MUNICIPAL CLIMATE CHANGE ACTION:
A CASE STUDY OF THE CITY OF OTTAWA'S "TASK FORCE
ON THE ATMOSPHERE ACTION PLAN"

BY
Mary Anne Strong B.A.

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Department of Geography and Environmental Studies

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ABSTRACT

Climate change is considered one of the most significant environmental challenges facing Humanity in the 21st Century. To date, international, national and municipal efforts to stabilise atmospheric levels of CO₂ strategies have for the most part been ineffective and global emissions continue to rise. Nevertheless, municipal governments in Canada and around the world are expected to play a key role in climate change mitigation strategies. The City of Ottawa has been active in municipal climate change action since 1992; when City Council committed to reducing greenhouse gas emissions to 20% below 1990 levels by 2005. To achieve this objective, in 1995 the City approved a local action plan, A Call to Action: Task Force on the Atmosphere Action Plan.

This thesis explores the tools and processes used to achieve the City's greenhouse gas emission reduction target, outlines the barriers faced during implementation and identifies potential next steps. Research is based on an examination of climate change; environmental policy and behaviour change literature and insights derived from in-depth personal interviews with individuals involved with implementing the City's plan.

This paper demonstrates that the City of Ottawa's plan has not achieved significant emission reductions and is not on target to achieve its 20% goal. Multiple barriers have been encountered during implementation including insufficient resources, lack of political leadership and inadequate institutional capacity. The issue of climate change is extremely complex, yet its crosscutting nature means that action on other important local issues can also reduce emissions. There are increasing calls to bring together the issue of climate change and sustainable development to provide a broad, integrated framework for assessing and monitoring the local environment. A small team of individuals in any community cannot effectively address climate change, yet our institutional structures are not well equipped to deal with issues in an integrated manner. Ultimately, concrete action can only be attained with the coordinated efforts of international, national, provincial and local governments. At the municipal level, institutional mandates and capacity must be expanded and the objectives of reducing energy use and emissions must be integrated across the corporation.

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CHAPTER 1

INTRODUCTION TO THE RESEARCH:

CLIMATE CHANGE AND MUNICIPAL RESPONSES

1.0 Introduction

Some scientists have identified global warming as an issue of concern since the turn of the century (Glantz, 1988, Foley, 1991). In the past two decades, the context in which global warming and associated climate changes are debated has evolved and the issue is now a significant global scientific and political issue. Climate change is acknowledged as one of the most serious environmental issues facing humanity this century (UNEP, 2000).

Although there has been considerable debate over the extent to which human actions are affecting climate, there is now consensus among leading scientists that anthropogenic emissions will be responsible for a global rise in temperature and other climate disturbances. The anticipated effects of climate change are highly variable, with benefits expected in some regions and economic sectors while other sectors are expected to encounter significant adverse impacts. Positive impacts could include a warmer winter climate and longer growing seasons which may increase agricultural potential in northern latitudes. Adverse impacts include: sea level rise and potential flooding of vast areas inhabited by humans; agricultural disruptions due to shifting rainfall and drought patterns; increasing climate instability and intensity; and human health impacts due to northward spread of tropical disease (Foley, 1992; Paterson, 1996, IPCC, 1998).

1.1 Background

In February 1991, formal negotiations commenced towards an international treaty on climate change. These negotiations led to the signing of the “Framework Convention on Climate Change” (FCCC) at the United Nations Conference on Environment and Development (UNCED) in June 1992. The 150 countries, including Canada, that signed this Convention committed to a voluntary target of stabilizing greenhouse gas emissions at 1990 levels by the year 2000. In ensuing years it became evident that most nations would not achieve this target. In December 1997, 160 nations, including Canada, negotiated a new international protocol in Kyoto, Japan. Once ratified, the Kyoto Protocol will commit Canada to reducing its greenhouse gas emissions by six per cent below 1990 levels between 2008 and 2012.

While climate change is obviously a global problem there is great potential for implementing successful policy responses at the local level and in many countries important policy initiatives are already being undertaken (Collier and Lofetdt, 1997). Many municipal governments in Canada and around the world have developed their own response strategies, making commitments to local greenhouse gas (GHG) emission reductions. As of March 2000, 372 cities around the world had joined the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection (CCP) program. In Canada, as of March 2001, over 70 Canadian municipalities, representing almost 60% of Canada’s population, had joined a Canadian partnership with the CCP program, the Partners for Climate Protection (PCP) program (PCP, 2000). PCP members

commit themselves to reducing their community's greenhouse gas emissions by at least six percent within ten years of joining the program.

Municipal climate change commitments often go far beyond the reductions called for in the Kyoto Protocol and meet the standards that scientists promoted in Toronto in 1988 and reiterated at the Second World Climate Conference in 1990. The Toronto Conference outlined ambitious targets with respect to reducing CO₂ emissions. Conference delegates agreed that governments and industry should reduce CO₂ emissions by approximately 20 percent below 1988 levels by the year 2005 as an initial global goal (Paterson, 1996). At the latter meeting, scientists argued that "technical, feasible and cost-effective opportunities exist to reduce CO₂ emissions in all countries. Such opportunities for emissions reductions are sufficient to allow many industrialized countries...to reduce these emissions by at least 20 percent by 2005" (Jaeger and Ferguson, 1991: 498, cited in Paterson, 1996).

Given the fact that approximately 75% of Canada's population lives in urban areas, the successful implementation of emission reduction commitments in Canadian cities is considered an important element to achieving Canada's Kyoto commitment (Government of Canada, 2000). The cities of Toronto, Vancouver, Edmonton, Regina and Ottawa were the first Canadian municipal governments to commit to reducing GHG emissions by 20% in their communities and their own operations and were founding members of the *20% Club*, formed in 1995 at Ottawa's City Hall (City of Ottawa, January 1995). In 1998 the

Federation of Canadian Municipalities' 20% Club partnered with ICLEI's CCP program to form Canada's Partners for Climate Protection program. Members of the PCP program commit to achieving absolute reductions of GHG emissions within their corporate facilities and functions and within their communities. Corporate achievements can help to demonstrate leadership as a municipality seeks to engage the community in measurable GHG reduction initiatives. If municipal GHG reduction strategies prove effective, associated decreases in emissions within these cities could have a significant positive impact on Canada's Kyoto commitment.

Municipal governments in Canada are considered uniquely positioned to address the issue of climate change and GHG emission reductions. Federal reports state, "as the closest level of government to individual citizens, and a major factor in local economies, municipalities can affect GHG emissions through regulations and by-laws, and as a facilitator, partner, and educator within the community" (Government of Canada, 2000). Total emissions under the control or influence of Canadian municipalities are estimated to be 296 megatonnes of CO₂, or roughly half of the Canadian GHG inventory (ibid.). Research also supports the value of local institutions taking the lead in a transition to energy efficiency, noting that local level energy conservation programs are often the most effective (Gaskell and Bernward, 1987; Stern and Aronson, 1984). While it is evident that municipal governments may be able to influence half of the Canadian inventory, most of these emissions are also under the control and influence of federal and provincial governments, thus all levels of government are also involved in developing solutions.

In general, akin to the federal government's approach, many Canadian municipal strategies reject the option of mandatory standards and regulations in favour of voluntary approaches designed to involve and motivate private and corporate citizens in community-wide efforts to reduce GHG emissions. For example, the City of Ottawa's 1995 plan states that "Action Plan elements are meant to stimulate and facilitate the uptake of measures and technologies which are in the individual and collective self-interest, not only for their beneficial impact on climate change, but for their many other benefits" (City of Ottawa, 1995). Studies demonstrate that Canadians have a high level of knowledge and concern for environmental issues, compared to citizens of other nations (Frizzel and Pammet, 1997), but despite Canadians' strong concern for the environment, they have limited awareness and understanding of climate change as an issue (McAllister, 1998). This lack of awareness means that local politicians are not being pushed by their constituents to encourage GHG reductions, and the citizens themselves are not necessarily involved in municipal-level solutions (Government of Canada, 1998A).

Given the threat and magnitude of climate change, global action strategies are being negotiated and national and local policies are being implemented. Success will ultimately depend on the sum of what individuals, families, communities and nations do to reduce their emissions of GHG. Bryner (1990) argues that nations will have to decide whether they should take the lead or wait until there is an international agreement. Communities, corporations, families and individuals face a similar choice. Municipal governments like

the City of Ottawa elected to lead on this issue and approved a community action plan in 1995, three years prior to Canada's Kyoto commitment.

1.2 The Local Action Plan

Municipalities across the country vary widely with respect to the opportunities and resources available to implement local climate change programs. The enormous difference in population, geography and infrastructure makes it impossible and illogical to apply a single suite of GHG reducing actions at the municipal level. There is a wide variation in the level and pattern of GHG emissions from one municipality to the next in regards to energy use patterns, urban form, waste management strategies and urban greening opportunities. Therefore strategies must be formulated with this diversity in mind. Current research suggests that there is a clear need for individual strategies, developed with local knowledge, tailored to local circumstances and opportunities, and integrated with other community development strategies (Government of Canada, 1998A).

Increasingly, municipalities are addressing climate change through Local Action Plans (LAPs), which outline solutions unique to their community. Evidence suggests that municipal governments that have taken an ad hoc approach to climate protection have been far less effective than those that have developed a Local Action Plan (ibid.).

Municipal governments involved in the PCP program commit to achieving five milestones:

Milestone 1: Completion of a greenhouse gas inventory for both municipal operations and the community.

Milestone 2: Establish an Emission Reduction Target (preferred targets are 20% reduction in greenhouse gas emission from municipal operations, and a minimum six percent reduction for the community, both within ten years of joining the program).

Milestone 3: Develop and approve a local action plan aimed at reducing emissions and energy use in municipal operations and the community. Action plans must incorporate public awareness and education programs.

Milestone 4: Implement the local action plan.

Milestone 5: Monitor, verify and report on progress.

(Government of Canada, 1998; PCP, May, 1999; ICLEI, 1997A).

Success will ultimately depend on achieving all five milestones and meeting the community's emission reduction target. Research shows that even among those communities that develop a local action plan, significant institutional and jurisdictional barriers impede progress (Moore, 2000; Government of Canada, 1998A). Identified barriers to successful implementation of local action plans include:

- Lack of clear mandate to address emissions.
- Lack of institutional and analytical capacity.
- Financial constraints.

Elements that improve chances of successful attainment of climate change goals include:

- Establishing clear targets.
- The use of multiple benefits to build support and partnerships.
- The need for political leadership.
- Involving end users.
- Rewarding bureaucratic initiatives.
- Leveraging of resources through partnerships.
- Use of innovative financing.
- Use of market mechanisms.
- Ongoing monitoring and evaluation.
- Integration with other programs (Robinson, 1999).

Despite the multiple barriers noted above, it is asserted that municipalities can influence the level of GHG emissions in their communities in several ways. For example they often have direct control over the following: municipal operations; landfill management, solid waste reduction strategies; land use planning, parks and community greening strategies. These are all potential components of local action plans (Government of Canada, 1998A).

As of March 1999 while over 60 Canadian municipalities had pledged to reduce their GHG emissions through the development of local action plans, only six had actually developed and commenced implementation of a community action plan (Robinson, 1999). With so many communities poised to develop and implement community level GHG emissions reduction programs, it is timely to evaluate an existing program as a case study to assess the strengths and weaknesses of the approaches taken. This information could benefit other municipalities developing local action plans.

1.3 Local Action Plan: City of Ottawa

In August 1992, Ottawa City Council passed a resolution committing to a 20% reduction in GHG emissions from 1990 levels by 2005. A fundamental first step of any action plan process is the creation of an inventory of emissions and “business as usual” emissions forecast, which are the first two milestones of the action plan process. The emission profile is considered important to determine where the local emissions originate, so that measures can be targeted to reduce emissions where they can have the most impact (PCP, 1999). As part of the City of Ottawa’s Local Action Plan (LAP) process both a corporate and community emission inventory was developed as a first step to developing a mitigation strategy. Table 1.1 illustrates the baseline (1990) emission inventory established for the City of Ottawa. Once inventory work was complete, the City of Ottawa developed both a community and corporate action plan to achieve their emission reduction commitment.

Table 1.1 City of Ottawa 1990 CO₂ Emission Inventory

Sector	CO₂ Emissions tonnes¹	% of Total Emissions
Residential	537,588	21%
Commercial	1,109,844	44%
Transportation	846,293	34%
Corporate Operations	32,000	1%
Total Emissions	2,525,725	100%

Adapted from City of Ottawa, (1997) Greenhouse Gas Reduction Action Plan: Second Annual Progress Report and City of Ottawa (1999) A Corporate Plan for Greenhouse Gas emission reductions: Third Annual Progress Report.

The Corporate Plan for Greenhouse Gas Emissions Reductions approved by Council August 25, 1995, identified specific actions to reduce GHG emissions, primarily through increasing the energy efficiency of facilities and fleets. Between 1990 and 1998 the City reported an 18% reduction in corporate energy use, corresponding to a 19% decrease in GHG emissions (City of Ottawa, 2000). Even though the City's corporate emissions are a very minor component of the City of Ottawa's GHG inventory, a corporate plan is considered an important way to demonstrate leadership as municipal governments attempt to engage the broader community in reducing emissions (Government of Canada, 1998A).

1 . Initial City documents focus on CO₂ emissions while later reports also include methane emissions, converted to CO₂ equivalents (eCO₂). Greenhouse gas emissions are often used interchangeably with CO₂ emissions in City documents, but only CO₂ and methane are addressed.

Three sectors: residential, commercial/institutional and transportation, account for 99% of the community's emissions. The community Action Plan was directed at these three sectors.

In 1994, a Task Force on the Atmosphere was established and led by Mayor Jaclyn Holtzman to assist in the development and implementation of the community action plan.

In October 1995 after a year of multi-stakeholder input, A Call to Action: the City of Ottawa's Task Force on the Atmosphere Action Plan (Action Plan) was approved. The Action Plan defined eleven separate elements, each of which became a program designed to reduce greenhouse gas emissions in three key sectors of the community. Since 1995, the City has been implementing Task Force recommendations in an effort to achieve its 20% emission reduction target.

As one of the first members of Canada's PCP program, the City of Ottawa has received national recognition for their Action Plans. It is also the only municipal climate change program in Canada to have received Champion Gold Level Reporter status and the 1998 and 2000 Leadership Award for the municipal sector from Canada's Climate Change Voluntary Challenge and Registry (VCR) Inc. The VCR was established in 1995 by the Government of Canada through Natural Resources Canada to encourage corporations to take voluntary actions to reduce GHG emission from their activities, and is a key element of Canada's National Action Program on Climate Change. Since the City of Ottawa is recognized for its leadership in local climate change initiatives and is midway to its target

date of 2005, it is timely to evaluate their current progress towards their 20% community GHG emission reduction target and to assess achievements to date and barriers encountered during program implementation.

1.4 Goal and Objectives

The goal of this thesis is to evaluate the City of Ottawa's community action plan implementation strategy. Research will focus on the barriers encountered and lessons learned during the implementation of the City of Ottawa's community action plan, A Call to Action: Task Force on the Atmosphere Action Plan (1995).

Specific case study objectives include an evaluation of the process and programs used to achieve the emission reduction target, and an assessment of whether individual programs implemented by the City to achieve the emission reduction objective have achieved measurable emissions reductions. Research will assess:

1. **The Process:** whether the process implemented was effective in reducing emissions; and
2. **The Results:** whether the program can achieve/ has achieved measurable emission reductions.

Global climate change and its many interrelated issues are extremely complex and volumes of research have been undertaken to understand the underlying physical processes, impacts and potential institutional responses. A brief understanding of these

issues is essential to provide the context in which the City's response strategy is undertaken.

The overall purpose of this thesis will be supported by the following research elements:

- A summary of the current understanding of the causes of anthropogenic climate change, consequences and mitigation strategies (global, regional, local) to provide the context in which local action plans are being implemented.
- The importance of scale when framing the issue of climate change and developing response strategies.
- A summary of current international, federal and provincial responses and their influence on municipal strategies.
- A summary and discussion of the current understanding of social science approaches to changing human behaviour linked with Project Management theory to develop a framework for evaluation.
- Case study and evaluation of specific approaches used to achieve GHG emission reductions and resulting emission reductions achieved, and
- Identification of potential next steps required achieving the City of Ottawa's 20% emission reduction target.

1.5 Research Questions

In the context of addressing the climate change issue at the municipal level the following questions will be addressed:

- What specific goals and objectives have been set?
- What programs or policies have been developed to reduce GHG emissions?
- How has the issue been defined and presented to the community?
- How effective have these programs been: what has worked well, what could be changed to enhance effectiveness?
- What are the opportunities and barriers to an effective local program?
- To what extent have local programs been supported and / or impeded by other levels of government?
- What are the elements of successful community GHG reduction programs at the local level?
- Will voluntary approaches be sufficient to achieve municipal goals?

1.6 Research Scope

This case study focuses on the City of Ottawa's community climate change action plan. Considered a leader in local climate change action, the City is midway to the 2005 date targeted to achieve their 20% community GHG emissions reductions. Only six municipalities across Canada have implemented action plans and with Ottawa's plan more developed than others, there is an opportunity for an early assessment of municipal responses to climate change. Furthermore, the City's approach is similar to the federal government's strategy in that both programs focus on promoting voluntary action to reduce emissions, primarily through leadership programs and awareness campaigns.

An extensive body of literature on the science of climate change serves as a foundation to understanding the physical causes and impacts at the macro scale. However, there is considerably less information in the literature from a social science perspective to help illustrate the policy dimensions involved in establishing community partnerships and designing effective policy responses and programs at the micro level. Social science investigations of climate change have been identified as a gap in current research (Chen, 1983; Cohen, 1998; Redclift, 1998). This research will attempt to bridge this gap by evaluating local policy and behavioural solutions, which will ultimately be required to foster long-term emission reductions within communities.

This is a detailed case study of the experience of one municipality and due to the unique circumstances of local communities findings may not be completely applicable to other communities. The research will provide enhanced understanding of local strategies developed to reduce GHG emissions. Knowledge of key barriers encountered and potential strategies to overcome barriers will be useful for communities that have made commitments to local climate change action.

Since commencing this research the City of Ottawa has amalgamated with eleven adjacent municipalities that were within the boundaries of the former Region of Ottawa Carleton. The City of Ottawa studied for this report refers to the former City of Ottawa prior to amalgamation of the City that came into force on January 1st, 2001. The population of the City of Ottawa has almost doubled due to amalgamation, thus one can

expect that emissions will be significantly higher in the new City boundaries. All discussion and analysis in this document refers to the former City of Ottawa with the exception of recommendations set out in Chapter 7.

1.7 Structure of Thesis

Chapter 1 established the purpose of the research, the rationale for a case study of the City of Ottawa's Task Force on the Atmosphere Action Plan implementation and has provided a brief summary of the methodology which will be used to evaluate the City's progress in addressing this important global issue. Global climate change is a complex and much debated topic. Local response strategies cannot be viewed in isolation from regional, national and international responses. Though the focus of this research is the City of Ottawa's community action plan, it is recognised that the City's response is undertaken within the context of actions taken within other jurisdictions and within a dynamic scientific research framework, which serves as a foundation for international agreements and national, provincial and municipal response strategies. The issue is sufficiently complex that strategy formulation at the local level is not done in isolation from the broader international and national scientific and political dimensions and these issues are discussed further in Chapters 2 and 3.

Chapter 2 describes the causes and potential consequences of anthropogenic climate change and illustrates the relative importance of fossil fuel use to the overall increase in atmospheric GHG emissions. The discussion illustrates the importance of scale in

addressing emission reductions since decreasing emissions from fossil fuels can also reduce local and regional air pollutants which impact the health of community residents and ecosystems. It is also argued that reducing fossil fuel emissions through enhanced energy efficiency can also result in local economic benefits.

The potential range of response strategies to address environmental problems is outlined in Chapter 3. International, federal and the Ontario provincial government responses to climate change are then briefly described to establish the context in which the City of Ottawa is implementing its local response strategy. Chapter 4 describes the initial vision and objectives of the City's A Call to Action: Task Force on the Atmosphere Action Plan (also referred to as the Community Plan) and provides background from the literature to establish principles of effective environmental outreach strategies and to identify elements of successful projects. The methodology for in-depth interviews of individuals involved in implementing the City's Action Plan is outlined at the beginning of Chapter 4. Chapters 5 and 6 are an in-depth evaluation of the implementation of the Task Force on the Atmosphere Action Plan. The former evaluates the overall program and the latter Chapter provides a detailed analysis of the programs developed and implemented to achieve emission reduction in each key sector identified in the Action Plan. The final Chapter (7) summarises the key barriers encountered during implementation and outlines potential next steps to further the attainment of the City's GHG emission reduction objective.

CHAPTER 2

A CLIMATE CHANGE PRIMER

This chapter outlines the current understanding of climate change science and establishes the rationale for the need to study local effects and municipal emission reduction opportunities. A basic primer on the physical process of climate change will serve as a foundation for those unfamiliar with the science of climate change. Global and Canadian climate change impacts are briefly discussed followed by an analysis of the key causes of climate change at the international, Canadian and municipal levels. The final section illustrates the importance of scale in approaching the issue and advances the need to link issue to regional and local priorities in order to catalyse action.

2.0 Atmospheric Processes and the Natural Greenhouse Effect

Solar radiation is the primary source of energy that drives all physical processes on Earth. Slightly over half of the solar energy arriving in Earth's outer atmosphere reaches the surface with the remainder absorbed by the atmosphere or reflected back to space. Solar radiation that reaches the surface is absorbed and radiated back into the atmosphere as thermal radiation. Having been warmed by thermal radiation emitted from Earth, the atmosphere itself transmits heat, which is either radiated back to Earth or emitted to space. The warming effect of the atmosphere is known as the greenhouse effect due to similarities with the heat trapping effect of glass in a greenhouse.

Atmospheric components that absorb and transmit thermal radiation are commonly termed greenhouse gases due to their warming effect in the atmosphere. Naturally occurring greenhouse gases include water vapour, ozone, carbon dioxide, methane, nitrous oxide and other trace compounds (Environment Canada, 1997B), with water vapour, and carbon dioxide being the most important (Royal Commission, 2000). Nitrogen and oxygen, which dominate the earth's atmosphere, neither absorb nor emit thermal radiation and are not greenhouse gases. Greenhouse gases (GHG) occur naturally in relatively minor concentrations in the atmosphere, yet they have a profound influence on global temperatures and are responsible for sustaining life on earth (Houghten, 1997). Without the natural insulation provided by the atmosphere, Earth's mean surface temperature would be -20°C , 35°C colder than the current global average of approximately 15°C . The natural greenhouse effect is of fundamental importance to sustaining life on earth. Without it Earth would be too cold to sustain life (ibid.).

The greenhouse effect, whereby naturally occurring GHGs keep the earth warm enough to be hospitable, is based on well-established scientific principles. The first scientist to identify the greenhouse effect was French scientist Jean-Baptiste Fournier in 1827 (ibid.). The idea that human activities may change the composition of GHGs in the atmosphere and impact the world's climate has deep historical roots (Foley, 1996). The effect of carbon dioxide (CO_2) on atmospheric warming has been recognised since the turn of the century, when Swedish scientist Svante A. Arrhenius estimated that a doubling of anthropogenic CO_2 emissions would produce a global warming of about 7 to 11 degrees,

figures close to modern estimates (Glantz, 1988).

In 1957, international studies monitoring the global environment validated the assumption of increasing concentrations of CO₂ in the atmosphere (ibid.). Successive research assessments produced by scientists around the world have increasingly supported the perspective that the Earth is heating up and human actions are implicated (Glantz and Adeel, 2000). Recent studies estimate that if CO₂ emissions continue to grow at current rates, there will be a doubling of 1990 atmospheric CO₂ by the year 2030 (Watson et al, 1998) and the resulting enhancement of the greenhouse effect is expected to alter climate on a global scale. Hence, the current concern about global warming and climate change is not related to the presence of naturally occurring GHGs in the atmosphere, but with human-induced increases in concentrations of these trace gases beyond ambient levels which enhance the natural greenhouse effect.

2.1 Human Activities and an Enhanced Greenhouse Effect

Since the industrial revolution, human activities have been responsible for increased concentrations of naturally occurring GHGs and have added new ones such as chlorofluorocarbons (CFCs). Increases in anthropogenic concentrations of GHGs are expected to lead to a rise in average global temperature. Temperature increases associated with anthropogenic increases in GHGs are termed the enhanced greenhouse effect, more commonly referred to as climate change or global warming. There is now widespread agreement among scientists that human activities will increase average global

temperatures; projected increases are greater than any observed temperature change over the past 10,000 years (Watson et al., 1998; Houghton et al., 1990). Most recent estimates project an increase in global average temperature from 1990 values of between 1.4°C to 5.8°C by 2100 (IPCC, 2001A).

Carbon dioxide (CO₂) is recognised as the most significant anthropogenic GHG contributing to the enhanced greenhouse effect (Houghton, 1997, Environment Canada 1997B). Estimates show that increasing carbon dioxide levels are responsible for as much as 70 % of the enhanced greenhouse effect to date, whereas methane (CH₄) accounts for approximately 24 %, and nitrous oxide (N₂O) approximately 6% (Houghton, 1997). Atmospheric levels of CO₂ resulting from human activities such as burning fossil fuels and clearing land have greatly increased since the industrial revolution, increasing from pre-industrial levels of 280 parts per million by volume (ppmv) to current levels of 360 ppmv, an increase of approximately 30%, the highest levels recorded in 160,000 years (Houghton, 1997; Keeling and Whorf; 1998, cited in UNEP, 1999). Globally, CO₂ emission continue to increase at a rate of 0.4% per year) and nearly four-fifths of the extra CO₂ entering the atmosphere is estimated to have come from burning fossil fuels (Royal Commission, 2000). Less significant causes of elevated global CO₂ emissions include land use changes and the loss of forests, which sequester atmospheric CO₂, agriculture and non-energy industrial activities such as the use and production of CFCs (Watson et al., 1998).

Figure 2.1 illustrates the growth of atmospheric CO₂ concentrations since 1750. It is apparent that while CO₂ levels have been rising since 1750, the increase in global carbon dioxide levels has accelerated throughout the 20th century. Environment Canada (1997) estimates that over the last 40 years, annual global CO₂ emissions have increased from 6 gigatonnes (GT, 10⁹ tonnes) to 22.5 GT, an almost four fold increase. Concerns over the potential impact of increasing CO₂ emissions and concentrations on climate have stimulated an interest in developing public policies aimed at reducing global atmospheric concentrations of CO₂. It is estimated that in order to stabilise concentrations of CO₂ at double their pre-industrial levels, it would be necessary to reduce annual emissions of CO₂ to 60% to 70% below 1990 levels (IPCC, 1991; Royal Commission, 2000). Given continued increases in emissions, it is widely recognised that current response strategies can only slow the rate of change and reduce the magnitude and urgency of the adaptations human communities will be required to take and may increase the chance that wildlife communities can adapt (Royal Commission, 2000).

