PROFILE FOR COMMUNITY ACTION SERIES

Climate Change:
A Profile for Community Action

A Companion to Harmony Foundation of Canada's Community Action Workshop Manual

Harmony FOUNDATION

Serving Communities Across Canada and Around the World

The Commonwealth Foundation
1994 Fellowship

THE GLOBAL 500

United Nations
Roll of Honour
for Environmental
Achievement

Since 1985, Harmony Foundation has served community groups and educators from every Canadian province and 31 countries around the world. Our goal is to build the skills of individuals, schools, communities and other organizations so that they are prepared to deal with the challenges facing them. As a result of our training, many people have developed school and community projects that have helped raise environmental awareness and contributed to local environmental improvement. Our approach is characterized by:

Self-Sufficiency
Our programs and publications provide the skills and tools that communities, organizations and educators need to deliver their projects self-sufficiently and to organize independently.

Capacity Building
Our programs assist individual action, community initiatives and the development of educational programs and resources. Most importantly, we build the capacity of individuals and organizations so that they can respond positively to the environmental problems they face.

Global Perspective
Environmental education and community initiatives must be understood within their regional, national and global context in order to be truly supported by and integrated into society. Our programs encourage cooperative action on environment and development issues and active Canadian leadership and participation in the global campaign.

National Unity
Through our Institute for Environmental Values Education and other programs Harmony Foundation continues to bring Canadians together around common concerns leading to an increased sense of national unity and pride.

Efficient Use of Resources
By providing our programs and resouces to organizations across Canada we avoid duplication of effort and encourage efficient use of resources. Through our partnerships with other organizations we respond to the needs of the public in a cost-effective way.

Leveraged Support
We have maximized our support by using it to persuade other corporations, foundations and government agencies to join our efforts – thus leading to more extensive results. This approach has helped us attract a broad base of support and cooperation from corporations, foundations, federal and provincial governments and international agencies.

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In 2000, Harmony Foundation's *Building Sustainable Societies* program focussed on the issue of climate change, through our new initiative *Canadian Communities and Climate Change: Tools for Action*.

Principal Funder, Canadian Communities and Climate Change
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Foreword

Michael Bloomfield
Founder and Executive Director, Harmony Foundation

For over 15 years, Harmony Foundation has created and delivered education programs for individuals, communities, educators and workplaces working towards positive solutions to environmental problems and their underlying causes. During that time it has become increasingly clear that the most effective solution to environmental problems is prevention, based on the knowledge, skills and cooperation we need to make sound decisions in our own lives and work together internationally, regionally and in the communities where we live. Education will be a central part of any successful strategy.

There is a wide array of environment and community development training and education programs based on single themes such as nature appreciation, resource management or applied science and technology. These approaches, while having their place, have been too limited to deal with the complexity of most community, environmental and social issues.

At the root of global crises such as climate change are the values that cause us to behave in environmentally destructive and selfish ways. The role of education must be to develop values and skills that will lead to environmentally sound and humanitarian decisions and, ultimately, to positive action. Such education must be widely accessible, with a multi-disciplinary focus. It must help people of all ages and backgrounds to understand the interrelationships between values and behaviour and environmental quality, social justice and equity, and it must provide the tools to act on this knowledge. Links between community, national and global concerns must also be stressed. As environmental and community development issues increase in number, importance and complexity, we will be forced to rethink our goals and values to ensure they lead to environmentally sound and just behaviour in communities worldwide, contributing to national efforts and global cooperation.

'When a group of people are sailing in a boat, none of us has the right to drill a hole under our own seat'

Our challenge is to provide education and training programs that are comprehensive, integrative, positive and responsive to changing environmental, social and economic realities. We must also counter the stumbling blocks to positive action, including disempowerment, cynicism, lack of knowledge or skills and inadequate leadership. Education, at its best, must develop a population that is aware of the world and concerned about it, and has the knowledge, skills, goals and commitment to work together toward solutions of current problems and the prevention of new ones.

The need for environmental scientists, regulators and advocates is clear. However, to successfully meet our environment and community development challenges we must promote a massive program of training and education that will help individuals develop goals and values that respect others, are compatible with a healthy environment, promote progressive social and economic decisions and lead to positive action for the benefit of people around the world, as well as other species and future generations. We know the problems, we have the means to deal with them, and future generations will judge us harshly if we fail to act.

