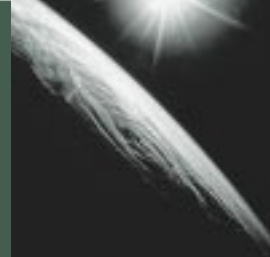


C L I M A T E O F C H A N G E



Taking Charge: Personal Initiatives

David Suzuki Foundation

Finding solutions

December 1997

This report is part of a series on climate change produced for the David Suzuki Foundation leading up to the 1997 and 1998 meetings of the Conference of the Parties to the UN Framework Convention on Climate Change in Kyoto, Japan (COP 3), and Buenos Aires, Argentina (COP 4). A description of each of these reports appears on the back cover. They are available free to download from the David Suzuki Foundation website: <www.davidsuzuki.org> or can be ordered directly from the address below.

The Authors

The Pembina Institute for Appropriate Development is an independent citizen-based organization. Its mandate is to research, develop and promote policies and programs that lead to environmental protection, resource conservation, and environmentally sound and sustainable resource management.

The main focus of the Institute's work is energy/environment and economy/environment issues and solutions. It has a dedicated Climate Change Program to address the long-term policy and education needs associated with this unique issue. Activities include the creation of educational materials on climate change, the design and review of municipal and corporate greenhouse gas emissions reduction strategies, and the development of appropriate public policy tools for addressing the issue. The Pembina Institute's Climate Change Program is directed by **Robert Hornung**. Prior to joining the Institute, Robert worked on the climate change issue with Friends of the Earth Canada, Environment Canada and the Organization for Economic Co-operation and Development.

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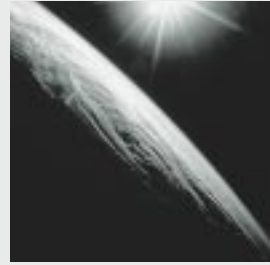
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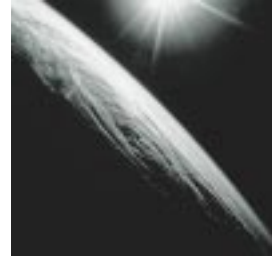
Initiatives

We've all heard about climate change, but many Canadians remain confused and uncertain about what climate change is and what its implications are for Canada, the world, themselves and their children.

This partly reflects media coverage of the issue, which tends to focus on areas of disagreement and conflict among scientists, economists and other stakeholders, rather than on the broad areas of consensus that do exist. As a result, many Canadians have been immobilized – unsure of what they and others can do to address climate change and uncertain about whether action is needed at all.

This cannot continue. The broad scientific and economic consensus that exists on the climate change issue makes it absolutely clear that Canadians must immediately begin to reduce the greenhouse gas emissions that have begun to change our climate. Under the Kyoto Climate Change Protocol, Canada has also committed to reduce emissions to 6% below 1990 levels by 2012.

Each of us needs to take personal responsibility for our own contribution to the problem. Yet individual Canadians cannot do this alone. We all need to work in our communities to pressure municipal governments to reduce greenhouse gas emissions and to use our powers as consumers and citizens to send a strong message to corporations, and federal and provincial governments, to do the same.



1

Why do we need to take action to protect the climate?

THERE ARE THREE REASONS WHY ALL OF US NEED TO MAKE GREENHOUSE GAS emissions reduction a priority.

1 Climate change threatens Canada's environment and economy

The Intergovernmental Panel on Climate Change (IPCC), made up of 2,500 of the world's leading scientists and economists, stated in 1995 that "the balance of evidence ... suggests that there is a discernible human influence on global climate."¹ With this statement, scientists moved human-induced climate change from the realm of theoretical speculation to accepted fact. Climate change is real and it is happening now.

The science of climate change is discussed in detail in the first report of this series, *A Glimpse of Canada's Future*. As that report makes clear, the continued emission of greenhouse gases from human activities is likely to cause further increases in average global temperatures and sea levels, as well as increase the frequency and severity of extreme weather events. Such climatic changes could have serious impacts on human health, Canada's ecosystems, and the economic activity that depends on our natural resources (e.g., forestry, agriculture, fisheries).

According to the IPCC, global greenhouse gas emissions need to be reduced by more than 60% to avoid a doubling in the atmospheric concentration of carbon dioxide (the level at which most scientists have studied the potential impacts of climate change). This is a challenging task, and accomplishing it will require, as a first step, that Canada and all other industrialized countries start acting immediately to reduce greenhouse gas emissions below current levels.

2 Reducing greenhouse gas emissions makes economic sense

The main greenhouse gas produced as a result of human activity is carbon dioxide (CO₂). Carbon dioxide is emitted when we burn fossil fuels (i.e., coal, oil, natural gas) to produce energy to power our industry, heat and light our

Greenhouse gases include carbon dioxide, methane and nitrous oxide. Combustion of fossil fuels (coal, oil, natural gas) to produce our electricity, fuel our vehicles, heat our homes and power our industries is the main human source of greenhouse gas emissions. According to the IPCC, the average global temperature has increased by approximately 0.5 degrees Celsius in the last 100 years and average sea levels have risen by 10-25 cm over the same time period.

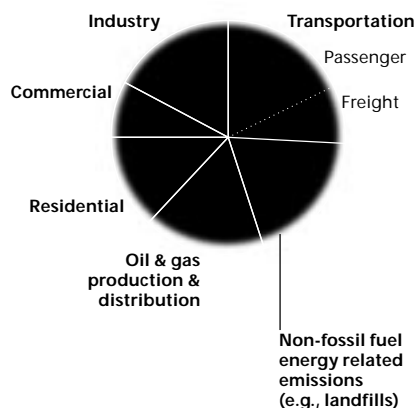


FIGURE 1. CANADA'S GREENHOUSE GAS EMISSIONS BY SOURCE

SOURCE: National Air Issues Coordinating Committee, *1996 Review of Canada's National Action Program on Climate Change*, November 1996. Greenhouse gas emissions associated with electricity production have been assigned to the sectors making use of the electricity.

homes and businesses, and fuel our vehicles. Carbon dioxide is also released to the atmosphere through deforestation. Other significant greenhouse gases are methane (CH₂) and nitrous oxide (N₂O).

While Canada produces only two percent of global greenhouse gas emissions, it is still one of the top 15 emitters in the world. Moreover, Canada is one of the highest emitters of greenhouse gases per person in the world.² The main sources of greenhouse gas emissions in Canada in 1995 are illustrated in Figure 1.

Clearly, we can only address climate change by reducing our dependence on fossil fuels as an energy source. Doing this will also help us deal with a host of other environmental issues, including wilderness destruction, oil spills, acid rain and urban smog, that are associated with the production, transport and combustion of fossil fuels. There are three main strategies for reducing the greenhouse gas emissions associated with our fossil fuel use:

- increasing the efficiency with which we use fossil fuels;
- replacing fossil fuels that produce the most carbon dioxide (coal) with fossil fuels that produce the least carbon dioxide (natural gas); and
- replacing fossil fuels with energy from renewable sources like the sun, wind, biomass and falling water.

Another report in this series, *Canada's Window of Opportunity*, illustrates how pursuing these three strategies produces a range of economic and social benefits in addition to the environmental benefits outlined above. In fact, many of the actions we can take as individuals to reduce our dependence on fossil fuels will protect the environment, reduce our energy use, and put money in our pockets when our energy bills go down. When we spend that money in our communities, we create local economic activity and jobs.

After examining the environmental, social and economic benefits of reducing fossil fuel use, the IPCC concluded in 1995 that "despite significant differences in views, there is agreement that energy efficiency gains of perhaps 10% to 30% below baseline trends over the next two to three decades can be recognized at negative to zero net cost"³ (negative net cost means an economic benefit). In other words, the multiple benefits generated by reduced fossil fuel use means that taking action to reduce greenhouse gas emissions makes economic sense for Canada.

3 Each of us can make a difference

The economic and environmental threat posed by climate change, and the multiple economic and environmental benefits that will result from action to reduce greenhouse gas emissions, provide a strong rationale for action. That action must start locally – with each and every one of us. Why are individual Canadians and local communities a key element of the climate change solution?

To begin with, every Canadian is an important contributor to the climate change problem.⁴ In 1995, Canada produced 619 million tonnes of greenhouse gas emissions. Of this total, approximately 25% was directly related to the use of

fossil fuels by individuals to meet their personal transportation needs (e.g., gasoline) and their energy demand for space and water heating and appliances (fossil-fuel based electricity, oil and natural gas).⁵ This means that on average, every Canadian is directly responsible for the emission of more than five tonnes of greenhouse gas emissions into the atmosphere each year. Figure 2 illustrates the relative contribution made by different energy-related emission sources to the greenhouse gas emissions of individual Canadians in 1990.

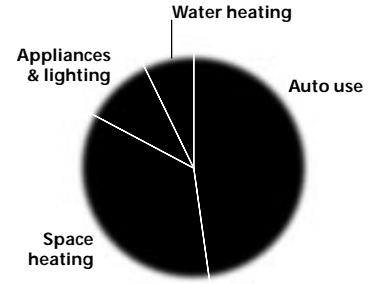


FIGURE 2. INDIVIDUALS' GREENHOUSE GAS EMISSIONS BY SOURCE

SOURCE: Environment Canada, *Greenhouse Gas Miser Handbook*, 1993.

By reducing our own greenhouse gas emissions, each of us can contribute to the climate change solution. Chapter 2 of this report describes how you can calculate and monitor your own greenhouse gas emissions and outlines the range of actions you can take to reduce your impact on the global climate.

We can also make it easier to reduce our own greenhouse gas emissions by working to make our communities more climate-friendly. The design of Canada's urban areas has been strongly influenced by open spaces and low energy prices. Consequently, Canadian communities are characterized by urban sprawl, strict separation of residential and business areas, and low population density that results from a heavy reliance on large single family residences. These design characteristics ensure that our communities are inefficient users of energy and other resources and they hinder individual action to protect the climate.

Fortunately, municipal governments can use a range of tools to take actions in areas of municipal responsibility. These areas include land use planning, building standards, waste management, and water and transportation infrastructure. Chapter 3 provides an overview of the types of actions you can encourage your community to take to improve the efficiency of resource use and reduce greenhouse gas emissions.

Actions by individuals and communities alone, however, will be inadequate to address the climate change problem. Corporations must also be held accountable for their greenhouse gas emissions, and federal and provincial governments must provide a regulatory and fiscal framework to encourage and support climate-friendly actions. Chapter 4 provides some suggestions on how we can use our power as consumers and citizens to pressure corporations and governments to respond to the threat posed by climate change and to take advantage of the economic opportunities presented by greenhouse gas emissions reduction.

Canada has made a commitment to stabilize emissions of greenhouse gases at 1990 levels by the year 2000 and is now negotiating stronger commitments internationally. Despite our good intentions, however, Figure 3 illustrates that Canada's greenhouse gas emissions had already increased to 9.8% above 1990 levels by 1995 and are projected to increase further to 19% above 1990 levels by the year 2010.⁶

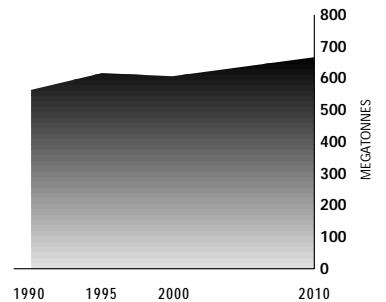
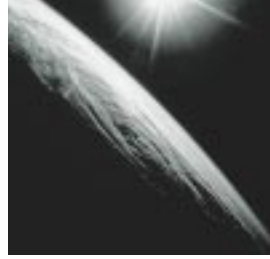


FIGURE 3. CANADA'S GREENHOUSE GAS EMISSIONS

SOURCE: UN FCCC Secretariat FCCC/SB/1997/6 25 July 1997, plus second national communications

This projection cannot become a reality. The potential economic and environmental impacts of climate change make it clear that Canada must take immediate action to reduce its greenhouse gas emissions. Each of us can make a difference. More importantly, we have to.



2

Practical actions you can take to reduce greenhouse gas emissions

What is your contribution to global climate change?

A good way to begin your efforts to protect the climate is to understand your contribution to the problem. Carbon dioxide is the main greenhouse gas, and it is not difficult to estimate the amount of carbon dioxide emissions you are directly responsible for producing.

First, estimate or measure your level of energy use in transportation and within the home on an annual basis. This means you need to quantify the:

- litres of transportation fuels used in your personal vehicles (gasoline, diesel, etc.);
- kilowatt-hours of electricity used in your home; and
- litres of oil or cubic metres of natural gas used in your home.

This information can be obtained directly from bills or receipts. Where it is more difficult to determine energy used (e.g., public transit or transportation by air), you can estimate activity levels instead (e.g., kilometres travelled).

Once you have all of this information, you can move to the second and final step. In this step, you multiply your fuel use or activity data by standard conversion factors that will translate the data you have collected into carbon dioxide emissions. In virtually all cases, these conversion factors are the same across Canada. The one major exception is in the area of electricity use. Greenhouse gas emissions associated with the generation of electricity vary from region to region in Canada because we use different sources of energy to produce electricity in different parts of the country. A full list of the conversion factors you will need to calculate your own personal greenhouse gas emissions inventory is provided in Appendix A.

The table below provides a sample worksheet you can use to calculate your own personal greenhouse gas emissions based on the fuel use and activity data you collect and the standard conversion factors found in Appendix A.



TABLE 1. CARBON DIOXIDE EMISSIONS – CALCULATION WORKSHEET⁷

EXAMPLE: Member of a family of 3 living in a suburban Ontario home

ACTIVITY	A ANNUAL CONSUMPTION	B AVERAGE NUMBER OF USERS	C CO ₂ CONVERSION FACTOR	D TOTAL ANNUAL CO ₂ EMITTED (KG) D=(A/B) X C
Home Energy Use				
Electricity	5,500 kWh	3	0.15 kg/kWh	275
Natural Gas	3,500 m ³	3	2.2 kg/m ³	2,567
Oil	0 litres		3.0 kg/litre	0
Transportation				
Car	2,500 litres	3	2.5 kg/litre	2,083
Public Transit	1,000 km	1	0.04 kg/km	40
Air Travel	2,000 km	1	0.25 kg/km	500
Total Annual Individual Carbon Dioxide Emissions (add figures in Column D)				5,465 kg of CO₂

By preparing such a worksheet on an annual basis, you can monitor how your greenhouse gas emissions change over time in response to your actions to protect the climate. Your actions can make a notable difference.

For example, the family described in the above table produces over 2 tonnes of greenhouse gas emissions per person by driving their car approximately 25,000 km/year (we'll assume the car uses 10 litres of fuel to travel 100 kilometres). If the family travelled 25% of that distance by public transit instead, total greenhouse gas emissions from transportation would fall from 2,623 kg/person to 2,186 kg/person – a 17% reduction.

The table presented above provides only one tool for calculating your contribution to climate change and measuring your progress in reducing greenhouse gas emissions. Other tools you can use include: Environment Canada's *Greenhouse Gas Miser Handbook*, the International Council for Local Environmental Initiative's "Personal CO₂ Calculator" and "Commuter Calculator", and the Carbon Calculator now being developed by the David Suzuki Foundation and the Sustainable Development Research Institute at the University of British Columbia.