Figure 2.1 Trends in Atmospheric CO₂ Levels

Source: Houghton, John. Global Warming: The Complete Briefing. Cambridge University Press, 1997. Pp. 25.

2.2 Regional Variation in Global Anthropogenic GHG Emissions

Atmospheric concentrations of CO₂ are increasing at a global scale and resultant climatic change will occur globally. However, it is often argued that the global nature of the climate change discourse obscures and diffuses the relative responsibility of developed nations for observed increases in GHG concentrations (Smil, 1993; Taylor and Buttell, 1992). In fact, there are vast regional differences in the creation of anthropogenic GHG emissions that lead to climate change. Figure 2.2 illustrates the regional differences in the production of GHG emissions to highlight the need for Canadian action to reduce

emissions produced within Canada.

Industrialised nations account for nearly 2/3 of accumulated GHGs in the atmosphere and over 55% of sulphur and nitrogen oxide pollution, emissions which are primarily attributed to energy use (Byrne and Rich, 1992). In 1985, industrialized nations produced 74% of global CO₂ emissions, while developing nations accounted for 26% (IPCC, 1991). Emissions in developing nations are anticipated to increase over the ensuing decades. The IPCC projects that these emissions will account for 44% of the global total by 2025. An examination of per capita emissions trends provides further evidence of the developed nations role in changing the atmosphere. In North America, per capita CO₂ emissions in 1995 were 19.93 tonnes per year, over two times higher than any other industrialized region and over 90 percent higher than many developing nations (IPCC, 1990; UNEP, 1999). There are arguments advocating the use of the “polluter pay” principle and increasing international demands for accountability from the United States and Canada (Smil, 1993; Shue, 1996). Though richer nations are the largest producer of GHGs, drastic unilateral action from any one nation would have little impact on global GHG concentrations (Smil, 1993), thus global agreements and efforts remain essential. As the worlds’ largest per capita emitters of CO₂, however, North Americans should bear an ethical responsibility for taking direct action to reduce per capita GHG emissions (Coward and Hurka, 1993).

Figure 2.2: Carbon Dioxide Emissions per Capita

Source: UNEP, 2000, pp. 25.

2.3 Greenhouse Gas Emissions in Canada

In Canada, CO₂ is by far the dominant GHG, accounting for 80.6% of Canada's total GHG emissions in 1995 (Environment Canada, April 1997). Figure 2.3 illustrates the relative contribution of various GHGs in Canada. Figure 2.4 shows the important role energy plays in Canada's GHG emission inventory, accounting for over 85% of Canada's of Canada's emissions. The energy sector includes total emissions of all GHG from energy activities including: energy transformation; industry; transport; commercial and institutional sectors; residential and oil/natural gas systems. In 1995, total GHG emissions from the energy sector were up 11% over 1990 levels, CO₂ accounts for close to 99% of all emissions in this sector (ibid.).

Figure 2.3: Canada's Greenhouse Gas Emissions by Gas Type (1995)

Source: Adapted from Environment Canada. Trends in Canada's Greenhouse Gas Emissions 1990- 1995. April 1997. Pp.4.

Figure 2.4: Sources of Canada's 1995 Greenhouse Gas Emissions

Source: Adapted from Environment Canada. Trends in Canada's Greenhouse Gas Emissions 1990- 1995. April 1997. Pp. 5.

In 1996 fossil fuel combustion made up 78% of Canada's total energy consumption and accounted for 78% of Canada's GHG emissions (Statistics Canada, 2000). Recent trends show that per capita emissions are rising, between 1990 and 1995, CO₂ emissions rose 8%. Between 1990 and 1998, Canada's GHG emissions have increased 13 %, from 612 mega tonnes (MT) to 692 MT (Environment Canada, 2000). Clearly these trends cannot continue if Canada's Kyoto targets are to be achieved.

2.3.1: Municipal Greenhouse Gas Emissions in Canada

In 1996, 78% of Canada's population was urban; 66% of the urban population lived in cities with populations greater than 100,000 and 48% were in cities with populations over 500,000. Ontario is the most urbanised of Canada's provinces with the largest percentage of urban dwellers in Canada at 87% (Government of Canada, 1998A). Total GHG emissions from the municipalities sector in Canada are estimated to be 296 MT, fully half of Canada's national total. The dominant sectors contributing the GHG emissions at the municipal level in Canada are personal and freight transport which account for approximately 37% of emissions, residential buildings which account for 28% of municipal emissions and the institutional, commercial and industrial (ICI) sector which contributes 27% of total emissions (adapted from Government of Canada, 1998A). The Municipalities Table of the federal climate change consultation process affirms that these figures make it apparent that municipal government engagement is necessary to any successful national strategy. The City of Ottawa's 1990 emission inventory of approximately 2,500,000 tonnes of eCO₂ represents less than 1% of the 296 MT

municipal total, which illustrates the extent to which a coordinated approach to municipal government action will be needed. No one city working in isolation can achieve sufficient results, but the sum of effective concerted efforts could be considerable.

2.4 Projected Global Climate Change Impacts

Understanding of the causes and impacts of climate changes has been greatly enhanced by the Intergovernmental Panel on Climate Change (IPCC), established in 1988 to assess scientific evidence, to evaluate the environmental and socio-economic consequences of climate change and to formulate response strategies. IPCC reports are widely cited in climate change literature and are a primary source of scientific information on climate change.

The IPCC's recent estimates project a warming of global average temperatures from 1.4°C to 5.8° C by 2100 (IPCC, 2001). Projected temperature changes are expected to lead to global sea level rise of between 9 to 88 centimetres due to thermal expansion of the oceans and ice melt (ibid.). This most recent IPCC estimate is almost double the projection of earlier reports estimating sea level rise of 49cm by the year 2100 (Watson et al. 1998). The projected sea level rise is significant enough to entirely flood some small island nations (Houghton, 1997). Climate models predict that surface air will warm faster over land than oceans and warming is expected to be 50% to 100% greater in high northern latitudes (IPCC, 1990). Climate change impacts also include increased global average precipitation and evaporation with winter precipitation forecasted to increase in

the high and middle latitudes.

Worsening weather extremes may be possible with climate change due to changes in the mean and /or variability of climate during the 21st century, but it is not possible to predict the magnitude and timing or regional patterns of such events (IPCC, 2001). Many climatologists are now saying that the increasing severity and frequency of El Ninos in the 20th century may be attributable to climate change (Dotto, 1999). In past reports, the IPCC was more cautious in estimates of variation in climate and extreme weather events, asserting that there is no clear evidence that weather variability will increase in the future (IPCC, 1990). However, the 2001 assessment report acknowledges that potential climate extremes could have major consequences. In spite of scientific uncertainty, severe weather is frequently linked to climate change in the media. For example, Prince Charles recently received prominent media coverage with his assertion that human activity is responsible for recent prominent weather disasters (Clover, 2000). Many Ottawa residents also are exposed to headlines such as “UN Issues Killer Weather Alert: Hurricane Floyd on Leading Edge of Century of Natural Disasters, Report Says” (Spears, 1999), in which global warming is attributed as a cause. Public information on climate change is more likely to be received through the media than through IPCC reports which can contribute to perceptions of a link between climate change and extreme weather.

2.4.1 Projected Canadian Climate Change Impacts

As a geographically vast and diverse nation, Canada is expected to exhibit considerable regional variation in climate change impacts (Chiotti, 1998). Regional variations include greater warming potential in interior regions than near the coastlines, and greater winter warming in the Arctic than in Southern regions. Stress on the Arctic ecosystems caused by elevated temperatures is expected to be greater than in the rest of Canada. An anticipated warming of 8-10 °C could result in the disappearance of much of the ice pack from the Arctic Ocean during the summer months, leading to increased precipitation, shore erosion and stress on polar wildlife species. The tundra ecosystem may shrink to about half its current size (Hurka, Coward, 1993).

By the end of the 21st century temperature increases in Canada could be three times higher than global averages (Environment Canada, 1997B). Selected potential effects of higher temperatures in Canada include: loss of migratory waterfowl habitat; northward shift of southern boundary of permafrost; terrestrial forest species may migrate north to higher latitudes; northern expansion of agricultural production; and sea level rise (Chiotti, 1998). Water flow in the St. Lawrence River could be reduced by up to 20% and loss of soil moisture in the prairies and around Great Lakes could lead to reduced agricultural productivity and food security threats (Hengeveld, 1999).

Impacts of these changes will also reflect regional variations. Shaw et al. (1998) evaluated regional vulnerability to sea level rise and concluded that most of Canada's

coastline will experience low to moderate impacts, while only 3% of Canada's coastlines are highly sensitive to sea level rise. Highly sensitive areas include many areas of the Maritimes, the Fraser River Delta, British Columbia (BC), and the Beaufort Sea coast. In Atlantic Canada, accelerated sea level rise is expected to lead to increased coastal erosion, flood hazards, storm damage and property loss. In BC, sea level rise could threaten low-lying areas such as Greater Vancouver, particularly Richmond and Delta where existing dykes and other infrastructure will need to be upgraded. These examples underscore the importance of regional scale analysis since on the whole, Canada is not at great risk of sea level rise (Chiotti and Urquizo, 1999). These examples also underscore the need for regional and local response strategies developed to adapt to and to mitigate local climate change impacts.

Chiotti and Urquizo (1999) note that health effects linked to climate change in the literature generally address only those health effects associated directly with climate warming. The principal direct effect is excessively hot weather and associated heat-related stress and/or death. If temperatures climb as anticipated, many Canadian cities can expect to experience a significant increase in the average number of very hot days, and more frequent and longer heat waves. Currently there are approximately 70 heat related deaths in Montreal and 20 in Toronto every year, it is estimated that this may increase to 460 and 290 respectively by 2020. Health effects associated with smog are also expected to be exacerbated due to the combination of increased emissions and heat which may lead to more urban smog, already a significant problem around Canadian

cities. In addition, elevated global temperatures may trigger the northward spread of tropical diseases such as malaria (ibid).

Mounting evidence suggests that climate change impacts may already be occurring. For example, the McKenzie Basin Impact Study (Environment Canada, 1997A) found that parts of the North have already experienced a 1.5°C temperature increase this century and that spring thaw arrives one week earlier than a decade ago. Tree ring based reconstructions of climate in the Rocky Mountains indicates that summer and spring temperatures in the last half of the 20th century have been warmer than any period within the last 900 years. Glaciers have lost an estimated 25 percent of their mass this century and analysis of temperature records and ice mass evidence suggests that the late twentieth century has been exceptional in the context of the last 1000- 3000 years (Luckman, 1998).

2.5 Uncertainty

It is difficult to read any literature on climate change without encountering the word uncertainty. Uncertainty is associated with future climate projections, and although temperature changes during this century are consistent with predictions of global warming, they remain within the range of natural variability. Lack of certainty over the timing and magnitude of climate change impacts has assisted those opposed to undertaking policy action now to combat potential future climate change. However, Environment Canada, the IPCC and many others assert that despite uncertainties, the balance of evidence suggests a discernible human influence on global climate. Evidence

cited includes changes in global mean surface air temperatures, changes in seasonal atmospheric temperatures, and global sea level rise of a 10 to 25cm in the past 100 years (Environment Canada, 1997; Hengeveld, 1999; IPCC, 2001).

A major barrier to attributing climate change to a specific cause is that of understanding natural variability. However, accumulating evidence suggests that the combination of changes now occurring are increasingly difficult to attribute to natural variability alone (Jacobs, 1998). The inadequacies of climate models are also frequently cited as reason to doubt climate forecasts. A key argument is that computer models used are inadequate since they do not account for cloud formation and the absorption CO₂ by oceans. (ibid.). However, climate models analysing past variability suggest that warming in the past century exceeds expected natural variability. There is also increasing evidence of agreement between model predictions of climate response to human interference and observed trends (Hengeveld, 1999; Jacobs, 1998).

Hengeveld (1999) provides a synthesis of 770 scientific papers and reports relevant to climate change that have appeared in peer-reviewed papers since 1997. He notes that while uncertainties about projections of future climate change remain large, there are a number of certainties and important conclusions that can already be drawn including:

- The existence of a natural greenhouse effect, which keeps the earth warm enough to sustain life.
- That human activities are increasing global atmospheric concentrations of GHGs

that result in enhanced atmospheric warming.

- There is now high confidence that global warming is unavoidable.
- Equilibrium global response to a doubling of CO₂ concentrations will be in the range of 1.5 to 4.5°C.
- Water vapour in the lower atmosphere will increase by approximately 6% per degree of warming.
- Sea levels will rise.
- Drier summers in continental Northern hemisphere and more intense tropical storms over oceans also appear likely (Hengeveld, 1999).

Many scientists now insist that much of the debate about scientific uncertainty within the media and policy communities, particularly in the US, appears to have been distorted by the significant weight placed on the opinions of think tanks at the fringes of science, rather than on peer reviewed conventional science (Hengeveld, 1999). In spite of broad scientific agreement about the causes and impacts of climate change, the media often present the issue as the subject of on-going scientific debate. The dominant role of the mass media in shaping public perception and awareness of environmental issues (Sachsman, 2000), should be recognised in the context of developing local communication strategies.

Lack of consensus among scientists is no reason to avoid action. The numbers of scientists who believe climate change will occur are far greater than those that reject the

idea. Therefore, it becomes difficult to argue that action should not be taken simply because a small minority of scientists have a different view. In the absence of certainty, the “precautionary principle” agreed to by Canada and 178 other nations at the United Nations Conference on Environment and Development (UNCED) is now often applied to issues such as climate change. The precautionary principle states that “where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNCED, 1992).

There are also compelling reasons for justifying intervention to prevent climate change on other grounds since virtually every policy option has many other benefits, particularly when the scope of analysis is brought down from a global to a local scale. The multiple benefits of taking action to reduce GHG emissions are convincing. This point will be illustrated in Section 2.7 and expanded upon in subsequent chapters where it will be demonstrated that as the scale of analysis moves to local levels, the benefits of reducing GHG emissions become much more apparent.

2.6 Re-framing the Issue, Expanding the Analysis

The debate on whether climate change is in fact occurring and whether or not we should be concerned has largely obscured some certainties, which can be clearly linked to the issue. For example, there is certainty that fossil fuel combustion is a primary cause of elevated CO₂ levels in the atmosphere. Using fossil fuel to produce energy is also known

to contribute to other environmental problems such as smog and acid rain at regional and local scales. As the scale of analysis moves from global to local levels the uncertainties associated with climate change science may remain, but other issues can be more clearly linked to the debate. Cohen et al. (1998) provide a critique of current scientific, reductionist framing of climate change research. They argue that much global environmental debate falls into the “IPCC fallacy” where human and social dimensions of global change are usually provided as an appendage to the extensive body of work that defines the problem in terms of natural sciences. They add that there is a fundamental difference between groups and individuals studying global environmental change. In particular, there is a difference between a natural science approach that defines problems in terms of energy flows and a social science approach, which defines the problem in terms of human behaviour. The dominant scientific approach to climate change has constructed the issues as amenable to scientific analysis, but has largely ignored the human dimensions of the problem, and the difficult and locally differentiated politics of responding to it. Integrating social science research and knowledge more closely with the existing climate change discourse, combined with a closer examination of the issue of scale are both elements that social science research has identified as required to expand understanding of the issue (Chen et al. 1988; Hinchcliffe, 1996; Chiotti, 1998; Cash and Moser, 2000).

2.7 Issue Linkages and the Importance of Scale

Matching global scale objectives to reduce GHG emissions with domestic priorities is a

potential means to overcome the fact that climate change is seen as a low priority issue in many nations (Gupta and Hisschemoller, 1997). Gupta and Hissemoller argue that effectively addressing climate change will largely depend on the opportunity to create win-win situations through concrete linking of issues. They add that energy and fossil fuel combustion is a natural link since air pollution is an issue that many developing and developed nations are already struggling with. CO₂ has become a focus of climate change research due to its position as the primary cause of anthropogenic warming. Fossil fuel combustion, the primary cause of elevated CO₂ emissions would seem a logical focus for response strategies. By expanding and re-framing the climate debate from a focus on CO₂ abatement, to include a clearer emphasis on fossil fuel emission reduction strategies one can also gain an expanded understanding of the costs and benefits to action at the local level. However, the global nature of climate change discourse does not generally address local and regional impacts of fossil fuel combustion.

In recent years there has been a growing recognition that both the science and policy of air issues need to be addressed in an integrated fashion. Traditionally, atmospheric issues have been dealt with on an individual basis in what is often termed a “stove-pipe” approach (Munn and Marrouf, 1997). Canada has a suite of separate air issue policies and agreements at the global, bi-national, national and regional scales. Climate change is perceived as a key stressor upon other air issues, but analysis of the co-benefits of GHG abatement and other air issues is rare (ibid. P.8). Current estimates of the co-benefits in the literature tend to focus principally on avoided damages to human health and much

less attention is paid to the co-benefits of increased social welfare and environmental improvements (Chiotti, 1998).

Reducing CO₂ emissions through reduced fossil fuel combustion is seen to have the additional benefit of achieving reductions in conventional air pollutants, improving local and regional air quality and associated environmental and human health impacts (ibid.; Last et al., 1998). Urban areas in particular are expected to experience human health impacts associated with air quality. The most cost effective method of reducing GHG emissions is achieved by reducing fossil fuel combustion through energy efficiency, altering agricultural practices and fuel switching. Fossil fuel combustion not only produces CO₂, it also releases other emissions. For example, the combustion of coal for electrical power generation releases the air pollutants sulphur dioxide, oxides of nitrogen, particulate matter and ozone - all of which have direct and indirect impacts on human health (Munn and Marrouf, 1997). Many of these pollutants, precursors to other atmospheric pollutants such as acid rain and smog, are known to have damaging effects on human health. For example, air pollution has a significant impact on the health of Canadians. Approximately 5,000 premature deaths in Canada are attributed to air pollution (Last et al., 1998). Smog costs Ontario more than \$1 billion a year in hospital admissions, emergency room visits and absenteeism (Ontario Medical Association, 2000). In Ottawa each year, 100 premature deaths and 33 million health care dollars are linked directly to air pollution (ibid.). These costs could be reduced if strategies to reduce fossil fuel emissions through the implementation of Local Action Plans are effective.

Potential economic benefits to climate change responses are also becoming increasingly evident at the municipal level. For example, in Toronto, the Better Buildings Partnership (BBP), launched in 1996 to improve energy efficiency in Toronto buildings, has created 3,000 new jobs and reduced annual building operating costs in the city by \$6 million. The program has created an estimated \$60 million dollars of investment in the local economy (BBP, 2000) and provides a good illustration of the linkages between reducing energy use, emissions and local economic development. Portland Oregon has reduced energy use in its own buildings resulting in \$1.2 million in annual utility savings and reducing emissions by 10,000 tonnes annually. In addition, through an energy management plan, the City of Saarbrücken, Germany reduced emissions from its own buildings and facilities by 50% between 1980 and 1996, saving 33,000 tonnes of CO₂ and reducing annual operating cost by the equivalent of \$3.5 million \$US (ICLEI, 1997B).

It is evident that as the scale of analysis decreases from global to local, the scope of the issue can expand widely and climate change can be closely linked to local and regional atmospheric issues. It can also be linked to associated public health issues such as respiratory illness. In addition, action to reduce emissions can have economic benefits at the local scale as evident by the Toronto BBP example. There are increasing calls for linking climate change action more closely to broader objectives of sustainable community development (Hinchliffe, 1996). There are similarities between climate change and sustainable development; both concepts address human impacts on the

environment, particularly on global dimensions (Cohen et al, 1998). Climate change was identified as a major problem associated with sustainable development by the Brundtland commission in 1987 and is interconnected with sustainable development issues such as energy use, land use, economic and social issues. However, despite the similarities and linkages with multiple issues the approach to sustainable development and climate change have diverged both from a research and policy perspective (ibid.). As previously indicated, the climate change debate has been largely science driven and has been characterised by a form of scientific reductionism, which has largely bypassed the complex, locally specific and interconnected problems of sustainable development. The problem-driven nature of the field of sustainable development is characterised by a local scale, human behaviour approach (ibid). Reaffirming the local connections to the global climate change discourse will likely be essential to mobilising concrete action on the issue.

2.8 Summary

This chapter has outlined the broad issue of climate change, its causes and consequences. The discussion illustrates that the emissions causing climate change are not uniformly distributed globally. Similarly, the impacts of climate change will vary regionally at national and global scales. Fossil fuel combustion is identified as the primary cause of elevated GHG emissions and it was demonstrated that North Americans contribute disproportionate amounts of CO₂ on a per capita basis. While uncertainty has been identified a reason to delay action it was argued that there is sufficient certainty to take

action now, especially when the combined impacts of fossil fuel use at local and regional scales are taken into account. It was demonstrated that when the scale of analysis is shifted from global to regional and local scales, the multiple benefits of taking action are more clearly identified and the crosscutting nature of the issue is more clearly evident. There are increasing arguments in favour of integrating climate change responses to broader sustainable development issues. Chapter 3 examines the range of response strategies available to reduce emissions and briefly outlines international, national and the Ontario provincial government response. This information is important to establish the broader institutional context in which the City of Ottawa is implementing its Local Action Plan.

CHAPTER 3

OVERVIEW OF CLIMATE CHANGE RESPONSE STRATEGIES

Chapter 3 provides an overview of the range of response strategies available to reduce the impact of climate change. Response strategies at the international, national and provincial level are then outlined. International climate change negotiations and agreements are discussed briefly, followed by a review of Canada's national climate change response and the Government of Ontario's position. Though the discussion will be brief, it is important to outline the response of other levels of government to provide the context in which the City of Ottawa's climate change program is being implemented.

3.0 Collective Responses to Environmental Problems

The problem of coordinating behaviour for the common good is one that all human groups have faced. Hunter-gatherer societies cooperated with each other and divided up the various activities necessary for survival (Gardner and Stern, 1996). In modern times, as human technology has become more sophisticated, there is a need for even greater cooperation between people to coordinate individual behaviour toward the common good.

For example, national transportation systems require the coordination and limitation of individual behaviour with traffic control signals, speed restrictions and other regulations and restrictions (ibid.). In recent years, international agreements such as the Kyoto protocol are attempting to coordinate behavioural changes through international

commitments to climate change mitigation.

Modern societies organize themselves to make collective decisions through their political and social institutions. Success at dealing with environmental problems depends in part on the strength and adaptability of institutions and the relationships among them (Firoino, 1995; O’Riordan and Jordan, 1999; WCED, 1987). Institutions are central to understanding and responding to global environmental change but are not yet adapted to effectively understand and address global change (O’Riordan and Jordan, 1999). The Brundtland report illustrated the point in two widely quoted paragraphs:

“The objective of sustainable development and the integrated nature of the global environment/development pose problems for institutions, national and international... Yet most of the institutions facing those challenges tend to be independent, fragmented, working to relatively narrow mandates with closed decision processes... The real world of interlocked economic and ecological systems will not change; the policies and institutions concerned must.” (World Commission on Environment and Development, 1987, p. 9, cited in O’Riordan and Jordan, 1999)

Environmental policy-making remains fragmented as environmental responsibilities are often distributed across several departments and are broken into many relatively independent components. This leads to further fragmentation as problem definition, analysis and decision-making are left to individual departments where connections to linked issues may be missed. Problems tend to be broken into artificially small pieces

with air, water, and waste issues considered separately. In recent years many have argued for better integration of environmental programs with other policy sectors such as energy, agriculture, land management, transportation, and foreign policy, where implications for environmental quality are substantial (Gerlach, 1991; Fiorno, 1995; WCED, 1987; O'Riordan and Jordan, 1999). Institutions remain limited in their ability to integrate environmental issues due to the mismatch between short institutional time frames of business plans and quarterly reports and longer time frames in which ecological systems work. In addition, the scale of environmental issues does not lend itself to management within a single jurisdiction. Institutions must also begin to tackle these complex issues across jurisdictional scales (Cash and Moser, 2000). The ability of institutions to integrate important multi-dimensional, long-term issues like climate change will be essential to achieve concrete results. Climate change mitigation may represent an opportunity to more closely link multiple policy issues if co-benefits of action are clearly identified during the implementation process.

3.1 Framing the Issue

The relationship between the way environmental problems are labelled and defined is an important factor in determining the range of response strategies available. For example, whether global warming is defined as a climate issue, as an energy or fossil fuel combustion, or as a human health issue will determine the range of available responses. Defining the problem as sea level rise or changes to forests or ecosystem health will also influence responses (Fiorino, 1995). Policy makers who define problems in technical

terms will likely respond with technical fixes such as scrubbers on power plants and catalytic converters, rather than with energy efficiency measures, transportation controls, behaviour change programs or integrated strategies (ibid.).

To date, the international debate has defined climate change as a warming problem and the focus of global response strategies has been on reducing overall global warming potential by addressing global atmospheric concentrations of CO₂. Framing the climate change issue as a global problem has led many governments to believe that mitigation strategies can be implemented on a global level. For example, for many nations including Canada, mitigation efforts may be in the form of joint implementation, which focuses on reducing or sequestering GHG emissions in developing and developed nations. Defining climate change as either an energy or a fossil fuel use issue may have evoked very different response strategies. If all climate change mitigation is sent abroad, countries taking the global approach to climate change mitigation will continue to struggle with the local and regional impacts of fossil fuel use, such as smog and acid rain. Making the links between global air issues and closely related local and regional issues will be essential to providing effective strategies that can achieve multiple benefits at all scales.

3.2 Policy Tools for Environmental Problems

There is a range of tools available to governments to address environmental problems. In general, there are three broad categories of policy tools available for promoting desired

social and individual behavioural changes:

1. Education programs.
2. Government laws and regulations.
3. Financial Instruments.

3.2.1 Education

Education to promote voluntary action is a key thrust of current response strategies in Canada; it is seen as a necessary first step to motivating citizens to act and to foster public support for broader government intervention in the future. This approach assumes that increasing public knowledge on an issue can bring about changes in behaviour. Most programs developed to alter behaviour rely heavily on large-scale information campaigns (Gardner and Stern, 1996). Outreach material describes the nature and severity of the problem in an effort to convince the public that action on their part is essential. Information programs then describe specific actions that individuals can take to solve the problem. Information intensive programs attempt to alter behaviour through media advertising, brochures, flyers and newsletters (McKenzie-Mohr, 1996). This approach is used for many important issues such as seat belt safety, smoking and drug awareness campaigns. Though it has been demonstrated that multiple external barriers to action can limit the short-term effectiveness of information programs, they may have a significant impact over the longer term. However, evidence suggests that information campaigns are only likely to induce behaviour compatible with individual's deeper values. In addition, information programs are more effective when designed according to psychological

principals of communication and directly address the link between attitudes and behaviour (ibid.).