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Introduction

Congratulations on taking an important step towards fighting climate change. Knowledge is power, and by understanding what climate change is all about, you can decide how your community can best add its efforts to the initiatives taking place across Canada and around the world.

In this Profile you'll find facts, resources, inspiration and a wealth of ideas on how to tackle climate change in your community.

You'll find this Profile tells you what you need to know about climate change in clear, accessible language. The **Overview** explains what climate change is, what causes it, and what impacts it could have here in Canada and around the world. A short glossary defines any technical terms that are used. At the back of the Profile, the **Climate Change Cheat Sheet** summarizes everything in a handy three-page format.

You'll also find inspiration in the pages that follow. The **Success Stories** provide a wealth of ideas on how communities can take action on climate change. Read about what groups across Canada and internationally have done to reduce their local greenhouse gas emissions through transportation, energy, industrial emissions, greenspace, agriculture and educational initiatives. You'll also discover lots of resources for further information in each of these areas.

The **Personal Action Checklist** at the back of this publication has some excellent suggestions on changes you can make in your own life to reduce greenhouse gas emissions.

If this Profile motivates you to action, you may want to consider some of the other publications and programs that Harmony Foundation offers. *Climate Change: Profile for Community Action* is only the tip of the iceberg – there is an array of tools available to you through Harmony's **Building Sustainable Societies** program, outlined below.

The Program

As the diagram on page 3 illustrates, *Building Sustainable Societies* is a three-tiered program composed of training sessions, community action workshops, and local initiatives. The goal of the program is to provide community groups with the necessary knowledge and project planning skills to launch local climate change projects.

The Training Session

In our Training Sessions, we prepare community group representatives to run Community Action Workshops, by familiarizing you with the activities and facilitation techniques in our *Community Action Workshop Manual*. Call us to find out if we'll be offering one in your region in the near future.

The Community Action Workshop

The Workshop provides your group with an opportunity to work together to learn more about a selected environmental issue, identify community assets and needs, articulate a vision to solve a particular problem of your choice, and develop an action strategy. Above all, it is an opportunity for your group

to work as a team. You'll find a more detailed description and agenda for the Workshop on page 4.