The rest of this chapter describes a wide range of actions you can take to protect the climate, particularly through reductions in your use of transportation fuels, electricity, and home heating fuels. By reducing your energy bills, many of these actions will save you money in addition to reducing greenhouse gas emissions.

Life cycle thinking

Most of us make purchases by comparing the retail price of different products and buying the least expensive one. If you want to incorporate a concern for climate change into your purchases, however, you need to engage in life cycle thinking. In essence, life cycle thinking requires us to move beyond the retail price to consider the cost of products and activities at all stages of their production and use. How can you apply life cycle thinking?

First, consider the environmental impact of a product over its entire life. For example, the greenhouse gas emissions from the tailpipe of a car are not the only emissions related to the use of that car: manufacturing the car and the fuel it runs on also produce emissions. This makes options like bicycling even more attractive from an environmental perspective!

Second, consider the economic costs of a product over its entire life. While an energy efficient appliance is better for the environment, you may hesitate to buy it because its retail price is higher. What you need to consider, however, is how much it will cost you to run the appliance over its lifetime. From this perspective, it is often less expensive because your monthly energy bill is reduced.

Most energy using appliances and equipment have a label (Ener-Guide) that can help you calculate the relative energy use and energy costs of different products over their lifetime.



Get out of your car!

If you and three of your neighbours have a 20 kilometre commute to work and have been driving separately, then each day four people are driving 40 kilometres, or 160 kilometres per day. If you all participated in one car pool, you would reduce the distance travelled by 120 kilometres. This means that the four of you would reduce your total greenhouse gas emissions and fuel costs by 75%! These savings add up fast. If all of you work 200 days per year, car pooling will reduce total kilometres driven by 24,000. If the average fuel efficiency of your vehicles is 10 litres per 100 kilometres, you and your neighbours will have saved 2,400 litres of fuel. If gasoline costs 60 cents per litre, your total savings are \$1,440, or \$360 per person, per year. The economic and environmental benefits of public transit are even greater, and walking or cycling will eliminate both greenhouse gas emissions and your fuel bill!

SOURCE: Pembina Institute, 1997

Strategies you can use to reduce greenhouse gas emissions

The seriousness of the climate change threat, and the fact that it is a global problem with many causes and effects, often leaves Canadians feeling that their actions cannot make a difference. Nothing could be further from the truth. There are many practical steps we can all take to reduce our greenhouse gas emissions. These actions can be grouped into three categories:

Behavioural and lifestyle changes

We can change our behaviour and lifestyles to make our activities more efficient and less wasteful. For example, we can make a difference by doing things as simple as living closer to our place of work or turning the lights off in unoccupied rooms in our homes. Many of these changes can also bring positive economic, environmental, health and social benefits.

Purchasing decisions

We can purchase goods and services that have less impact on the climate – such as energy efficient light bulbs, appliances or automobiles. While some of these products may have a higher initial cost, many will save you money over time (see sidebar on “life cycle thinking”, page 7).

Civic involvement

We can actively use our power as consumers and citizens to influence corporate and government policy. Some of the actions companies and governments need to take are discussed in chapters 3 and 4.

The rest of this report provides an overview of the types of actions you can take to help protect the climate, drawing on all of these strategies.

Actions you can take to reduce your greenhouse gas emissions

According to Environment Canada, Canadians use more energy per capita than citizens anywhere else in the world.⁸ You can do three things to reduce the greenhouse gas emissions associated with your personal use of fossil fuels:

- reduce your demand for energy for transportation and in the home;
- increase the energy efficiency of your car and your home (including the building shell, heating, lighting and appliances); and
- switch to energy sources that produce fewer greenhouse gas emissions but still meet your personal energy needs.

The suggestions which follow can provide impressive results, but they do not

form a comprehensive list. When going about your daily affairs, ask yourself what other actions you can take to reduce your energy demand, increase your energy efficiency, and make your use of less polluting energy sources a higher proportion of your total energy use. Appendix B provides a list of additional information sources you can use to identify and implement actions to reduce your personal greenhouse gas emissions.

TRANSPORTATION

Transportation accounts for almost half of individual Canadians' greenhouse gas emissions. This is due primarily to our extensive use of the automobile, but other forms of transportation also contribute. For example, air travel produces a tremendous amount of greenhouse gas emissions per passenger kilometre.

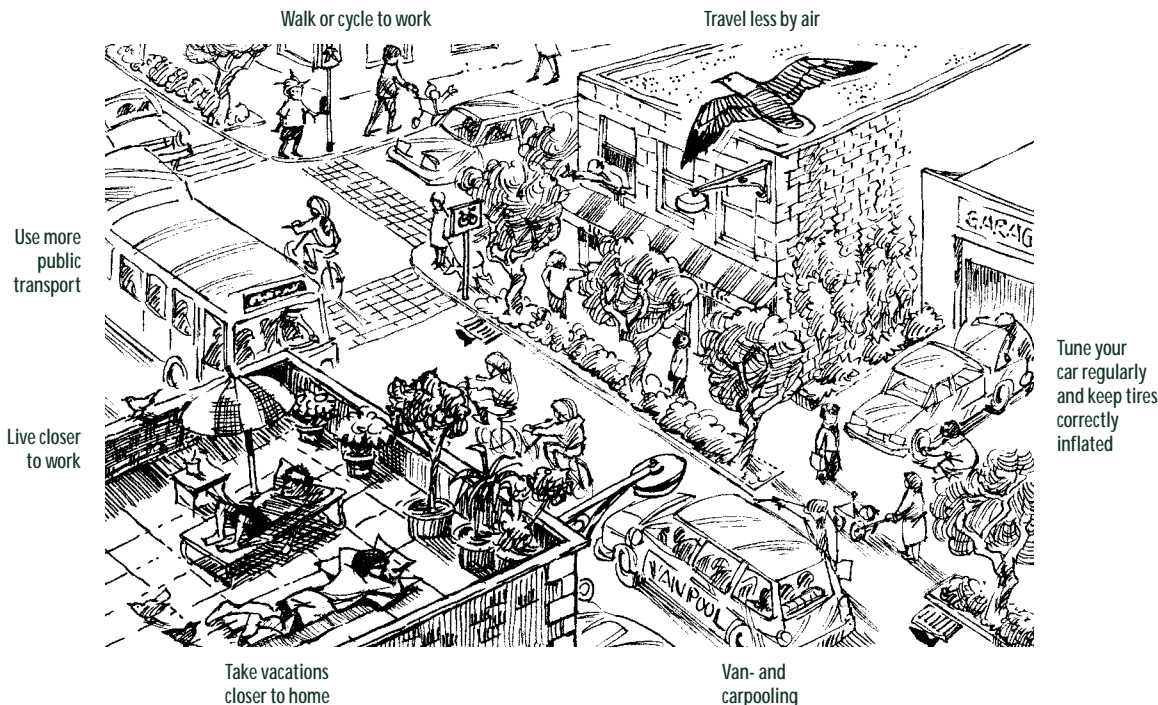
The key to reducing your demand for transportation fuels is to get out of your car! Walk, cycle, carpool, or take the bus to get from point A to point B. When you do use your car, use it less. Live closer to work, take vacations closer to home, and combine several activities into a single trip instead of making multiple trips. Finally, you can reduce your need for transportation by doing more things at home: telecommuting, renting videos, and home shopping. In all cases, you'll protect the environment and save money.

If you have to use a car, one important way to decrease your demand for transportation fuels is to improve the energy efficiency of your vehicle. A well-tuned car with properly inflated tires can improve your car's fuel efficiency by 5-15%. Energy efficient driving habits, such as minimizing idling, driving within the speed limits, and accelerating and decelerating gradually, can

Replacing gasoline with biomass fuels

In many parts of Canada, you can now buy ethanol blended fuels (5% ethanol, 95% gasoline). While the use of such blended fuels only marginally reduces greenhouse gas emissions from transportation, they do represent a first step toward the future development and use of pure ethanol fuels. The use of pure ethanol fuels could ultimately provide a very large benefit for the climate if the fuel is produced from biomass products like wood waste and prairie grasses and not energy-intensive crops like corn.

SOURCES: Several Natural Resources Canada's publications, listed in Appendix B



Fuel efficient cars reduce emissions and save money

The average fuel efficiency of all cars now on the road in Canada is 12 litres per 100 kilometres and the average fuel efficiency of new cars is about 8.5 litres per 100 kilometres. If your vehicle is an older vehicle that averages 12 litres per 100 km, and your next replacement vehicle gets 6 litres per 100 kilometres, you can cut your greenhouse gas emissions and fuel costs in half!

If you were driving 20,000 kilometres per year, the purchase of this more fuel efficient vehicle would prevent 3 tonnes of carbon dioxide from entering the atmosphere and would, if gasoline costs \$0.60/litre, put \$720 back in your pocket at the end of the year.

When you compare the fuel efficiency of different vehicles, make sure you compare cars to mini-vans and pickups, as well as comparing vehicles within each class. You'll see that large differences in fuel efficiency ensure that North Americans' current love affair with mini-vans and other large vehicles carries a large environmental cost. Make sure that your needs cannot be met by a smaller car before purchasing a mini-van or pick-up truck.

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook*, Natural Resources Canada/Transport Canada's *Fuel Consumption Guide*, and the Pembina Institute

improve your fuel consumption by up to 25%.⁹ Finally, you can have a dramatic impact on the energy efficiency of your vehicle by paying attention to fuel efficiency whenever you purchase a new car.

Currently, cars are run almost exclusively by internal combustion engines fueled with gasoline or other fossil fuel products such as diesel, propane or natural gas. Although choices are limited at this time, you will have more and more opportunities to use renewable or low greenhouse gas emitting transportation fuels in the future. Keep your eyes open to future options such as pure ethanol fuels, electric vehicles, and cars powered by hydrogen fuel cells. Each of these alternative energy sources for transportation has some potential to significantly reduce greenhouse gas emissions.

SPACE HEATING AND COOLING

Energy use in the home accounts for the other half of greenhouse gas emissions produced by individual Canadians. By far the largest emissions source in the home is space heating and cooling. There are a number of steps you can take to reduce your demand for energy from fossil fuels to provide these services.

First, you can take steps to improve the energy efficiency of your home's building design and shell by focusing on components such as walls, doors and windows. This is important because air leakage accounts for up to 40% of the heat loss from an average home.¹⁰ You can minimize that leakage by sealing leaks in the walls and roof, fully insulating the walls, basement and attic, caulking and weather-stripping your windows and doors, adding shrink wrap to the interior of windows in the winter, and purchasing energy efficient windows and doors. As you take actions to seal up your home, you should install a fresh air ventilation system to maintain good air quality.

Energy efficient construction is good for the climate and your pocketbook

A home built to R-2000 standards uses just two-thirds of the energy of a conventional home. This means that an R-2000 home produces only two-thirds of the greenhouse gas emissions of a conventional home when the homes are heated by oil, natural gas or fossil fuel based electricity. And R-2000 homes are just the beginning. "Advanced Houses" have been constructed that use only 50% of the energy of an R-2000 home!

An R-2000 home costs two to five percent more than a conventional home. For example, an R-2000 home may cost \$185,400 as

compared to a \$180,000 conventional home. If the energy needs of the conventional home produce fuel and electricity bills of \$1,500 per year, the energy bills in the R-2000 home would be only \$1,000 per year. This \$500 per year saving would pay back the higher purchase price in about 10 years and continue to generate savings beyond that point. In addition, you will be able to sell the home at a higher than conventional price because of its energy efficient design.

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook*, Natural Resources Canada's *The R-2000 Home: More Than Energy Savings*, and the Pembina Institute

You can also make sure that the next home you purchase is more energy efficient than your current home. In particular, you should seek out a home that meets the federal government's R-2000 building standard or better.

Second, you can take advantage of a range of technologies to help reduce your demand for heating and cooling in the home. For example, you can use a programmable thermostat to keep your house cooler at night or when you are away; or you can cool your home with window shades and awnings, improved attic insulation and ventilation, and ceiling fans instead of an energy consuming air conditioner. In fact, one of the best "technologies" we have to control our demand for space heating and cooling is the tree. Proper landscaping can have a significant impact on your home's energy consumption in both summer and winter.

Third, you can ensure that you use the most energy efficient technologies available when space heating and cooling services are required. While most Canadian homes should not require an air conditioner, make energy efficiency a priority if you have to purchase one.¹¹ Have your furnace tuned up regularly to keep it running at optimal efficiency; this means every year for an oil furnace and every other year for a gas furnace. Finally, consider replacing your existing furnace with a more energy efficient system and make sure that any new home you purchase uses energy efficient furnace technologies.

Finally, the impact of space heating and cooling on the climate does not only depend on the quantity of fuel used, it also depends on the type of fuel used. If you have a conventional oil furnace, you can reduce greenhouse gas emissions by 20% simply by switching to a conventional natural gas furnace. An energy efficient natural gas furnace would reduce emissions an additional 40%.

Better yet, you can use renewable energy sources to supplement or offset your oil or natural gas furnace. For example, "passive solar energy" (e.g., high performance sun-facing windows and mechanisms to store and distribute solar

Save energy and money with energy efficient furnaces

The seasonal efficiency rating of gas and oil furnaces for the home ranges from 50-60% for conventional furnaces to 85-95% for energy efficient furnaces. Higher energy efficiency means more energy goes into heating your home and less is wasted. If heating with wood, use an efficient stove, such as an automatic-feed pellet stove.

High efficiency oil and gas furnaces will use only 60-70% of the fuel used in conventional oil and gas furnaces, and will cut carbon dioxide emissions from the average household by two to three tonnes a year. While these furnaces are more expensive to purchase, they will produce economic savings as well. For example, if your fuel costs are currently \$800 per year with a 60% efficient natural gas furnace, a switch to a natural gas furnace with 96% efficiency will save you \$300 each year. In most cases, replacing a conventional furnace with a high efficiency furnace will pay back your investment in five to six years.

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook* and Natural Resources Canada's *Heating With Oil and Heating With Gas*

Heat pumps capture the energy around us

Heat pumps can supplement or replace your existing heating system. Air-source heat pumps extract heat from the outside air and bring it into your home in winter (air at -18 degrees still contains 85% of the heat of air at +21 degrees) and vent heat from your home in summer. Adding this technology to your existing electric furnace can reduce energy use by 30%. Ground-source heat pumps (earth energy systems) take heat from the earth or ground water in cold weather and transfer it

to the house through an underground piping system. This technology can reduce energy costs by 65% when compared to an electric furnace. You should remember, however, that the economic benefits of heat pump technologies will vary from one region of the country to another and each case must be evaluated on its own merits.

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook* and Natural Resources Canada's *Heating and Cooling With a Heat Pump*

Using trees to save energy

Trees can provide winter wind-breaks and summer shade. They also absorb carbon dioxide and other pollutants from the atmosphere. To reduce home heating and cooling energy needs:

- densely plant evergreen trees to the northwest of your home as a windbreak; and
- plant leafy deciduous trees near the south of your home to provide shade in summer, yet allow the sun through in winter.