The literature suggests that climate change information campaigns are unlikely to be sufficient to achieve the sustained changes that are required to reduce emissions over the long term. Multiple intervention tools are identified as the most effective agent of long-term change (Gardener and Stern, 1996; Fiorino, 1995; Gaskell and Bernward, 1987). However, many of the tools described in the next section do not fall within municipal government jurisdiction and as such, cooperation of all levels of government will be needed to achieve the desired objectives.

3.2.2 Laws and Regulations

Governments use laws and regulations to encourage desired individual behaviours and discourage undesirable behaviours. For example, laws regulate how people operate motor vehicles, including maximum speeds, stop signals etc. Governments also require the payment of taxes for the public interest. Laws and regulations are enforced by threat of fine and/or imprisonment. Direct regulation can take several forms including standards, restrictions or bans. Advantages of the regulatory approach are: simplicity, uniform treatment of sources and knowledge that all producers are doing their fair share. This approach encourages actors to comply by making it in their self-interest to do so to avoid penalties for infractions (Fiorino, 1995). However, regulatory approaches and the apparent simplicity of technology-based standards are not at all simple to develop and

negotiate and they are expensive to implement. For example, standards may not be as uniform as desired since old and new sources are generally treated differently and innovation may be discouraged with this approach (ibid.). At the local level, many of these options must be developed in cooperation with other levels of government. For example, in Ontario, building codes, which can have a considerable impact on energy use, are the responsibility of the provincial government. Provincial governments must support higher standards, or provide enabling legislation to municipalities before policies can be enacted at the local level to improve building codes.

In general, Canada's focus on voluntary GHG emission reduction programs has precluded the development of comprehensive regulations and standards to achieve the Kyoto commitment. In addition, the City of Ottawa explicitly stated that it is favouring a voluntary approach, focussing on educating and motivating citizens to take action to reduce emissions.

3.2.3 Financial Instruments

The cost of direct regulatory approaches can be several times higher than the cost of economic incentive approaches (Fiorino, 1995). The case for using financial instruments comes from environmental economics. Waste assimilative capacities of common property resources such as the atmosphere do not carry a financial cost to those that use them, the market encourages their overuse and deterioration and this conveys the false message that society places no value on free goods such as clean air and water (Fiorino,

1995; Garner and Stern, 1996). The theory of market incentives predicts that if shared long-term costs could be tied more directly to those using the resource, and linked more closely to the specific actions causing the problem, people would do less to harm the environment. This economic theory suggests that people would take care of the environment by making it in their economic self-interest to act (Gardner and Stern, 1996). Market incentives fall into one of five categories: pollution fees; tradable permits; deposit-refund schemes; market barrier reductions and the elimination of government subsidies. Incentives can be used to help individuals overcome specific external barriers and can be powerful tools encouraging/discouraging specific behaviours. Research underscores the need to understand your target group when considering an incentive approach because if the target group is already sufficiently motivated to engage in an activity, the use of a financial incentive may undermine their internal motivation (Gardner and Stern, 1996; Kassirer and McKenzie-Mohr, 1997).

Pollution fees such as taxes and charges make polluters directly accountable for the social costs of their activities by making them pay for each unit of pollution produced. Carbon taxes on fossil fuels are an example of this approach. The amount of carbon in fuels determines the amount of CO₂ emitted during combustion. Proponents of carbon taxes recommend levying a tax on fuel to ensure users help pay for environmental costs of their actions (Fiorino, 1995; Bryner, 1990). To date, the federal government has avoided the use of carbon taxes as an option to reduce Canada's emissions. Given the current widespread media attention and high levels of public concern over higher fuel prices, it

appears unlikely that a carbon tax could be levied on the Canadian population at this time without considerable political risk. In addition, carbon taxes have the potential to harm the poorest citizens while affluent citizens may not be as negatively impacted by higher fuel prices.

There is considerable interest in the use of emission reduction credits and tradable permits to promote reductions in GHG emissions at the national and global scales. An emission permit system is based on the concept that rights to pollute or emit are provided to various emission sources, and are subject to limits to overall emissions. Groups that fall below allowed emissions limits would be able to trade or sell entitlements on an open market, providing an incentive to increased efficiency. The effectiveness of emission reduction credits depends on their availability and expected market value and rules and eligibility requirements are yet to be determined. Tradable permits are considered an important component of international and national climate change strategies, but are not yet an important option within the municipal sector.

3.2.4 Multiple Tools

Social science research indicates that using a combination of policy tools is the most effective strategy and that these can act in synergy (Fiorino, 1996; Gardner and Stern, 1996; Stern and Aronson, 1984; Gaskell and Bernward, 1987). For example, anti-smoking campaigns were largely ineffective when only information was provided. However, once policies were implemented to discourage smoking in public places, and

economic incentives / disincentives were added, smoking decreased (Gardner and Stern, 1996). Given the enormous challenge of climate change, a range of policy tools ranging from ongoing public education, to fiscal incentives/disincentives and legislation will likely be required to change the way in which nations produce and use energy.

3.3 Climate Change Response Strategies

Responses to climate change include policies aimed at “mitigation” and “adaptation”. Mitigation refers to measures designed to reduce anthropogenic greenhouse gas emissions, whereas adaptation refers to measures designed to reduce impacts and vulnerability to climate change (Chiotti and Urquizo, 1999). Adaptation refers to societal adaptation to the gradually unfolding impacts of climate change. Until very recently climate change policies have concentrated almost exclusively on mitigation strategies. However, more attention is now being paid to adaptation in the science and policy literature (Chiotti and Urquizo, 1999; Lorenzoni et al, 2000).

3.3.1 Potential Mitigation Measures

The main focus of the climate change debate revolves around reducing the absolute amount of CO₂ being emitted into the atmosphere on a global scale. The primary response to achieve this objective centres on changing the way in which the world obtains and uses energy. Other common responses focus on reducing the concentration of CO₂ in the atmosphere through enhancing its storage in the oceans, soils or forests (sinks).

Potential measures include:

Source Oriented Measures:

- Energy conservation and energy efficiency
- Fossil fuel switching
- Renewable energy
- Nuclear energy

Sink Enhancement Measures:

- Capture and Disposal of CO₂
- Enhancement of forest and soil sinks (Royal Commission, 2000, Jempa and Munasinghe, 1998).

3.3.2 Reducing Energy Use

The most cost-effective method of reducing energy related GHG emissions is through actions that reduce fossil fuel combustion. These actions include energy efficiency and fuel switching (Bryner, 1990; Chiotti and Urquizo, 1999). Obtaining more energy per unit of CO₂ emitted is a key response that is achieved by using energy more efficiently or switching to less carbon intensive fuels. For example, natural gas has a lower carbon content compared to oil, which in turn has less carbon than coal. Reducing reliance on coal based power generation can also significantly reduce CO₂ emissions per unit of energy since natural gas contains 14.6 kilograms per gigajoule while the carbon content

of coal is 24.1 kg per GJ. (Royal Commission, 2000).

In recent years most western economies have experienced increases in energy efficiency of about 2% per year. Between 1973 and 1987, the United States lowered its energy intensity by 27%. For example, the energy intensity of a refrigerator has fallen by 67% in that period (Jempa and Munasinghe, 1998). In addition, advancing technology continues to improve the energy intensity of fossil fuel generating plants. For example, a new coal fired plant is approximately 40% more efficient than many existing facilities. However, beyond a certain point energy efficiency cannot be further improved unless the low-grade energy produced as a by-product is used. This can be achieved through implementing combined heat and power plants that can achieve efficiencies of 70 to 80% (Royal Commission, 2000).

In spite of recent improvements, there remain significant opportunities to further increase the energy efficiency of key sectors. There is great potential for increasing the efficiency of energy use through smarter use of technologies, especially in the heating and cooling of buildings and in cars and other vehicles. For example, estimates indicate that in the USA there remains the potential for energy savings of 45% in buildings, 30% in industries, and 30% in cars (DeCicco and Ross, 1993 cited in Jempa and Munasinghe, 1998). In Canada it has been estimated that emissions can be reduced by as much as 35% to 50% in these sectors through aggressive energy efficiency measures (Torrie and Parfett, 2000). A recent City of Ottawa report also indicates that there are potential economic

energy savings of \$107 million and energy efficiency improvement potential of 29% in the City's existing building stock (ICLEI, 1999).

3.3.3 Renewable Energy

There is general agreement that large-scale development of alternatives to fossil fuel use must be part of the global response to the threat of climate change. Alternatives were actively pursued during the oil crisis of the 1970s but interest waned once oil prices and supply stabilised. Responding to climate change has led to a resurgence of programs aimed at advancing alternative energy sources (Royal Commission, 2000). Renewable energy sources include: solar, wind, hydroelectric power, geothermal, and biomass sources (Jempa and Munasinghe, 1998). Most of these resources, with the exception of biomass energy vary in supply, and some such as wind or solar are much more cost competitive when produced at small scales near the place of consumption (ibid.)

3.3.4 Sink Enhancement Measures

Other approaches to climate change mitigation include managing aspects of the global carbon cycle to reduce atmospheric concentrations. These include:

- Preventing the CO₂ produced from reaching the atmosphere, through the use of end of pipe technology.
- Increasing the amount of CO₂ removed from the atmosphere by growing vegetation to sequester carbon.

- Increasing the rate at which CO₂ is taken up by the surface layer of the ocean and transferred to the deep ocean (Royal Commission, 2000).

Although increasing the uptake of carbon from vegetation could in principle offset a proportion of the emissions from burning fossil fuels, there are arguments that terrestrial ecosystems could also be a source of future net emissions (ibid.). In addition any significant sequestration would require planting an area as large as Europe. While recovering CO₂ produced when fossil fuels are burned and disposing it underground is technically feasible, this option is extremely expensive with various solutions estimated to increase the cost of electrical generation by between 20% and 86%. In addition, capture and disposal of CO₂ is not suitable for small installations or dispersed energy uses (ibid.).

The UK's recent Royal Commission report sums up the global response challenge associated with climate change, identifying reducing fossil fuel use as a primary response and carbon sequestration and storage as minor, secondary responses:

“The core of a global response to the threat of climate change must be the most effective and reliable forms of action, those which reduce the amounts of carbon dioxide produced by burning fossil fuels. Recovering some of the atmospheric carbon dioxide and disposing of it in underground strata might make some contributions. The more the carbon

storage capacity is expanded, the less daunting the challenge of reducing carbon dioxide emission will be.” (Royal Commission, 2000 pp. 45).

3.4 International Climate Change Response

The political discussion on climate change developed gradually during the 1980's, and the issue emerged as a significant global political topic in 1988 (Paterson, 1996). The United Nations recently surveyed over 200 environmental experts who identified climate change as the most significant emerging environmental issue of the next century (UNEP, 1999).

Formal negotiations towards an international climate change treaty began in 1991. These negotiations were long, difficult and the subject of much debate². Negotiations held in advance of the United Nations Conference on Environment and Development (UNCED) led to the drafting of a Framework Convention on Climate Change (FCCC) that was signed at UNCED in Rio de Janeiro, June, 1992. This Convention was signed by over 150 nations and is seen as the first step in a long road towards international climate change action (Johnson, 1993). The FCCC did not contain a clear, unambiguous commitment to the goal of stabilising emissions in developed countries at their 1990 levels, let alone address the need for reducing them (ibid.). In his closing address to international delegates at the UNCED Conference, Maurice Strong, Secretary General of UNCED stated that: “You must act quickly to bring the climate convention and its

2. It is beyond the scope of this paper to delve into the politics of global agreements. For an overview, see Paterson, 1996.

protocols in line with what scientists are telling us, that carbon emissions must be cut by at least 60 per cent, just to put the global warming trend on hold. It is too late for protracted discussions and delay” (cited in Johnson, 1993, p.522). Since the signing of the FCCC, protracted discussion and delays have continued and global CO₂ emissions continue to rise, increasing by 400 million tonnes between 1995 and 1996 (UNEP, 1999).

At Rio, climate change was seen as one of the key issues associated with sustainable development, however since UNCED, climate change and sustainable development have taken separate paths (Cohen et al., 1998).

The slow progress of international climate change action has been largely attributed to the United States and their intransigence over the setting of emission targets. The final wording of the FCCC is indicative of compromises made to bring the U.S. on-side. Instead of targets to achieve emissions reductions or stabilisation commitments, the final text of the FCCC commits nations to “enact policies with an *aim* of stabilising emissions” (Paterson, 1996). From an environmental point of view, the Climate Convention was deemed inadequate since no clear emission reduction targets were set (ibid.).

During the first Conference of the Parties (COP1), Germany tabled a formal proposal for a protocol on CO₂ emissions in which nations would commit themselves to a percentage reduction in emissions within a given time frame. The final text of the proposal contained no clear targets, which was a disappointment to environmental non-governmental organisations (ENGO's), which had been anticipating a proposal to reduce

CO₂ emission by 20% by 2005 (ibid.). During this time it was becoming apparent that while many industrialised nations were agreeing that existing commitments were inadequate, many were also acknowledging publicly that they were not going to meet their existing stabilisation commitments. COP1 resulted in the Berlin Mandate, which began the process to strengthen international climate change commitments (ibid.).

The Berlin Mandate led to negotiations that culminated in the signing of the Kyoto Protocol by 160 nations during COP3, December 1997. Once ratified, this legally binding agreement goes beyond the voluntary controls of the FCCC and commits nations to limiting their greenhouse gas emissions. Kyoto commitments apply only to the 38 developed nations and countries in transition in Central and Eastern Europe. Individual nations have targets that reflect their varying circumstances and the overall reduction in greenhouse gas emissions is 5.2 percent below 1990 levels. The treaty has a flexible time frame with emission target dates set over a five-year period (2008-2012), to allow for variations in economic growth, weather and other factors. The treaty proposes built-in flexibility provisions to enable countries to find the lowest cost options to reaching their Kyoto Targets. These include investing in activities to sequester carbon, such as reforestation to increase the absorption of CO₂, carbon trading and credit systems and clean development mechanisms and joint implementation (IISD, 1998). Rules on the implementation of flexibility mechanisms remain the subject of intense international debate.

Ratification of the Kyoto Protocol has been stalled due to unresolved issues revolving around the rules for implementing the protocol. COP6, which was to have set the rules for implementation, resulted in failure as talks broke down and national governments left without an agreement. International environment groups designated Canada as the most obstructive of the 180 countries at COP6 (Mitchell, 2000).

A key barrier to agreement was the issue of carbon sinks. Canada and the United States argued that carbon absorption of their forests and farmlands should be counted against the emissions they send into the atmosphere. The European Union affirms that the Kyoto Protocol ought to result in less CO₂ being emitted into the atmosphere and views the North American proposal as a means of avoiding emissions reductions (*ibid.*). As illustrated in Figure 2.2 North Americans are by far the largest per capita source of CO₂ emissions and fossil fuel combustion is the primary cause of elevated CO₂ emissions globally. The refusal of these two nations to more actively reduce their own emissions is seriously weakening international agreement. As this research reached the final draft phase, recently elected American President George Bush announced that the United States has withdrawn its participation in the Kyoto Protocol. The long-term impact of this decision on international agreements remains to be seen.

3.5 The Canadian Climate Change Response

The Kyoto Protocol commits Canada to reducing GHG emissions by 6% from 1990 levels by the 2008 - 2012 period. Between 1990 and 1996, total Canadian GHG emission

increased by 11.6%, with emissions from the transportation and residential sectors rising at higher than average rates (Statistics Canada, 2000). Based on current “business-as-usual” projections, this means that actual emissions reductions will need to be approximately 25% below forecast levels to achieve this goal (Cheminfo, 1999). Following the Kyoto conference, the Prime Minister of Canada and provincial Premiers agreed that climate change is an important global issue and that Canada must do its part, but in such a way that no region is asked to bear an unreasonable burden. In April 1998, the joint meeting of the Federal, Provincial and Territorial ministers of energy and the environment agreed on a process to develop a national implementation strategy on climate change. In 1998, a National Climate Change secretariat, which includes membership from provincial, territorial and federal governments, was established to coordinate the preparation of Canada's implementation strategy.

Similar to the global emphasis on climate science, Canada's strategy has placed considerable emphasis on climate research to provide better information on climate trends, processes and potential changes. Much of this research is approached through continued investment in climate modelling (Cohen et al. 1998). The National Action Program on Climate Change (NAPCC) response to the UNFCCC has centered on the Voluntary Challenge Registry program to encourage industries to find greater efficiencies in the production and consumption of energy. There are also national communications programs for public education, programs that promote the development of alternative fuels, energy efficiency and an enhancement of carbon sinks in agriculture and forestry

(ibid.). Voluntary action by Canadians is seen as the key means to reduce GHG emissions, especially during the period when the national implementation strategy is being developed. Voluntary action includes individual Canadians reducing their own GHG emissions by making energy efficient transportation and purchasing decisions; early action by industry, business and governments; and joint implementation to reduce emissions from developing nations through emission trading and clean development mechanisms (Cheminfo, 1999).

A major component of Canada's implementation strategy has been the establishment of GHG Issues Tables to provide input from stakeholders and experts from within government, industry, environmental NGO's and other groups. A total of 16 Tables, representing all key areas involved in producing GHG emissions, were established to provide input into the national implementation strategy. Issues Tables were mandated to produce reports reviewing existing knowledge and experience on GHG mitigation and identify potential measures to address greenhouse gas emissions within their specific sector. Issues Tables generally fall into two categories as defined by the Issues Table Synthesis Paper (Cheminfo, 1999). Group I represents larger industrial companies with largely point source emissions such as power generation, pulp mills, and manufacturing. Group II sector Tables represent a larger group of constituents including the general public and covers area and mobile sources such as transportation, buildings and municipalities.

A main focus of mitigation strategies in Group II is enhanced education and awareness and citizenship programs designed to promote individual behavioural changes and foster increased uptake of energy efficient technology (ibid.). Behavioural solutions are recognized as particularly important components of mitigation strategies for the Buildings, Transportation and Municipalities Issues Tables where changes to individual human actions can lead to reduced emissions (ibid.). In 1998, the federal government established the Climate Change Action Fund (CCAF) to promote research and action in public education; science, impacts and adaptation; technological and policy development. The CCAF provided \$150 million over three years 1998 to 2001 to advance Canadian action in these key areas, including \$30 Million earmarked for public education and outreach. Table 3.1 summarises the major emphases of the Sectoral Table responses that have particular relevance for the City of Ottawa emission profile, which is dominated by emissions from the transportation and residential, commercial/ institutional building sectors. This table illustrates the extent to which local action plans and public education and awareness programs are considered integral to the National Implementation Strategy.

TABLE 3.1: Strategy Summary for Government of Canada Sector Tables

	Orientation or Major Emphasis		
Sector Table	Mitigation Approach	Key Measures	Challenges, Issues
Transportation	Behavioural, Technology	Education, Economic Instruments, Technology, Fuel efficiency programs, alternative fuels	Measurement of emission sources, Measurement of program effectiveness
Municipalities	Behavioural, Technology, Sink enhancements	Local Action Plans Citizenship programs Public education	Jurisdictional, Resources, Measurement
Buildings Residential, Commercial	Behavioural, Technology	Education, Energy efficiency programs	Measurement of emission sources, Measurement of program effectiveness

(Adapted from Cheminfo, 1999 pp.11)

3.5.1 The National Business Plan and Implementation Strategy

In October 2000 Canadian Energy and Environment Ministers, with the exception of Ontario approved Canada's National Implementation Strategy on Climate Change and released Canada's First National Climate Change Business Plan, which set out concrete actions designed to achieve the Kyoto commitment. The National Implementation strategy continues the same themes for response strategies as those outlined in the sectoral table analysis. The strategy takes a phased approach; with Phase I being in force

until Kyoto is ratified. Five themes are the foundation of the Phase I response strategy:

1. Enhance awareness and understanding: inform, educate and build awareness of science and the impacts of climate change.
2. Promote technology and innovation: increase the availability of new technologies and promote commercial opportunities here and abroad.
3. Governments lead by example: to send a clear signal to all Canadians that climate change must be addressed.
4. Invest in knowledge: includes enhanced modeling, international aspects, science, impacts and adaptation to reduce scientific uncertainty.
5. Encourage action in seven key sectors: agriculture, buildings, electricity, forestry (sinks), industry, municipalities and transportation.

With the emphasis on continued research to reduce uncertainty, increasing education and awareness and enhancing voluntary measures, the federal government's response cannot be considered an aggressive approach to climate change and emission reductions in Canada. As outlined in Section 3.2.4, the literature suggests that using a combination of tools including regulation, financial incentives and education will produce the most effective results. Failure to take a more aggressive position in Phase I may lead Canadians to believe that the government does not view climate change as a priority, and is not leading by example on the issue which may in turn limit their own response.

A guiding principle of this strategy is that no region should bear an unreasonable burden

in implementing the protocol (*ibid.*). It is unfortunate that this statement does not reflect the fact that in addition to potential burdens associated with response strategies, there can also be many opportunities and benefits from taking action as demonstrated in the co-benefits literature and by municipal government examples such as Toronto's Better Buildings Partnership outlined in Chapter 2.

3.6 Provincial Response Strategy

Provincial governments across Canada have not taken substantial action to address the issue of climate change (Pembina Institute, 2000). In particular, the Government of Ontario has recently refused to sign on to Canada's National Implementation Strategy announced in October 2000. The Ontario Government's position on the national process is that they have already "demonstrated leadership by taking aggressive early action to develop the most comprehensive and effective range of programs in all of Canada. By actively targeting a full range of smog and greenhouse gas emissions, Ontario's programs represent an effective, coherent effort to improve air quality and combat climate change" (Newman, 2000). Then Ontario Environment Minister Dan Newman adds that a coordinated North American approach to this international issue is required since we share the continent with one of the world's largest emitters of smog and GHGs. Thus, any aggressive provincial strategy appears to be waiting for the Americans to ratify the Kyoto Protocol, which appears unlikely. Delay precludes taking any aggressive action on energy efficiency or promoting alternative energy technologies that could have positive impacts on local and regional environmental problems such as smog and acid rain.

The Pembina Institute and the Environmental Commissioner of Ontario do not agree with the provincial government's own assessment of its climate change response. Eva Ligeti noted in the 1998 Environmental Commissioner of Ontario (ECO) Annual Report that the Ontario government's stated response to climate change is their participation in the National Process. However, their primary activity at this level was to argue for delay in any significant action pending further analysis of the costs and benefits (Pembina Institute, 2000). The fact that they have refused to sign on to the National Climate Change Implementation Strategy indicates that they have walked away from their primary response strategy. Other than their participation in the national process, Ontario has relied on existing programs such as the Smog Plan and Drive Clean programs as their contribution to climate change action (ECO, 1998). However, the ECO's review found that provincial ministries have not done the analysis needed to support their assumptions about the ability of these other programs to deliver reductions in greenhouse gases. The Pembina Institute evaluated Provincial Government performance on various activities associated with climate change and awarded the Ontario Government a score of 27.5 out of a possible 100 points (Pembina Institute, 2000).

Individuals involved in implementing Ottawa's Action Plan provided overwhelming confirmation of the Pembina Institutes scorecard of Ontario Government action. The consensus of those interviewed is that the Ontario government has not supported municipal action on climate change, in spite of the potential opportunity for addressing other environmental, health and economic development issues when action is taken.

3.7 Summary

This chapter reviewed the variety of response strategies available to reduce atmospheric concentrations of CO₂ and reduce the threat of climate change. The way an issue is defined or framed was shown to have an impact on the range of responses that will be selected. Three broad categories of potential response strategies were then described: education, legislation and market incentives. The research indicates that a combination of these approaches is generally more effective than applying one single strategy. Specific measures for reducing atmospheric concentrations of CO₂ were identified. Primary policy responses target changing the way the world obtains and uses energy. Another common response is to reduce atmospheric concentrations of CO₂ through enhancing its storage in oceans, soils and forests (carbon sinks). The most cost effective method of reducing energy-related CO₂ emissions may be through actions that reduce fossil fuel combustion and developing energy alternatives. Sink enhancement measures may not be a preferred option due to uncertainties over whether terrestrial ecosystems could ultimately become a net source of CO₂ and the extent of additional planting required to achieve significant sequestration. Disposal of CO₂ appears to be a feasible but expensive

technical option.

International responses, Canada's national strategy and the Ontario Government response were outlined next. While international climate change negotiations have been ongoing for several years, significant progress remains elusive and global emissions continue to climb. The 1997 Kyoto Protocol was the first international agreement to establish clear emission reduction targets and time lines for achieving these targets. However, ratification of the Kyoto Protocol has been stalled and it is now in jeopardy, partly due to disagreements over the issue of carbon sinks. Canada's national response strategy appears to focus on increased scientific research, technological innovation, and voluntary strategies to promote behavioural solutions through education and information campaigns. Other policy instruments such as regulation and financial instruments play a more minor role. It was argued that provincial governments in Canada have not taken significant actions to address the issue of climate change. In particular, the government of Ontario's response has been deemed weak and they have recently refused to participate in Canada's Implementation Strategy. Municipal government authority is expressly delegated by provincial legislation (Hoehn, 1996), thus more aggressive policy actions to reduce emissions may also be constrained by a lack of delegated authority for changes to buildings codes or other areas of provincial jurisdiction. The Ontario government's lack of involvement may impede the City of Ottawa as it pursues its relatively aggressive 20% emission reduction target.

Municipal climate change response strategies are carried out within the context of the international, national and provincial responses identified herein. This chapter has illustrated that to date, there has been a lot of negotiation, analysis of potential responses and limited actual response. The next three chapters detail the City of Ottawa's response strategies and examine the effectiveness of the approaches selected to achieve the emission reduction target.

CHAPTER 4

OTTAWA'S "TASK FORCE ON THE ATMOSPHERE ACTION PLAN"

The previous chapters have illustrated broad issues associated with climate change and the variety of response strategies available to reduce increased concentrations of anthropogenic greenhouse gas emissions. Municipal strategies are carried out within the context of international, national and provincial responses identified in Chapter 3. In August 1992, the City of Ottawa became one of the first municipal governments in Canada to pass a resolution committing itself to a 20% reduction in GHG emissions, below 1990 levels by 2005. In 1995 the City approved both corporate and community action plans to achieve this objective. These plans predate the Kyoto Protocol, which has served as a foundation for Canada's response and the City's targets exceed Canada's 6% emission reduction target negotiated at Kyoto by 14%. The successful implementation of Ottawa's community action plan, which represents 99% of Ottawa's emission inventory, should help advance changes in energy consumption and individual behaviour required to achieve Canada's international commitments.

Environmental projects such as developing and implementing a local action plan are complex and long term. Partners for Climate Protection (PCP) members commit to reducing emissions within a ten-year period and the local action plan sets the framework for achieving the emission reduction target. How well the local action plan project is structured and implemented will be fundamental to achieving a community's objective.