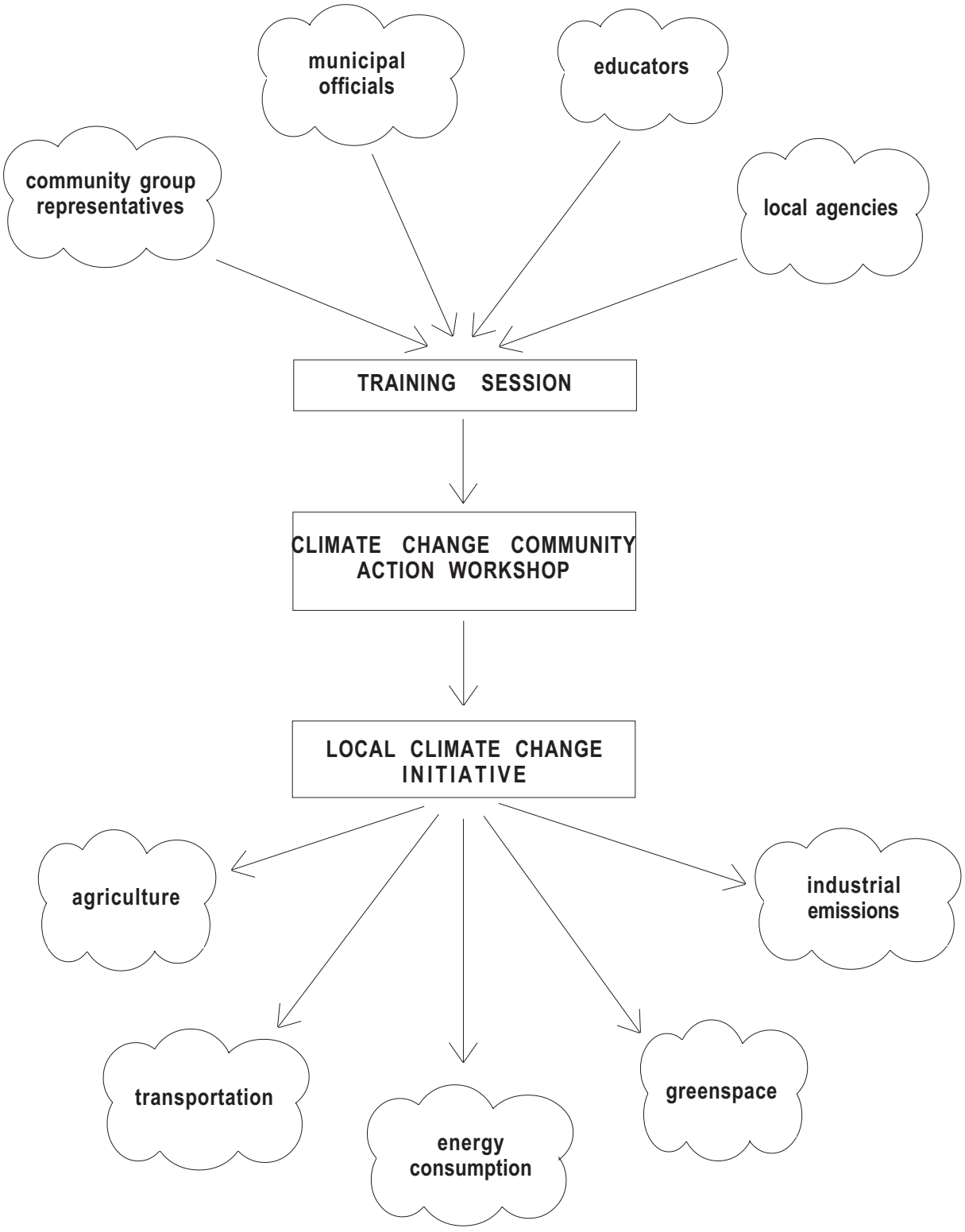
The *Community Action Workshop Manual*

This *Manual* is an ideal companion to the Profile you are now holding. While the Profile provides you with a clear understanding of climate change, the *Community Action Workshop Manual* shows you how to take effective local action through a simple and tested project planning framework. Together, the *Community Action Workshop Manual* and *Climate Change: Profile for Community Action* provide you with everything you need to tackle climate change.

We hope you'll find a wealth of ideas and information in *Climate Change: Profile for Community Action* and that you are inspired to act on the knowledge you will gain. Good luck in all your present and future endeavours, and remember that education is the starting point for global change.

As Margaret Mead famously remarked, never doubt that a small group of committed people can change the world – in fact it's the only thing that ever has.

Building Sustainable Societies
Project Structure



Community Action Workshop Agenda

Put your climate change ideas into action! The Community Action Workshop is designed to guide community groups through the process of planning a local initiative. It takes a funnelling approach: beginning with the "big picture" of climate change and its global implications, the focus then narrows to an examination of climate change within the community and the selection of a specific local problem to tackle. The workshop culminates in the development of a detailed action plan to address the selected problem.

The Workshop is broken into five modules, for maximum flexibility, and takes approximately 11 hours in total to run. Please see Harmony Foundation's ***Community Action Workshop Manual*** for full details.

Pre-Workshop Communication and Planning

Activity 1: Planning the Workshop
Activity 2: Setting Ground Rules

Understanding the Big Picture

Activity 1: Welcome, Opening Remarks, Introductions and Overview
Activity 2: Analysing Our Issue
Activity 3: Values and Behaviour: Widening Our Circle of Concern

Focussing Our Community Vision

Activity 1: Profiling Our Community
Activity 2: Defining a Problem
Activity 3: Mapping Our Assets
Activity 4: Creating Our Vision

Moving From Awareness to Action

Activity 1: Developing Our Action Plan
Activity 2: Meeting the Challenges
Activity 3: Measuring Success
Activity 4: Planning for Follow-Up
Activity 5: Community Action Workshop Closure

Taking the Next Steps

Activity 1: Preparing to Launch

Guiding Principles

The design and content of Harmony Foundation's Training Sessions and Community Action Workshops are based on the following educational principles:

Values-Based
An examination of values provides the foundation required to effectively understand one's own and other's world views. From this understanding participants can consciously and conscientiously benefit from various perspectives and actions to generate innovative solutions.

