUMA’s website can provide.
- Advertise renewable energy projects.

Funding

Eight small communities believe that funding issues should be addressed.

- Non-matching grants
- Incentives and disincentives
- Knowing how much funding there is per region so that the community knows how good a chance they have of receiving a grant.

Cooperation and advocacy

Five small communities identified several points in regard to cooperation and advocacy.

Noteworthy examples of cooperation and advocacy include:

- Joint municipal projects that connect several communities together which share similar goals.
- Aggregate program to buy energy efficient street lighting (e.g. LEDs).
- AENV and Alberta Infrastructure need to work together and cooperate on projects.

Table 44: Support for action interview results- small communities

Response	Frequency
How AENV can support	6
Information resources	12
Human resources	4
Leadership	1
Funding	8
Cooperation/advocacy	5

4.0 RECOMMENDATIONS

4.1 Municipal Climate Change Action Plan

The Alberta Urban Municipality Association and Alberta Environment develop a Municipal Climate Change Action Plan which sets out the following:

- a) Vision
- b) Goals
- c) Principles
- d) Roles and responsibilities
- e) Categories and examples of actions
- f) Indicators of success
- g) Time frame
- h) Resources

4.2 Municipal Climate Change Action Centre

The Action Plan should be developed in conjunction with an information portal (i.e. website called Municipal Climate Action Centre). The Municipal Climate Change Action Centre will include information on effective actions municipalities can take to reduce emissions, adaptation, and funding and knowledge resources to support municipal efforts.

Information within the Municipal Climate Change Action Centre must be easy to access and understood. In other words, care will be taken to ensure info on the website is strategic and appropriate for municipalities so that it does not become overwhelming.

4.3 Team of Experts

There is a shared consensus that a Team of Experts or SWAT team be formed immediately to provide municipalities with expertise on effective methods of reducing GHG emissions.

Furthermore, there is the need to immediately address elements of the Team of Experts/Swat team such as, how the team would be deployed, who would contribute to funding and how much. AUMA is prepared to host this team, in order to ensure buy-in and ownership by municipalities. The Team may not be housed out of AUMA offices but instead be virtually connected and accessible via the Action Centre.

4.4 Comprehensive Funding Program

Develop a comprehensive funding program that includes non-matching grants, loans, and incentives. This program will help cover upfront costs of GHG reduction activities as these costs are a common barrier for many municipalities.

4.5 Short Term Actions

Speaking with municipalities has brought to light actions that can be taken in the short term. As it will take time to implement larger initiatives and to develop and fully deploy a formal Municipal Climate Change Action Plan, actions that can be taken within the next year to reduce municipal GHG emissions are listed below:

- Compile a toolkit on increasing walkability as there are many resources available. There are many municipalities that are already considering walkability providing information would be beneficial to these municipalities.
 - Provide information on walkability by using current municipal examples.
- Organize workshops and seminars.
 - AUMA can use opportunities such as the Annual Convention and regional sessions to provide information on actions that municipalities can take to reduce emissions.
- Partner with organizations such as Climate Change Central to increase public awareness of existing climate change programs.
- Partner with Alberta Environment's Alberta Conservation Team (ACT) to identify opportunities to increase public awareness about the need to reduce emissions and actions individuals can take.
- Provide detailed information of renewable energy and energy conservation programs available via the AMSC and other organizations.
- AUMA research streetlight standards as well as the ability of municipalities to negotiate efficient lighting with firms such as ATCO and Fortis.

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6.0 APPENDIX 1

6.1 Energy Efficient Lighting

6.1.1 Light Emitting Diodes

LEDs can be used for municipal applications such as parking garages, parking lots, outdoor public areas, and street lighting. LEDs typically use 50 percent less electricity and have a lifespan up to 10 years longer than traditional light fixtures such as high pressure sodium (HPS) lamps. Their lifespan is estimated at approximately 50,000 to 100,000 hours. This results in significantly lower utility bills, lower maintenance costs and fewer greenhouse gas (GHG) emissions from the generation of electricity. In addition to being more energy efficient than other light fixtures, they are also less toxic given that they do not contain mercury or lead, reducing the cost of disposing toxic materials in landfills. LED streetlights also generate lower light pollution than HPS lamps since they emit light directionally (Green Biz 2003).