The City of Ottawa's Task Force on the Atmosphere Action Plan (Action Plan) was developed to reduce emissions in three key energy sectors in the City. Detailed case study evaluation of the implementation of this action plan is the focus of the next three chapters.

Chapter 4 presents the evolution of the Action Plan strategy from the formation of the Task Force to the planned implementation strategy. Since the primary emphasis of Ottawa's plan has been to develop information and education campaigns to change behaviour, elements of successful education campaigns are explored in more detail. In addition, any successful projects have fundamental management components that must be addressed and key elements of successful projects are identified. Finally, drawing from the discussion set out in Chapters 2 through 4, a framework for evaluating the program is presented. Subsequent chapters will evaluate the actual implementation of the plan to determine whether it has achieved its initial objectives.

4.0 Research Methodology

Data Acquisition and Analysis

Case study research is based on a qualitative evaluation of existing programs and interviews with experts in the field who have been directly involved in implementing the City's Action Plan. The methodology included in-depth semi-structured interviews (Appendix 1). The interview population consists of all individuals identified as members of Action Plan's Working Groups, Implementation Team, Advisory Committee

and CO₂ Corporate Challenge. A total of 30 individuals were contacted for an interview and of those, 19 agreed to take part in the process. The primary reason provided by individuals not consenting to an interview was their limited involvement in the program and/or a gap of several years since any personal involvement in the program. Other individuals identified as members of Working Groups or the Advisory Committee had left their original positions and could not be located. Each respondent was asked a specific core set of questions for consistency, but were provided with the opportunity for spontaneous, individual response. Questions were both general and specific. General questions revolved around key aspects from project management and environmental policy literature. Project-specific questions were directed towards those directly involved in each specific initiative. Results are summarised and analysed within the text of the thesis. Responses are generalised where there is broad agreement of fact or opinion and dissenting viewpoints are presented if deemed significant. Interview results are discussed in general terms to avoid identifying the respondents, who were assured of anonymity and confidentiality, with the exception of specific permission for direct quotations.

4.1 Ethical Consideration

Individuals interviewed were informed of the purpose of the research through letters requesting their participation. All respondents signed an informed consent form prior to the interview process. Respondents were assured of anonymity and confidentiality, with the exception of quotations. Direct references and quotations were used for this research for several reasons. First, opinion and anecdotal evidence of participants is one the key

basis for evaluation, and is often subjective. References to original sources can assist in demonstrating the validity of evaluation. Second, it is anticipated that there will be a range of views on program goals and outcomes. It is important to include different interpretations, to consider all other explanations before drawing conclusions. The use of citations allows for these different perspectives to be articulated precisely in the speaker's own words. Third, responses to interview questions vary by individual. Occasionally a response may seem particularly salient for its insight and will be worthy of direct quotation. Any direct references have been included with the express written consent and approval of the written quotation by that individual.

4.2 Task Force on the Atmosphere Action Plan and Implementation Strategy

In October, 1995 after a year of multi-stakeholder input, "A Call to Action: the City of Ottawa's Task Force on the Atmosphere Action Plan" was approved to help the City and its residents achieve the 20% greenhouse gas emissions reduction target. The Action Plan defined 11 separate elements, each of which became a program designed to reduce the major contributors to greenhouse gas emissions in the community in the residential, commercial/ institutional and transportation sectors. Individual program elements are outlined in Table 4.1.

TABLE 4.1: Task Force on the Atmosphere Action Plan: 11 Program Elements
(Source: Adapted from City of Ottawa, 1995)

Sector	Program Element	Objective, Description
Residential	1. Information and Referral Service (IRS)	To provide energy efficiency information to: homeowners, tenants, builders, contractors and architects
	2. Home Energy Rating System (HERS)	To provide energy efficiency information to homeowners and prospective buyers
	3. Favourable financing for energy efficiency	To reduce the barrier of high capital cost of energy retrofits by encouraging lending institutions to provide favourable financing
	4. Contractor certification	City to provide a list of certified energy efficiency to perform retrofit work to assure quality standards
Commercial/ Institutional	5. Ottawa's CO ₂ Corporate Challenge	To challenge and assist corporations and institutions to reduce their CO ₂ emissions
	6. Federal buildings initiative (FBI)	To disseminate FBI information to local corporations. FBI program aimed at improving energy efficiency in federal buildings
	7. Expand the role of energy service companies (ESCOs)	ESCOs provide up-front financing and install retrofits, are repaid over time through energy savings. Reduces key barriers of technical expertise and financing.
Transportation	8. Transportation awareness program	To educate the public about the health effects and local and environmental impacts of their transportation habits
	9. Transportation demand management (TDM)	To help employers provide incentives to employees who make energy-efficient transportation choices
	10. Alternative fuels demonstration program	To provide information on alternative fuels to local fleet managers to encourage use of alternative fuels
Monitoring	11. Greenhouse gas emission monitoring program	To measure the success of the Task Force on the Atmosphere Action Plan and identify areas that need improvement

Table 4.1 illustrates the extent to which the City's response strategy focussed almost exclusively on information and education dissemination to the various stakeholder groups. The literature suggests that there are some important elements that should be adhered to when disseminating information on environmental issues, which are discussed further in Section 4.5.

Upon issuing its final report, the Task Force on the Atmosphere was dissolved and an Implementation Strategy was initiated. A key intention of the Implementation Strategy was to maintain the multi-stakeholder participation that was a central component of the original Task Force. The Implementation Strategy consisted of three separate entities, namely:

1. *An Advisory Committee*: The Advisory Committee mandate is to ensure the successful implementation of the Action Plan; it is composed of representatives from organisations responsible for implementing elements of the Action Plan, and others with a proven interest in seeing City Council's greenhouse gas reduction commitments achieved.

Specific Committee responsibilities included:

- Reviewing Annual Reports prepared by the Implementation Team.
- Reviewing annual monitoring on City-wide GHG emissions.
- Issuing progress reports of the action plan elements and recommend next steps.
- Remaining available to the implementation team as a sounding board for

proposed changes to the Implementation Strategy, or to help overcome barriers faced during implementation.

2. *An Implementation Team*: Consisting of City of Ottawa staff, the Implementation Team was established to act as a technical resource and to assist with the development and implementation of each Action Plan element. Once implementation occurred, the team was delegated responsibility for overseeing the day-to-day operations of programs.
3. *Individual Action Plan Work Groups*: Comprised of partner organisations who helped create the Action Plan or who are interested in seeing particular Action Plan elements implemented. These were to be formed on an ad-hoc basis for individual programs (City of Ottawa, 1995).

The implementation framework is more clearly illustrate in Figure 4.1, which shows the extent to which the multi-stakeholder involvement formed the basis of the implementation strategy.

**Figure 4.1: Implementation Framework:
City of Ottawa Task Force on the Atmosphere Action Plan**

Source: A Call to Action: City of Ottawa's Task Force on the Atmosphere Action Plan
Pp. 28.

4.3 Multi-stakeholder Engagement

As evident in 4.1, multi-stakeholder participation was a primary objective of the Task Force and it was a central component to the Action Plan implementation strategy. Task Force members consisted of senior decision makers in the community, environment and energy experts, and representatives from interested sectors and organisations such as Ottawa Hydro and the Region of Ottawa-Carleton. Senior representatives of the

community were specifically targeted because it was deemed necessary to involve individuals with the authority to influence their portion of the energy use sector (Cahill, 1994). Task Force members agreed to assist in developing and implementing the action plan.

Since the beginning, securing stakeholder participation has been a challenge. For example, the Region of Ottawa-Carleton's public transit authority, OC Transpo, did not become involved in the Task Force citing "more pressing matters" (Stacey, 1994, cited in Cahill, 1994 pp. 95). Given that transportation emissions are such an important contributor to greenhouse gas emissions at the local and national level, the lack of participation of the public transit authority left a large gap in stakeholder involvement. Another key player absent from the outset was the Federal Department of Public Works and Government Services, which operates the majority of federally owned facilities and negotiates leases for rental facilities. At the time, the federal government accounted for 21% of local employment and its lack of participation was considered a serious constraint to achieving the GHG emission reduction target. The Ontario government also declined participation on the Task Force. Even within City operations, the Department of Urban Planning and Development displayed a clear lack of interest (*ibid.*). The lack of planning input created a situation where urban form, which can greatly influence a community's energy profile (Torrie, 1994), was seldom discussed at meetings and is not an element of the original Action Plan strategy (Cahill, 1994).

The general public is a key stakeholder group, which appears to have been largely absent from the process. Public involvement is not clearly documented in the formal records and respondents indicate that there was no broad consultation of the general public during the development of the Action Plan. The public was invited to the launch of the Task Force and to a public feedback session of the draft Action Plan report. However, the public feedback session was poorly attended and it is unclear how public feedback was incorporated in the final report. According to some respondents, the lack of public involvement in implementing the local Action Plan is a program gap that continues in 2000.

Stakeholder consultation was much more comprehensive for senior community representatives who were conferred with extensively prior to developing the program. There is a general consensus that discussions with key stakeholders led to the decision to pursue strictly voluntary emission reduction programs, with an emphasis on education, rather than mandating building code changes or pursuing other more aggressive policy options.

4.4 Elements of Successful Public Awareness Campaigns

Ideally, public awareness campaigns will enhance knowledge, foster attitude change, forge commitment and provide public support for policy and regulatory changes that, in the long term, may have a substantial impact on behaviour (Government of Canada,

1998). Information is also an essential first step to overcoming external barriers to individual action such as ignorance and misinformation (Gardner and Stern, 1996; McKenzie-Mohr, 1996). If people do not know which of their daily actions are most responsible for energy use and emissions, they cannot act on a desire to make a difference. In addition, although they are considered an essential first step to public action, research clearly indicates that information campaigns by themselves, rarely lead to desired behavioural changes (*ibid.*).

Research demonstrates that there is very little relationship between attitudes and knowledge and behavioural changes (Gardner and Stern, 1996; Stern and Aronson, 1984). While positive attitudes are conducive to action, they are only predictive of action under certain conditions. Information is most effective when barriers to action are low (inexpensive, convenient). Behavioural changes are much more likely when strong barriers to action are removed. Barriers are higher when actions are inconvenient, complex or expensive. Providing information to change attitudes combined with the removal or reduction of external barriers has the potential to be more effective than traditional information intensive campaigns (Gardner and Stern, 1996; Kassirer and McKenzie-Mohr, 1997). Knowledge of the barriers associated with behaviour change and developing programs targeted at reducing specific barriers are identified as key components of outreach programs and as such, they are essential to developing effective municipal GHG emission reduction strategies.

Uncovering barriers to individual action is considered to be a critical first step to any outreach program, but it is most often over-looked. Reasons for skipping this stage include assumptions that barriers are already known, time restraints and cost. Barrier identification may add to the cost of a program, but the additional costs may be minimal compared to redesigning a program that was ineffective because it was based on incorrect assumptions. There are three common strategies to uncovering barriers: literature reviews, focus groups and surveys (McKenzie-Mohr, 1996). Program evaluation should include an assessment of the extent to which the City of Ottawa identified the barriers to local action prior to developing their community outreach programs.

Selecting the Behaviour to Change

Carefully choosing the behaviour to change is of fundamental importance to achieving the desired result. Quantitative and technical information can more clearly direct one to behaviours that have the greatest impact on a given problem (Gardner and Stern, 1996). In Canada, there exists a wide body of research that outlines the primary cause of elevated GHG emissions in each sector. In addition, each municipality that develops a community action plan is required to complete a detailed analysis of their local GHG emission profile. This allows communities to target their programs based on local emission profiles, which can differ greatly from community to community. For example, while the residential sector is an important component of national GHG emission reduction strategies, it is even more important for a city like Ottawa. The City's residential sector

accounted for 30% of 1990 GHG emissions (City of Ottawa, 1995), while nationally the residential sector accounted for just over 17% of energy-related GHG emissions. In Canada, space and water heating account for 82% of total energy consumption in this sector (61% and 21% respectively). Lighting accounts for 4%, appliances 13%, and cooling 1% (Government of Canada, 1998B). To ensure maximum emission reductions in this sector, communication strategies should ensure that residents understand the differential impact of the range of energy efficiency choices available.

Communicating Solutions

The literature suggests that there are considerable benefits to distinguishing between one-time (or infrequent) energy efficiency actions and repetitive curtailment activities. Curtailment activities include actions such as cutting down the number of car trips, switching off lights and turning down thermostats. Curtailment actions require on-going effort on the part of the individual to continue saving energy and may lead to a decrease in comfort levels, which may lead to a feeling of sacrifice among individuals (Gardner and Stern, 1996). There is a significant difference between increasing energy efficiency and promoting curtailment behaviours. For example, purchasing a more fuel-efficient vehicle can achieve 20% energy savings compared with altering driving habits alone. Purchasing and maintaining more fuel-efficient vehicles and appliances also tend to be one time or very infrequent actions that do not generally involve lifestyle changes. Research indicates that though Canadians are concerned about the environment, they are not keen to make major shifts in their every day lives (Cheney, 1998), thus promoting

energy efficiency purchasing choices may gain wider public acceptance than promoting individual lifestyle changes.

Curtailment actions can be important for their indirect effect on maintaining peoples' consciousness about the need to conserve energy in addition to their minor energy savings benefits. However, research indicates that messages focussing primarily on curtailment may produce negative consequences. If the public focuses their efforts on curtailment activities, the failure to save large amounts of money may lead them to conclude that energy conservation, besides requiring sacrifice, doesn't work. As a result, people may then be unreceptive to any future messages that encourage energy efficiency. (Stern and Aronson, 1984; Gardner and Stern, 1996).

Thus, communications should make the distinction between the relative benefits of curtailment actions versus purchasing more energy efficiency products. If no distinction is made, the public may select minor curtailment activities instead of the changes that have the most impact. Studies demonstrate that the average householder often believes (incorrectly) that they can save twice as much money by reducing lighting use as by using less hot water. In addition, householders are generally unaware of the technical options available for saving energy, especially modifications to heating systems (Stern and Aronson, 1984). In Canada's residential sector, lighting accounts for only 4% of GHG emissions and turning off unnecessary lights can reduce this by 18%. Outreach promoting switching off lights should identify this action as a minor contribution to

energy efficiency compared to the potential for large emission reductions through space heating improvements. In contrast, it is estimated that GHG emissions from space heating (61% of residential energy use) could be reduced by 38% if high efficiency equipment is added and building insulation is improved (Government of Canada, 1998). Information campaigns that do not provide a ranking of the most effective energy conserving strategies may run the risk of leading interested consumers to select a less energy saving option. The result could be a demoralized consumer with reduced incentive for additional effort (Stern and Aronson, 1984). Communication strategies need to ensure that the public is provided with information that can lead them to select the actions, which will have the largest impact on energy savings and emission reductions (ibid.). The best strategy may be to pursue a long-term plan to increase the efficiency of vehicles and buildings while promoting curtailment activities in the short term as necessary but not sufficient actions to achieve desired results.

The previous section demonstrated the need to effectively differentiate between energy efficiency actions and curtailment behaviours to ensure that the best opportunities to reduce energy are identified. Other elements of successful public outreach strategies include:

- Keeping the message simple, visual, and personally relevant.
- Providing balanced perspectives on problems and solutions.
- Avoiding scare tactics or pleas for sacrifice.

- Using multiple approaches, media, and local agents.
- Promote consistent reinforcing messages.
- Providing feedback, reminders and prompts and elicit a public commitment (Environment Canada, 1998).

4.5 Project Management

The development and implementation of climate change action plans and programs span several years. Using sound project management techniques will be fundamental to implementing a successful local action plan. Key elements of successful projects from the literature are:

- Clearly defined goals and project mission.
- Top management support.
- Effective project team.
- Sufficient resources.
- Engaging stakeholders including effective client/ customer consultation, involvement, communication and responsiveness to clients.
- Ongoing monitoring and feedback.
- Appropriate policy.

(Adapted from J. Jiang, G. Klien and J. Balloun, "Ranking of System Implementation Success Factors" Project Management Journal, December, 1996. Cited in Gido and Clements, 1999)

Projects that fail to achieve the desired objective often fail due to several factors such as:

- Plans that are too simple or too complex and unrealistic.
- Major conflicts remain unresolved.
- Lack of, or ineffective leadership.
- Initial goals and objectives not agreed upon.
- Inadequate monitoring and control.
- Inappropriate, inadequate staffing.
- Weak communication between team members.

(Gido and Clements, 1999)

4.6 Analytical Framework

An analytical framework for evaluating municipal climate change programs is essential prior to case study review and analysis. This section outlines some guidelines for evaluating municipal climate change programs. The previous sections have provided an overview of the elements of successful public awareness campaigns. In addition, Chapter 2 outlined the co-benefits deemed key components of municipal strategies while Chapter 3 illustrated that the way an issue is framed limits the range of policy responses. Potential policy responses to reduce GHG emission were then outlined. A combination of these elements provides a framework for evaluating the City of Ottawa's Action Plan. Table 4.2 illustrates the evaluation criteria for the case study, which considers two key components:

The Process:

The choice of tools selected to achieve the desired result and the process used to implement the program play a critical role in the success of any project.

The Results:

An assessment of the ability to achieve the desired ends - measurable GHG emission reductions - will establish the viability of the project at the outset. Measurable emissions reductions associated with a specific project will provide an indicator of its success.

TABLE 4.2: Evaluation Criteria: Task Force on the Atmosphere Action Plan

EVALUATION CRITERIA:	DESCRIPTION
1. THE PROCESS	
Framing the Issue and the identification of co-benefits	<p>The relationship between the way environmental problems are labelled and defined is an important factor in determining the range of response strategies available</p> <p>Identifying the broad community benefits are deemed important elements of local-scale action</p>
Response strategies	<p>The primary response is a direct reflection of the way in which the issue is defined</p> <p>Governments have three general response strategies to environmental problems: Education programs, laws and regulations, financial instruments</p> <p>Using multiple tools is considered the most effective approach</p>
Effective Project Management Techniques	<p>Includes:</p> <p>Clearly defined goals and project mission</p> <p>Senior management</p> <p>Adequate resources</p> <p>Effective project team: clear breakdown of tasks/responsibilities and effective communication between team members</p> <p>Engaging stakeholders</p> <p>On going monitoring, feedback and plan adjustments</p> <p>Appropriate policy- see response strategies</p>
Communication	<p>Identification of co-benefits</p> <p>Identification of barriers</p> <p>Solutions presented- clear identification of measures that will have the greatest impact on emissions</p>
Information dissemination	<p>Keep the message simple, visual, and personally relevant</p> <p>Provide balanced perspectives on problems and solutions</p> <p>Avoid scare tactics or pleas for sacrifice</p> <p>Use multiple approaches, media, local agents</p> <p>Promote consistent reinforcing messages</p> <p>Provide feedback, reminders and prompts and elicit a public commitment</p>

EVALUATION CRITERIA:	DESCRIPTION
2. THE RESULTS	
Program provides opportunity for measurable emissions reductions.	Required actions are specific, clearly identified and have the ability to achieve measurable emission reductions
Measurable GHG emissions reductions achieved	The program has been able to report and measure greenhouse gas emission reductions

4.7 Summary

This chapter presented the City of Ottawa's Action Plan implementation strategy, which involved the formation of an Advisory Committee, project Working Groups and a City Implementation Team. Ongoing multi-stakeholder participation was deemed a key element of successful implementation of the action plan. However, even at the outset, several key groups were absent from the process. For example, the local public transit authority, the City's planning department, the provincial government and federal Public Works and Government Services Department chose not to become involved. In addition, the public was not generally involved in the development of the plan and there is no clear role for public engagement in the implementation strategy. Thus, even prior to implementing the plan there are several key gaps identified in the desired multi-stakeholder framework. Chapter 5 provides additional insight into ongoing stakeholder engagement during the implementation phase of the action plan.

Due to the City's emphasis on information and education to achieve its objective, some broad principles of effective information dissemination were discussed. The benefit of clearly differentiating between minor curtailment behaviours versus energy efficiency actions was emphasised. It was also noted that any successful project must possess some fundamental elements such as adequate resources, senior management support and an effective project team. These are all components that were included in the Evaluation Framework (Table 4.2) which provides a framework for evaluating the Action Plan's process and results.

Chapter 5 provides an in depth analysis of the overall action plan and delves more deeply into the key element of successful projects to evaluate the City's implementation process.

Chapter 6 is an in depth evaluation of the specific programs developed for each of the three key sectors. This analysis will draw more closely upon the elements of effective outreach strategies to evaluate the City's process and progress. The final chapter outlines key barriers and recommends changes to further advance the City's emission reduction objective.

CHAPTER 5

TASK FORCE ON THE ATMOSPHERE ACTION PLAN IMPLEMENTATION

5.0 Evaluation: Implementation of Overall Program, 1995 to 2000

Using the criteria for successful projects outlined in Chapter 4, this chapter discusses the implementation of the Task Force of the Atmosphere Action Plan and evaluates progress towards attaining the 20% emission reduction target. The previous chapter identified and defined eleven separate action elements, each of which became a program designed to reduce greenhouse gas emissions in the community. Each element was designed to address the major contributors to greenhouse gas emissions in the City of Ottawa in the residential, commercial and transportation sectors. The intention was to develop and implement these programs through ongoing multi-stakeholder partnerships and involvement of an Advisory Committee, an Implementation Team and individual Action Plan Work Groups.

All individuals who have been involved in the Implementation Strategy were contacted for in-depth interviews, which are a foundation for further evaluation of the City's climate change strategy. The program evaluation that follows takes a two-pronged approach. First, the overall program is discussed and evaluated for its ability to achieve the overall objective. Secondly, individual programs developed to target the three key emission sectors: transportation, institutional / commercial (I/C) and residential will be

profiled and evaluated. The next section provides a discussion of the overall program. Using critical project success factors from the literature and drawing on important elements from the environment literature, the overall program will be evaluated to determine its ability to achieve results. Individual programs will be evaluated in more depth, drawing upon current understanding of approaches to change behaviour, in Chapter 6.

Table 5.1 summarises results from the analysis of the overall program using elements of the evaluation framework identified in Chapter 4. Following Table 5.1 is an in-depth discussion of interview respondents' comments and insights to further illustrate the points outlined in the table.

Table 5.1: Summary: Action Plan Evaluation

EVALUATION CRITERIA	ACTION PLAN OBJECTIVES/ ACTIONS	ASSESSMENT DERIVED FROM INTERVIEWS/ EVALUATION
1. The Process		
Framing the Issue	<p>Primary focus on the issue of global climate change and CO₂ emission reductions.</p> <p>Clear identification of local co-benefits in Action Plan documents.</p>	<p>Global climate change focus has not provided a significant enough driver for extensive local action. Strong opinion that CO₂ emission reductions have not had a high political priority at any level of government, including City of Ottawa.</p> <p>Local environmental, social and economic benefits of taking action (primarily through energy efficiency) viewed as key drivers to local action. Message of community co-benefits was often obscured in communications which focused on CO₂ emission reductions.</p>
Response Strategy: Policy Tools	<p>Policy to promote voluntary actions to reduce emissions.</p> <p>Focus on providing education and information on the problem of global climate change, associated impacts and potential actions to reduce emissions.</p>	<p>Voluntary measures deemed necessary but not sufficient to achieve the 20% reduction target.</p> <p>Other policy tools such as regulation changes, fiscal incentives / removal of disincentives required to motivate further action. Several respondents noted the need for “carrots and sticks” citing examples such financial incentives, carbon taxes, increased fuel efficiency standards.</p> <p>Respondents noted that many actions are also beyond municipal jurisdiction and will require cooperative action from other levels of government.</p>
<p>Identification of energy efficiency as key action required to reduce emissions.</p>		

Table 5.1: Summary: Action Plan Evaluation

EVALUATION CRITERIA	ACTION PLAN OBJECTIVES/ ACTIONS	ASSESSMENT DERIVED FROM INTERVIEWS/ EVALUATION
Critical Project Success Factors		
Clearly defined Goals and Project Mission	To reduce CO ₂ emissions to 20% below 1990 levels by 2005.	<p>Overall objective was clear, agreed upon by all participants. Respondents were able to identify primary program objectives.</p> <p>Secondary objectives such as economic benefits, broad environmental concerns and corporate leadership not well defined- emphasis was on CO₂ emission reductions.</p>
Senior management/ Council support	Initial strong support of Task Force, which was led by the Mayor of Ottawa.	<p>Limited political involvement once Action Plan was approved aside from annual approval of progress reports.</p> <p>Very limited senior management support at City of Ottawa (era of downsizing), led to temporary staffing and limited program budgets.</p> <p>Environmental Management Branch (program lead) almost eliminated twice during early program implementation.</p> <p>Weak senior management support among stakeholder groups restricted the scope of stakeholder involvement. Many participants required to do Action Plan work in addition to and apart from regular work duties.</p>

Table 5.1: Summary: Action Plan Evaluation

EVALUATION CRITERIA	ACTION PLAN OBJECTIVES/ ACTIONS	ASSESSMENT DERIVED FROM INTERVIEWS/ EVALUATION
Project Management/ Team Dynamics	Action Plan Implementation Strategy clearly defined program tasks and ongoing multi-stakeholders involvement, including role of Advisory Committee, Working Groups and Implementation Team.	Staff and external stakeholder confusion over roles and responsibilities. External stakeholders waiting for leadership from City but perceived management support at City to be weak (citing ongoing threat of branch elimination as example). Program staff initially anticipated stronger role from Advisory Committee members and Working Groups. Confusion over specific roles and responsibilities, Implementation Team assumed the lead in all initiatives.
Adequate Resources	Program resource requirements not outlined in Action Plan.	Inadequate program funding and staffing led to ongoing search for external funding support to continue program activities.
Stakeholder Engagement/ Communication	Requirement and methods of ongoing multi-stakeholder involvement clearly outlined in Action Plan.	Loss of program continuity due to inability to retain staff attributed to temporary nature of positions and ongoing threat of branch closure.
	Action Plan identifies specific actions designed to reduce barriers of target groups.	Securing broad stakeholder engagement has been limited from the outset, some key sectors not represented such as the public transit authority and Federal Public Works and Government Services department.
	Annual progress reports to City Council a requirement identified in Action Plan	Public engagement very limited from the outset.
On-going monitoring feedback and plan adjustments		On-again, off-again communication from City staff provided inadequate program continuity.
		Annual reports provided opportunity to evaluate program direction and political profile.
		Annual reports time-consuming, especially tracking energy and emissions data given limited staff resources. Some respondents recommended streamlining reporting, providing an annual program synopsis to Council but tracking emissions much less frequently.