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook* and the Tree Canada Foundation

The environmental and economic benefits of a clothesline

An average family uses approximately 50kWh of electricity per month by using their clothes dryer. If a household were to hang their clothes to dry instead (either inside or outside), they would reduce their demand for electricity by 600 kWh per year. In Alberta this would prevent ½ a tonne of carbon dioxide from entering the atmosphere and reduce your electricity bill!

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook* and Power Smart's *Electricity Use at Home* fact sheet

heat) can meet about 25% of the heating requirements of a new home if the home is oriented to maximize exposure to the sun. Heat pumps can also dramatically reduce your need for fossil fuel based energy.¹²

HOUSEHOLD ELECTRICITY USE

While the greenhouse gas emissions associated with electricity use vary from region to region in Canada, the electrical energy used to provide lighting and to power household appliances accounts for almost 10% of the greenhouse gas emissions that are the direct responsibility of individual Canadians. Reducing your use of electricity generated by fossil fuels will help to protect the climate, but you can save money and eliminate the environmental impacts associated with any form of electricity production (e.g., hydropower or nuclear power) by taking steps to decrease your electricity consumption.

The first thing you can do is eliminate unnecessary or wasteful use of electricity. Simple things like turning out the lights when a room is not in use, running only full loads in the washing machine, and minimizing your use of the dishwasher can make a real difference to the climate.

The second thing you can do is make sure that all the electrical appliances and equipment you use are energy efficient. For example, a microwave oven uses half the energy of a conventional oven, and a slow cooker uses only 10% of the energy of a microwave oven.¹³ As illustrated in the table below, the purchase of a more expensive energy efficient appliance instead of a conventional appliance will save you money and protect the climate over the product's lifetime.

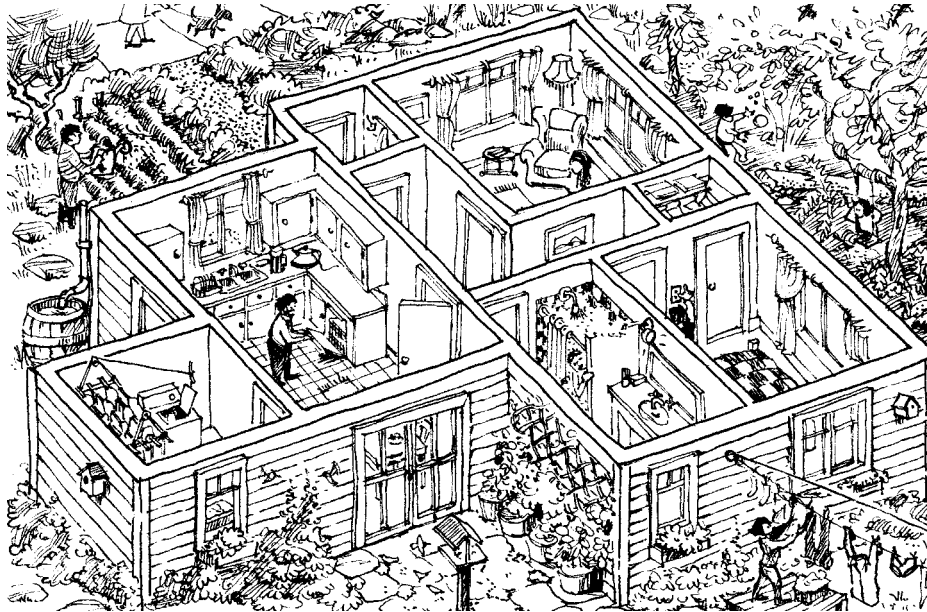
The third thing you can do is to purchase climate-friendly electricity produced by renewable energy sources like biomass, falling water (small scale hydro), the sun and the wind. Unfortunately, most electric utilities in Canada do not provide consumers with a "green power" option at this time. We can change that. Contact your electric utility and inform them that you would be

TABLE 2. LIFETIME REDUCTIONS IN ENERGY BILLS AND CARBON DIOXIDE EMISSIONS PRODUCED BY USING HIGH EFFICIENCY APPLIANCES INSTEAD OF APPLIANCES WITH AVERAGE ENERGY EFFICIENCY¹⁴

APPLIANCE	\$ SAVINGS (if electricity costs \$. 07/kWh)	CARBON DIOXIDE EMISSIONS AVOIDED (Saskatchewan)
Clothes Dryer	\$328	3.8 tonnes
Clothes Washer	\$1,227	14.1 tonnes
Dishwasher	\$487	5.6 tonnes
Range	\$252	2.9 tonnes
Freezer	\$184	2.1 tonnes
Refrigerator	\$385	4.4 tonnes

Replace old appliances with Power Smart ones Use curtains to cut down heat loss & draughts Use low-energy light sources Plant deciduous trees in front of south-facing windows

Grow a vegetable garden
Collect rain water
Use a drying rack in winter



Wash only full loads in washing machine and dishwasher Take shorter showers and use 'low flow' shower head Turn lights out in unoccupied rooms Use a clothesline in summer

Showing your commitment in the shower

About 40% of household hot water is used for baths and showers. By using a low-flow shower head, you can save 20% to 40% on shower water usage. For an average household, this can save \$80 in energy costs and from 200 to 400 kilograms of carbon dioxide per year!

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook* and Power Smart's *Residential Domestic Hot Water Heating* fact sheet

interested in purchasing "green" power and that you would like to see them make such a product available to you. In some parts of Canada, green power may initially cost you more than conventional electricity (until a big enough market develops to allow producers to obtain economies of scale), but this is only because the environmental damage associated with conventional electricity production is not reflected in its cost.

WATER HEATING AND USE

According to Environment Canada, Canadians are the second highest consumers of water per person in the world.¹⁵ These high levels of water use can have a significant impact on greenhouse gas emissions if the energy used to heat and transport the water is provided by fossil fuels. There are a number of simple steps we can take to conserve water, particularly hot water (e.g., taking shorter showers, watering the lawn less frequently, washing the car less).

We can also make existing equipment more water efficient (e.g., installing a toilet dam) or we can purchase new water efficient appliances like low-flow showerheads and toilets that will decrease our demand for water and save us money.

Finally, you can have an influence on the energy you use to heat your water. First, you can make your water heating more efficient by turning down the temperature on the hot water tank to 54 degrees Celsius and by wrapping the tank and pipes in an insulating blanket. Second, you can use a solar hot water

Even a light bulb can make a difference

A 13-watt compact fluorescent lamp provides as much light as a 60-watt incandescent bulb. But you would need 10 incandescents over the life of one compact fluorescent, and the incandescents use more electricity. In fact, the 10 incandescent bulbs will use 200 kWh more electricity than a compact fluorescent bulb over its lifetime. In Nova Scotia, this would prevent 146 kg of carbon dioxide from entering the atmosphere! If you take into account the purchase prices and the energy costs (at 7.5 cents/kWh), you will find that you will also save \$15 by purchasing the compact fluorescent light.

SOURCES: Natural Resources Canada's *EnerGuide - Household Lighting* and the Pembina Institute



Protecting the climate from your laundry room

One quarter of the average household's hot water use is for laundry. If you were to completely switch to cold water washes and rinses, you would reduce your hot water heating needs by one quarter!

A standard electric hot water heater uses 350 kWh per month, so you could save 1,050 kWh per year through this simple action. What are the economic and environmental benefits? If your electricity rate is 8 cents per kilowatt hour, you would save \$84 a year. In Alberta, this action would reduce carbon dioxide emissions by more than 1 tonne a year.

SOURCES: Environment Canada's *Greenhouse Gas Miser Handbook*, Power Smart's *Residential Domestic Hot Water Heating* fact sheet, and the Pembina Institute

heating system to meet up to 75% of your hot water needs, relegating your existing greenhouse gas emitting system to a back-up role.¹⁶ Solar hot water heaters preheat your water before your conventional system gets involved and can directly provide heating for specific uses like swimming pools. Aside from the environmental benefits, solar hot water heaters provide economic benefits as well. After all, once you pay for the initial system, whether it supplements or replaces your current system, the cost of the energy is free!

ADDITIONAL ACTIONS YOU CAN TAKE

While this chapter has focused on greenhouse gas emissions associated with home and transportation energy use, each of us contributes to climate change in other ways as well. These other sources of greenhouse gas emissions are harder to quantify, but there are nonetheless several actions we can all take to reduce the impact of these activities on the climate.

Waste

According to Environment Canada, Canada produces more waste per person (2.2 kg/day) than any other country.¹⁷ This has implications for Canada's greenhouse gas emissions because fossil fuels are often used to provide the energy required to dispose of goods and services and to create the new products that replace them. In addition, decomposing organic waste in landfills emits methane into the atmosphere. By following the 4 R's, you can reduce your production of waste and reduce greenhouse gas emissions.

You can protect the climate through the 4 R's

REDUCE: You can reduce the energy used to manufacture and dispose of products by consuming less and by purchasing products that use fewer resources (e.g., less packaging).

REUSE: Reusing products, and favouring products that are not disposable or single use, will reduce the energy associated with the manufacture and disposal of goods and services.

RECYCLE: You can reduce the energy used to manage waste by recycling and minimizing the amount of waste that needs to be disposed of. Diverting organic waste through composting will reduce methane emissions from landfills and enhance the soil in your

garden. Purchasing recycled products will also protect the climate because they generally require less energy to produce and therefore fewer greenhouse gases are emitted in their manufacture.

RECOVER: You can encourage your landfill operator to investigate whether or not it can cost-effectively capture the methane emissions coming from the landfill and use that methane as a source of energy. This will produce carbon dioxide emissions, but carbon dioxide is a less potent greenhouse gas than methane – making this an action that benefits the climate.

Food production and consumption

Agriculture is an important source of greenhouse gas emissions. We use energy to grow, irrigate, process and transport our food. Nitrogen-based fertilizers release nitrous oxide to the air. Ruminant animals (e.g., cows) produce methane emissions. Excessive tillage of soils releases carbon that becomes carbon dioxide in the atmosphere.

Overcoming barriers to taking action

This chapter has described a wide range of actions you can take to reduce your own greenhouse gas emissions and has given you tools to measure your progress over time. The only barrier to implementing the simplest of these actions is your own commitment to climate protection. It is really up to you whether or not you do things like: keeping your car tuned up, caulking and weather-stripping your windows and doors, turning out the lights when you are not in the room, and taking shorter showers. While these simple behavioural changes only represent the first step in climate protection, they are totally within your control, and they can make a difference.

Other behavioural and lifestyle changes suggested in this chapter may, however, pose more of a challenge. Living closer to work, cycling, using passive solar energy, recycling, and growing food in a community garden can all reduce greenhouse gas emissions but take more effort. Your ability to make these changes will depend on the opportunities available within your community. Are there homes near where you work? Have safe cycling paths been built? Do homes maximize solar exposure by facing south? Is there a recycling program? Are lands set aside for community gardens?

Clearly, the structure and organization of our communities can pose barriers to our own individual efforts to reduce greenhouse gas emissions. We can respond to these barriers in frustration and throw up our hands and walk away. Or, we can work within our communities to remove these barriers. In particular, we can pressure municipal governments to take actions that will facilitate and encourage individual and community actions to protect the climate.

Municipal governments have an important role to play in climate protection because they are responsible for such things as land use planning, building standards, waste management, and water and transportation infrastructure. In each of these areas, municipal governments have access to a range of tools that will allow them to take actions that improve the efficiency of resource use and reduce greenhouse gas emissions.

Make your eating habits climate friendly

On average, food on supermarket shelves in North America has travelled 2,000 miles from where it was produced. Purchase food grown in your region, or grow your own food in your yard, on your balcony, or in a community garden. To minimize the energy required to produce your food, select whole foods that are less processed, purchase organically-grown food that did not require chemical fertilizers, and eat more vegetables and grains instead of meat because the production of meat is energy and water intensive.



We must use our power as citizens to pressure municipal governments to take action. We need to make our voices heard by doing things like:

- writing or meeting our local government officials and politicians,
- writing letters to the editor in our local newspapers that call for action,
- obtaining support for specific actions from local service organizations, community groups or businesses,
- working with local environmental organizations to educate our community about climate change, and
- taking actions such as starting or helping to operate compost centres, community gardens, farmers' markets, recycling depots, carpools, and bicycle paths.

The next chapter describes some of the actions you can urge municipal governments to take to remove local barriers to climate protection and to encourage and facilitate greenhouse gas emissions reductions by individuals and communities.





3

Practical actions your community can take to reduce greenhouse gas emissions

Where do your community's greenhouse gas emissions come from?

The major sources of greenhouse gas emissions within Canada's communities are:

- fossil fuels (gasoline, propane, natural gas) used to transport people and goods within the city;
- fossil fuel-based energy (electricity, oil, and natural gas) used to heat and cool buildings, or to power equipment and appliances;
- decomposing organic waste in landfills that produces methane emissions; and
- the disturbance of forested lands and soils which releases the carbon stored in them, producing carbon dioxide.

While most cities produce greenhouse gas emissions from these sources, Canadian cities are much more greenhouse gas intensive than their European counterparts. The most important reason for this is the way our cities are designed. Wide open spaces and relatively low energy prices have produced an urban form in Canada that is characterized by urban sprawl, strict separation of residential and business areas, and a heavy reliance on large single family residences, all of which give Canadian communities a low population density. These design characteristics have serious implications for greenhouse gas emissions.

First, the design of our cities makes it relatively more expensive to develop public transportation systems and makes alternative modes of transport like cycling and walking less practical. Canadians are therefore much more dependent on their cars than Europeans. As a result, transportation-related greenhouse gas emissions per person are three to four times higher in Canadian cities than in European ones.¹⁸

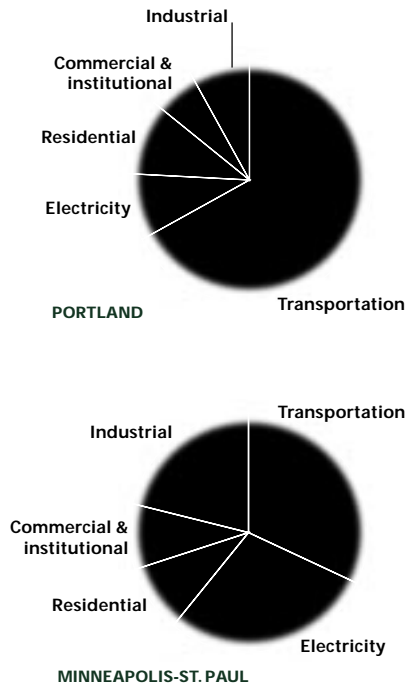


FIGURE 4. GREENHOUSE GAS EMISSIONS FROM PORTLAND AND MINNEAPOLIS-ST. PAUL, 1988

SOURCE: International Council for Local Environmental Initiatives

Second, the design of our cities means that the physical infrastructure required to deliver utility services like heat, power and water is often expensive and inefficient. For example, it is much more difficult to take advantage of energy efficient district heating and cooling opportunities in Canadian communities.¹⁹ District energy systems heat and cool buildings from one central plant as opposed to having individual heating and cooling systems in each building or residence. While these systems are rare in Canada, between 30% and 50% of all homes in Finland, Sweden and Denmark are heated through a district heating system, rising to more than 80% in major urban centres.²⁰

Third, the design of our cities means they take up a lot more space than their European counterparts and destroy more agricultural land, grasslands, forests and wetlands. Such destruction contributes to climate change because it releases the carbon that had been sequestered in those plants and trees. This loss of land to urban development means there will be fewer plants and trees in the future to remove carbon dioxide from the atmosphere.