City of Austin, Texas

The City of Austin has estimated that by retrofitting 5,000 streetlights, the City could save up to \$500,000 per year. These savings do not include additional maintenance and labour cost savings. Given that LEDs have a much longer lifespan than typical HPS lamps, the city estimates that there will be \$27,000 in savings from replacement costs over the life of LEDs. The combined annualized savings to the City could be \$10,178 per year with a payback of 6.5 years. Austin Energy has a \$17 million-per-year rebate program that encourages commercial and home energy customers to purchase and use products that provide significant energy savings. Austin's LED lighting rebate of \$300 per-kilowatt-of capacity-reduced aims to cover 30 percent of the upfront cost of LEDs to help businesses explore the benefits of this new technology (Lightboard 2008).

City of Ann Arbor, Michigan

City of Ann Arbor reported that approximately \$1.5 million a year, 25 percent of total energy budget, was spent on traffic signals and streetlights. After upgrading to LED traffic signals in 2000, the City reported savings of \$49,000 annually. Since street lighting makes up 92 percent of the \$1.5 million annual bill, the City plans on retrofitting streetlights to LEDs to further increase savings on electricity (Arkansas Business 2007).

City of Raleigh, North Carolina

In a small project exploring the use of LEDs for municipal applications, the City of Raleigh installed LED lights on the third floor of a municipal parking garage. The LED fixtures are estimated to save 46,720 kilowatt-hours per year, or 40 percent of the lighting energy load. This equates to \$2,803 of savings per year.

City of Toronto, Ontario

Toronto is the first Canadian City to join the LED City international initiative, which works to share best practices about evaluating, promoting, and deploying LED technology through municipal infrastructure. Converting Toronto's 160,000 streetlights to LEDs will save approximately \$6 million a year in electricity costs in addition to reducing GHG emissions by approximately 18,000 tonnes (Green Biz 2007).

6.1.2 Other Options

City of Calgary, Alberta

Another energy efficient street lighting option is EnviroSmart lights. For instance, the City of Calgary replaced 37,000 dropped lens residential streetlights with lower wattage, flat lens EnviroSmart fixtures. Before the retrofit, Calgary street lighting levels were among the highest in North America. The flat lens EnviroSmart fixtures are a version of the Cooper OVH series made by Cooper Lighting, while the lamp is a high pressure sodium (HPS) Lumalux/Eco lamp made by Osram Sylvania. The Lumalux/Eco lamps operate 25 percent longer than standard HPS lamps, with the increased lifespan reducing maintenance costs. The lamps are more environmentally friendly because they contain less lead and mercury. Since the lamps contain less mercury and less, they are easier to dispose of which leads to lower disposal costs (Osram Sylvania 2008). The City of Calgary reports energy savings of 25,000 MWh, generating electricity savings of \$1.7 million a year. The City estimates that the new lights will reduce annual municipal GHG emissions by 16,000 tonnes (FCM 2003). By 2011 or 2012, the City estimates that it will regain the cost of installing the new fixtures from energy savings. Furthermore, the flat lens streetlight fixtures increase visibility by directing light onto the roadway while reducing glare and excess light pollution (City of Calgary 2008).

City of Prince George, British Columbia

The City of Prince George employed light sensing controls in 170 residential streetlights. During off peak hour when there are few pedestrians and vehicles around, the streetlights dim. City

expects to reduce energy consumption and costs by approximately 40 percent with light sensing controls (Energy Advantage 2008).

6.2 Climate Change Workshop

6.2.1 Background

The AUMA held a climate change workshop with external stakeholders on August 20th, 2008. The workshop was held in order to examine the e-scan and get feedback, discuss recommendations, discuss what a Municipal Climate Change Action Plan could look like, what stakeholders can bring to the table, and what next steps should be taken.

The stakeholders that attended the workshop include the Alberta Association of Municipal Districts and Counties (AAMDC), Alberta Environment, Alberta Municipal Affairs, the Clean Air Strategic Alliance (CASA), Climate Change Central (C3), Natural Resources Canada, and the Pembina Institute.