Table 5.1: Summary: Action Plan Evaluation

EVALUATION CRITERIA	ACTION PLAN OBJECTIVES/ ACTIONS	ASSESSMENT DERIVED FROM INTERVIEWS/ EVALUATION
2. Results Program provides opportunities for measurable emissions reductions	Most Action Plan elements focus on broad information dissemination and do not expressly focus on specific actions that can have significant impacts on emissions.	<p>No, voluntary nature of program and focus on information has limited ability of program to achieve substantial results.</p> <p>Most respondents indicated that a more aggressive approach including regulation and financial instruments will be required to achieve the 20% emission reduction target.</p>
Measurable GHG emission reductions achieved.		<p>No, emission reductions reported to date cannot be attributed to the Action Plan. Any emissions reductions identified in progress reports are largely attributed to external factors, beyond the control of the City of Ottawa, particularly the changing fuel mix of electrical supply in the 1990's from coal to nuclear power. A shift towards increased reliance on coal for electricity is expected to reverse this trend in 2000 and beyond, increasing emissions attributed to electricity use.</p> <p>Program needs to develop a means of tracking the results of individual measures and programs.</p> <p>City is not on target to achieve the 20% objective.</p>

5.1 The Process

Establishing an effective process to achieve a desired objective is fundamental to achieving an effective outcome. The following sections examine several key components in the process developed to achieve the City of Ottawa's 20% emission reduction target. With respect to government action on climate change, one needs to assess the appropriateness of the policy instruments selected to achieve the desired outcome. As illustrated in Section 3.2, there is a range of policy tools available to governments to address environmental issues. These tools are classified in three broad categories: education programs, laws and regulations, and financial instruments. Social science research indicates that the most effective policy approach is to use a combination of intervention strategies, rather than a single approach (Gardner and Stern, 1996; Fiorino, 1995). In addition, the way a problem is labelled and defined influences the range of policy tools selected. The following section evaluates the way the initial action plan defined the problem. This is followed by an evaluation of the policy tools selected to achieve the 20% emission reduction target.

5.1.1 Framing the Issue

Climate change is generally framed as both a threat and an opportunity for Canadian municipalities. Threats include risks to infrastructure, flooding of low-lying communities and threats to drinking water supply (ibid.). Threats are often the only impacts noted in much of the global climate change literature. At the local level, where individual action occurs, climate change mitigation is often presented as an opportunity. Research from the

Municipalities Table (Government of Canada, 1998) states that much of the enthusiasm for taking action at the local level stems from multiple benefits that will accrue to individual communities from local initiatives. These initiatives may include: increasing energy efficiency; developing renewable energy sources; expanding landfill gas recovery and waste reduction programs; and promoting community greening and land use planning initiatives. Local benefits that motivate action identified by both CCP and PCP program participants include: improved air quality and public health, lower infrastructure investment costs, reintegration of land uses, decreased automobile dependence and traffic congestion, enhanced economic development, and job creation (Government of Canada, 1998; ICLEI, 1997).

The City of Ottawa's Action Plan clearly indicates a recognition of the considerable co-benefits of local climate change actions as the following excerpt suggests:

“ The Task Force on the Atmosphere is committed to developing and implementing solutions to contribute to the overall reduction of CO₂, as well as other harmful air emissions, with the emphasis on providing a cleaner and healthier environment for City of Ottawa residents” (City of Ottawa, 1995, pp.2).

In preparing its response strategy, the City identified many of the local co-benefits to community action including economic, environmental and health benefits. In addition, the Action Plan also clearly identified the most important measure to achieve its GHG emissions reduction goal, energy efficiency. However, program descriptions and development in the early stages were clearly focussed on reducing CO₂ emissions, and

co-benefits were largely identified as a secondary benefit to this key objective. The primary emphasis on reducing CO₂ emissions does not coincide with stakeholders' views on what the key drivers are at the local scale. In fact, though the Action Plan was clearly developed to confront the issue of climate change, respondents for this research clearly indicate that what drives local action is not necessarily concern about climate change, *the primary drivers are local economic and social benefits such as saving money and improving air quality*. Respondent also observed that the issue of climate change is not really being "driven" by any level of government which makes it even more important to combine the objective with issues that are higher up on the political agenda. Detailed discussion of individual programs in Chapter 6 shows how the early focus on CO₂ reductions has shifted and messaging now focuses on highlighting the potential for economic savings and other local benefits. CO₂ emission reduction is now defined largely as a co-benefit of energy efficiency measures.

5.1.2 Response Strategy

As previously stated, the City's action plan rejected the option of mandatory standards and regulations in favour of a voluntary approach designed to involve and motivate the private and corporate citizens of Ottawa in a community wide effort to reduce GHG emissions. The action plan was designed to be monitored over time and new voluntary, incentive/ disincentive-based regulatory measures were to be added, as necessary, to meet the 20% target (City of Ottawa, 1995). Respondents were asked their views on the effectiveness of the City's voluntary approach and were asked to identify other policy

tools that could help further reduce emissions in the community.

There was complete agreement among interview respondents that the voluntary approach used to date will not be sufficient to achieve the City's 20% GHG emission reduction target. Though they were deemed insufficient, there was also a strong consensus that voluntary programs are a necessary component of any strategy to reduce emissions. Several respondents expressed the view that voluntary approaches could be sufficient within a longer time frame of ten to fifteen years. For example, one respondent stated that there are sufficient economic reasons to increase energy efficiency but that these are not yet well enough understood. All respondents identified the need for additional policy instruments such market incentives and targeted legislation. Many of the additional instruments identified largely fall beyond municipal jurisdiction including: enhanced vehicle and appliance standards, selected tax and other fiscal incentives and the aggressive facilitation of new technology. The active participation of other levels of government was identified as an essential next step required to achieve the program objectives. The next steps are discussed further in Chapter 7.

5.2 Project Management: Critical Project Success Factors

5.2.1 Clearly Defined Goals

The extent to which initial project goals are clearly defined, understood and agreed upon are essential components of a successful project. The stated goal of the City's community action plan was "To achieve a 20% reduction in GHG emission from 1990 levels by

2005" (City of Ottawa, 1995). All respondents were able to correctly identify the overall goal, including those with limited program involvement. However, it also became clear during the interview process that, while most participants were interested in achieving the primary 20% objective, they identified several other reasons for becoming involved. Their reasons included broad environmental, economic and social issues including: air quality, job creation, retaining capital in the community, and quality of life issues. Organisations involved in the process expressed a desire to increase their profile and demonstrate community leadership. Despite the fact that most participants identified a variety of other motivating factors for becoming involved, the original program objectives were clear and agreed upon by all stakeholders surveyed, thus this element of a successful project was in place. These findings do not refute the importance of having clearly stated goals but suggest that participation in a program such as Ottawa's GHG gas reduction program is governed by a wide array of factors that extend beyond the attainment of one goal. This suggests it is important to consider the full suite of environmental, social or economic factors that motivate participation to stimulate broader participation in the program.

All respondents identified the economic and health benefits of local climate change action as the key drivers of the City of Ottawa's climate change program. Those interviewed for this research identified two key drivers for local action: the economic incentive including cost savings and community investment, and reducing air pollution and related health impacts. Other stated drivers included general environmental improvement and reduced

traffic congestion. Some respondents clearly indicated that action on climate change is secondary to the community benefits of action. As one respondent stated “Co-benefits permeate municipal action; municipalities can integrate many benefits, since actions have implications regarding public transit, environmental quality of life, community investment and enhanced tax bases”.

While many cities across Canada have elected to take action due to the multiple benefits that can accrue to their cities, those who have not taken action often cite prohibitive costs.

If municipalities successfully reduce GHGs within their communities while achieving other community objectives they may be able to refute economic arguments that predict economic disaster if climate change mitigation is undertaken. Potential harm to the American economy is a key reason cited for President Bush’s withdrawal from the Kyoto Protocol (CBC, 2001). In order to effectively counter the economic arguments against taking mitigating action, it will be necessary for cities involved in GHG emission reduction programs to clearly document and measure economic costs and benefits where possible. The ability to quantify the broader social and health benefits of taking action to reduce emissions should also be expanded.

While recent climate change literature is beginning to address the issue of the potential multiple benefits of GHG emission reductions, municipalities engaged in local climate change action have recognised the benefit of tying the issue to local-scale problems and opportunities. Bringing the issue from a global to local scale can enhance the level of

understanding of the benefits of mitigation strategies and the benefits associated with reducing fossil fuel emissions can be more readily apparent. For municipalities, many of the benefits that accrue from successful actions to reduce GHG emissions will occur in the near term and in their own communities. In fact, in Ottawa the co-benefits of reducing emissions are seen as the primary driver of local action. Most individuals interviewed expressed the view that focussing on the local benefits of taking action is the most effective strategy to engage stakeholders. This suggests that goals need to be more specifically tied to other community environmental, social and economic objective, in other words, the objective of sustainable community development.

5.2.2 Senior Management and Council Support

Strong program support at the senior management and / or council level is essential to ensuring any program's success. Respondents' views on the level of management support varied but the general consensus can be summed up by one respondent's comment that the program received "moral support, not financial support". One respondent attributes the lack of senior management support as the biggest barrier to successful program implementation, since this lack of support meant that there was no ongoing commitment to fund the program, which in turn reduced the opportunity for long-term planning. In addition to a lack of long-term funding, severe budgetary issues threatened the suspension of the entire program twice in the late 1990's. The City's Environmental Management Branch, the program lead, was almost closed down twice by senior management during the early stages of program implementation. Though the

manager of the Environmental Management Unit was a key player driving the implementation of the plan, requests for program support intended for City Council were often blocked by senior management. The uncertain future of the branch, coupled with limited program resources, made it difficult to retain staff.

City Council support was perceived to be generally stronger than management support at the City of Ottawa. Many indicated that Council support is the key reason the program still exists, since when presented with two budgets that would eliminate the Environmental Management Branch and its programs, Council gave an eleventh hour reprieve (Cahill, 2000). However, City Council did not continue any active engagement in the program other than receiving the annual progress reports and providing a small budget. The Advisory Committee did not retain any elected official membership once the original Task Force had completed its work and program implementation commenced.

Within other organisations involved on the Advisory Committee and Working groups, some senior managers were very supportive, particularly at the University of Ottawa. The University's support was largely attributed to a strong corporate culture, which supports environmental actions and energy efficiency. Senior managers at other organisations involved were generally less supportive; endorsing staff involvement provided it didn't affect existing work plans. Over the long term, most Working Group and Advisory Committee participants were available for only limited roles due to the inability to integrate program participation into their existing work duties. Any program work

assumed was to be performed in addition to existing responsibilities. Thus, weak senior management support from the partner organisations eventually resulted in a much-diminished role for the Working Groups and Advisory Committee than originally envisioned.

Several respondents offered potential ways to gain senior management support in their organisations. Their key recommendation is to keep the message focussed on economics. For example, senior managers are more interested in what a program costs and the length of economic payback. Presenting an environmental message to senior management is seen by respondents to be an ineffective way to solicit their support. Even at the University of Ottawa, which is recognised by the Voluntary Challenge and Registry Inc. for its innovative energy efficiency program, the engineer involved does not necessarily receive senior management endorsement for the program's environmental benefits. Senior management support for energy efficiency initiatives is directly tied to the economic benefits such as utility cost savings, which when clearly documented, can provide incentive to continue energy efficiency retrofit work. The key message from respondents is to know your target audience, selling climate change action to senior management is deemed to be less effective than selling energy efficiency investments as a means to reap energy savings.

Some respondents also noted that while marketing utility cost savings can be important, utility costs actually play a relatively minor role in the overall budget of their businesses

and many senior managers are still reluctant to go beyond simple three year paybacks to make energy efficiency investments. Several respondents noted that the addition of “carrots and sticks” such as incentives / disincentives and the threat of regulation may stimulate more action than trying to convince individuals and companies to act. To date, the focus on voluntary measures at the City of Ottawa has precluded any investigation of additional policy levers such as regulatory changes, direct financial incentives and the removal of disincentives to spur greater action. Many of those interviewed identified the federal government as having the primary responsibility to advance more aggressive policy changes.

5.2.3 Resources

Adequate resources are a fundamental component of any successful project. Resources include human resources and program implementation budgets. Implementation of the Action Plan has struggled from the outset with a lack of both adequate staffing and funding. For example, although Council had requested the Environmental Management Branch (EMB) to create the Task Force on the Atmosphere, its formation was stalled for nearly a year due to lack of personnel at the EMB (Harper, cited in Cahill, 1994). Between 1995 and 1999, no permanent staff positions were created within the City to ensure the implementation of Task Force recommendations, and the EMB was almost shut down permanently due to ongoing downsizing of City operations. Staffing instability is seen to have seriously limited the ability of the program to retain staff. Both program staff who had been instrumental in the development and early implementation of

the Action Plan left the City in 1998 and their positions were vacant for several months. Respondents noted that this created a large gap in ongoing program continuity, which effectively derailed any program momentum, especially in programs like the Corporate Challenge, where participants were waiting for City leadership prior to taking action themselves.

Human resource capacity remained limited until 1999 when two permanent full-time positions were created. However, some respondents stated that there is also a general lack of professionals with experience in developing and implementing municipal GHG emission reduction programs and this observation is consistent with identified barriers to municipal CO₂ reduction programs across Canada (Robinson, 1998). The new staff members hired for the climate change program did not have any previous experience developing and implementing community climate change action plans and this may have resulted in more delays while program staff evaluated early programs and identified new directions.

All respondents cited an ongoing lack of consistent staffing and program resources as the primary barrier to achieving the City's emission reduction target. Even when program staff was available, program budgets were very limited. As one respondent put it, "staff with no budget is an impossible situation". The lack of resources resulted in ongoing pressure to secure external program funding support, which as one respondent observed, meant that programs were often tailored to meet the needs of the program funding

agencies, rather than being tailored to local needs. This issue is discussed further in Section 6.3.1. Establishing and maintaining effective partnerships and intergovernmental cooperation are seen as an important means of overcoming budget constraints. Due to its proximity to the federal government, the City has played a role in piloting and testing federally developed programs. The City's most successful program to date, EnviroCentre, discussed in Section 6.2.3, is an example of local implementation of a federal program through community partnerships.

5.2.4 Effective Project Team

The evaluation of the competency of a project team and team management is sensitive and subjective. During the interviews, the question was not asked explicitly, instead, comments and insights that arose from the discussion were recorded when the issue arose.

There is evidence of a clear disparity in stakeholders' definitions of the project team.

For example, initially City staff defined the project team as consisting of all members of the Advisory Committee, Working Groups and the Implementation Team. Members of the City's early Implementation Team responded that there were expectations of more active involvement from the stakeholders, envisioning that the City would serve a Secretariat function to various Action Plan activities. Conversely, external participants expected leadership from the City and identified only City staff as part of the project team. Thus, there was some misunderstanding over who formed the project team. The general sense is that the Implementation Team expected more direct involvement from community stakeholders, while community members waited for leadership from the City.

This issue has severely limited the ongoing stakeholder involvement initially envisioned by the creation of the Working Groups and Advisory Committee.

The general consensus from Working Group and Advisory Committee members is that the Implementation team was very effective and able to achieve remarkable results given the scarce resources. However, there was also agreement that the development and implementation of all Action Plan elements including annual reporting of progress was beyond the scope of what a team of two can accomplish. When founding program staff left in 1998, all Working Group activities and the Advisory Committee were suspended. In 1999 when new program staff was hired, some Working Groups were re-established but in 2000, the Advisory Committee remained inactive. The absence of ongoing stakeholder involvement has negatively impacted the ability of many of the original programs to achieve their objectives. The circumstances surrounding Working Group and Advisory Committee involvement are discussed more completely in the next section.

5.2.5 Engaging Stakeholders

As noted in Section 4.3, from the beginning, securing stakeholder participation in the Action Plan process has been a challenge. For example, the Regional transit authority, the federal department of Public Works and Government Services Canada, the Province of Ontario and the City's own Planning Department were not engaged. Some community stakeholders have been very active including Consumers Gas (now Enbridge) and Ottawa Hydro (now Hydro Ottawa). Consumers Gas, which was instructed by the Ontario

Energy Board to create a demand-side management plan, has remained enthusiastic and active in its on-going participation in program activities such as greenhouse gas emission monitoring and the residential Working Group for EnviroCentre. Ottawa Hydro also continues to take an active role in the program, providing electrical use information for ongoing program monitoring as well as sitting on the residential Working Group. Active partnerships are identified as an important means to overcome barriers to financing municipal programs (FCM, 1996), thus partnerships will need to be maintained and strengthened if the City is to achieve the Action Plan objectives.

The Advisory Committee did not play the strong support role in implementation initially envisioned. The intention was for the Committee to help with the implementation and report on progress but instead, the Implementation Team performed this task. In addition, the Implementation Team called the meetings, set the agenda and provided all information prior to any meeting. Time constraints were the key reason cited by Advisory Committee members for their lack of more direct involvement. As previously indicated, the lack of strong management support within their own organisations meant that some committee members were involved as volunteers and could not devote significant extra time to the issue. Committee members also recall becoming frustrated with the lack of leadership at the City of Ottawa. The ongoing threat of program suspension and lack of progress to reduce emissions within City facilities frustrated Committee members and indicated a lack of commitment to the program, causing many to disengage.

5.3 Communication and Information Dissemination

Effective communication is another hallmark of project success. The Ottawa program however has been hampered with erratic communication strategies, sporadic meeting schedules, and on-again, off-again communication. Respondents were also asked about their opinion on whether the program adequately served the needs of the target group as a measure of the programs responsiveness to clients. The consensus of respondents was that many program elements were not responsive to specific client needs. One respondent asked the question: “does the target group need a climate change program? No”, thus the overarching focus on greenhouse gas emissions reductions may not have addressed client needs. Specific action-oriented programs that achieve tangible results were of more interest to stakeholders than broad-based information campaigns. For example, the CO₂ Corporate Challenge advocated employee awareness programs but as one member stated: “our approach is to make smart buildings instead of trying to remind people to turn off the lights”. Thus an employee awareness program that focussed on curtailment activities such as shutting off lights and computers did not address that participant’s priorities.

The initial Action Plan set the foundation for targeted stakeholder involvement of senior community decision makers who were to remain active through their involvement in Working Groups or on the Advisory Committee. However, the initial vision of ongoing stakeholder involvement failed to materialise. This is largely attributed to a perceived lack of leadership from the City and loss of program staff and continuity. The public is

another key stakeholder who has been largely absent from the process though specific initiatives have been targeted at the general public. These are outlined and discussed in more detail in Chapter 6.

5.4 Monitoring and Feedback

Adequate monitoring and feedback are essential to any effective project, particularly to projects such as this, where the primary objective is to achieve a measurable change in community GHG emissions. The first step for municipalities that develop action plans is to establish a baseline record of total emissions by sector. This is to be followed by routine GHG reporting program as a means to track programs and emission reductions and report findings to City Council, the PCP program and the Voluntary Challenge and Registry (VCR) Inc. Monitoring and reporting remains a key component of the Implementation Team's work plan due to the multiple benefits provided. The main benefit is the additional program profile provided by annual progress reports. For example, the 2000 program progress report received the VCR's Gold Level Reporter Award for its comprehensive approach to GHG mitigation. This award initiated a ceremony at the Mayors' Office and fairly extensive local media coverage, which help to elevate the program's profile and increase awareness within the corporation and the community. In addition, annual reports to Council are thought to keep these key decision-makers informed and engaged. However, given the need to raise the program's profile, formal reports may emphasise more positive elements of the program and avoid discussion of key problems. In fact, many of the barriers identified in this research are

not identified in formal program documents.

Another benefit of annual reports is the opportunity to evaluate the success of individual programs and readjust priorities as needed. Each of the City's three Annual Progress Reports (1996; 1997; 1999) provide a summary of program status and identifies planned adjustments as well as longer term priorities. The City's programs are assessed fully in the next chapter to illustrate the way in which programs have been evaluated and adjusted over time to ensure program objectives can be attained.

The Task Force on the Atmosphere Action Plan calculated the community's 1990 base year energy- related CO₂ emissions. This is achieved through gathering data from local utilities and transportation departments. As one of the first cities in Canada to measure municipal emissions, City staff and partners identified the need to develop a standardised reporting tool that could be used by all municipalities to monitor emissions using a national standard (City of Ottawa, 1995). In 1997 and 1998 the City began work in partnership with Environment Canada and the consultant group of Torrie Smith Associates to develop a standardised monitoring and reporting tool to facilitate consistent municipal GHG emission reporting. PCP members are now using an expanded version of the software tool developed through this partnership across Canada and Cities for Climate Protection members internationally (City of Ottawa, 2000).

Though there are obvious benefits to measuring emissions regularly, the time-consuming

challenge of gathering the appropriate data on an annual basis was identified as a key barrier to achieving the overall objective by program staff. One former staff member stated that so much time was taken in annual emission tracking and producing progress reports that it took away from program development (Gareau, 2000). Gathering data from utilities also appears to be becoming even more of an issue as utilities deregulate and ownership of this important information becomes perceived as a commodity. Some utilities are beginning to charge for energy consumption information. For example, the City of Sudbury was told that it would cost \$80,000 to receive the information required for its emission inventory (McDougall, 2000). Given the City's scarce resources, paying for this data is not a realistic option. More streamlined annual reporting may be an option worth pursuing. For example, it may not be necessary to provide a full inventory of community emissions every year, to avoid using scarce staff resources that may be put to better use developing and implementing programs. While emissions may not need to be measured each year an annual report on program development and individual programs results may help to retain or enhance the program's profile and ensure that objectives are achieved.

5.5 The Results

Measurable greenhouse gas emissions reductions are required to achieve the program overall objective of reducing greenhouse gas emissions by 20%, below 1990 levels, by 2005. Table 5.2 illustrates the emission reductions reported in the most recent City of Ottawa progress report. This table shows that 1998 GHG emissions in the City of Ottawa

were 5% below 1990 levels (City of Ottawa, 2000). However, this report does not directly attribute any emission reductions to existing programs established to reduce emissions. For example, the fluctuating emission profile in the building sector is generally attributed to on-going changes in the GHG intensity of fuel used to create electricity in Ontario. Recently, Ontario Power Generation (formerly Ontario Hydro) has been taking some of its nuclear reactors off-line. To compensate, the amount of power generated from fossil fuels, which contain higher volumes of CO₂, has increased which can have a considerable impact on greenhouse gas emissions per unit of electricity consumed. For example, in 1996 the City of Ottawa found that an 8% reduction in the City's overall corporate energy use translated into a 29% reduction in CO₂ emissions. In 1998, the City's overall corporate energy use decreased by a further 4%, but greater reliance by Ontario Power Corp. on fossil fuel to produce the City's electrical energy, resulted in an increase in CO₂ emissions of 3,000 tonnes above 1996 levels (*ibid.*).

The 1998 data on Table 5.2 highlights some of the difficulties in tracking changes in emissions. The report notes that inventories from prior years did not provide any documentation of the methods and assumptions used to arrive at the figures in previous reports. This report used different methods to calculate emissions and data for buildings emissions was not available by sector. A high level of confidence was placed on the figures for buildings and methane while transportation emission estimates have lower confidence levels (*ibid.*). Thus, while the City of Ottawa reported a 5% emission reduction, different methods were used to arrive at 1998 figures limits confidence in this

figure. Some respondents identified that available methods of data collection for tracking transportation emissions are the weakest component of the City's inventories. Billing and consumption information is available from utilities and waste collection in tonnes is tracked closely facilitating the calculation of emission inventories provided that the information is made available to municipal governments.

TABLE 5.2: Trends in GHG Emissions in the City of Ottawa

Greenhouse Gas Emissions in the City of Ottawa 1990 to 1998 (Tonnes eCO₂) 2.				
	1990	1993	1996	1998
Residential	537,588	484,310	479,080	1,573,163*
Commercial	1,109,844	855,284	938,650	
Total: Commercial/Residential	1,647,432	1,339,594	1,417,730	1,573,163
Transportation	846,293	855,284	839,003	853,800* ¹
Methane	457,770	429,013	386,060	375,370 * ²
Total Emissions	2,951,796	2,718,731	2,642,793	2,802,333

Source: City of Ottawa, April 2000, pp. 7.

* Aggregate of all CO₂ Emissions from electricity, natural gas and fuel oil. No breakdown available by sector. See Appendix 1 for details.

*¹ Information from R. Parfett and Associates. GIS-Based Sustainable Urban Planning Tool V1.0.

*² Assumption given recent trend- see Appendix 1 for more detail

The asterisks for Table 5.2 illustrates some of the City staff's difficulty in quantifying

2. eCO₂: CO₂ equivalent. Generally GHG are converted to the equivalent of either carbon or CO₂. One tonne of methane equals 21 tonnes of CO₂ and one tonne of nitrous oxide is 230 tonnes of CO₂.

emissions given a lack of available data and poor documentation of methods used to arrive at previous figures. Thus the report cautions that the 1998 figures reveal general trends rather than accurate emission totals. When emission totals are calculated at a broad aggregate level by sector such as the City has done, it is a challenge to separate the effect of external factors such as the electrical fuel mix, from the effect of specific programs or initiatives. Tracking annual energy use, and per capita energy trends in addition to GHG emissions levels may more clearly illustrate the effectiveness of energy efficiency measures, since energy usage is not affected by fluctuations in fuel mix.

Table 5.2 also illustrates the impact of methane emissions resulting from waste generation converted to the equivalent in CO₂ emissions. Methane emissions were not considered in the original Action Plan but were added in later progress reports due to new information showing the relative significance of methane emissions at the local scale. The City of Ottawa progress report attributes the decline in methane emissions to increased waste diversion rates since 1990, which have lowered the amount of waste sent to landfill in the city from approximately 110,000 tonnes in 1990 to 90,000 tonnes in 1998. While the influence of methane emissions was added to the first annual progress report and subsequent reports, the Action Plan did not provide for new programs targeted at this sector. Jurisdictional issues within the community can likely explain the reason for the lack of programs in this sector. The City of Ottawa was not responsible for community waste management programs and landfills, which were the mandate of the Region of Ottawa-Carleton. Therefore, while the City has added the effect of methane on

local emissions, it has not had the jurisdictional authority to develop programs or policies targeted at this sector. City reports attribute the decline in emissions in this sector to waste management and diversion programs established to achieve other environmental and social objectives.

As stated, City of Ottawa progress reports do not directly attribute any of the aggregate emission reductions to any individual Action Plan element and most changes are attributed to factors beyond the municipal control, or to the incidental impact of other programs. Improving the ability to measure the results of individual programs was a need expressed by many of those surveyed for this research. In addition, when evaluating the numbers, it became evident that progress reports did not have a consistent method to report emissions, and baseline numbers varied from one report to another. When evaluating these numbers it is important to consider them estimates rather than absolute emission totals.