While Canadian and American cities generally produce far more greenhouse gas emissions than cities in Europe, different North American cities can have very different greenhouse gas emission profiles, as illustrated in Figure 4.

Indeed, every community has a distinct greenhouse gas emissions profile. The differences between cities can be explained by factors such as: the energy source for electricity production, the industrial mix, and facilities for public transportation. While all communities must act to fight climate change, the unique characteristics of each community’s contribution to the problem mean that many actions will have to be developed locally to reflect local conditions and priorities.

You can make an important contribution to your community’s response to climate change. Your priority should be to encourage your municipal government to make a political commitment to fight climate change by first developing a comprehensive action plan to reduce greenhouse gas emissions. At the same time, you can advocate specific actions your municipal government can take to protect the climate. While some municipal governments may be unwilling to act solely in response to climate change, the multiple environmental and economic benefits of many of these actions can help convince your local politicians to take action.

Key elements of a comprehensive community action plan on climate change

If your community is to successfully develop and implement a comprehensive strategy to reduce greenhouse gas emissions, the first priority must be to obtain a strong political commitment to climate protection. This is because actions to

address climate change often challenge traditional ways of thinking and acting. There is frequently resistance to change, no matter how positive the outcome, and strong leadership is required.

One way to get your local politicians to make a commitment to fight climate change is to get them to include a greenhouse gas emissions reduction objective in the municipality's overarching policy document (e.g., an Official Community Plan). Such an objective will increase public awareness of the climate change issue, send a clear policy signal, and provide legal support for action to reduce greenhouse gas emissions.

You can also urge your municipal government to demonstrate its commitment to climate protection by getting it to join one of the several initiatives that now exist in Canada to help municipalities become more efficient and reduce their greenhouse gas emissions. These initiatives, with contact information, are described in Appendix C.

Once a political commitment has been made, you can work to ensure that your municipal government follows through on that commitment by doing four things.

First, your municipal government must gain an understanding of the sources of greenhouse gas emissions within your community. Like individuals, communities can develop their own greenhouse gas emissions inventory. An inventory is critical because it helps identify possible areas of action, aids in setting targets, and provides a benchmark against which progress can be measured. The Canadian Cities for Climate Protection Software for Municipal Operations can help your local government develop a greenhouse gas emissions inventory for municipal operations. Another software product that will enable municipalities to estimate greenhouse gas emissions produced in the community as a whole is now being developed. For more information on these products, contact the International Council for Local Environmental Initiatives (see Appendix C).

Second, your municipal government needs to identify its priority areas for action and establish performance targets. Priority areas will be determined by a number of factors, including: citizen concerns; potential partnership opportunities; past performance; and the potential environmental and economic benefits of action. Performance targets that are challenging and quantifiable send a clear signal to citizens and municipal employees that the municipal government is serious about its commitment to climate protection.

Third, your municipal government needs to develop an action plan to reduce greenhouse gas emissions and meet the performance targets that have been established. To be comprehensive, the action plan should cover municipal operations and the community as a whole, and it should address the following areas: land use planning, energy efficiency in buildings, transportation, renewable energy sources, and urban afforestation. Actions that improve water

Like individuals, communities can develop their own greenhouse gas emissions inventory.

There are many
cost-effective
actions your
municipal
government can
take to protect
the climate.

efficiency or promote waste minimization will also reduce greenhouse gas emissions.

Fourth, your municipal government needs to monitor, measure and report on the results of the actions taken and the progress made toward performance targets that have been set. This will allow everyone in the community to assess the relative effectiveness of different actions and identify any adjustments that need to be made.

While a growing number of Canadian communities are making commitments to reduce their greenhouse gas emissions, the vast majority of Canada's municipalities remain silent on the climate change issue. You can help change that, but getting your municipal government to make a political commitment to address this issue could take some time.

In the meantime, there are many cost-effective actions your municipal government can take to protect the climate. Whether or not your community has made a public commitment to control greenhouse gas emissions, you can advocate the implementation of such actions by your municipal government. The rest of this chapter discusses these actions and their multiple economic and environmental benefits.

Specific actions municipal governments can take to reduce greenhouse gas emissions in the community

If Canada is to successfully and significantly reduce its greenhouse gas emissions, we must change the way we plan, organize and build our communities, and do it soon. Municipal infrastructure across Canada is deteriorating and in serious need of repair. Because transportation systems, buildings and various public facilities represent a significant public investment, it is simply good sense to design and construct or rehabilitate this infrastructure with climate protection in mind. It is much less costly and a great deal more efficient to incorporate climate-friendly measures into the original design than to make adjustments later – and municipalities will save money in the long run. Canadian cities should ensure that their future development maximizes the use of energy efficient technologies (e.g., public transit, district energy) and renewable energy sources (e.g., passive solar energy).

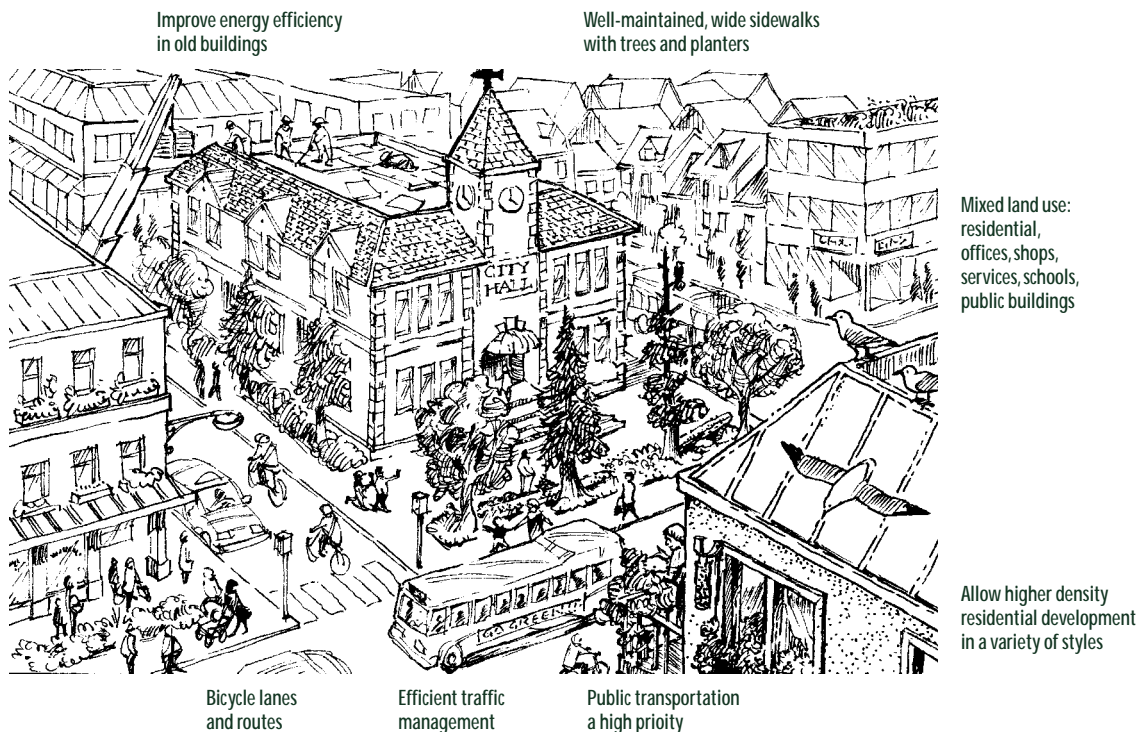
Urban design and land use planning have a huge direct influence on the infrastructure systems that are required, and thus the amount of greenhouse gases that are emitted within the community. For this reason, one of your first priorities as an activist seeking to reduce your community's greenhouse gas emissions must be to pressure your municipal government to make its land use planning and site design practices more climate friendly.

LAND USE PLANNING

Official community plans and policy statements are important framework documents that establish short- and long-term goals, objectives and broad strategic directions for municipal land use planning policy.

Two key things you can do to make your municipality more climate-friendly are: (1) argue that future municipal development must be consistent with some key guiding principles; and (2) put pressure on your municipal government to incorporate these principles into official planning documents. These guiding principles include:

- allowing mixed land use (that is, residences, worksites, shops, services, schools, transit, etc. in close proximity to each other);
- encouraging higher density residential development by facilitating the construction of functional and attractive compact and diverse housing stock (that is, more housing units on less land, as well as a mix of housing styles that includes single-family homes, duplexes, row housing, apartments, etc.);
- making alternative modes of transportation, such as walking, cycling and public transit a high priority; and
- applying traffic management techniques that facilitate efficient vehicle use and provide more opportunities for different modes of transportation (motorists, transit riders, truck drivers, pedestrians, and cyclists) to share the existing transportation network and infrastructure.



Breaking auto dependence through mixed use development

Vancouver's West End is one example of what can be done to reduce auto-dependence through mixed-use development. The West End has been through several incarnations in the last century and is now a mix of high- and low-rise buildings, with narrow streets, plenty of planters and trees, wide sidewalks, and small setbacks. The scale invites people, not cars, and the proximity to shops and services makes access by foot easy and convenient. The overall design creates a public realm that is safe, inviting and conducive to community. Like many other communities and neighbourhoods that lure pedestrians, cars can parallel park on the street, but there is little need to actually drive anywhere.

SOURCE: Alan Thein Durning, "Pedestrian Paradise" in *Sierra Magazine*, May/June 1997



Mixed use development, geothermally heated building, Vancouver.
Hotson Bakker Architects
Developer: *Saltlick Projects Ltd.*

If your municipal government adopts these climate-friendly principles in its official planning documents, it will be easier for you and your fellow citizens to hold your local government accountable for any land use planning decisions it makes that are inconsistent with them and bad for the climate.

Even if your municipal government does not formally adopt these principles, however, it can still take actions that are consistent with them and that will reduce greenhouse gas emissions. Moreover, every municipal government has a range of tools it can use to implement such actions, such as bylaws, permit approval processes, financial incentives and education programs. Some of the specific actions you might encourage your local government to take that are consistent with these climate friendly land use planning principles are listed below.

Mixed use development

Mixed use developments allow people to live, work, shop, and go to school all in the same neighbourhood, thus building a stronger sense of community ownership and commitment. Promoting this type of development to your municipal government is consistent with a broader trend that sees this "village concept" of planning gaining popularity in the U.S. and in some Canadian cities.

Mixed use developments help reduce greenhouse gas emissions because they make alternative modes of transportation more feasible and convenient and because they provide an opportunity to capture and use waste heat from large commercial or industrial facilities for use by local residences.

Municipal governments can promote mixed use development through revisions to their zoning bylaws, through negotiated requirements in their permit approval processes for new developments, and by using incentives such as tax breaks. Some of the specific objectives you can encourage your municipal government to pursue include: providing a mix of services within easy walking distance of homes in new subdivisions and providing housing in large commercial developments or in a nearby location.

Increased density of development

Higher density development usually means more homes on less land. These can be smaller single-family dwellings, single-family dwellings with smaller lots, or various forms of multiple family units. You need not argue that your municipal government must maximize density (e.g., everyone in an apartment building), but simply that it should increase density from today's extremely low levels. Your suggestions may be well-received because aging infrastructure and changing demographics, especially smaller families and an older population, are making increased density a more attractive option for both new and existing (e.g., infill housing) neighbourhoods.

Increased density can reduce greenhouse gas emissions because it makes district heating and cooling systems more practical and it makes public transit systems more cost-effective. In addition, higher population density is likely to make the area more attractive to retailers and the service sector, increasing the municipal tax base and further reducing the reliance on private vehicles for meeting peoples' basic needs.

Municipal governments can use zoning bylaws, financial incentives and the permit approval process to promote increased density. You can encourage your municipal government to pursue specific objectives such as promoting more compact and more diverse housing stock (e.g., change lot-line zoning and setback requirements and allow construction of second units on a property), reducing development charges for higher density developments, exploring district heating and cooling opportunities, and ensuring that all new commercial developments that employ a lot of people provide safe and convenient access to public transit.

Providing for alternative modes of transportation

The most common form of transportation in our cities is the most inefficient – a car carrying a single occupant. We are addicted to our cars, and the design of our communities fosters that addiction. According to U.S. statistics, car trips of less than 800 metres (about a 12-minute walk) make up less than one percent of the total vehicle distance travelled, but they can account for about six percent of the total emissions from household travel because such short trips represent an inefficient use of the vehicle.²²

Alternatives like walking, cycling, carpooling, and public transit can all make a significant contribution to greenhouse gas emissions reduction. Citizens, however, will not use alternatives to their own automobile unless they are safe, direct, and convenient. Planning principles like mixed use developments and increased density will make alternatives to the private automobile more attractive and practical for citizens.