6.2.2 Key Points

The following section outlines the key points that stakeholders addressed during the workshop.

Climate Change Central

- The Me-First program addressed a number of important barriers.
- C3 would like to implement additional programs.
- C3 shares common goal of creating an information portal that includes programs currently available.
- It is necessary to put more work into sharing information sources
- C3 is working on an number of programs which can help municipalities decrease their emissions
 - Looking into the feasibility of using Local Improvement Charges towards energy retrofits for homes
 - BioFleet program
- Biodiesel market development program in western Canada. The program provides information, education, workshops, demonstrations, tools, and common branding to support the expanded use of biodiesel. Activities include a first users incentive and biodiesel workshops (Climate Change Central 2007).
- Alberta Solar Showcase

- The program involves installing solar photovoltaic modules in 20 municipalities on municipal buildings. The goal of the project is to educate municipal leaders and citizens about the value of grid-connected systems and the positive impact renewable energy sources such as solar can have on the community. The examples of grid connected solar are used to help decision makers and installers see the benefits and reveal policy barriers that prevent residential solar power from connecting to grid (Climate Change Central 2007).

Alberta Municipal Affairs

- There is a need to engage utility companies in increasing the energy efficiency of streetlights as streetlights are sometimes owned by utility companies not the municipality.
- Municipal Affairs has also identified the need to create climate change team of experts to assist municipalities, so this recommendation aligns well with the Departments own strategies. Building capacity is key.
- Could look at educating municipal elected officials on the leadership role they have to play in reducing emissions. It is about governance not just about municipal operations.
 - Could look at providing education via the Elected Official Education Program (EOEP)

Alberta Association of Municipal Districts and Counties

- It does not make sense to have duplicate programs for urban and rural municipalities.
- Need to consider how to coordinate between the two Associations.
- Language is important, there is a need to emphasize energy savings and the economic benefits that come from that, not just “climate change”
- Consider using the ICLEE conference next year as an opportunity to get messages out
- The public is the wildcard.

Natural Resources Canada

- There is a need to look at a regional approach to climate change
 - For example the Capital region in Victoria has been working together on climate change and there are other examples from around Canada that should be considered in creating the plan for Alberta.
- In terms of creating a team of experts or a SWAT team, BC went through deliberations as to whether to create a central team that would visit communities or to place an expert in individual communities. Nova Scotia also has looked at the SWAT team idea. Their deliberations will be useful as Alberta considers how to move forward.

Natural Resources Canada has the following related programs

- Sustainable Buildings and Communities Group
 - Community Energy Planning Methodology
 - A step by step procedure to developing a long-term plan for the community, who to involve, what to do, what to ask, and what to expect (Natural Resources Canada 2008).
 - Urban Archetypes
 - Can be used as a reference by municipalities, urban planners and developers to better understand the energy implications of different development patterns (Natural Resources Canada 2008).
- When developing an action plan you need to make sure that there is a clear vision. What is the improved future you are working towards? Using the right energy, not fossil fuels?
 - Convince communities that they can make their own energy. Showing municipalities how they can produce renewable is very empowering.

Clean Air Strategic Alliance

- Have someone on staff of AUMA (or another institution) instead of sending someone to each community
- Look at long term
 - Part of long term solution above and beyond “low hanging fruit”
 - Pursue full cost accounting

Pembina Institute

- Training elected officials
 - It goes beyond public awareness to real leadership towards change
- Emphasize the governance role
 - The need for municipalities to be leaders
 - The need for municipalities to ensure their policies support GHG reductions.
 - Province has a role to play in supporting governance by also ensuring its policies are in alignment (building codes etc.)
- The Land Use Framework will be important in reducing emissions
- CASA is currently working on the Clean Air Strategy which may lead to further initiatives that are complimentary to a Climate Change Action Plan.

Alberta Environment

- Need to consider if availability of financial resources or the capacity to access available resources is the real barrier.

6.2.3 Conclusions

- Each of the participants provided very positive feedback on the environmental scan
- Each of the participants also indicated that they would like to stay engaged in the development of a Climate Change Action Plan to varying degrees
 - An Advisory Committee which provides comments and suggestions may be the most appropriate venue for engagement.