5.7 Summary

The Action Plan has achieved limited results during the implementation period from 1995 and 2000 and no emission reductions have been directly attributed to specific action plan measures. The inability of the program to achieve the desired objective can be ascribed to the failure of the process developed to achieve the objective. The environmental literature suggests that the most effective approach to solving complex environmental problems is a combination of policy tools, which includes information and education,

legislation and market incentives. Based on the literature, the City's choice of voluntary approaches and education and information campaigns will likely be insufficient. Respondents share this view as most expressed the need for additional instruments such as financial incentives/disincentives and enhanced legislation

The general consensus is that the initial project vision established by the Task Force was also constrained by a lack of resources to implement the objective. Inadequate resources are directly linked to the lack of program continuity, which resulted from overburdened staff needing to continually seek external funding support, while at the same time attempting to develop and deliver all elements of the Action Plan. Weak senior management support at the City is seen to be the main reason for inadequate funding of the Implementation Strategy. Council is viewed as slightly more supportive, though not engaged in any ongoing capacity. The initial vision of ongoing stakeholder involvement in the process was not realised and community members indicated weak leadership from the City of Ottawa, demonstrated by ongoing threats of branch closure and limited action within their own corporate facilities, as a key reason for their lack of long term engagement. Thus, in addition to the selection of a limited response strategy, some of the fundamental elements of a successful project were missing including, but not limited to: sufficient resources, effective stakeholder involvement and adequate top management support. The next chapter explores individual programs more closely and illustrates how some have evolved over time in an attempt to overcome some of the barriers identified in this chapter.

CHAPTER 6

EVALUATION OF PROGRAMS BY SECTOR

The previous chapter provided an assessment of the Task Force on the Atmosphere Action Plan and identified several barriers that have prevented the program from achieving the desired outcome. Some of the barriers identified were a lack of program and staff resources, weak senior management support and the absence of sustained involvement of Advisory Committee and Working Groups members. This Chapter examines the programs designed for each of the three key emission sectors and how they have evolved over time to address some of the barriers faced in early action plan implementation. Programs will be evaluated according to the process used to achieve the objective and the ability of the program to demonstrate measurable emission reductions. Table 6.1 summarises the respondents' assessment of individual programs targeted at the three key sectors, Institutional and commercial, residential and transportation. This is followed by an in-depth examination of individual programs.

6.1 Institutional / Commercial Sector

6.1.1 CO₂ Corporate Challenge

The CO₂ Corporate Challenge (usually referred to as the Corporate Challenge) was one of the Action Plan's foundation programs. It was designed as a leadership initiative through which to promote the economic benefits of increased energy efficiency by encouraging

local companies to demonstrate community leadership in implementing energy efficiency measures. It was also envisioned to be a local delivery mechanism for the National Voluntary Challenge and Registry Inc. The rationale for this link was to provide local decision-makers with credible local examples of energy efficiency actions and their demonstrated cost savings, and to give higher local profile to program participants (City of Ottawa, 1995).

The specific objectives of the Corporate Challenge were to:

- Raise the profile of CO₂ reduction initiatives and the City's 20% reduction target among the public and among leading private and public sector organisations.
- Demonstrate leadership in CO₂ emissions reduction that will contribute to attaining the City's target of a 20% CO₂ emission reduction.
- Help participants take direct action to reach their own targets.

While the original statement identified the need to promote the economic incentive of energy efficiency, the program itself was primarily framed as a CO₂ reducing initiative. The name of the program and program communication materials illustrate the priority placed on CO₂ emission reductions; other benefits of energy efficiency are mentioned as minor co-benefits to corporate involvement to reduce CO₂ emissions.

The Corporate Challenge has similarities to the national Partners for Climate Protection program described in Chapter 1, and with the Voluntary Challenge and Registry program, identified as a core element of the national strategy in Section 3.5. All three programs encourage organisations to take voluntary action to reduce their emissions by committing themselves to developing and implementing action plans. In return for their corporate commitment, it was expected that the Corporate Challenge members would receive benefits such as the promotion of the participant as good corporate citizens, the ability to network with other businesses, corporations and institutions trying to achieve similar objectives, and the opportunity to participate in block purchases and pilot projects that may reduce the costs of emissions reductions. Local corporations participating in the Corporate Challenge were asked to commit to developing an action plan in a process very similar to the process required to develop a local action plan including:

- Making a public commitment to becoming a partner and participant, and to support the City in achieving its 20% target.
- Identifying and quantifying emission sources under their direct and indirect control.
- Producing an action plan that defines the participants' individual goals and outlines how they will be achieved.
- Identify indicators to monitor and track progress and to measure the success of their actions.
- Commit to a time line for implementation (City of Ottawa, 1995).

Of the nine founding Corporate Challenge participants, eight were interviewed for this report; one organisation could not be located. Of the eight, four have developed and implemented a corporate action plan including the City of Ottawa, Ottawa Hydro, Enbridge and the University of Ottawa. One of the organisations, the University of Ottawa, has developed an action plan and implemented substantial energy efficiency measures. Like the City of Ottawa, they have received recognition from the VCR Inc. The University was unable to develop their Action Plan until they were able to hire a staff member to undertake the project. However, the contact at the university does not attribute any of their success to their participation in the Corporate Challenge. Instead, their success is attributed to a strong institutional commitment to the environment and energy efficiency, which has been put in practice for over twenty years. It was the respondent's perception that the City of Ottawa lacked the same strong institutional commitment. Other respondents also indicated that the absence of clear leadership from the City created frustration among the founding Corporate Challenge participants. Other organisations that had completed action plans did so with limited success and comprehensiveness. Three respondents stated that participation was accomplished in their spare time, as they were expected to perform this task in addition to their regular duties. Ottawa Hydro's efforts focussed on employee awareness and recycling while Enbridge Consumers Gas' Action Plan is for the entire corporation, based in Toronto, and does not disaggregate results specific to Ottawa.

The organisations that did not develop an Action Plan cited several reasons including a lack of resources, weak senior management support and competing corporate priorities. Two organisations had undergone a comprehensive restructuring and emission reductions, never a large priority, became a non-priority. One organisation was frustrated in their involvement in the Corporate Challenge expressing the view that they were not appropriate candidates for the program from the outset. For example, they leased their building and had already implemented substantial energy efficiency measures, thus they did not understand the need to develop an action plan. However, when their concerns were expressed, they did not perceive that their issues were adequately addressed and the program was not adjusted to fit their needs. In addition they perceived the program as very much on-again, off-again with small flurries of activity punctuated by long silences. When initial program staff left in 1998 the program was suspended and it has not been resurrected.

Some Corporate Challenge members expressed the opinion that the City had not taken adequate action in their own facilities, which was a ongoing source of frustration given the City's expectations of participants. The City has reported some success in its Corporate Action Plan progress reports. In 1998, the City reported an 18% reduction in energy use and GHG emissions were 19% below 1990 levels (City of Ottawa, 1999). Most of these reductions are directly attributed to building upgrades. However, these actions occurred after the establishment of the Corporate Challenge and results have been reported since its unofficial demise. Given the extent to which community members

expressed the need for the City to demonstrate leadership in their own operations, it may have been more effective to undertake specific corporate measures with demonstrated results, prior to attempting to engage the broader community.

The Corporate Challenge is generally recognised as being an innovative program, however, several corporate respondents did not see the benefit of taking part in a local program that duplicated national programs such as the VCR Inc. The federal government was generally viewed as the lead for such programs and they were also perceived to be able to offer economic incentives to participate that municipal governments cannot offer.

Results

The Corporate Challenge did not achieve its stated objectives. Apart from the City of Ottawa's corporate emission reductions, estimated at 6,300 tonnes of CO₂ (City of Ottawa, 1999), there are no documented reductions resulting from this program. In addition, most members did not create an action plan nor did they implement specific actions that could be documented in future reports. Given that the City's baseline (1990) emissions in the Institutional / commercial sector were over 1 million tonnes of CO₂, this represents a reduction of less than 1%. Therefore, this program was ineffective at gaining meaningful emission reductions in the targeted sector.

Table 6.1 Summary of Process and Results: Commercial / Institutional Sectors

Program/ Description	Goal	Strategy	Results	Barriers
CO₂ Corporate Challenge: Leadership Initiative to demonstrate the benefits of implementing energy efficiency measures	To raise the profile of the City's CO ₂ emission reduction target To demonstrate leadership and participate by taking direct action to reduce emissions	Members required to: Make a public commitment to supporting the City's 20% target Inventory emissions from their operations Develop and implement an Action Plan Monitor and track progress	City of Ottawa developed and implemented a Corporate Action plan and documented emission reduction of approximately 6,300 tonnes of CO ₂ , 1% of 1990 C/ I sector emissions Corporate Challenge members did not develop Action Plans under this program. One former member developed Action Plan through participation in federal programs (Voluntary Challenge Registry, Energy Innovators)	Perceived duplication of federal programs Strong perception of a lack of leadership from City of Ottawa Inadequate resources and senior management support within participating organisations

6.1.2 New Commercial / Institutional Program Directions

The Corporate Challenge was a program requiring the development of corporate emission inventories, Action Plans, transportation initiatives and awareness programs similar to the milestone process required of PCP members. Apart from the City's own internal initiatives, the program achieved no documented emission reductions. The City is now trying to narrow the focus of programs targeted at the institutional / corporate sector to more explicitly address the specific needs of building owners. Since the main source of

emissions in this sector is energy use in buildings, the establishment of a program specifically targeted at energy use became a first step in a Corporate Challenge redesign (City of Ottawa, 2000). The proposed new program is modeled after the City of Toronto BBP, identified in Section 2.7. The BBP is a city initiative to improve air quality and renew Toronto's building stock through energy efficiency retrofits. It was originally launched as a pilot project in June 1996 by the City of Toronto, in cooperation with Consumers Gas, Ontario Hydro, Toronto Hydro and the Toronto Atmospheric Fund (TAF).

Since its establishment in Toronto, the BBP has reported significant reductions in GHG emissions and has achieved other objectives including significant economic investment in the community. For example, the Toronto Dominion Centre, built in 1969, underwent a building retrofit through the BBP program. Energy efficiency improvements included installation of efficient lighting and fans, heating and cooling retrofits and chiller improvements. It is estimated that this project will save an estimated \$5 million per year through reduced energy costs. The environmental benefits asserted include CO₂ emission reductions of 35,000 tonnes annually, equivalent to the CO₂ absorption of 1 million trees (BBP, 2000). Examples of the most common types of building efficiency initiatives implemented by BBP participants are: improvements to the building envelope, heating/cooling retrofits, fuel switching, installation of automated systems, water-efficiency and plumbing changes and lighting upgrades. Noticeably absent from this list are behaviour change campaigns that focus on curtailment and on-going changes to

individual behaviour to reduce energy use. Each of the measures listed are energy efficiency improvements that require a one-time change, which has been demonstrated to be much more effective than trying to encourage on-going repetitive behavioural changes such as switching off lights.

Promotion material for the BBP promotes a positive message to the target audience. For example, the key marketing slogan is " *Better* your building, *Better* your Business". Climate change is identified as an important co-benefit of participation in the BBP, but the primary message remains focussed on economic efficiency. The key message to property owners and managers is summed up in the following quotation: "If you're concerned about your bottom line, the BBP should be at the top of your list." (BBP, 2000). Local economic benefits are also highlighted. For example, outreach material states that BBP participants have invested more than \$60 million in Toronto's economy and that its full impact could be up to \$3 billion. The environmental co-benefits identified include reduced GHG emissions and improved air quality.

The development of a similar program in Ottawa denotes a shift in the way the City of Ottawa is framing and responding to the issue of climate change in the ICI sector. Rather than the original focus on developing corporate action plans to reduce CO₂ emissions, this program is framed as a business opportunity. The primary driver behind the program is economic efficiency, thus participants do not necessarily need to be aware of, or concerned about climate change to participate in this program. Interviews suggest that

this approach may be more suitable for the target audience who have identified reduced energy costs and community leadership as the key motivating factor for becoming involved in the Corporate Challenge.

In-keeping with the priorities expressed by the target group, the new communications strategy will present the opportunities associated with energy efficiency and promote energy efficiency retrofits rather than the development of comprehensive action plans. The program has also been specifically targeted to reduce the barriers to energy efficiency retrofits that have been identified by stakeholders. Barriers are anticipated to be reduced by putting building managers in touch with pre-screened energy service companies, providing technical assistance through utility partners, providing template contracts, establishing and overseeing a loan fund, and providing awards and promotional coverage for participating buildings (City of Ottawa, 2000).

One of the biggest shifts in the direction to be taken by the City of Ottawa's Better Buildings Program is a movement towards using additional policy instruments to encourage energy efficiency. City staff responsible for the programs are currently exploring changes to land use, zoning and other municipal policies and tax incentives / removal of disincentives as a means to achieving greater reductions. The literature has demonstrated that using a combination of the three types of policy tools (education, laws and regulation, fiscal instruments) is the most effective way to achieving policy objectives. To date evidence indicates that the education programs favoured by the Task

Force's Action Plan have not produced the desired results so examination of alternatives is required.

Results

The City of Ottawa's new program is modeled after an existing program that has already demonstrated measurable emission reductions. City staff project that the Better Buildings Program can result in measurable emission reductions, estimated at between 16,000 to 42,000 tonnes of CO₂ per year (ibid.). A consultant report also indicates that there is the potential for \$67 million in achievable utility bill savings with an investment of \$500 million in energy efficiency retrofits (ICLEI, 2000). If this level of retrofit activity is achieved, it is estimated to generate 8,000 person-years of employment in the community (City of Ottawa, 2000). These figures underscore how the City is marketing the new program through highlighting the economic incentive to take part rather than focusing on the environmental benefits. In addition, adding other policy measures that can further promote energy efficiency could lead to better results than depending on education to stimulate action. The Better Buildings Program will need to document building energy use information before and after each retrofit to document the resulting GHG emission reductions and utility cost savings. Documented success stories may help promote further participation and can be used to identify positive results that may otherwise be obscured by aggregate growth in emissions due to ongoing expansion and construction in this sector.

6.1.3 District Energy Systems

Another new program direction at the City that may provide substantial reductions in GHG emissions is the implementation of district energy systems. District energy systems use central energy plants to meet space heating, hot water and cooling needs for buildings and their installation can help reduce the energy intensity of urban settlements. These combined heat and power plants replace individual, building based furnaces, boilers, chillers and coolers by distributing thermal steam energy from central plants to individual buildings, while simultaneously generating electricity for local sale and distribution. In Europe, district energy plays a major role in the energy system, and the planning and construction of such systems is integrated into planning and building of urban infrastructure. The use of district energy in Europe is considered a dominant reason for the relatively lower energy intensities of European cities compared to North America cities (TSA, 1994). In Canada, the electrical power system has developed according to a centralized model in which most electricity is generated in large central stations, and there has not been any significant development of district energy systems (ibid.)

In November 1999, the City was approached by Natural Resources Canada (NRCan) to participate in the development of a District Energy System in Ottawa. Other stakeholders invited to participate included: the Region of Ottawa Carleton, the National Capital Commission, Public Works and Government Services, Ottawa Hydro, Enbridge Consumers Gas and the City of Hull. The district energy project in the downtown core is expected to cost in the range of \$30 million and there appears to be tremendous

opportunity for public- private partnerships since investors are expected to fully recover costs through the sale and transmission of steam. In addition to the GHG emission reductions, estimated at over 100,000 tonnes per year for this system, district energy systems retain capital in the local economy and insulate the community against price fluctuations in a deregulated utility market (City of Ottawa, 2000). The key to the effective implementation of this program will be the ability to sustain the public-private partnership that initiated it. The City's climate change programs has had ongoing difficulty securing resources, thus, leveraging funds and ongoing commitment from a variety of partners will be essential to ensure the project proceeds. Leveraging funds through public-private sector partnerships has been demonstrated to be an effective approach to overcoming financial barriers. Section 6.2.3 illustrates how similar partnerships have been developed to more effectively target the residential sector.

The previous sections have illustrated how the institutional / commercial sector was initially targeted with the broad-based Corporate Challenge program that required participants to commit to developing and implementing corporate Action Plans. The focus of the program was on reducing CO₂ emissions and results have been negligible. The new program orientation is on building efficiency and the economic incentive to take action is the main message. This message may have more impact than the original focus on taking action to reduce emissions, which was not generally seen to be a primary motivator for senior decision-makers. The new direction to examine policy tools that go beyond the original focus on education and voluntary measures are an important new

direction and it will be interesting to examine the impact once these proposed changes are implemented.

6.2 Residential Sector Programs

6.2.1 Residential Outreach

The City of Ottawa's approach to the residential sector has evolved from early problem-focused campaigns to more recent solutions-oriented approaches. This section illustrates how the problem has been defined, presents how messages have been communicated and evaluates the solutions presented. The Action Plan clearly identified the most important measures to achieve its GHG emissions reduction goal, energy efficiency. However, the first residential outreach material developed (City of Ottawa, 1995) was much less clear about the preferred actions to reduce emissions in the residential sector. While the Action Plan clearly linked local co-benefits to global climate change solutions, the first public communication titled Global Warming: Local Action (1995) focuses much more on the problem of global warming. Outreach strategies have evolved over time and the problem of climate change has now become a minor component of the City's recent solution-oriented response strategies.

The Global Warming: Local Action brochure, a four-page public information brochure presents the issue as follows:

- Experts Predict Global Warming: Greenhouse Gases blamed.

- City of Ottawa Sets targets for Greenhouse Gas Reductions.
- Individuals can help fight global warming.

The pamphlet then explains the issue of global warming, the global impacts and its key causes. It illustrates the per capita influence that Canadians and local residents have on global GHG emissions, and identifies energy use through the burning of fossil fuels as a key contributor. In this case, global warming is the problem to be solved; the co-benefits of local action are a relatively minor component of the brochure's focus and are identified briefly as "fringe benefits". The material does not provide any discussion of the local impacts of global warming, nor the additional negative effects of energy use such as air pollution. Research suggests that messages with personal relevance and imminent local impacts, rather than distant, global effects will be more effective (Cheney, 1998; Government of Canada, 1998). Thus, a message with clearer identification of potential local and individual impacts may have had more weight than the message provided in Ottawa's first outreach pamphlet.

After two pages of defining the issue and consequences of global warming, solutions are presented. Solutions identified include both curtailment and energy efficient purchasing actions and estimates the impact of each behaviour change on CO₂ emissions and fuel use are presented. For example, driving an efficient vehicle is said to cut emissions by 50% over the life of a car while maintaining proper tire inflation can save 5% in fuel costs. In addition, it encourages the purchase of energy efficient appliances and furnaces, noting

that purchasing an energy efficient fridge will save homeowners 5,000kg of CO₂ and \$400 over a 17-year period. Reduced CO₂ emissions are the focus of the pamphlet, with minor reference being made to other benefits such as cost savings through reduced fuel use, parking and vehicle operating costs.

Results

This first outreach document was distributed through information kiosks at public libraries, shopping centres and community centres and the back of the form invites feedback from the public regarding the City's climate change strategy. There is no documentation, however, to determine the extent of feedback received from this program, nor is there any means of quantifying its impact. Interview respondents indicated that public response was negligible. Contrary to recommended practice from the literature, there is no evidence that public surveys were undertaken to establish a baseline level of awareness prior to the program, therefore, it is difficult to determine actual uptake or to attribute any emission reductions to this outreach program. However, given the lack of program resources, it is not surprising that follow-up surveys were not undertaken.

6.2.2 1997: Information and Referral Service (IRS)

The second major public communication strategy for the City of Ottawa's climate change program was the establishment of a public information and referral service. The objective of the information and referral service (IRS) is to provide information to community members interested in undertaking energy efficient investments. The stated

assumption behind the IRS is that sufficient economic incentive already exists to undertake residential energy efficiency measures during building design, construction and renovation and that what is lacking is good, timely, information from a credible source. It was anticipated that by providing citizens with useful, concise information at the right time, lost opportunities to implement energy efficiency measures would be avoided and potential GHG emissions reductions could be maximized (City of Ottawa, 1997).

To achieve the objectives of the IRS, the City of Ottawa developed the Ottawa Green Information Line (OGIL). OGIL is a menu driven telephone system developed to provide a central location for information on energy efficiency for City residents. The system provides information on a wide variety of topics such as new home construction, renovation, the home office, heating, cooling, lighting, transportation and waste. The OGIL, which is part of the City's Meridian phone system, has been in place since September 1997. Since its launch, the OGIL has been marketed using brochures, refrigerator magnets and business cards.

The OGIL denotes a shift in the City's approach to framing and communicating the issue of climate change, from a central focus on global warming and CO₂ emission reductions, to a focus on economic incentives and energy efficiency. Promotional material is positive and solutions oriented, promoting energy savings with a strong emphasis on saving money. Information presented provides some clear examples of energy efficiency versus curtailment actions. For example, new home purchasers are directed to purchase

an energy efficient R-2000 home for the improved re-sale value and reduced energy costs.

Reducing GHG emissions is presented as an additional benefit to improving energy efficiency.

Results

As recommended in the literature, the City also established a means of monitoring the OGIL that records the number of phone calls and the number of information trees visited by each caller. However, there was no mechanism to ensure that the information provided was used, thus no measurable GHG emission reductions could be linked to the program. Monitoring indicates that the OGIL has not achieved high uptake levels. For example, in 1999 there were a total of 160 calls to the line, and of those, only 62 individuals progressed beyond the initial greeting. Many of the information items provided by the OGIL received no visits (City of Ottawa, 2000).

Clearly, this program is not reaching a sufficient number of residents to produce a significant increase in citizen awareness and action on energy efficiency and climate change. This system was generally perceived to have good information, though if few people are using it, the substantial emission reduction required in the residential sector will not be achieved. A possible reason for the failure of this program could be a lack of investment prior to program development to determine the barriers to energy efficiency within the community. Initial research to identify barriers may have indicated that a menu-driven telephone information system was not an appropriate response strategy. The

City is now moving away from broad-scale information campaigns to more targeted approaches to achieve emission reductions in the residential sector.

6.2.3 EnviroCentre

In 1999 the City helped to establish EnviroCentre, an independent not-for-profit enterprise, to reduce emissions in the residential sector. EnviroCentre is an example of a relatively effective community partnership developed to help the City overcome key barriers to implementing residential programs: human and financial resources. As a not-for-profit business, EnviroCentre can provide flexibility in staffing, provide a community profile and secure grants for marketing and developing the program (Silk, 2000).

EnviroCentre's funding comes from grants from regional, municipal and federal government levels and the private sector. Representatives of each sector also participate on the Board of Directors, which has replaced the initial residential sector Working Group for the Action Plan. Unlike other City programs, EnviroCentre has a business plan with clear targets, time lines and deliverables and is accountable to the Board of Directors. Though City Implementation Staff remain active with EnviroCentre, the day-to-day implementation of residential outreach has been delegated to the General Manager, freeing City staff to deal with other implementation issues.

The cornerstone of EnviroCentre's service is *EnerGuide for Houses (EGH)*, a residential energy assessment tool designed by Natural Resources Canada (NRCan). A qualified evaluator visits a home and assesses its energy related features and provides an energy

efficiency rating, much like the EnerGuide rating seen on appliances (City of Ottawa, 2000). The resulting Energy Assessment Report provides a detailed description of each measure homeowners can undertake to improve the efficiency of their home. The effect of energy efficiency measures are clearly illustrated and differentiated from more minor changes associated with curtailment behaviours. For example, one report indicates that the assessed home's existing space heating equipment is consuming 81% of the energy use in the home, lights and appliances account for 8% and hot water 10%. Recommended improvements to the heating system are very specific, providing advice on adjusting dampers to installing a high efficiency furnace (Green Home Inspection, 1999). The literature suggests that most individuals are not aware of what specific actions have the most impact on energy use (Stern, 1984) and the detailed information provided in this report can help to overcome this barrier. Cost estimates for each action are also provided as well as potential annual utility bill savings. The report also highlights the economic incentive of energy efficiency, stating that the homeowner could save over \$670 per year in energy costs should all recommended actions be undertaken. Providing personally relevant information is an element of successful public outreach identified in the literature.

Although EnviroCentre is identified as an important component of the City's climate change strategy, the service is marketed as a home comfort / air quality assessment, a renovation guide and a contractor quality assurance support. The fact that GHG emissions will be reduced as a result of home improvements is seen to be incidental to

homeowners and as such, the climate change message is presented as a co-benefit to purchasing this program. Thus, rather than the City's original focus on communicating climate change to the target group, messages now communicate home comfort and the costs savings associated with energy efficiency to the population. EnviroCentre surveys each homeowner requesting the service to document information on the home and determine the homeowner's primary motivation for requesting the service. Anecdotal evidence suggests that the primary motivation for obtaining an EGH is to save money, home comfort concerns are a close second, followed by environmental and health concerns (Silk, 2000). This would suggest that communication should continue to target the key message of saving money and home comfort and that environmental welfare can continue to be addressed as a beneficial co-benefit.

Though a lack of program resources has limited the ability to develop broad outreach material, City and EnviroCentre staff have become creative in targeting residential outreach. To overcome budget constraints, staff now use free community newspapers articles to target specific areas such as older neighbourhoods where homes are prime candidates for energy retrofits. Outreach material presents positive messages of home comfort and energy savings while noting that energy efficiency can also mitigate climate change. This approach conforms to proven strategies in the literature that indicates that the message needs to provide a personal connection, focussed on positive solutions and multiple benefits (Environment Canada, 1998). A detailed local success story is provided to illustrate results achieved within the target community. The research

indicates that high profile success stories demonstrating solutions in action, are elements of successful campaigns (ibid). Other tools identified for disseminating information on EGH include holding seminars at local renovation stores, mass mailings in utility bills and City permit applications and forming partnerships with contractors, builders, co-ops and condominium boards to market bulk EGH sales.

This program has many of the elements of a successful grassroots campaign. Research indicates that learning and change happen most effectively when the message is one-on-one such as with home energy audits, or with presenters working with local community groups (Environment Canada, 1998). EnviroCentre has elements of both of these success factors including direct homeowner contact with the EGH assessor and through presentations to local groups. The literature also indicates that messages are most successful when the same information is conveyed many times and is conveyed from a variety of sources. EnviroCentre's use of multiple media including local and regional newspapers provides a variety of sources. The establishment of a credible NGO voice has also been identified in the literature as an important vehicle for delivering the message (ibid.). EnviroCentre is a not-for-profit environmental NGO that can deliver the message to the community while demonstrating the support of other levels of government and the private sector in its outreach campaigns

Results

Unlike earlier broad-based information campaigns identified in the sections 6.2.1 and 6.2.2 the EnviroCentre program has the ability to measure the results of any upgrades. A free follow-up assessment can measure the energy reductions achieved once clients have implemented report recommendations, which can demonstrate the effectiveness of energy efficiency measures for the benefit of both program staff and homeowners. NRCan recently reported that homeowners in Ontario who had an EnerGuide assessment and then implemented energy efficiency measures, improved the homes' efficiency by an average of 6% and reduced CO₂ emissions by an average of 1.7 tonnes per year per household (Silk, Nov. 2000). While these numbers are relatively impressive on an individual basis, to date only 500 City residences have used this voluntary service. In addition, extensive research indicates that only 20% to 30% of households that receive an energy audit take action on recommendations (Stern and Aronson, 1984). Even optimistically assuming that all 500 units will take remedial action, based on the potential emission reductions of 1.7 tonnes per household, the aggregate impact of EnviroCentre's service to date is a reduction of approximately 850 tonnes of CO₂. This represents 0.15% of the City's 1990 residential emissions, which totalled almost 540,000 tonnes. While EnviroCentre provides an important service which can help support emission reduction targets, clearly more aggressive approaches will be required to achieve the required results in the residential sector. Respondents identified the need for new housing energy efficiency standards, changes to land development patterns and incentives for energy efficiency investment as additional elements required to reduce emissions in this sector.