To truly break our addiction to the car, however, municipal governments must invest in infrastructure that supports alternative modes of transportation. Providing such infrastructure must be a priority in land use planning. Some of the specific objectives you can encourage your municipal government to pursue through its land use planning policies include:

- developing and maintaining an integrated network of bicycle lanes or paths on major commuter routes and encouraging all major worksites to provide bicycle storage facilities and amenities (e.g., showers, lockers);
- keeping sidewalks in good condition, and ensuring that new developments include safe and attractive pedestrian facilities;

Using wood waste to warm a community

The Cree community of Ouje-Bougoumou constructed a district energy system in which a large central furnace uses waste wood from nearby sawmills. The system serves 150 homes and various public buildings and businesses. After five years, subscribers are expected to save up to \$1,000 per year on their heating bills compared to oil or electricity. In addition to reducing greenhouse gas emissions (when the wood is sustainably harvested), nitrogen oxide emissions will be about 35% less than they would be with a comparable oil-fired system.²¹

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute

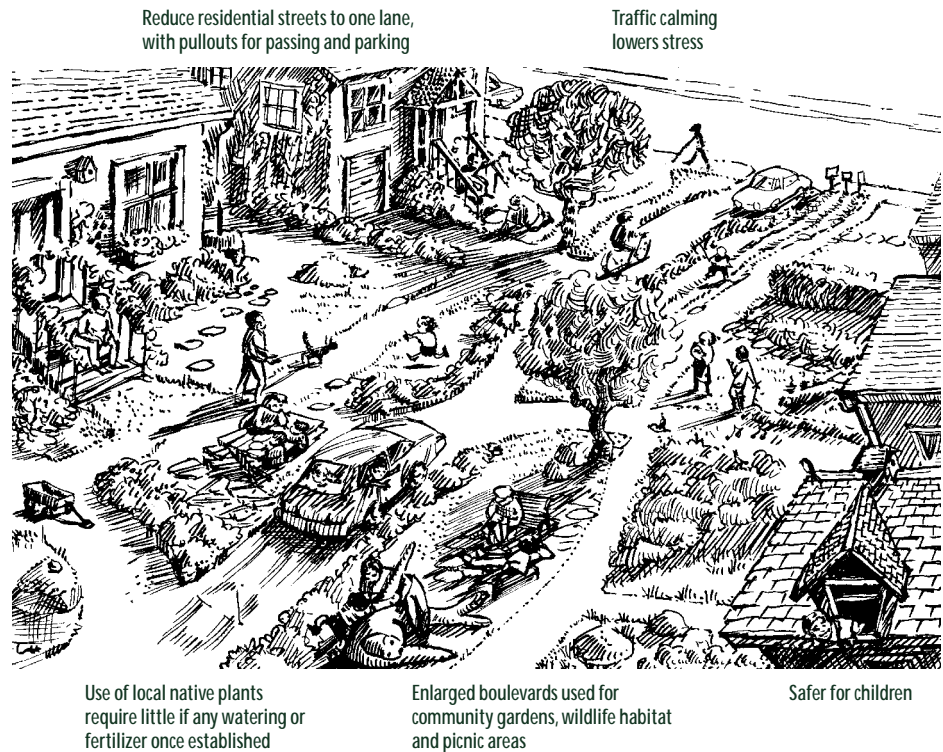


Making walking a central part of city life

As part of its overall travel plan, the City of Perugia, Italy developed and implemented a walking policy. The growth of car traffic had led to environmental problems and posed a risk to the city's historical heritage. The travel plan introduced measures to promote walking, including the development of a pedestrian network, which was built with municipal funds. The network was developed by establishing a pedestrian zone in the historic centre; establishing controlled traffic zones, authorizing access to residents only; and creating mechanized pedestrian ways, including escalators, elevators and pedestrian walks of special design. There has been a high degree of acceptance, as seen by the demand for extensions to the system. Studies have shown that 50% of the local population consider 600 metres or more to be an acceptable walking distance. Peripheral car parks, which in the past were little used and were originally designed to serve modal split points through a shuttle service, are increasingly being used in combination with the pedestrian network.

SOURCE: ICLEI, with original case description from European Commission Expert Group on the Environment, 1996

- investing in public transit and adopting land-use policies that favour public transit over private autos (e.g., bylaws limiting available parking for cars, or allowing developers to provide less parking if they promote alternative modes of transportation); and
- providing facilities for carpooling, such as special lanes or parking spaces.



Redesigning roads to protect the climate

To save construction and maintenance costs, the City of Chico, California revised its street standards for residential and commercial subdivisions to allow for narrower streets. The municipality realized that unusually wide streets lead to faster speeds by motorists, have higher construction costs, consume valuable land, increase water runoff and ambient temperatures, discourage walking and are unattractive. City planners now also recommend a reduction for curb standards from the current 4.5-6 metres to a curb radius of

between 2.4 and 3 metres. This encourages vehicles to slow down and makes crossing streets easier. Reducing street widths also reduces heat build-up, thus reducing the energy used for air conditioning. Cost savings are estimated to be 16% for actual construction and 12% in maintenance costs.

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute

Traffic management

Changes in municipal land use planning practices are essential if alternative forms of transportation are to become more viable. But municipal governments can also use the planning process to improve the efficiency with which private automobiles flow through the city. Such actions help protect the climate by improving traffic flow and allowing automobiles to burn fossil fuels more efficiently.

You can encourage your municipal government to use its land use planning policies to increase automotive efficiency. Two ways of improving efficiency are reducing congestion and reducing speed. Some actions that will reduce traffic congestion are improved timing and synchronization of traffic signals, establishment of truck routes that avoid the city core, and replacing four way stops with two way stops. Traffic speed can be reduced by using traffic calming measures like narrower streets, speed bumps, benches or planters.

SITE DESIGN

While municipal governments are responsible for land use planning in general, they can also influence the design of specific sites within a broad land use plan. In particular, they can affect the way in which buildings are positioned on a site as well as the landscaping that is done around the buildings. This is important from a climate change perspective because these factors can have a large impact on the energy requirements of the building over its lifetime.

You can encourage your municipal government to ensure that site designs maximize the potential for renewable energy use and minimize a building's overall energy demand. For example, in all new developments, you can encourage your municipal government to protect and preserve existing trees, strategically plant new trees to reduce heating and cooling needs, and protect access to solar energy by maximizing solar gain and protecting southern exposure.

ENERGY EFFICIENCY IN BUILDINGS

Some of the biggest long-term gains in climate protection will come from urban redesign. But municipal governments have a wide range of additional opportunities to reduce greenhouse gas emissions.

One of the most important areas where municipal governments can have an influence is the efficiency with which our buildings use energy. There are many cost-effective opportunities to improve energy efficiency in older homes and commercial buildings, and even most new buildings fall far short of what is technically possible and cost-effective in terms of energy efficiency. Municipal governments can use various tools that will allow your community to capture the economic and environmental benefits of energy efficiency improvements in buildings.



Let the sun shine in

Municipal governments can use bylaws or their permitting process to ensure that new buildings are oriented toward the sun, and that future developments are prohibited from obstructing direct sunlight. For example, in Boulder, Colorado, all new developments must not be obstructed from sunlight between 10 a.m. and 2 p.m. on December 21, the shortest day of the year.

SOURCE: California Energy Commission, *Energy Aware Planning Guide*, 1993

Demonstrating the best that energy efficiency can offer

Green on the Grand is a two-storey, 2190-square metre office building in Kitchener, Ontario, built near the Grand River. As Canada's first C-2000 office building (C-2000 is the federal government's voluntary energy efficiency standard for commercial buildings), it was designed to be energy efficient and environmentally responsible, meeting or exceeding the requirements of the C-2000 program. Specifically, the building will require only 40% of the operating energy and 28% of the water use of a conventional building designed to the American ASHRAE 90.1 energy efficiency standard. Construction waste was reduced by 84% through a combination of reducing material requirements, re-using waste materials on site and recycling other materials. All of these reductions were achieved in a building that offers a superior indoor environment, attractive and functional layout, and a long lifetime.

SOURCE: C-2000 Program website at <http://greenbuilding.ca/abc-2000.html>

When encouraging your municipal government to actively promote energy efficiency improvements in buildings, you should stress the fact that municipal government actions would:

- stimulate local economic activity as homeowners and businesses make energy efficiency investments;²³
- reduce energy bills for local citizens and businesses, with those savings being reinvested in more productive areas of economic activity in the community;
- lower energy bills for municipal governments, freeing up funds for other municipal spending or tax reductions;
- improve worker productivity by creating more comfortable working conditions; and
- reduce greenhouse gas emissions, urban smog and other environmental impacts associated with the production and use of fossil fuels.

Supportive municipal government policy for new buildings

Despite our cold climate, new buildings are seldom constructed in Canada with energy efficiency as a priority. Building codes contain the minimum construction standards for each province but, for the most part, building codes are more concerned with safety than with matters such as energy efficiency. To the extent that they deal with energy efficiency, the standards tend to be minimal, and capture only part of the energy efficiency improvements that are economically justifiable today. New Model National Energy Codes for Buildings and Houses have been developed that do incorporate energy efficiency considerations, but these have not yet been adopted anywhere in Canada.

Municipal governments can provide incentives and encouragement for developers to exceed the energy efficiency requirements included in the building code through the use of energy efficient building demonstration projects, direct financial incentives (e.g., tax breaks or reduced permit fees), energy efficiency rating and labelling systems for buildings, or the establishment of negotiated development standards and administrative requirements that must be met before development permits can be granted. You should encourage your municipal government to make energy efficiency improvements a high priority for new buildings in your community.

Promoting energy efficiency in new buildings

The City of Toronto is using its permitting system to encourage energy efficiency improvements in buildings. To receive an occupancy permit from the City, an owner or developer must submit an Energy Efficiency and Conservation Plan that includes measures for energy efficiency in the building. As well, a qualified engineer or architect must certify that the building was designed and

constructed according to the plan. In this way, the City ensures that new residential construction goes beyond the provincial building code and meets the federal R-2000 voluntary energy efficiency standard for residential buildings, and that new commercial construction meets the ASHRAE 90.1 energy efficiency standard developed in the U.S.

SOURCE: ICLEI, Local Initiatives Project Summary #45

Supportive municipal government policy for existing buildings

While new buildings can be built to be much more energy efficient than existing structures, the existing stock is considerably larger than the number of new buildings constructed each year. Accordingly, if municipal governments are serious about reducing greenhouse gas emissions, they must improve the energy efficiency of existing homes, shops and offices.

Municipal governments can use bylaws, voluntary agreements, permit approval processes, financial incentives and direct subsidies to encourage building owners and home owners to invest in energy efficiency improvements. To capture the environmental and economic benefits of energy efficiency investments, you might suggest to your municipal government that it:

- pass a bylaw requiring all buildings that are resold in the community to have undergone specific energy efficiency improvements before the sale can proceed;
- require all building retrofits above a certain size to demonstrate that the retrofit will improve energy efficiency before a permit is granted;
- issue free or less costly permits for building owners and developers who implement energy efficiency retrofits;
- subtract the cost of energy efficiency retrofits from property tax assessments or provide a break on property tax increases for building owners who undertake energy efficiency retrofits;
- challenge other organizations to voluntarily seek out and implement energy efficiency improvements and then publicly recognize their accomplishments;

Challenging others to do their part

To meet its greenhouse gas emission reduction goal, the City of Ottawa has created a Corporate Challenge program. It believes the program will lower corporate costs, improve corporate recognition, encourage employee participation and enhance community “livability”, which includes both environmental and economic benefits. Eight organizations are currently in the program. One member, the University of Ottawa, has focused on energy efficiency. Since 1990, the University’s Physical Resources Service has lowered its overall energy bill by \$1.3 million, mostly by implementing energy efficiency measures in the physical plant and facilities. With the

existing measures paying off sooner than expected, the University plans to invest another \$1.89 million in various water and energy conservation measures that are expected to save \$814,333 per year. In addition to installing technical devices, the University is also spending money to train and educate facility operators and to inform students, faculty and visitors. The program managers expect that a \$20,000 investment in stickers and signs to remind people to turn off the lights and take other measures will help reduce energy costs by \$300,000 a year.

SOURCE: City of Ottawa’s Corporate Challenge Action Bulletin

Making energy efficiency a priority

The City of Toronto has developed a Better Buildings Partnership, with an initial goal of undertaking comprehensive energy and water efficiency retrofits in approximately 100 industrial, commercial, institutional and multi-residential buildings in both the public and private sector. This will require \$30 million in investment and will create 430 person-years of employment in the first year. The result will be that building operating costs will drop by more than \$3 million annually for the first two years (the retrofits consist of packages of short-term and long-term payback measures that repay the original investment over three to ten years). In addition, this initial phase of the program is expected to reduce carbon dioxide emissions by 40,000 tonnes per year. Ultimately, the Better Buildings Partnership is expected to become a full-scale city-wide program that will generate \$3 billion in investment and reduce carbon dioxide emissions by 1.8 million tonnes per year.

SOURCE: Federation of Canadian Municipalities Case Studies 1997

Demonstrating leadership in municipal government buildings

Phase I of a retrofit program for the City of Drumheller, Alberta began with an audit of five city facilities in the fall of 1993 to determine usage of electricity, gas and water. The five buildings were the pool, arena, civic centre, fire hall, city hall and the water treatment plant. All buildings were retrofitted with energy saving devices (e.g., occupancy sensors, T-8 lamps), and each facility had unique installations that were appropriate to its use (e.g., a low-emissivity ceiling was installed in the arena). The City paid all capital costs, which amounted to about \$530,000. Energy savings in the first year were \$52,000, and the City expects annual savings to be normally between \$80,000 and \$85,000 for the five buildings.

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute

Renewables to the rescue

Emergency call boxes powered by solar energy are installed in many locations across North America. In Calgary, solar-powered cellular telephone boxes are installed along several freeways for use by motorists who encounter problems with their vehicles or to report accidents. While utility service may be available for many sites, the cost of a solar system is typically much smaller than the cost of trenching power into the location (on the order of \$500 as opposed to as much as \$6000).

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute

- demonstrate leadership by upgrading the energy efficiency of municipal buildings; and
- subsidize the costs of energy audits that identify and quantify potential energy efficiency improvements in the residential sector.

RENEWABLE ENERGY SOURCES

Renewable energy is energy that comes from the sun, wind, falling water, biomass, tides and geothermal sources; it is not depleted by use but is naturally renewed on a regular, quantifiable basis. Over the long term, renewables represent the only sustainable source of energy available. They are a key component of a community climate protection strategy because most renewable energy sources do not produce carbon dioxide emissions. The one exception, biomass, will produce no net carbon dioxide emissions if the biomass is produced on a sustainable basis that allows the carbon dioxide released from combustion to be offset by carbon dioxide removed from the atmosphere by growing biomass.

You should encourage your municipal government to promote greater use of renewable energy in your community for several reasons:

- renewable energy sources are usually locally based and their use will create jobs and economic activity in the community while reducing a community's dependence on, and payments for, external energy sources;
- renewable energy cuts down energy bills because once the initial investment is made, the energy source itself is often free; and
- renewable energy use reduces greenhouse gas emissions and other environmental impacts associated with the production and use of fossil fuels.

Municipal governments can use various tools to promote renewable energy. Community education programs and demonstration projects can inform residents about the benefits of renewables and overcome public misperceptions and lack of knowledge about renewable energy. Municipalities can also take steps to overcome barriers that block direct use of renewable energy (e.g., protection of solar access in new developments).

To get your own municipal government thinking about renewable energy, you may want to focus on encouraging them to demonstrate leadership by taking actions to increase the use of renewable energy in their own operations.

Green power procurement

“Green Power” refers to electricity that is produced from renewable sources with minimal environmental impacts. You should urge your municipal government to inform its electricity provider that it wishes to use green power to meet all or part of its electricity needs. While many electric utilities do not provide a green power option at this time, they are likely to respond to increased demand for green power in the marketplace. Where a green power option is available, it may

cost more than conventional electricity in the short term, but a wider customer base and additional suppliers are expected to bring down green power rates within a few years. Indeed, if the environmental costs associated with electricity production were factored into the price, green power would already look like a bargain!

Niche and remote applications

The cost-effectiveness of renewable energy is enhanced for niche and remote applications because they are far away from the existing electrical grid. You can encourage your municipal government to use renewable energy technologies to provide:

- lighting (e.g., bus shelters, signs, pathways, school zones);
- monitoring (e.g., water meters, traffic monitors and recorders, ice detection systems);
- heating (e.g., municipal swimming pools, municipal buildings); and
- communications (e.g., emergency call boxes, warning sirens, emergency communications).

Use of landfill gas

While not a renewable resource in the true sense, landfill gas does provide an alternative or supplement to fossil fuels and, in many cases, it is an alternative that is now being wasted if there are potential users of this energy near the landfill site. About 50% of landfill gas is methane, an important greenhouse gas. Combusting the methane does produce carbon dioxide emissions but: a) carbon dioxide is a less powerful greenhouse gas than methane, and b) energy from methane can be used to replace energy from other sources that produce more greenhouse gas emissions. Not all landfills are viable candidates for landfill gas recovery, but you can certainly encourage your municipal government to investigate whether or not your local landfill is a potential energy source.

Landfills as an energy source

An example of landfill gas utilization is a project in the Township of Langley, B.C. In response to concerns over the migration of landfill gas at the Jackman Landfill, the Township constructed a landfill gas collection and utilization system. The gas is collected from the landfill and piped 1.5 km to Topgro Greenhouses where it is combusted. While carbon dioxide emissions are produced through the combustion process, these emissions are utilized to supplement plant growth within the greenhouses owned by the

company and are not simply flared into the atmosphere. The cost of constructing the collection and utilization system was \$500,000. Topgro Greenhouses pays the engineering firm that constructed the system for the gas it uses and the Township of Langley will receive an eight percent royalty on gross sales once the system has been in operation for four years.

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute

Greening a government's power supply

The federal Ministries of Natural Resources and Environment are pursuing pilot "green power" projects to help meet the electrical needs of their facilities in Ontario and Alberta and discussions are underway in other provinces. In each of Ontario and Alberta, this amounts to about 13 GWh of electricity per year. In April 1997, it was announced that City of Calgary Electric had won the right to produce this power in Alberta. The green power purchased through this program will be new and incremental power, and the utilities that provide the power will have to demonstrate that greenhouse gas emissions are being displaced and that efforts are being made to promote green power more broadly among customers.

SOURCE: Natural Resources Canada 1997



Pooling for climate protection

The Jack Bell Foundation (JBF) Vanpool Program for commuters was established in 1992 to reduce traffic congestion and pollution by reducing the number of single occupant vehicles on the road in the lower mainland of British Columbia. Each vanpool comprises up to eight commuters who live close to one another and work in approximately the same area. They travel to and from work each weekday in a minivan owned and insured by the JBF. The route is planned so that the least possible time is needed to collect passengers. Riders within a vanpool group pay the same fare even though they may not all be the same distance from work.

The JBF Vanpool has recovered 100% of operating and capital costs from fares since April 1994. The 90 vanpools now operating in B.C. carry 720 people and reduce pollutant emissions by about 170 tonnes per year. The current incremental cost saving to society is estimated at more than \$1.3 million/year (based on costs that would otherwise be incurred to provide additional roadway capacity).

SOURCE: Jack Bell Foundation

TRANSPORTATION

Transportation is the single largest source of greenhouse gas emissions in Canada. As noted earlier, a comprehensive municipal response to climate change must include changes to land use planning practices that make alternatives to the car more accessible and attractive. Municipal governments must also be willing to invest in the infrastructure required for alternative modes of transportation.

At the same time, however, municipal governments can do more to reduce greenhouse gas emissions from transportation than simply change land use planning practices. Bylaws, financial incentives and education programs can also be used to encourage people to use alternatives to private automobiles and to ensure that any private vehicles that are used operate efficiently.

By advocating and getting municipal governments to take action in these areas, you will not only help protect the climate, but will also address a number of the other negative economic and environmental impacts of the automobile (e.g., urban smog, traffic accidents). In addition, these actions will diminish the need to expand municipal transportation infrastructure, which is expensive, destroys natural ecosystems and contributes to the contamination of surface and ground water.

Additional actions to get people out of cars

Some of the actions you can urge your municipal government to take to increase the use of alternative modes of transportation, beyond changes to land use planning practices, include:

- reducing and enforcing speed limits;

Reducing emissions by telecommuting

The City of San Diego now has a permanent telecommuting program, with 35 employees participating, and 500 telecommuters expected within five years. This is over 5% of city staff, excluding law enforcement. The program does not include any additional funds for equipment. City departments may reimburse employees for phone calls, required software and modems within their existing budgets. Primary costs involved staff time to set up and evaluate the pilot program: training (about \$300 per commuter-supervisor pair), phone costs (\$30/month per telecommuter), computers, and maintenance and administration. About 5-15% of one administrative position is needed to maintain

and expand the program. After start-up costs, the program broke even within three years, and direct benefits outweighed costs five to one. Direct benefits included increased employee effectiveness, decreased sick leave, decreased turnover, reduced parking requirements, and office space savings. Commuting costs and time were also reduced. The average commute of 550 km/year results in a savings of over \$350/year in vehicle operating costs and often reduced employees' need for a second vehicle. Vehicle emissions for telecommuters were reduced by 63-73% on telecommuting days.

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute

- making it more difficult and costly to park private vehicles by banning or limiting parking in some areas, increasing the costs of parking, and being more diligent about issuing parking tickets for violators;
- providing financial incentives to encourage the purchase of transit passes, such as reduced prices for companies that are willing to provide transit passes to their employees;
- allowing cyclists to transport their bikes on public transit;
- working with community groups to promote and finance ridesharing and para-transit programs;
- providing free bicycles for public use for local transportation through partnerships with community groups and service clubs;
- providing information on telecommuting (working from home) to the private sector; and
- requiring large employers in the municipality to implement a trip reduction program for their employees (where the employer provides incentives to get employees to use alternative forms of transportation).

Additional actions to improve the operating efficiency of vehicles

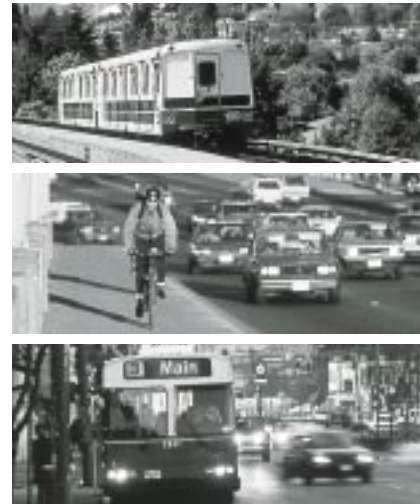
Some of the actions you can encourage municipal governments to take in this area include education programs on vehicle fuel efficiency and proper maintenance, as well as bylaws that prohibit excessive vehicle idling and make vehicle emissions testing mandatory.

URBAN AFFORESTATION

A healthy and growing urban forest can make an important contribution to the fight against climate change, because trees remove carbon dioxide from the atmosphere. However, this is only one of many benefits provided by trees. Depending on the species, trees can:

- enhance the energy efficiency of buildings by providing shade in summer, letting sunlight through in winter and serving as effective windbreaks;
- mitigate the “heat island effect” by cooling the air on summer evenings and by helping to prevent heat build-up during the day;
- increase personal comfort by shading streets and sidewalks;
- provide habitat for birds and other animals;
- increase property values;
- act as air purifiers by removing a variety of toxic and other pollutants;
- act as noise barriers; and
- reduce the impact of heavy rainfall and subsequent erosion.

Capturing these benefits can be an attractive proposition for municipal governments. The actual cost of planting and then maintaining municipal trees is a fraction of the value of the services they provide over their lifetime. In addition,



Using regulation to reduce greenhouse gas emissions from transportation

The City and County of Denver, Colorado has passed a number of ordinances that require compliance in the key areas of idling vehicles, smoking vehicles and alternative fuels. The “Idling Vehicles Ordinance” prohibits vehicle idling except under certain circumstances. The “Smoking Vehicles Ordinance” makes it unlawful for any owner or operator of a gasoline-powered engine to cause or permit to be operated in the city any gasoline-powered engine that emits any visible air contaminants for a period of more than five seconds. The “Alternative Fuels Ordinance” requires anyone owning a fleet of more than 30 vehicles to convert 10% of the fleet to clean-burning fuels, with some exemptions.

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute



Protecting the urban forest

The City of Edmonton has 60,000 elm trees on public property, valued at \$400 million. This is one of the largest concentrations of uninfected elms in the world. The City initiated a program to monitor for the disease vector (the European elm bark beetle) and trapped a very small number of beetles in 1995 and 1996. No diseased trees have actually been reported to date. Edmonton has taken a multi-pronged approach to prevent the disease or minimize elm tree loss by aggressively pruning its own trees, conducting public education sessions, using volunteers to undertake an inventory of elms on private property, providing disposal facilities for elm firewood and increasing funds to implement the overall strategy. In early 1997, Council passed a bylaw to enable the City to diagnose and remove elms if necessary, including from private property, and to make the storage of elm logs illegal.

SOURCE: City of Edmonton Bylaw No. 11468

many of these costs can be reduced through partnerships with service clubs, the Tree Canada Foundation, or youth, church and environmental groups. Urban afforestation projects do, however, require patience and a long-term commitment, and the payback period will normally be quite a bit longer than investments in areas such as energy efficiency.

If you want your municipal government to capture the multiple benefits of the urban forest, you can encourage it to protect and maintain existing trees, and plant new trees.

Protect and maintain existing trees

You can encourage your municipal government to use city ordinances and bylaws to protect and manage the urban forest. Bylaws can address objectives such as restricting or prohibiting the removal of trees in certain areas of the city without explicit permission, requiring trees that are removed to be replaced onsite or elsewhere, and mandating proper maintenance and handling of trees to prevent the spread of pests and disease on public as well as private property.

Plant new trees

Municipal governments can use financial incentives, public investment, regulatory strategies and voluntary partnerships to plant new trees on public property as well as encourage property owners to plant trees in suitable locations. Some of the specific actions you can encourage your municipal government to take include:

- requiring developers to plant a specific number of trees per lot according to lot size, or providing a tax break or reduced permit fees for developers who plant a certain number of trees and commit to maintaining them for five years;
- providing free or cost-shared locally-appropriate trees to homeowners along with information on how to plant and care for the tree;
- negotiating with a local nursery in the spring to provide a free tree (suitable for the area), with a minimum purchase by homeowners; and
- planting a specified number of new trees every year on public property.

Greening the city

Edmonton's "Parks, Naturally" program reintroduces natural landscapes of native plant and tree species to areas within the city that previously had been disturbed by human activity. While the City selects and prepares areas for planting, and provides the trees and plants, it relies extensively on community groups and local volunteers to plant and care for the trees and plants. To support these volunteers, the City provides training sessions

for group leaders. Since 1993, over 500,000 trees have been planted in Edmonton, and the "Adopt-A-Park" program enables local citizens to provide ongoing care and maintenance for these natural areas. Edmonton has also prepared a five year Naturalization Master Plan to reduce mowing and maintenance costs along roadways and within the river valley system and major city parks.

SOURCE: Federation of Canadian Municipalities 20% Club

WATER EFFICIENCY

There are also some less obvious ways municipal governments can work to reduce a community's greenhouse gas emissions. For example, improving the efficiency with which water is used and transported will reduce the amount of energy required to transport and heat water in the community, thereby reducing greenhouse gas emissions.

When advocating actions to improve water efficiency to your municipal government, you can point out that such actions will:

- reduce the costs to municipal government of providing a clean, adequate and reliable supply of water;
- alleviate water shortages;
- reduce the environmental and societal impacts associated with large withdrawals of surface and ground water;
- defer or avoid the capital costs of upgrading or building new water and wastewater infrastructure; and
- reduce the amount of wastewater that must be treated.

Canadians do not have strong financial incentives for water conservation because they pay less for water than virtually anyone else in the industrialized world.²⁴ Accordingly, you should urge your community to provide market signals that encourage improved water efficiency such as: implementing user-pay principles (e.g., water metering), making water more costly with increased use, and ensuring water users cover the full cost of water infrastructure construction and maintenance.

You should also encourage your municipal government to require or provide incentives for the installation of water-efficient equipment in building construction and retrofits, eliminate leaks in the municipal water distribution system, ban non-essential uses of water (e.g., car washing at home) and educate the community about water conservation. Most municipalities can, with a comprehensive water efficiency program, reduce community water use by at least 10% to 15%.

WASTE MINIMIZATION

Another area where municipal governments can take action to reduce greenhouse gas emissions is in the area of waste management. By minimizing the amount of waste going to landfill, municipal governments can reduce the amount of energy used to manage waste disposal as well as the greenhouse gas emissions produced by decomposing organic matter. Many of these actions will provide both economic and environmental benefits.

When advocating actions to minimize waste in your community, make sure you let your municipal government know these actions can:

- reduce municipal costs for collecting, transporting and disposing of waste;

Investing in water demand side management

The Town of Port Elgin, Ontario, facing a multi-million dollar expansion of its water treatment plant, elected instead to purchase and install residential water meters and implement an intensive water conservation program. These measures cost the town \$550,000 and reduced summer water use by 50% as well as reducing wastewater flow by 30%. The town annually saves \$12,000 in water and sewage treatment operating costs.

SOURCE: *Building Eco-Efficient Communities: A How-To Guide*, Pembina Institute



Pay as you throw

When faced with increased tipping fees and closure of the local landfill, Airdrie, Alberta established the province's first user pay/unit limit waste collection system in 1992. The initial limit was five units per week, which was reduced to three units when a backyard composting program was introduced. Residents must purchase a sticker at a cost of \$2.00 for any additional units. A community recycling depot is at the heart of the waste reduction system and accepts a wide range of materials. An exchange program is also offered to residents at the depot. Promotion and education have been critical to the success of the program, including composting courses and demonstrations and waste reduction techniques. Revenue from the sale of recyclables has grown, and the community has significantly reduced the total amount of waste going to landfill despite population growth of nearly 25 percent. Airdrie is already well below the provincial per capita target of 0.54 tonnes by the year 2000.

SOURCE: Alberta Action on Waste,
*Compendium of Alberta Waste Minimization
Projects*

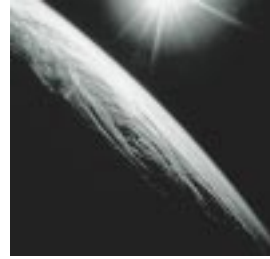
- defer and possibly avoid the costs of finding and building a new landfill site or the costs of closing an existing site; and
- create local jobs and municipal revenue from new recycling and composting programs.

Your arguments for improved efficiency in waste management will be timely as many Canadian communities face declining landfill capacity and problems finding new landfill sites. In addition, the Canadian Council of Ministers of the Environment (CCME) has established a national waste minimization goal of reducing the weight of municipal solid waste sent to landfill by 50% from 1989 levels by the year 2000. Some of the key objectives you will want to promote as part of a comprehensive municipal waste management strategy include: implementation of user-pay initiatives; enhanced recycling; separation of organic materials; and promotion of the re-use of materials in the community.

Your municipal government has a number of tools it can use to pursue these objectives. Some of the things you can encourage your government to do include:

- passing regulations banning specific types of waste from landfills;
- implementing user fees for waste disposal;
- investing in recycling and composting facilities;
- supporting and promoting waste exchanges and waste audits; and
- educating local citizens about methods to minimize waste production.





4

What else do we need to do to reduce greenhouse gas emissions?