Table 6.2 Summary of Process and Results: Residential Sector Programs

Program/Description	Goal	Strategy	Results	Barriers
Public Outreach flyer: Four page information brochure	To communicate issue of climate change to public and to solicit feedback	Several key messages: Experts predict global warming, greenhouse gases blamed City of Ottawa sets targets Individuals can help fight global warming	Outcome unknown Problem focussed outreach did not directly address local impacts nor the negative effects of energy such as air pollution Messages having personal relevance and addressing imminent local concerns may have more impact Avoid messages that call for personal sacrifice	No ability to track results of broad outreach No documented feedback from public No survey work done to establish existing levels of concern and barriers to action to more effectively target outreach to address local barriers
Information and Referral Service: Ottawa Green Information Line (OGIL)	To provide citizens with timely information on energy efficiency to maximize opportunities for energy efficiency choices and GHG emission reductions	Telephone-based information system to serve as information clearing house on energy efficiency Strong emphasis on saving money, energy efficient equipment investments	Outcome unknown- 62 residents accessed system in 1999, indicating either limited awareness of OGIL or a limited perception of a need for the information, or both	No ability to track outcome No documentation identifying an assessment of community needs or barriers to energy efficiency to determine need or demand for OGIL service
EnviroCentre Independent, not for profit enterprise	To promote energy efficiency and reduce emissions in the residential sector	Residential energy audits provided using EnerGuide for houses (developed by federal government) Run by Board of Directors	500 city residents have used the service. Maximum emission reduction potential to date of 1.7 tonnes of CO ₂ , less than 1% of the City's 1990 residential emissions	Voluntary service with limited resources for marketing Respondents cited a need for more aggressive measures including: mandating energy labeling in homes, increasing energy efficiency standards in building codes / appliances, examining changes to land development practices and providing financial incentives, removing disincentives

6.3 Transportation Sector Programs

The transportation sector is considered the biggest challenge to the City of Ottawa's ability to achieve its emission reduction target. Most interview respondents indicated an important role for enhanced fuel efficiency standards for vehicles to achieve reductions in this sector, which is beyond the jurisdiction of municipal governments. In addition increased use of public transit and alternative modes of travel such as bicycling are also considered important factors. However, there was a general consensus that the recent withdrawal of federal and provincial funding for public transit may have a large impact on the City's ability to deliver an effective alternative choice to the private automobile. Research indicates that if individuals do not perceive transit as being an effective or efficient alternative they will not use it, even if motivated to change their behaviour (Garner and Stern, 1996). Structural barriers such as inadequate transit and transportation infrastructure that favours cars over alternative transportation modes were considered by respondents to be important factors limiting change in the transportation sector.

Two Working Groups were formed to guide the implementation of transportation programs aimed at reducing emissions in the ICI and residential sectors. These Working Groups were to serve as a foundation for on-going stakeholder involvement and input into programs. With a few exceptions, however, transportation Work Group participants indicated that they were not active in the development and implementation of transportation programs. For example, two Work Group members do not recall attending more than one meeting and one member never clearly understand the role expected of her

in the process. Interview participants indicated that the Implementation Team took the lead in the two transportation sector initiatives: an employer-based transportation demand management program and a media-based transportation information campaign.

6.3.1 Employer-based Transportation Demand Management (TDM) Program

The first initiative undertaken to target the transportation sector was the development of an employer based transportation demand management (TDM) program, targeted at members of the Corporate Challenge. TDM is an emerging area of transportation management and includes measures aimed at limiting the growth of automobile use, particularly by commuters in urban areas. The key objectives of the corporate TDM program included:

- Reducing single occupancy vehicle commuting by employees.
- Reducing total vehicle kilometres travelled.
- Increasing the use of alternative transportation modes.

The short term objective of the Action Plan Element was to pilot an employer-based TDM program at the City of Ottawa and the Region of Ottawa Carleton and, based on this experience, create a model program to distribute to members of the Corporate Challenge as part of their efforts to reduce corporate emissions. However, interview respondents indicated that the City of Ottawa was unable to establish its own corporate TDM program, largely attributed to a lack of senior management support and staff

resources. Instead of piloting a program at City Hall and the Region, a comprehensive TDM toolkit was developed and delivered to all Corporate Challenge participants.

The TDM Toolkit, entitled: Meet the Challenge, Rethink your Transportation Choices (1998) was developed in partnership with Environment Canada and City program staff.

The toolkit presents a variety of reasons for implementing a TDM program to the target group, including reduction of CO₂ emissions, reduced overhead costs and healthier employees. In this material, climate change is not identified as the primary impetus and all co-benefits are given relatively equal weight. The document is well organised and transportation working group members recalled that it provided very good information.

One of the primary recommendations of the Toolkit is the need to designate an employee to assume the role of Employee Transportation Coordinator. The importance of this component cannot be overstated. At the City of Ottawa, for example, a transportation coordinator position was not created, and the TDM program was never established. In 1999, the Region of Ottawa Carleton created a Mobility Services branch to develop and implement TDM programs. Until this program was established, the Region was not able to develop and implement a corporate TDM program.

Corporate Challenge respondents recalled receiving the TDM toolkit, but of all Corporate Challenge participants, only the University of Ottawa has been active in implementing a TDM program. The other respondents did not use the toolkit citing reasons such as a lack of relevance to their circumstance and an absence of staff to develop and implement an

internal TDM program. One respondent stated that “the problem with sending a toolkit is that it sits on the shelf with no staff to read it or implement the program”. One particularly frustrated respondent indicated that most of their sixty or so employees were already commuting by bicycle and bus and sending a large TDM toolkit was “total overkill”. This feedback indicates that had program staff consulted with the target audience prior to developing a TDM toolkit, they may have learned that these organisations had many barriers to developing a TDM program that were not resolved by receiving a toolkit. For example, if the human resources are not available to implement a program a toolkit may not be used, or even read by the target group.

Results

The corporate TDM toolkit achieved no documented results. Federal funding supported the development of this document and it is possible that the priorities of the funding agency, rather than the needs of the target group, led to the development of a comprehensive toolkit that was not used by Corporate Challenge recipients. Sending a toolkit to organisations without the staff to implement programs, or to organisations lacking the perception of need for additional programs is not an effective use of scarce resources.

6.3.2 Transportation Awareness Campaign

The Transportation Awareness Campaign was aimed at raising awareness about the relationship between transportation choices and resulting environmental problems (City

of Ottawa, 1996). Specific objectives of the campaign included:

- Creating an ongoing framework for effective collaboration between municipal and federal levels of government with regard to public education and awareness.
- Raising awareness about the relationship between the environment, health and transportation behaviour, and to increase participation in the transportation initiatives of the City of Ottawa's Task Force on the Atmosphere.

The campaign was intended to take advantage of the fact that there are a variety of different players at various government levels attempting to influence transportation behaviour for various social, economic and environmental reasons. The approach of the campaign was to bring together all of these interested parties to create a message that is coordinated and integrated, to avoid public confusion and provide consistency (Strategic Communications, 1996). Interestingly, the Region of Ottawa Carleton, a key stakeholder due to its jurisdiction over public transit, arterial roads and the local health department, was not identified as a partner or stakeholder in the Communications Strategy.

The initial phase of the program ran in 1996 and featured 92 promotional announcements of thirty seconds in length. This first phase was to be expanded in subsequent years. However, funding for the first phase had all come from external sources and the City did not have the budget or staff to continue to the next phase. The key message was: "Small Changes Make a Big Difference" and the focus was on promoting awareness of the link between individual choices and air pollution and global warming (City of Ottawa, 1997).

While there was mention of air pollution, the primary focus of the message was climate change and no links were made to health or economic objectives as originally intended. Canadians are concerned about air pollution and consider it a primary factor affecting their health (Duffy, 2000) which suggests the need to continue to make the link between climate change and local air pollution as a potential means of catalysing action.

Results

The City of Ottawa's Environmental Management Unit did not have the sustained program funding to develop and implement a transportation awareness program. The inability to sustain and build on the message and communication strategy over the long term, and a lack of capacity to measure program results through follow-up surveys limits the ability of this program to deliver the emission reductions required in this sector. A lack of involvement of the City's own transportation department and the Region of Ottawa-Carleton are also identified as program weaknesses. In addition, there was a general consensus among interview respondents that addressing the transportation sector will require much more than education and awareness programs and will involve developing enhanced standards and expanding municipal infrastructure and land use planning that supports alternative transportation choices.

The transportation sector was generally considered the largest challenge for the City of Ottawa's climate change program and interview respondents indicated the need for a strong coordinated approach to transportation from all levels of government. The

development and delivery of a TDM toolkit and a few local radio information campaigns are unlikely to have a significant impact on GHG emissions locally, or nationally. Many of the individuals interviewed identified enhanced standards for fuel efficiency as the key measure that could have the greatest impact in this sector. In addition, respondents from Ottawa identified the elimination of provincial and federal subsidies for public transit as a large barrier to promoting alternative transportation behaviour locally.

Interview respondents identified the need for a coordinated approach to addressing transportation issues that must be achieved through municipal, provincial, and federal cooperation. Through this research it became apparent that a more coordinated approach was also required at the municipal level. While the initial action plan developed a framework for on-going stakeholder participation in the process through the establishment of Working Groups, these working groups were relatively inactive. The transportation programs were developed by climate change program staff with relatively little input from the Working Group members, some of who are trained transportation engineers. The City's own Transportation Planner, Alternative Modes, had limited involvement in the development of the TDM toolkit or the Transportation Awareness Programs. Given the shortage of staff resources and the broad scope of measures required to reduce transportation emissions in the community, it may have been more effective to delegate implementation and accountability to the City's Transportation Department, which has much more expertise and resources available. The absence of a lead role from the transportation department may have been due to the deficit of senior

management support at the City. The Planning Department was not involved in the climate change action plan and as a result, transportation planners were not tasked with integrating the consideration of GHG emissions into departmental priorities.

Section 3.0 identified the important role that institutional structures play in developing solutions to environmental problems. This example shows the limited capacity of the City of Ottawa's institutional structure to deal with the issue of climate change and transportation. The climate change program and its associated projects were evidently seen as separate issues with which transportation planners and engineers need not become involved. This situation cannot continue if cities and nations are to address transportation emissions in a substantive way. To achieve long-term results in the transportation sector, the objective of reducing GHG emissions must become integrated across all divisions and become part of the work objectives of transportation, planning and engineering departments. The role of the environment staff could then be to provide input into transportation initiatives and to report on measures undertaken to reduce the environmental impacts associated with this sector. Some respondents identified a need for the climate change program to take on the secretariat function first envisioned for the program. One respondent stated that the climate change program should not directly develop programs, particularly in areas where there is already considerable expertise. Rather, it was suggested that the program should focus on auditing and reporting, and the provision of environmental policy expertise. This recommendation should be considered for further program implementation. Delegating the responsibility of implementing

programs and policies to reduce emissions to the appropriate City departments would help to integrate the objective of reducing emissions across the corporation and may increase the likelihood of achieving emission reduction targets.

Table 6.3 Process and Results: Transportation Sector Programs

Program/ Description	Goal	Strategy	Results	Barriers
Employer-based Transportation Demand Management (TDM) Program	<p>Reduce single occupancy vehicle commuting by employees</p> <p>Reduce total vehicle kilometres travelled</p> <p>Increase the use of alternative transportation modes</p>	<p>Pilot an employer-based TDM program at the City of Ottawa and Region of Ottawa Carleton</p> <p>Distribute a TDM Toolkit to Corporate Challenge participants to develop corporate TDM programs</p>	<p>No measurable emission reductions identified</p> <p>City of Ottawa did not establish a corporate TDM program</p> <p>Region of Ottawa Carleton established a TDM program in 1999 after creating a TDM coordinator staff position</p> <p>Corporate Challenge participants did not develop TDM programs</p>	<p>Limited staff and resources to develop a TDM program at City and in Corporate Challenge organisations- limited staff available to read or implement recommendations in TDM Toolkit</p> <p>No perceived need to develop a TDM program among some groups, informal programs already in place in other groups</p>
Transportation Awareness Campaign Media-based information campaign	<p>To raise public awareness of the link between transportation choices and environmental issues</p> <p>Create and ongoing framework for collaboration between federal and municipal governments on transportation awareness programs</p>	<p>First phase featured 92 promotional messages on local radio stations</p> <p>Subsequent phases to build on messages from the first phase</p>	<p>No measurable emission reductions identified</p> <p>Project terminated after Phase 1 due to lack of resources</p>	<p>Inadequate resources to develop further phases</p> <p>Many respondents noted that addressing emissions in the transportation sector will require much more than education and awareness programs. Key additional elements cited include: Enhanced fuel efficiency standards Expanding municipal infrastructure to support alternatives transportation modes Need for a coordinated approach to transportation from all levels of government</p>

6.4 Summary

This Chapter examined the various programs developed to target the City of Ottawa's key emission sectors and has demonstrated that the programs implemented to date have not resulted in any significant GHG emission reductions. Potential and documented emission reductions of individual programs are approximately 7,150 tonnes CO₂, a mere fraction of the 1990 community emissions inventory total of 2,500,00 tonnes of CO₂. Clearly, the City's focus on information and awareness programs has failed to achieve any significant emission reductions and attaining the 20% target appears unlikely. In addition, broad-based awareness campaigns that initially focussed on reducing CO₂ emissions and informing residents about global climate change have been reframed to focus on specific actions that will have the biggest impact on emissions. Communication strategies have been redefined to create messages that will have more relevance to the target groups. Though it is too early to tell, the implementation of the Better Buildings Partnership, district energy systems and increased market penetration of EnviroCentre may be able to make substantial gains in the buildings sector. These gains could be greater if combined with policies that provide financial incentives or disincentives or target regulatory changes such as building code changes requiring higher energy efficiency during construction. Using a combination of approaches is considered more effective than a reliance on one method.

The transportation sector remains a challenge that has not been addressed to any significant level and respondents identified the need for national and provincial

governments to take more action in this sector, particularly through increased vehicle standards and more funding for public transit and other alternative transportation infrastructure. The need for horizontal integration of environmental priorities across City of Ottawa departments is viewed as an essential element of long-term emission reductions.

CHAPTER 7

KEY BARRIERS AND POTENTIAL NEXT STEPS

This chapter provides a discussion of the key barriers encountered by the City of Ottawa during the implementation of the Action Plan. Potential next steps identified by interview participants are then outlined and options to move forward are presented and evaluated. Case study respondents were asked for their input on three key questions. First, they were asked for their opinion of the main barriers that impede the City from achieving their 20% GHG emission reduction target. Second, they were asked to provide specific examples of further actions required to achieve the 20% emission reduction target. Finally, respondents provided an assessment of the role of other levels of government in achieving municipal climate change objectives. A closer integration of climate change objectives with the broader objectives of sustainable development is identified as a potential next step for moving forward. The concluding section offers a summary of the research process, an assessment of the methods used, and final observations.

7.0 Key Barriers

Three key themes were dominant in the discussion of barriers to the City's progress: resources, political leadership and integration.

7.1 Resources

Almost all respondents identified insufficient human and financial resources as the fundamental barrier to achieving emissions reductions in the community. The consensus of respondents is that insufficient resources, including inadequate program funding and an absence of consistent staffing have greatly affected program quality and continuity. The absence of sustained program funding caused the program to take a reactionary role to program development with staff “constantly hustling for money” as one respondent put it. This meant that there was an ongoing search for external funding to keep the program going, which may have led to tailoring the program to funding agency priorities, rather than to the needs of the target group. This in turn may have resulted in products such as the TDM Toolkit, which were distributed to Corporate Challenge participants but was neither used, perceived to be useful for the majority of this target group.

The issue of inadequate resources at the municipal level has been recognised in National Climate Change Process documents and the Municipalities Table Option Paper (2000) has identified the need for enabling measures to enhance capacity at the municipal level through grant-based programs and staff training. Recently, the federal government acted on this recommendation and provided additional funding for municipal action. In June 2000, the federal government and the Federation of Canadian Municipalities announced the establishment of two multi-million dollar funds to encourage municipal investment in climate change, clean air and other environmental improvements. The initial commitment is \$125 million including a \$100 million revolving fund for interest bearing

loans and loan guarantees, and \$25 million in grants over five years, which will cover 50% of the cost of feasibility studies to examine municipal options for improved environmental efficiency (Government of Canada, Oct. 2000). Several respondents identified these funds as an important added incentive that may contribute to achieving results at the municipal level.

Given the existing program experience at the City of Ottawa, it may be well positioned to benefit from these funds. Three project proposals have been submitted to the inaugural funding round including proposals to study the feasibility of district energy systems, and two projects to advance the implementation of energy efficient retrofits in City facilities, which staff say have been stalled due to economic pay-backs that are longer than the City's required seven-year period. Though it is too early to tell, access to these and to other external funds may help the City overcome one of the key barriers to reducing community GHG emissions.

Other respondents identified the need to develop innovative local funding solutions. Recommendations included funding the climate change program on a cost-recovery basis from energy savings, implementing a fee on building permits, or the establishment of a revolving fund modelled after the Toronto Atmospheric Fund. Program staff stated that there were attempts to fund the program on a cost-recovery basis through energy savings from municipal building retrofits but institutional barriers blocked this approach. The budget allocation structure at the City meant that the cost savings from energy retrofits

would have been taken from other department's budgets, simply not an option that could move forward (Gareau, 2000). This barrier has not yet been overcome. Similarly, possibly due to the original focus on voluntary measures, financial mechanisms such as implementing fees on building permits have not been pursued. One respondent identified the need for an in-depth analysis of all regulatory and financial mechanisms within municipal jurisdiction, which could facilitate energy demand and supply changes options that will help the City achieve its relatively aggressive 20% emission reduction target. This case study suggests that implementing policies that move beyond voluntary measures and information dissemination will be required if a substantial downward shift in emissions is to take place.

Several respondents cited Toronto's Atmospheric Fund as a model to overcome resource constraints. In January 1988, the City of Toronto became the first city in the world to commit to a 20% reduction of CO₂ emissions from 1988 levels by 2005 (City of Toronto, 1989). To achieve this objective, Council established an Office of Energy Efficiency, the Healthy City Office and approved the Toronto Atmospheric Fund (TAF). The TAF is a self-sustaining fund established with an original endowment of \$23 million from the 1992 sale of city property. Interest from investment and loans totalled \$650,000 per year in 1998 (City of Toronto, May 1999). The TAF provides grants and loans for Toronto based community projects that relate to the following three objectives:

- To reduce GHG emissions and GHG precursors.

- To promote public understanding of climate change and its urban implications.
- To create and preserve urban green spaces that act as carbon sinks.

The TAF is able to effectively leverage broad community action with these funds and in 1999 provide grants totalling \$467,000 to community environmental projects. Through the TAF and other partnerships, the TAFS Cool Schools program budget has increased from \$50,000 to \$500,000 per annum (City of Toronto, March, 2000). The City of Ottawa has had very limited engagement with the community aside from involving selected senior decision-makers through the Task Force and Working Groups. It is difficult to see how the City can achieve its emission reduction objective without the active participation of the broader community. The establishment of community partnerships with incentives to community action through targeted funding are areas that need to be explored further.

Toronto's Energy Efficiency Office (EEO) was established in 1990, with a mandate to develop and implement a comprehensive energy efficiency and conservation strategy for the City. Initial staffing for the EEO included 5 positions, with an additional budget of over \$500,000 (City of Toronto, 1991). In 1999 the Energy Efficiency Office program budget was \$700,000 (City of Toronto, March 2000) and there were approximately six full-time staff, plus five or six additional contract employees and students (Seskus, 2000). These resources are significant compared to resources available for City of Ottawa's entire climate change program, which had two full-time staff and a budget of

approximately \$30,000 to co-ordinate, develop, monitor and implement all programs.

While additional resources will be required to achieve the City's objectives, one respondent noted that additional resources need to be targeted to specific areas, particularly where gaps in program funding can make a big difference. For example, focusing on areas with the potential for leveraging resources and partnerships with groups with common interests is an approach that has been used effectively with the City's residential outreach program, EnviroCentre. It is also the approach being planned for new initiatives in the I/C sector including the downtown district energy project and the upcoming Better Buildings Program. If resources are not targeted at specific gaps and identified needs, there may be a continued tendency to deliver programs, such as the TDM Toolkit, that may achieve funding agency objectives, but do not produce the desired results in the community.

The value of local partnerships cannot be overstated, and the human resource capacity available in the community must be mobilised to attain the programs objectives. The City of Ottawa's initial Action Plan recognised the importance of community involvement and established a format for ongoing dialogue through the Advisory Committee and Working Groups. These partnerships will need to be renewed and strengthened to help the City achieve its commitment. In addition, rather than a specific focus on climate change mitigation, new approaches should be more closely linked to local concerns, which have been articulated by respondents to be the main drivers for the involvement of their

organisations.

7.2 Political Leadership

Most respondents indicated that a lack of political will at the municipal, provincial and federal level was a significant factor in the inability of this program to achieve its stated objective. Generally, local political leaders and senior management have not been considered supportive, which has limited program budgets and profile. One advisory Committee member summed up the general view as follows:

"The Advisory Committee was very concerned that the City of Ottawa was doing nothing in their own facilities, yet they were promoting action in the community. Why should they assume that we should pick up the ball and run with it if they were not willing to tackle the same issues internally?"

The City eventually developed and implemented internal energy efficiency measures and in 1998 reported an 18% reduction in corporate energy use, corresponding to a 19% decrease in CO₂ emissions below 1990 levels (City of Ottawa, 1999). However, any early momentum that may have existed for the Corporate Challenge program was impeded by a perceived lack of leadership and commitment from the City, which had not yet implemented the measures expected of other community partners.

Respondents were asked how to overcome the lack of political and senior staff commitment. Program staff indicated that there has been some success with event-based

activities. For example, a national Clean Air Day Canada Campaign had members of City and Regional Council and the Federal Environment Minister handing out newspapers to thank constituents for taking public transit. These events, which are generally well covered in the media, serve to provide profile for the politicians and profile for the program and may be the type of win-win events that can foster better political support within the organisation. Similarly, the program's profile was raised internally through the Chief Administrative Officer's involvement as the "Champion" of the corporate commuter challenge event to encourage alternative transportation habits among employees. Although these events are short-lived and there is no direct evidence that they produce sustained behavioural change, community participation and media coverage warrant their ongoing support. In the year 2000, for example, the City of Ottawa reported that almost 11,000 people took part in the National Capital Region's Commuter Challenge campaign (June 2000).

Lack of leadership is an issue that extends beyond the municipal level with most respondents expressing the view that there has also been a lack of strong support and direction from all levels of government. All respondents noted that the Government of Ontario has been absent from the debate in general, and has not been a contributor to the City's program in particular. It is interesting to note however, that the Ontario government cites the City of Ottawa's success as an example of how Ontario has responded to air pollution and climate change (Government of Ontario, Oct. 2000).

The federal government is generally viewed as being slightly more active in climate change response strategies, though respondents did not perceive climate change to be a priority issue at any political level. The recent failure of international climate change negotiations, largely attributed to the positions taken by Canada and the United States appears to justify this view. As previously indicated, climate change is an issue that crosses boundaries and jurisdictions and as such, a coordinated intergovernmental approach is required. How this can be achieved can be the subject of another paper!

Next steps

All respondents indicated that the federal government should play the largest role in climate change response strategies. The majority of respondents identified the need for the federal government to provide stronger support to voluntary municipal initiatives and for all levels of government to consider more aggressive regulatory approaches and the use of financial instruments. There was a general consensus that the federal government needs to lead in developing more aggressive responses to help Canada achieve the Kyoto commitment. While the federal government was deemed to be the dominant player in climate change response strategies, respondents identified a clear need for all levels of government to work together if emission targets are to be realised.

Some respondents identified the need to more effectively involve municipalities in helping to develop and implement federal government programs and policies. For

example, some recognise a strong federal role for public education and outreach on the issue of climate change that can be used as a framework for local action. The general perception of respondents was that the City's program lacked a sense of being part of a larger movement to reduce emissions and that government partnerships and a much higher political profile for the issue could help gain momentum in the community. It must be noted, however, that the City's Action Plan was initiated and implemented prior to the Kyoto Protocol, and respondents indicate that the issue now has much higher profile than in 1995 when the Action Plan was launched.

Limited resources significantly impaired the ability of the City of Ottawa to carry out broad education and outreach campaigns. The transportation awareness campaign outlined in Section 6.3.2 is an example of a program that was not effective due to the fact that the message could not be repeated consistently to the target group. As part of the National Implementation Strategy, the federal government has identified the need for a national public education and outreach strategy to provide a framework for consistent, reinforcing messages to the Canadian public. Regional hubs should be in place to more clearly target the message to local circumstances. City staff identified the need to work with the federal government to develop longer-term community outreach and consistent messages, which may help fill a key gap in the City's program. However, with the provincial government's refusal to sign on to the national implementation strategy, the ability of Ontario municipalities to participate in this national program is now limited. There is a general hesitation in the federal government to deal directly with municipalities

without the province's express consent (Kirby, 1993, cited in Cahill, 1994).

7.3 Integration

Consuming and supplying energy more efficiently and increasing the use of renewable energy are the main components of any emission reduction strategy. To date, the City of Ottawa has focused reducing energy demand and a closer examination of supply options such as a switch to renewable energy has not yet been undertaken. The City of Portland, Oregon has expressly addressed the need to support the development of renewable energy sources such as solar, wind, biomass and small hydroelectric power plants in their Local Action Plan and have an objective of purchasing 100% of City government electrical generation from renewable energy by 2010 (City of Portland, 2001). While community district energy system options are already being explored (Section 6.1.3), future City of Ottawa work will need to examine local opportunities to purchase and produce alternative energy.

Ultimately energy management programs need to be broadly-based in the community, comprehensive in their coverage of sectors and end uses, and the consideration of energy and environmental sustainability needs to be integrated into urban form and land use planning practices (Torrie Smith Associates, 1994). Decisions made at the community level about urban form, transportation and neighbourhood design have a profound effect on energy and air related emissions (CMHC, 1999; Jaccard et al, 1997). The majority of those interviewed indicated the need to more closely tie the strategic consideration of

energy into long term land use planning and policies. The wide-spread application of district energy systems and alternative supply options, considered an important means of reducing energy intensity in communities, are much more successful when their planning and development is integrated with the planning and development of urban infrastructure and the power supply system. Integrating the consideration of energy consumption into a community's land use planning process is considered a central element of any long-term strategy to address emissions (ibid.). The absence of involvement from the Planning Department at the City of Ottawa is an institutional barrier that will need to be overcome to gain long-term changes in the community.

7.3.1 Integration and Sustainable Community Development

The issue of integrating the consideration of environmental issues into the broader context of human development is a fundamental objective of sustainable development. Though there are arguments about what sustainable development actually means the most widely adopted definition is "that which meets the needs of the present generation without compromising the ability of future generations to meet their needs" (Jones, 1996). Many local governments support the principles of sustainable development in their corporate visions. The City of Ottawa's Official Plan is no exception, with mission and vision statements that expressly support the concept of sustainable development. The integration of economic, social and environmental goals is fundamental to achieving this objective. Though this view is laudable, the City has failed to implement this vision operationally in the context of climate change and the environment. The environment is

still one “silo” in the municipal structure and is not well integrated into the decision-making process. Even within the Environmental Management Branch individual environmental issues are not well integrated. For example, there are several separate programs ranging from "sustainability" and natural and open space protection to environmental assessment and climate change. One respondent noted that program staff have little knowledge of, or involvement with, other branch activities and there is no overall environmental management strategy to tie the pieces together. This paper has illustrated the extent to which municipal action on climate change is driven by local priorities and issues, thus, more closely tying the issue of climate change mitigation to other local environmental and sustainable development priorities may help build broader institutional and community support.

Sustainable Development and Sustainable Energy Use:

Some local governments are starting to integrate the objectives of atmospheric emission reductions and energy within a broader context of environmental and sustainable development goals. The City of Toronto has recently developed a more comprehensive approach to environmental issues as indicated by their recently released Clean, Green and Healthy: A Plan for an Environmentally Sustainable Toronto (2000). This plan was developed with extensive consultation of community and business groups and includes a range of environmental issues and responses including: land preservation, sewage and storm water management, hazardous and solid waste generation and disposal, and energy and atmospheric issues. Many of these other issues link directly to climate change and

greenhouse gas emissions. Conserving land, for example, enhances the potential for carbon sequestration; waste generation and landfill gas contributes significant greenhouse gas emissions at the urban scale and energy use is closely linked to air pollution and greenhouse gas emissions. Providing a framework for environmental action that can more closely link all these local priorities may be a way to engage community members in the City of Ottawa. The City of Sudbury has recently expanded the scope of its Local Action Plan to include a range of community environmental concerns after community feedback demonstrated that a focus on greenhouse gas emission reductions was too narrow. EarthCare Sudbury is now being developed as a sustainable community plan (McDougall, 2001).

A shift in focus from climate change action to promoting sustainable communities is also evident in the Partners for Climate Protection (PCP) program through which the City of Ottawa has established its climate change commitment. Since its formation, the PCP program has held three national workshops. The first one in 1998 attracted less than 100 participants, over 150 participants attended the second and the third workshop, which was promoted as a Sustainable Communities Conference. Several hundred municipal representatives participated in this event, held in Ottawa in February 2001, including City of Ottawa staff from many different departments. In the past, only climate change staff attended the PCP workshops. Broadening the scope of the PCP initiative to include a range of participants can enhance understanding across municipal departments and bring the issue of climate change out of its “silo” within the Environmental Management

Branch. Ultimately, as more municipal staff become engaged in these issues, greater understanding and municipal support may be fostered which in turn could increase the likelihood of concrete action.

7.4 Results: Monitoring Progress

Case study research of the City of Ottawa climate change response strategy shows how the program has been monitored and programs adjusted throughout the implementation period to more closely tie to the needs and priorities of the target group. In addition, new measures have the potential for measurable emission reductions, an element missing in early program development. Respondents for this research have emphasised the need for concrete measures that can produce direct results, which may in turn foster momentum for further action. For example, documenting success stories from building retrofits implemented through the City's new Better Buildings Program may help develop and build the momentum needed to engage other community leaders.

Measuring aggregate community emissions has limited the ability to demonstrate the impact of individual programs targeted to achieve the 20% emission reduction objective.

The use of environmental and other relevant indicators may be a more effective means of tracking progress over the long term. The City of Toronto has, for instance, developed a list of environmental indicators to track the progress of its environmental plan which

includes monitoring of:

- The amount of green space per capita.
- Energy consumption per capita.
- Public transit use.
- Emission of CO₂ by sector.
- Emission of priority pollutants.

The City of Ottawa has its own Indicators Program and recently released a set of indicators for the community. However, unlike Toronto, the City's indicators are not clearly linked to a specific plan of action that defines the methods to be used to influence changes to any of these indicators over time. Providing indicators without a coordinated framework for response may not be as effective as a coordinated strategic plan, monitored on a consistent basis for improvements in environmental conditions across the community. An integrated environmental plan, coupled with specific indicators to track progress, such as those developed by the City of Toronto, may be a more effective approach to monitoring progress. While it would still be necessary to track aggregate emission levels to monitor community greenhouse gas emissions, drawing out specific measures of progress can more closely illustrate areas that need to be targeted for improvement.

7.5 Program Gaps: Recommended Next Steps

7.5.1 Adaptation

None of the respondents interviewed identified the need to plan for, and adapt to a changing future climate as a required next step. However, given that the research indicates emissions reduction of 50% to 70% will be needed to stabilise the global climate, and the fact that global GHG concentrations emissions continue to rise, adapting to future climate changes will be required. Recognition of the need for strong adaptive response strategies is increasingly prevalent in the climate change literature and integrated mitigation and adaptation strategies at the community level are increasingly important (Lorenzoni et al., 2000). To date, the issue of adaptation has been absent from the City of Ottawa's climate change program reports, which focus solely on mitigation. The Insurance Bureau of Canada has recently pressed for more adaptive responses calling on local officials to upgrade the local sewer systems to prepare for climate change stating:

“Global warming, and what many believe are its related ice storms, tornadoes and freak heavy rain storms, put a heavy strain on Ottawa's decaying sewer system... we can reduce the cost of future natural disasters by ensuring that our municipal infrastructure is adequate to carry the load of most severe weather events” (Yakabuski, cited by Gray, 2000).

While others are much more cautious about making such a clear link between climate change and recent extreme weather events, the insurance industry is taking a more aggressive interest in the climate change issue in recent years, motivated by

unprecedented increases in insurance claims due to extreme weather (MacDonald, 2000).

The insurance industry has an obvious self-interest in achieving reductions in the damage caused by weather events and many groups such as Greenpeace and the United Nations Environment Program (UNEP) are involved in campaigns to persuade insurance groups to join with them to encourage governments to take more aggressive action on climate change (ibid.). However, in spite of insurers concerns, they are not working to push for mitigation and instead are focussing their efforts on pressing for national actions to increase Canadians resistance to extreme weather through infrastructure improvements (ibid.).

Along with infrastructure changes there is increasing awareness of the role that urban forests can play in absorbing CO₂, improving the energy efficiency of buildings when strategically planted, and reducing the urban heat island effect. Before humans began to clear land, vegetation stored about 900 billion tonnes of carbon, 90% of this sequestration occurring in forests. Today, only 560 billion tonnes of CO₂ are sequestered in forests, and this amount is diminishing. There is considerable interest in offsetting some CO₂ emissions through the use of forests as carbon reservoirs or sinks (Freedman and Keith, 1999).

Although urban trees absorb CO₂ a key local benefit of shade trees is their ability to cool the urban environment and reducing energy use and emissions associated with air

conditioning. Expanding urban tree planting can be an adaptive response to the warmer temperatures experienced in urban communities. In addition, trees can directly shade buildings and cool ambient air by offsetting some of the urban heat island effect associated with the built environment. A study commissioned by the Friends of the Earth in Toronto determined that planting enough trees to shade 30% of Toronto's residential buildings could reduce summer cooling use by 10% to 30% and winter heating loads by 15% to 30% (City of Toronto, 1991). Integrating community greening strategies to consider the impact of tree planting on climate change adaptation and mitigation should be included in future response strategies. Enhancing local green space will also support broader community environmental priorities such as increasing habitat and retaining storm water, reinforcing the need to link the benefits of climate change mitigation to other local priorities.

7.6 Observations and Conclusions

7.6.1 The Research Process

This thesis presented a detailed case study of the implementation of the City of Ottawa's Task Force on the Atmosphere Action Plan developed to help the City attain its commitment to reducing GHG emissions to 20% below 1990 levels by 2005. The research methodology included a literature review and in-depth interviews with individuals that have been involved with implementing the City's Action Plan. The interview population consisted of all individuals identified as members of the Action Plan

Working Groups, Advisory Committee, Implementation Team and Corporate Challenge.

Of the thirty individuals originally contacted, only 19 agreed to an interview. In retrospect this number is not surprising given that interview results show very limited ongoing involvement of most of the individuals identified as Work Group or Advisory Committee members, with a few exceptions.

The opportunity provided for spontaneous individual response ensured that a full range of individual insight was available to the researcher. Unfortunately, it also meant that the interviews could get side-tracked more easily into areas not particularly relevant to the discussion. Having a clear framework to guide the questions allowed interviews to refocus when required. The ability to gain additional insight outweighs the potential for digression and associated increases in interview times.

During this research I grappled with how to reign in the topic. Climate change is a huge subject as are the policy issues; environmental outreach and project management topics touched upon in this case study. In the end, I could not see how to effectively address the complex issue of climate change mitigation at the municipal level without acknowledging the larger scope of the issue, the range of policy tools available and identifying some constraints and opportunities associated with the variety of approaches taken. In essence, just as this thesis has demonstrated that the issue cannot be effectively addressed without widespread integration of priorities and programs across jurisdictions and municipal

departments, the research required an interdisciplinary approach that moved beyond addressing the issues from a uni-dimensional “climate change silo” perspective. This interdisciplinary approach greatly complicated the research and necessitated a rather superficial coverage of some of the important theoretical dimensions. Addressing the issue from a broader perspective, however, may have provided considerably more depth to the case study analysis than approaching the subject from any one perspective, such as public outreach, could have gleaned.

7.6.2 Observations and Conclusions

Climate change is viewed as one of the most pressing environmental issues this century. As a northern hemisphere nation, Canada is expected to experience greater temperature increases than the global average and may experience substantial changes to terrestrial and water systems. Global, national and municipal response strategies are being developed to address the issue and effective responses at all levels will be required to address this important issue. The importance of scale in understanding opportunities for action is identified as a key to expanding the scope of analysis and to more closely address the community benefits associated with actions that reduce emissions.

The City of Ottawa was among the first in Canada to develop and implement a community action plan reduce greenhouse gas emissions. Their aggressive goal was to reduce emissions to 20% below 1990 levels by 2005. The Task Force on the

Atmosphere Action Plan set out eleven measures to achieve this objective and established an Advisory Committee Structure and Working Groups to assist the Implementation Team. The response strategy focussed on motivating and engaging the community to take voluntary action to reduce emissions, which is similar to the approach taken by the federal government. This case study indicates that so far this approach has not been successful and the perception of all respondents interviewed is that the City will not achieve its climate change commitment. The evaluation of the overall program and individual programs implemented to date supports this perception. Any reduction in aggregate emissions identified in the progress reports has been attributed to external factors such as changes in the fuel used to produce electricity. In addition, individual programs targeted at the residential, transportation and the institutional and commercial sector have failed to produce any significant emission reductions. While new program directions identified in Chapter 6 have the potential for measurable emission reductions, it is too early to assess their impact.

There appears to be a fundamental mismatch between the City of Ottawa's aggressive emission reduction target and its selected response strategy which can hardly be deemed aggressive. To date, the primary response has been to promote voluntary initiatives through providing education and outreach and targeted programs such as EnviroCentre. Social science research suggests that using a combination of policy tools is most effective and most individuals interviewed for this case study identified the need to consider more

aggressive policy options including regulation and financial instruments. The City's limited results to date appear to support the need for stronger policy options to match the City's fairly aggressive 20% target. It also needs to be recognised that municipal action is taken without any express mandate to address air emissions.

The failure of the program to date is largely attributed to three primary barriers: insufficient resources, inadequate leadership from all levels of government and a lack of integration of climate change objective with broader community objectives, which are viewed as the key impetus for local action. Insufficient staff and financial resources disrupted program continuity from the outset and limited the ability of the program to effectively engage community partners. Respondents identified the new federal Green Funds as a potential means of overcoming funding barriers to program implementation. Many respondents recommended exploring innovative funding options such as the establishment of a revolving loan fund, modelled after the Toronto Atmospheric Fund. Given the perceived lack of community leadership on the issue in general, this may not be a feasible option. Community partners expressed frustration that City expected them to take action, while avoiding taking action in their own facilities. The constant threat of program suspension increased the perception that the City did not exhibit strong enough leadership, which may have contributed to inaction in the community. The City will need to re-evaluate its human and program resource commitments in light of the significant constraints placed on the program due to ongoing resource limitations. If politicians and

senior management are not supportive of more aggressive policy options, or additional resources, then the emission reduction target may need to be reduced, not a desirable option, but ultimately more attainable given the current context.

Though not expressly identified by respondents, the lack of clear mandate has been determined to be a key barrier to municipal action (Section 1.2). The barriers to program implementation outlined in this case study suggest that given other municipal priorities and ongoing budgetary pressures, voluntary commitments may not be sufficient to drive action.

Many potential additional actions identified by respondents to be necessary to achieve the 20% emission reduction target are the responsibility of other levels of government. There was a strong consensus that increased efficiency standards for appliances and vehicles could have a large impact on energy use and emissions. Examining financial incentives and removing disincentives to action were also identified as key elements of a successful strategy. While municipal governments have control over some of the potential policy levers identified by respondents, such zoning and land use policy, most of the policy instruments identified are beyond municipal government jurisdiction and will require policy direction and leadership from other levels of government. The perception of respondents for this case study is that this leadership has not been forthcoming. This perspective is supported by the recent refusal of the Ontario Government to endorse

Canada's National Climate Change Business Plan and the breakdown of international climate change negotiations, widely attributed to Canada's position. Thus, the broader policy context in which municipal climate change action is being undertaken is considered to be relatively weak. Local governments such as the City of Ottawa have been able to link actions that increase energy efficiency and reduce fossil fuel combustion to local benefits such as economic efficiency and air quality improvements, which may help overcome governmental and community inertia in responding to the issue of climate change. However, the limited international, national and local responses to date suggest that communities need to begin to consider adapting to climate change and the City of Ottawa will need to consider infrastructure upgrades and enhancements to the urban forest to accommodate potential changes in precipitation intensity and to reduce the enhanced urban heat island effect that may accompany climate change.

In Ottawa the co-benefits of reducing emissions are seen as the primary driver of local action and most individuals interviewed expressed the view that focussing on a range of local benefits of action may be the most effective strategy to engage stakeholders. The case study analysis of individual programs supports this assertion. Programs that have focussed on informing residents and business leaders of the issues of climate change and reducing CO₂ emission have not resulted in measurable emission reductions. Recent program development has reduced the primary focus on global warming and CO₂ emission reductions, new approaches are generally framed to promote economic and

other community benefits. The concerns articulated by specific target audiences will be more closely addressed. For example, the Better Business Program will be presented as an opportunity to increase corporate efficiency and save money, while at the same time demonstrating environmental stewardship. The residential sector program, EnviroCentre is marketing energy efficiency through messages which promote cost savings and home comfort, which survey research indicates is the primary motivation for improving household energy efficiency. Environmental activists may view these approaches with cynicism, but if they help achieve the desired environmental objective, why not continue? Research indicates that Canadians are not yet interested in sacrificing their lifestyle for the benefit of the environment (Cheney, 1998) and governments are not perceived to be taking strong action on environmental issues, especially climate change. In the absence of a fundamental paradigm shift from economic to ecological values, measures that promote environmental action and economic efficiency, without curtailing individual behaviour may be the most effective, albeit limited, short term response.

Ottawa's Task Force on the Atmosphere Action Plan has had limited emission reductions and its focus on reducing greenhouse gas emissions has been deemed insufficient to engage a range of stakeholders on an ongoing basis. The program has been developed and nurtured by a core group of individuals with limited involvement from other city departments, institutions or the general public. Attaining an aggressive 20% emission reduction target will not likely be achieved without substantial additional effort and a

range of additional policy actions, many of which require the cooperation of all levels of government and a range of city departments. The broader community and individuals will also need to become involved in actions that reduce emissions, though these actions may be undertaken for a range of other reasons. An integrated approach linking climate change mitigation and adaptation to other more tangible local priorities, viewed as the main drivers for action, is identified as a potential means for moving forward. Implementing a climate change Action Plan in isolation from a broader context that explicitly addresses the range of opportunities and drivers that motivate action has not been effective for Ottawa. The development of a broader environmental or sustainable development strategy or master plan like Toronto and Sudbury have undertaken (Section 7.3.1) may be an effective way to link climate change mitigation and adaptation with a broader range of local priorities. This approach could help to situate the issue of climate change more effectively within the context of local priorities and provide for more meaningful monitoring of progress over time through the use of a consistent set of indicators. Climate change mitigation would then become the beneficial co-benefit of local responses to economic, social and environmental issues and priorities.

Ultimately, as urban populations continue to rise, local strategies can be expected to play a significant role in addressing global environmental issues such as climate change. Local strategies that frame the issue of climate change more broadly and identify and document the range of community benefits associated with taking action to reduce GHG

emissions may help to establish and promote the case for taking action. Ultimately, documented local success stories may help break the current impasse in international climate change response and catalyse international action.

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APPENDIX 1

IN-DEPTH QUESTIONNAIRE

Open- ended interviewing requires some flexibility during the interview process. The researcher recognises that additional questions may arise during the interview process that are not listed below, these will be documented in the final report.

Critical Project Success Factors	Questions
ENDS:	
Goals: Clearly defined goals and project mission -Objective should be specific and agreed upon by all participants.	1.A What is the primary goal of the City of Ottawa's climate change program 1. B What is the overall goal of (each sub program in which you are involved)? 1.C How and why did you or your organisation become involved? 1. D What other objectives did you want to achieve?
Individual Role	2. A How and why did you become personally involved? 2. B What are your personal interests in climate change or the environment? 2. C What was your involvement in the process?
Environmental Aspects	

Critical Project Success Factors	Questions
Results: Does this program provide measurable GHG emissions reductions?	<p>3. A Will the City's overall 20% GHG emission reduction goal be achieved by 2005? Explain, what is feasible?</p> <p>3. B Have individual programs achieved measurable GHG emission reductions?</p> <p>3. C Why, why not?</p> <p>3. D Have other objectives been met: Which ones, how?</p> <p>3. E How have program results been measured?</p> <p>3. F Are the measurement instruments used sufficient and do they provide useful information?</p> <p>3. G What could be done to improve the measurement process?</p> <p>3. H Describe the key barriers that may influence the ability of this program to achieve the objectives.</p>
Problem Definition	<p>4. A What are the primary drivers for climate change action at the local level?</p> <p>4 B. Problems: How is the problem presented i.e. Climate change focus, local air quality, and health, economic?</p>
Choosing the behaviour to change Solutions	<p>5. A What specific actions were program participants encouraged/ required to take.</p> <p>5. B Can these actions achieve measurable GHG emission reductions?</p> <p>5. C How were actions selected?</p>
MEANS:	
Overall Strategy- Clear time lines and targets to achieve the long term objective	<p>6. A Were specific targets and time lines set for the attainment of the overall program objectives?</p> <p>6. B Did sub program have clear time lines and targets</p>

Critical Project Success Factors	Questions
Top management support	<p>7. A Did this program receive initial and on-going senior management support within your organisation?</p> <p>7. B If yes, - How was support demonstrated?</p> <p>7. C If no, - what barriers impeded senior management support? How were these overcome?</p> <p>7. D- repeat for Council support where relevant</p>
Project Management /team dynamics	<p>8. A Was a project manager clearly identified to lead the (overall and each sub-project) program? Who?</p> <p>8. B Was the overall project team and working groups provided clearly defined tasks, time lines and deliverables? Explain</p>
Working group dynamics	
Sufficient Resources	<p>9. A What level of resources have been committed to this program?</p> <p>\$\$:</p> <p>Staff Time:</p> <p>9. B Were resources sufficient to achieve the program objectives? Give specific examples- e.g. budget, number of staff.</p>
Client/customer involvement and consultation	<p>10. A Were stakeholders and the target group consulted prior to developing the program?</p> <p>10. B If so how?</p> <p>10. C If not, why not?</p> <p>10. D Is the consultation process on going?</p>
Communication: Framing the message; What was the main message presented (i.e. is the focus of informing the community of the problem of climate change? is the focus on solutions? Local benefits?	<p>11. A What were the key message presented to target groups?</p>

Critical Project Success Factors	Questions
Communication	<p>11. B How is program information communicated to the stakeholders and the target group?</p> <p>11. C What could be done differently to improve/increase communication?</p>
Uncovering Barriers	<p>12 A Was any initial survey work done to assess the existing concern and/or barriers of the target group?</p> <p>12 B If so how?</p> <p>12. C If not why not?</p>
Responsiveness to clients	<p>13. A Do you feel that this program adequately serves the needs of the target group?</p> <p>13. B Explain.</p>
Monitoring and feedback	<p>14. A Has the program be monitored and adjusted to ensure that the objective is attained?</p> <p>14. B If so, what changes have been implement?</p> <p>14. C Are any further changes planned?</p> <p>14. D Was there opportunity for feedback between program developers and target groups?</p> <p>14 E. How was this accomplished?</p>

Critical Project Success Factors	Questions
Policy Tools	<p>15. A What methods are used or could be used to promote program objectives?</p> <p>15 B Information: Yes/no Describe Comments</p> <p>15. C Regulation/legislation: Yes/no Describe Comments</p> <p>15. D Market incentives: Yes/no Describe Comments</p> <p>15 E. Other: Yes/no Describe</p> <p>15. F Are there specific government policies or structures that have impeded or promoted program objectives?</p>
Participation in other climate change and/or energy efficiency programs:	<p>16. A Are you currently a participating in any other program developed to reduce greenhouse gas emission or save energy?</p> <p>16. B Please list programs, explain involvement.</p> <p>16. C Are you interested in participating in future municipal climate change programs: If so, what type of program would most interest you?</p> <p>16. D If not, why?</p>

Critical Project Success Factors	Questions
Effectiveness of Voluntary Programs	<p>17. A How has your participation in voluntary programs (if any are named) contributed to achieving your program objectives? Explain</p> <p>17. B Will voluntary programs be sufficient to achieve your climate change objectives? Explain</p>
Government Support	<p>18. A What specific actions have or could other levels of government take to help your program achieve its GHG emission reduction goals?</p> <p style="text-align: center;">Have Taken Could Take</p> <p>Federal: Provincial: Municipal:</p> <p>18. B Have you received any grants or other financial assistance to develop and implement your program? Explain.</p>
The Climate Change Issue	<p>19. A Have you become any more aware of concerned about the issue of climate change since your initial involvement? Explain</p> <p>19. B How has the issue evolved since the inception of the program?</p> <p>19. C What influence have other related issues and programs had on your involvement? E.g. Kyoto Protocol, Federal Issues Tables, Partners for Climate Protection Program, Voluntary Challenge Registry, Energy Prices.</p> <p>19. D Was it public concern that drove the program or is the program attempting to influence public concern?</p> <p>19. E Is public opinion on the need to address the climate change issue important to the success of this program?</p>
Next Steps	<p>20. A What <i>specific</i> actions are needed to increase the chances of this program achieving the 20% GHG emissions reduction targets.</p>

APPENDIX 2

GLOSSARY OF TERMS AND ACRONYMS

(BBP)- Better Buildings Partnership: City of Toronto program run out of the Office of Energy Efficiency, aimed at reducing GHG emissions through comprehensive building retrofits.

(BBP Ottawa): Ottawa Better Buildings Program: Launched in January 2001 to reduce GHG emissions in the commercial/institutional sector through comprehensive building energy retrofits.

(CCP) Cities for Climate Protection Program: International municipal climate change program established by the International Council for Local Environmental Initiatives (ICLEI).

Climate Change: The term most commonly used to describe the multiple climate variations that are anticipated to arise from the *enhanced greenhouse effect*. These changes extend beyond temperature variation.

CO₂ One of the major greenhouse gases that warm Earth's atmosphere. Anthropogenic CO₂ is caused primarily by the burning of fossil fuels

eCO₂ Internationally, emissions are reported on a carbon basis. If emissions are reported as carbon, this figure is multiplied by 3.67 to get the equivalent in carbon dioxide emissions. Emissions are reported on a carbon equivalent or carbon dioxide equivalent basis. Generally all GHGs are converted to the equivalent of either carbon or CO₂. One tonne of methane equals 21 tonnes of CO₂ and one tonne of nitrous oxide equals 320 tonnes of CO₂.

EkWh Standardized unit of energy. Converts Joules, BTUs and other units to facilitate comparison.

GJ 10⁹ Joules. One gigajoule (GJ) is the amount of energy that would be consumed by ten 100-Watt light bulbs lit continuously for 12 days.

Gt 1 Gigatonne = 10⁹ tonnes. Gigatonnes of carbon = GtC

GtCO₂ 1 GtC = 3.7 Gt carbon dioxide

Greenhouse Effect A natural process whereby incoming solar radiation (energy) is

transmitted by the atmosphere to the earth's surface, which it warms. This energy is re-transmitted by the atmosphere as *thermal radiation*. Some of this energy is absorbed by *molecules of greenhouse gases* instead of being re-transmitted to space, thus warming the atmosphere. The name comes from the ability of greenhouse glass to transmit incoming solar radiation to warm the interior of a greenhouse. The natural greenhouse effect is due to the greenhouse gases naturally present in the atmosphere.

Enhanced Greenhouse Effect : The added warming caused by greenhouse gases present in the atmosphere due to human activities. According to the *IPCC* Business-as-usual scenario, the mean global temperature is expected to rise between 1.5 °C and 4 °C by the year 2055.

Greenhouse Gases Molecules in the Earth's atmosphere such as carbon dioxide (CO₂), methane (CH₄) and CFC's which warm the atmosphere because they absorb some of the thermal radiation emitted from the earth's surface (see greenhouse effect).

(ICLEI) International Council for Local Environmental Initiatives: International organisation of local governments formed to achieve and monitor tangible conditions in global environmental conditions through cumulative local actions.

IPCC: Intergovernmental Panel on Climate Change was established by the United Nations Environment Program (UNEP) and the World Meteorological Organisation (WMO) in 1988 for the purpose of assessing scientific information on climate change and evaluating its ecological, economic and social impacts.

Methane (CH₄): Greenhouse gases from rice production, cattle rearing, landfills, and ventilation of natural gas. It has 21 times the warming potential of CO₂ and a lifetime of 4 to 7 years in the atmosphere.

(PCP) Partners for Climate Protection program: Canadian partnership for municipal government action on climate change. A partnership between the Federation of Canadian Municipalities (FCM) and ICLEI.