EACH OF US CAN MAKE CHANGES IN OUR OWN LIVES THAT WILL HELP TO PROTECT the climate. By becoming advocates in our communities, we can also pressure local governments to take actions that will reduce our contribution to climate change and reduce greenhouse gas emissions in the community as a whole. Still, we can and must do more.

Holding Canadian companies accountable for their contribution to climate change

Making companies more climate friendly

At this time, Canadian companies are not obligated to protect the climate by limiting greenhouse gas emissions. Instead, federal and provincial governments have encouraged companies to voluntarily develop and implement climate change action plans and to report on them through the National Climate Change Voluntary Challenge and Registry Program (VCR). As of December 1996, more than 600 companies and organizations had made a commitment to participate in the program.²⁵

Unfortunately, this is much less impressive than it sounds. Approximately 50% of the registrants in the VCR have done nothing more than submit a letter signaling their intent to participate in the program. As of September 1996, the VCR had received just 73 submissions that included both a corporate inventory of greenhouse gas emissions and a commitment to take at least one action in the future to reduce those emissions.

A review of these 73 submissions by the Pembina Institute indicated that even though they were the best submissions made to the VCR, a number failed to provide enough basic information to ensure that the actions taken were

As consumers
and concerned
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issues.

credible. More importantly, most of the submissions failed to demonstrate that greenhouse gas emission reductions had become an important consideration in corporate decision making and that the actions being reported went beyond “business as usual.”²⁶ As a result, the VCR has not yet made a meaningful contribution to greenhouse gas emissions reduction in Canada.

Most companies will not invest in profitable greenhouse gas emission reduction opportunities if more profitable investments can be made elsewhere. To make climate protection more likely, companies can do things such as establish greenhouse gas emission reduction targets, initiate employee education programs on climate change, and change internal financial signals to provide incentives for greenhouse gas emissions reduction.

As consumers and concerned citizens, we have the power to influence corporate policy on environmental issues. Companies need to hear that we are concerned about climate change and that we are interested in what they are doing to reduce greenhouse gas emissions. You can help increase the importance and profile of the climate change issue in the corporate community by writing to the Chief Executive Officer of major companies from which you purchase goods or services and informing him/her that:

- you are extremely concerned about the climate change issue;
- you are interested in knowing what targets the company has established to control greenhouse gas emissions and what specific actions they have taken to protect the climate (you will be able to find all action plans submitted to the VCR on the Internet at <http://www.vcr-mvr.ca>); and
- you plan to make a company’s internal efforts to reduce greenhouse gas emissions a key factor in determining where you will spend your money for goods and services and where you will direct your RRSP’s and other investment funds (products like the Pembina Institute’s review of corporate submissions to the VCR can assist you in making these assessments).

Making goods and services more climate friendly

Chapter 2 stressed how each of us can use our power as consumers to protect the climate. For example, you should favour energy efficient automobiles, homes, heating equipment, and appliances, as well as electricity, heating systems and transportation fuels that rely on renewable energy sources. By making these choices, we will not only reduce our own emissions, we will also influence the types of goods and services companies offer in the marketplace. Companies will not produce products that no one buys. When you choose one product over another for climate protection reasons, make sure you let the salesperson or, better yet, the manager, know why you made that choice.

While our power as consumers can help get some products out of the

market, we also need to use that power to get new products into the market. Many of the energy efficient and renewable energy-powered products and services discussed in this report are available in the marketplace, but some of them (e.g., R-2000 homes, “green power”) are hard to find. If a company you plan to do business with (such as a homebuilder or electric utility) does not provide a climate friendly product or service that you want to buy, write the Chief Executive Officer of the company and demand that such a product be made available to meet your own personal needs and those of the planet. Such letters may not have an immediate effect, but over time they will make a difference.

Making federal and provincial governments take the climate change issue seriously

Despite the fact that Canada has made a commitment to stabilize its greenhouse gas emissions at 1990 levels by the year 2000, federal and provincial governments have shown little political will to grapple with this issue. While there is as yet little public pressure on governments for action to protect the climate, organizations like Imperial Oil and the Coal Association of Canada have lobbied vigorously to prevent Canada from taking any significant steps to reduce greenhouse gas emissions. As a result, while Canada’s National Action Program on Climate Change (NAPCC) does include a limited number of regulatory (i.e., energy efficiency standards) and information initiatives to promote greater energy efficiency and renewable energy use, it relies largely on voluntary action by industry to reduce greenhouse gas emissions in this country.

The NAPCC will not allow Canada to meet its current commitment to stabilize greenhouse gas emissions at 1990 levels by the year 2000, much less meet the stronger commitments to control greenhouse gas emissions that scientists say are required which have been negotiated internationally for adoption in Kyoto, Japan in December 1997. Actions taken by individuals and local governments, as described in Chapters 2 and 3, can help narrow the gap but will not be enough to allow Canada to fulfill its international obligations. Additional actions are required, but it is unlikely that federal and provincial governments will do more in the face of opposition from the fossil fuel industry unless there is clear public pressure for action. We must make our voices heard in federal and provincial capitals.

What do federal and provincial governments need to do? Essentially, they need to create an economic and regulatory framework that recognizes the importance of climate protection and sets standards and provides incentives that will help individuals, corporations and local governments reduce greenhouse gas emissions.

It is unlikely that federal and provincial governments will do more in the face of opposition from the fossil fuel industry unless there is clear public pressure for action.

For more information about the federal government's role in reducing greenhouse gas emissions, see *The Role of Government*, another report in this series.

The economic framework

Federal and provincial governments, with their powers in the area of taxation and public spending, have a significant influence on the economic signals provided in the marketplace. At this time, those signals provide incentives to increase greenhouse gas emissions, not decrease them. For example, energy in Canada is much cheaper than in most industrialized countries because we impose far fewer taxes on energy from fossil fuels. At the same time, direct government subsidies for the production of fossil fuels have long been several orders of magnitude greater than subsidies for the production of renewable energy. Finally, even the tax system has been found to be biased in that it provides more incentives for investments in fossil fuel development than investments in energy efficiency.²⁷

We need to let federal and provincial governments know that climate protection requires a readjustment of market signals to make greenhouse gas emissions production less attractive and investment in greenhouse gas emissions reduction more attractive. Some of the actions you can urge the Prime Minister, Premiers, and federal and provincial finance ministers to take include:

- *instituting ecological tax reform*: Imposing taxes on greenhouse gas emissions (i.e., a carbon tax) will reflect some of the environmental and social costs of fossil fuel use and provide an incentive to protect the climate. At the same time, other taxes could be decreased (such as payroll taxes, the GST or personal income taxes). In this way, environmental benefits are achieved by discouraging the things we don't want (that is, greenhouse gas emissions and other pollution), and lower taxes in certain areas encourage more of the things we do want – like jobs, income and investment.
- *ensuring equitable tax treatment*: The tax system should treat investments to reduce energy demand and develop new renewable energy sources as favourably as it treats investments in traditional forms of energy supply – like fossil fuel development. This would help reduce the possibility that the tax system actively encourages greenhouse gas emissions production.
- *ending direct subsidies for fossil fuel production and consumption*: Removing these subsidies will help ensure that governments do not promote greater development and consumption of fossil fuels than would naturally occur in the marketplace.

The regulatory framework

Federal and provincial governments have the ability to set minimum standards that can help limit the amount of greenhouse gas emissions produced by various goods and services. For example, federal and provincial governments have established minimum energy efficiency standards for a number of appliances and equipment.

There are, however, no standards on greenhouse gas emissions production. Strong energy efficiency standards do not cover the two major pieces of energy-using equipment owned by individuals – the home and the car. Some of the actions you can urge the Prime Minister, Premiers, and federal and provincial energy ministers to take include:

- *establishing greenhouse gas emission caps and allowing emissions trading:* Putting a legal limit, or cap, on the level of greenhouse gases that major emitters can produce and then allowing them to buy and sell emission reductions with other emitters reduces total emissions and allows polluters to reduce those emissions more cost-effectively.²⁸
- *regulating new energy developments:* Major new energy development that produces greenhouse gas emissions (e.g., coal-fired electricity, oil sand developments) can be required to offset their impact on the climate by investing in energy efficiency and renewable energy projects that reduce greenhouse gas emissions.
- *legislating fuel economy standards for automobiles:* The federal government should make it mandatory for the average new car to have a fuel economy rating of 5L/100km and the average new light truck to have a fuel economy rating of 7L/100km by 2005, replacing the current voluntary standards (for cars – 8.2L/100km; there are currently no standards for light trucks). This change is needed because, even with the present standard, fuel efficiency has still declined in recent years.
- *adopting new building codes:* Provincial governments should adopt the Model National Energy Codes for Buildings and Houses that they have recently negotiated with the federal government.
- *attaching conditions to support for municipal infrastructure:* Before contributing to municipal infrastructure investments that will supply more energy, water or transportation services, federal and provincial governments should require local governments to demonstrate that all reasonable demand-side management options have been considered.

Government programs

Government programs that support research and development of energy efficiency and renewable energy technologies, as well as programs that promote their use, have been dramatically cut or even eliminated by federal and provincial governments. Governments are now spending much less to promote energy efficiency improvements, transportation demand management, and the expanded use of renewable energy than they have in the past. Despite their critical role in climate protection, municipal governments receive little financial support or technical assistance in these areas.

Strong energy efficiency standards do not cover the two major pieces of energy-using equipment owned by individuals – the home and the car.

Programs that pursue these objectives will generate multiple economic and environmental benefits for Canadians and deserve government support. We need to let our elected leaders know that the threat posed by our changing climate is a serious concern and we need to encourage them to invest in such programs, and to establish a regulatory and economic framework that will protect the climate. Get the message to your Member of Parliament, the Prime Minister, your Premier and your representative in the provincial legislature. Write a letter, telephone, or send a fax or an e-mail. We can make a difference.



APPENDIX A. EMISSION FACTORS REQUIRED TO DEVELOP A BASIC INVENTORY OF YOUR CARBON DIOXIDE EMISSIONS²⁹

HOME HEATING AND ELECTRICITY

	CARBON DIOXIDE (CO ₂)
Natural gas: used as a heating fuel and power source (g/cubic metre)	1,880
Light distillate oil: used as a heating fuel and power source (g/litre)	2,830
Heavy residual oil: used as a heating fuel and power source (g/litre)	3,090

TRANSPORTATION

	CARBON DIOXIDE (CO ₂)
Gasoline (g/litre)	2,360
Diesel (g/litre)	2,730
Propane (g/litre)	1,530
Natural gas (g/litre)	1,880
Public transit (kg/km)	0.04
Air travel (kg/km)	0.25
Rail travel (kg/km)	0.17

ELECTRICITY CO₂ CONVERSION FACTORS – 1995

PROVINCE/TERRITORY	KG OF CO ₂ /KWH
Yukon/Northwest Territories	0.42
British Columbia	0.05
Alberta	0.92
Saskatchewan	0.82
Manitoba	0.01
Ontario	0.15
Quebec	0.00
New Brunswick	0.55
Nova Scotia	0.73
Prince Edward Island	0.00
Newfoundland	0.03

APPENDIX B. INFORMATION THAT CAN HELP YOU REDUCE YOUR PERSONAL GREENHOUSE GAS EMISSIONS

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Natural Resources Canada

CONTACT: The publications listed below are free on request to Natural Resources Canada.

Natural Resources Canada

Energy Publications
c/o Canada Communications Group
Ottawa, ON K1A 0S9
Toll-free publication line:
1-800-387-2000
fax: (819) 994-1498
<http://eeb-dee.nrcan.gc.ca>

Alternative Transportation Fuels

Alternative Transportation Fuels in Canada
Alternative Transportation Fuels – Ethanol
Alternative Transportation Fuels – Methanol
Alternative Transportation Fuels – Natural Gas
Alternative Transportation Fuels – Propane
Alternative Transportation Fuels – Hydrogen Power
Alternative Transportation Fuels – Electric Power

Vehicle Use

AutoSmart Car Economy Calculator
1997 Fuel Consumption Guide – Ratings for New Cars, Pickup Trucks, and Vans
AutoSmart Guide – How to Buy, Drive and Maintain Your Car the AutoSmart
Way (1997)

Lighting, Appliances and Home Office Equipment

EnerGuide – Household Lighting – Consumer's Guide to Buying and Using
Energy Efficient Lighting Products (1996)
EnerGuide – Household Appliances – Consumer's Guide to Buying and Using
Energy Efficient Appliances (1996)
EnerGuide Appliance Directory – 1997 Edition
EnerGuide – Office Equipment – Guide to Buying and Using Energy Efficient
Office Equipment

Home Heating and Cooling

Heating and Cooling with a Heat Pump (1996)
 Heating with Electricity (1996)
 Heating with Gas (1996)
 Heating with Oil (1996)
 A Guide to Residential Wood Heating (NRCan/CMHC, 1996)
 Operating and Maintaining Your Heat Recovery Ventilator (1996)
 Comparing Heating Costs (1996)
 Air Conditioning Your Home (1996)
 EnerGuide Directory of Room Air Conditioners (1997)
 All About Wood fireplaces (1996)

Building Shell

Consumer's Guide – Keeping the Heat In (1996)
 Consumer's Guide – To Buying Energy Efficient Windows and Doors
 Air Leakage Control (fact sheet, 1996)
 The R-2000 Home – More than Energy Savings (1993)
 The “New” R-2000 Home (1994)
 R-2000 Windows (1993)

R-2000 Toll-Free Information Line:
 1-800-38R-2000

Provincial and territorial programs

The Natural Resources Canada publication, *Efficiency and Alternative Energy Programs in Canada* (1995), provides information on programs offered by provincial and territorial governments that can help you reduce energy use and greenhouse gas emissions.

Electric and natural gas utilities

Most electric and natural gas utilities can provide you with information on how to reduce your energy use and greenhouse gas emissions. A limited number of utilities also have demand-side management programs that can provide you with technical and financial assistance to actually undertake some of these greenhouse gas emission reduction measures in your home.

Green Communities

Green Communities were started in Ontario in 1991 and, as of Spring 1997, the initiative had 16 members. The core service is the Green Home Visit, and over 85,000 visits have been completed to date. Trained assessors spend up to two hours in the home, working with the homeowner to identify ways to save money, improve comfort, and help the environment. Conservation hardware is installed during the visit. Householders are also offered access to qualified contractors and preferred rate financing, and discounts on recommended products and services. Other services and programs are offered to encourage water conservation and waste reduction. A National Green Communities Initiative has now been launched.

CONTACT:
Green Communities
Association
 4 Knox Street
 Peterborough ON K9H 2A8
 tel: (705) 745-7479
 fax: (705) 745-7294
 email: cmaynes@web.net
<http://www.ptbo.igs.net/~gca/>

Organizations working on climate change issues

David Suzuki Foundation <http://www.davidsuzuki.org>

- Executive Summaries of *Climate of Change* reports
- Details about how to order the briefing kit *Global Warming: Climate Change*
- News releases, current and archived
- Copies of all DSF climate change ads
- Health Statement on climate change
- Economists' Statement on climate change
- Addresses and e-mails of major political figures
- Information on how to join the Climate Change Action Team
- And coming soon, calculate how your personal share of greenhouse gas emissions compares to the average in your province.

Atmospheric Research & Information Centre: The Global Climate Change Information Programme <http://www.doc.mmu.ac.uk/aric/gcc/gcciphm.html>

Canadian Global Change Program <http://www.cgcp.rsc.ca/>

Environmental Defense Fund <http://www.edf.org/>

The EPA Global Warming Site

<http://www.epa.gov/docs/oppeoee1/globalwarming/>

Friends of the Earth <http://www.foe.org/>

Greenpeace <http://www.greenpeace.org/index.shtml>

The Intergovernmental Panel on Climate Change (IPCC)

<http://www.ipcc.ch/>

International Council for Local Environmental Initiatives

<http://www.iclei.org:80/iclei.htm>

Ozone Action <http://www.ozone.org/>

Redefining Progress <http://www.rprogress.org/>

Rocky Mountain Institute <http://www.rmi.org/>

Sierra Club <http://www.sierraclub.org/>

Sustainable Development Research Institute <http://www.sdri.ubc.ca/>

The Toronto Atmospheric Fund <http://www.iclei.org/taf/index.html>

Union of Concerned Scientists <http://www.ucsusa.org/>

United Nations Framework Convention on Climate Change

<http://www.unfccc.de/>

The West Coast Environmental Law Research Foundation

<http://www.bullitt.org/wce.htm>

World Meteorological Organization <http://www.wmo.ch/>

World Resources Institute <http://www.wri.org/>

World Wide Fund for Nature <http://www.panda.org/wwf/whatis.htm>

Worldwatch Institute <http://www.worldwatch.org/>

APPENDIX C. PROGRAMS TO HELP MUNICIPAL GOVERNMENTS AND COMMUNITIES TAKE ACTION ON CLIMATE CHANGE

The Alberta Eco-Efficient Communities Initiative

In Alberta, the Alberta Eco-Efficient Communities Initiative (AEECI) was developed through the Clean Air Strategic Alliance and is now being managed by the Pembina Institute. This Initiative is aimed at small and medium-sized municipalities (less than 20,000 population). It offers a range of tools and professional assistance to help municipalities become more eco-efficient and reduce greenhouse gas emissions in their own operations as well as in the broader community. The main focus is on building energy efficiency, water conservation, waste minimization, renewable energy sources, and transportation, although other areas such as green space enhancement, afforestation, and wastewater treatment are also addressed. The AEECI has published a 250-page “How-To” Guide and has a web site containing practical planning tools, potential partners and municipal success stories.

CONTACT:

The Pembina Institute
Box 7558
Drayton Valley, AB T7A 1S7
tel: (403) 542-6272
fax: (403) 542-6464
email: piad@ccinet.ab.ca
<http://www.piad.ab.ca>

The 20% Club

The Federation of Canadian Municipalities launched the 20% Club in 1995. The primary objective is to encourage municipalities to undertake a sustained effort to reduce emissions, with a 20% reduction as the ultimate goal. Members agree to share information and expertise, monitor progress, celebrate results and assist Canada to meet our international climate change commitments. In order to join, a municipality must publicly commit, in the form of a resolution, to reducing 1990 levels of greenhouse gas emissions by 20%. The 20% Club lays out a three-year strategy for anticipated achievements by members with the expectation that municipalities will be showing progress in reducing greenhouse gas emissions by the third year.

CONTACT:

Federation of Canadian Municipalities
24 Clarence St.
Ottawa, ON K1N 5P3
tel: (613) 241-5221
fax: (613) 241-7440
email: nricher@fcm.ca
<http://www.fcm.ca>

Energy Innovators Initiative

The Energy Innovators Initiative of Natural Resources Canada (NRCan) promotes the voluntary adoption of energy efficiency by organizations in the corporate, institutional and municipal sectors of Canada. There are now 23 municipal governments participating in the initiative. Municipalities who have joined the Energy Innovators program are encouraged to replicate the innovative, fully-integrated approach to energy efficiency projects that has been developed by, and successfully implemented under the Federal Buildings Initiative (FBI). The model uses energy performance contracting as the method for implementing projects. Under energy performance contracting, energy savings are guaranteed by energy service

CONTACT:

Phyllis Hoshino
Energy Innovators
Natural Resources Canada
Energy Efficiency Branch
580 Booth St.
Ottawa, ON K1A 0E4
tel: (613) 943-8293
fax: (613) 947-4121
<http://eeb-dee.nrcan.gc.ca/>

companies and the project is paid for from the energy savings. No capital is required “up front.” The integrated approach considers both the human and technical aspects of a project. Energy management training for building managers and operators, and employee communications are also part of this model. This comprehensive approach to energy efficiency addresses a number of barriers such as lack of capital, lack of information on technologies, lack of expertise within the public and private sectors to carry out this work, and lack of contracting and other procedure-related tools that can hinder the implementation of energy efficiency projects.

Through its FleetSmart program, NRCan also encourages fleets in Canada to reduce operating costs and environmental impacts through energy efficient practices and the use of alternative fuels.

The International Council for Local Environmental Initiatives

**CONTACT:
ICLEI**

City Hall, East Tower, 8th Floor
Toronto, ON M5H 2N2
tel: (416) 392-1467
fax: (416) 392-1478
email: iclei@iclei.org
<http://www.iclei.org>

The International Council for Local Environmental Initiatives (ICLEI) is a not-for-profit association of local governments and their associations dedicated to the prevention and solution of local, regional, and global environmental problems through local action.

The Cities for Climate Protection Campaign is ICLEI's international effort to reduce greenhouse gas emissions. It helps municipal governments develop local action plans by offering participants specific tools. These tools include a comprehensive assortment of worksheets, data collection forms, software and other analytical tools to conduct energy emissions analysis and develop action plans. Other tools include energy fact sheets, case studies on climate-related topics, and policy and practice manuals on energy efficiency in the building and transportation sectors.

ICLEI Energy Services was created to assist the municipal sector in reducing its energy consumption and associated CO₂ emissions while at the same time creating jobs through the facilitation of energy management activities in the municipal building stock. It assists municipalities in realizing the financial and environmental benefits of energy efficiency through a comprehensive range of Strategic Planning Services, which include:

- energy auditing of municipal facilities;
- identifying energy efficiency measures;
- financial modeling of aggregated efficiency opportunities;
- establishing benchmarks for energy use and CO₂ emissions; and
- ongoing monitoring of energy savings and CO₂ emissions.

Tree Canada Foundation

CONTACT:

Tree Canada Foundation
220 Laurier Avenue West, Suite 1550
Ottawa, ON K1P 5Z9
tel: (613) 567-5545
fax: (613) 567-5270
email: tcf@treecanada.ca
<http://www.treecanada.ca>

The Tree Canada Foundation provides education, technical assistance, resources, and financial support through working partnerships to encourage Canadians to plant and care for trees to help reduce the harmful effects of carbon dioxide emissions. These partnerships often involve corporate and public funds as well as significant volunteer efforts. The Foundation has been involved in the planting and care of over 50 million trees from 1992-1996. Its tree planting programs have involved over 1300 partners and over 100 corporations.

NOTES

1. Intergovernmental Panel on Climate Change. *IPCC Second Assessment – Climate Change 1995*. World Meteorological Association and the United Nations Environment Program, 1995.
2. Environment Canada. *Trends in Canada's Greenhouse Gas Emissions 1990-1995*. 1997.
3. *IPCC Second Assessment – Climate Change 1995*. An overview of cost-effective emission reduction opportunities in Canada can be found in *Canadian Options for Greenhouse Gas Emission Reduction (COGGER)*, Canadian Global Change Program Technical Report Series No. 93-1, The Royal Society of Canada, September 1993.
4. Environment Canada. *Trends in Canada's Greenhouse Gas Emissions 1990-1995*. 1997.
5. Resources Futures International, Torrie Smith Associates and the Policy Assessment Corp. *Reviewing the Progress Made Under Canada's National Action Program on Climate Change*. November 1996.
6. Natural Resources Canada. *Canada's Energy Outlook: 1996-2020*. April 1997.
7. This chart is adapted from Environment Canada's *Greenhouse Gas Miser Handbook*, with simplified examples inserted by the Pembina Institute. It does not go into the more complicated calculations of other greenhouse gases, such as methane emitted as a result of disposing organic waste in landfills and nitrous oxide emissions from vehicles. Carbon dioxide is the most prevalent greenhouse gas and is a good basic indicator of an individual's greenhouse gas emissions.
8. Environment Canada. *The State of Canada's Environment*. 1991.
9. These statistics are drawn from the *Greenhouse Gas Miser Handbook*, as well as two publications of Natural Resources Canada: *AutoSmart Guide – How to Buy, Drive and Maintain Your Car The AutoSmart Way*, and the *AutoSmart Car Economy Calculator*.
10. Please see the *Greenhouse Gas Miser Handbook* and Natural Resources Canada's fact sheet on Air Leakage Control.
11. Avoiding the use of air conditioners will not only reduce greenhouse gas emissions through reduced energy use. The chemicals used in air conditioning systems (HCFCs and HFCs) are also both extremely potent greenhouse gases and HCFCs also contribute to the destruction of the ozone layer.
12. The statistics in the preceding two paragraphs come from the *Greenhouse Gas Miser Handbook* and Natural Resources Canada's fact sheet and work sheet entitled *Comparing Heating Costs*.
13. This information is drawn from Environment Canada's *Greenhouse Gas Miser Handbook*. 1993.
14. The dollar savings are drawn from Natural Resources Canada's publication: *EnerGuide – Household Appliances*, and the carbon dioxide emission reductions have been calculated by the Pembina Institute.
15. Environment Canada. *The State of Canada's Environment*. 1991.
16. See the *Greenhouse Gas Miser Handbook*. 1993.
17. Environment Canada. *The State of Canada's Environment*. 1991.
18. Torrie, Ralph. *Findings and Policy Implications from the Urban CO₂ Reduction Project*. The International Council for Local Environmental Initiatives, Toronto, 1993.
19. District cooling systems are not only energy efficient, they often replace air conditioners that use HCFCs and HFCs – chemicals that contribute to climate change. HCFCs are also contributors to the destruction of the ozone layer.
20. Natural Resources Canada. *The District Heating Option in Canada*. 1995.

21. If wood used for energy is sustainably harvested, it is assumed that the carbon dioxide released when the wood is burned will be balanced by the carbon dioxide removed from the atmosphere by trees planted to take the place of those cut down.
22. California Energy Commission. *Energy Aware Planning Guide*. 1993.
23. A survey of economic literature conducted by the Pembina Institute indicated that investments in energy efficiency retrofits of buildings generated 3-4 times more jobs as equivalent investments in new energy supply because energy efficiency work is more labour intensive and produces savings that are then respent in the community to create more jobs and economic activity.
24. Pembina Institute. *Building Eco-Efficient Communities: A How-To Guide*. 1997.
25. Natural Resources Canada. *Voluntary Challenge and Registry – December 1996 Progress Report*.
26. Pembina Institute. *Corporate Action on Climate Change: 1996 – An Independent Review*. April 1997.
27. Natural Resources Canada and Department of Finance Canada. *The Level Playing Field: The Tax Treatment of Competing Energy Investments*. September 1996.
28. A good overview of emissions trading and other economic instruments can be found in the 1992 discussion paper, entitled *Economic Instruments for Environmental Protection*, prepared by the Government of Canada.
29. Data for emission factors in these tables were obtained from *Trends in Canada's Greenhouse Gas Emissions 1990-95*, and the *Greenhouse Gas Miser Handbook*.

CLIMATE OF CHANGE: THE DAVID SUZUKI FOUNDATION'S NEW REPORT SERIES

A Glimpse of Canada's Future

Written by Ellen Battle and Bill Stipdonk of Metrix Consulting and by Dr. David Suzuki, this report examines the ways Canada could be affected by climate change. Some of the topics covered include: how the greenhouse effect works, and how a warmer world will affect the social, economic and environmental fabric of Canada.

The Role of Government

A Briefing Paper to the Honourable Paul Martin, September 29, 1997

Canadian energy production and consumption are currently subject to taxation rules and government programs which interfere with the nation's ability to meet its greenhouse gas reduction targets. In this report, Michael Margolick of ARA Consulting Group shows how Canada's economy is currently structured to encourage ever-greater energy consumption, and therefore higher emissions of greenhouse gases. The report also presents a rationale for a plan to reduce greenhouse gas emissions.

Canada's Window of Opportunity

This report examines how a lowering of greenhouse gases would affect Canada's social, economic, and environmental goals. Specifically, the authors outline the benefits of switching to cleaner, less harmful energy sources. Suggestions for strategies which would help Canada make the transition to a sustainable future are also included. Authored by Ralph Torrie and Dr. Amory Lovins, this report provides readers with a snapshot of how Canada might prosper in a low-carbon future.

Keeping Canada Competitive

Since the 1992 Rio Earth Summit, few countries have lived up to the agreed goal of stabilizing greenhouse gas emissions at 1990 levels. Here in Canada, it is estimated that emissions are already between 8 and 13% above 1990 levels – one of the worst records of any developed nation. Canada's former chief negotiator Doug Russell, (with contributions from Pembina Institute's Robert Hornung) review how Canada's performance has compared with other countries, and examine the implications of Canada's failure to keep pace with international efforts to reduce greenhouse gas emissions.

Taking our Breath Away

The Health Effects of Air Pollution and Climate Change

This report explores the link between fossil fuel combustion, climate change, air pollution and human health. The authors, two medical epidemiologists and an air pollution specialist, find that as many as 16,000 Canadians are already dying prematurely every year as a result of air pollution. And because heat and sunlight are critical factors in the production of smog, global warming is expected to make air pollution worse. The authors conclude that climate change and air pollution are likely to further erode human health unless immediate steps are taken to reduce world consumption.

Canadian Solutions

In the final report of the series, we will analyse the commitments Canada made in Kyoto in 1997 at the Conference of Parties and propose an action plan to fulfill those commitments. Written by the David Suzuki Foundation and the Pembina Institute, this report proposes policies for Canada's municipal, provincial, and federal levels of government.



This report is printed on Arbokem, which is 45% agri-pulp, 43% post-consumer waste paper, and 12% calcium carbonate filler. Arbokem is manufactured by a totally chlorine and effluent free agri-pulp process.

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Finding solutions in science and society

The goal of the David Suzuki Foundation is to study the underlying structures and systems which cause environmental crises and then work to bring about fundamental change. We do this in four ways:

Research: The David Suzuki Foundation seeks out and commissions the best, most up-to-date research to help reveal ways we can live with nature.

Application: We support the implementation of ecologically sustainable models – from local projects, such as habitat restoration, to international initiatives, such as better frameworks for economic decisions.

Education: We work to ensure the solutions developed through research and application reach the widest possible audience, and help mobilize broadly supported change.

Advocacy: We urge decision makers to adopt policies which encourage and guide individuals and businesses, so their daily decisions reflect the need to act within nature's constraints.