Experiential
Experience is at the base of learning. The experiential learning cycle involves concrete experience, reflection on the experience, concept building and application, and it challenges people to risk beyond their current level of thinking and acting.

Holistic and Multi-disciplinary
Holistic education involves the whole person. It appeals to all dimensions of an individual (i.e., emotional, spiritual, intellectual, physical). A multi-disciplinary approach promotes learning through the integration of subjects. Effective social change education programs examine the interrelationships amongst many fields of study and amongst the various elements of societies.

Systemic
Understanding the systemic relationships between individuals, societies and the environment contributes to an integrated approach to problem solving. Everything we do affects something or someone else.

Cooperative
Cooperative learning is interdependent; we learn with each other and from each other. Both the facilitator and the participants contribute to the educational process.

Based on Critical Thinking
Critical thinking is a process, not a result. Critical thinkers aim to identify and challenge their own assumptions and knowledge about a particular topic or issue, along with information presented to them. They are open to forming new ways of viewing an issue and generating innovative solutions.

Situated within a Global Context
Community-based initiatives are central to effective environmental and social action, yet they must be understood within regional, national and global contexts in order to effectively bring about long-term change. Societal change must happen at all levels in order for initiatives to be truly supported by and integrated into societies.

Purpose

This section provides an introduction to climate change: what it is, what causes it, what impacts it could have (both internationally and in Canada), and how governments, corporations, communities and individuals can begin to tackle the issue.

The better we understand the issue, the more effectively we can take action.

Overview

The Heat's On

What is climate change? From a global perspective, it's a shift in the general patterns of our climate: an average rise in worldwide temperature and changes in wind and ocean currents. At a regional level, climate change means a shift from normal weather parameters. A single, extraordinarily hot day in Saskatoon is not evidence of climate change, but a general trend to warmer summer temperatures could be.

So, is our climate in fact changing? The majority of scientists now agree that the answer is yes, and that human activities contribute to this change (Houghton *et al.*, 1996). Certain gases that are naturally present in the atmosphere help our planet maintain its comfortably warm environment: carbon dioxide, methane, nitrous oxide and water vapour (see sidebars). However, in the 120 years since industrialization we have been supplementing this natural "greenhouse effect". By burning fossil fuels and cutting down forests, we have been increasing the concentrations of greenhouse gases at a dramatic rate (see Figure 1) and have added new ones such as chlorofluorocarbons (CFCs). For example, between 1970 and 1992 alone, emissions increased by 17% worldwide and by 35% in Canada. The result is rising average surface temperatures on the planet, which in turn leads to rising ocean levels and may also increase extreme weather events, such as intense tropical storms, floods and droughts.

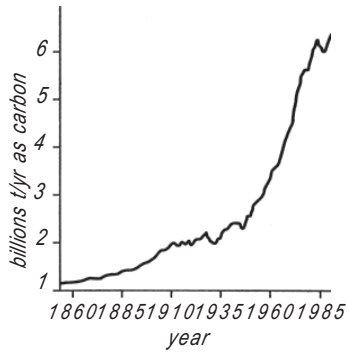


Figure 1: Global Carbon Dioxide Emissions Since 1860 (Source: Graves and Reavey, 1996)

Do We Need a Crystal Ball?

According to the Intergovernmental Panel on Climate Change (IPCC), an international panel of scientists created by the United Nations, the global average temperature is now 0.8°C above pre-industrial levels, and ten of the hottest fifteen years on record have occurred since 1990. Because life depends on a delicate balance, even an apparently minimal increase of 0.8°C can have an enormous impact.

While higher worldwide temperatures in the past century could simply represent natural variation, IPCC scientists agree the more likely explanation is that the earth is heating up – and the question is now how fast it's happening. To predict the rate of increase and its impacts, they have produced different climate change scenarios based on different levels of carbon dioxide emissions. These general circulation models (GCMs) suggest that if emission levels double by 2100, as they would if current trends continue unchecked, worldwide temperatures may increase between 1.7°C and 4.0°C from 1990 levels.

Not surprisingly, climate change is a complex area, and there are significant uncertainties involved in predicting the pace of change, the magnitude of the impact, and the effect on different regions. Despite these uncertainties, we need to begin taking action now. The implications of climate change are

Carbon Dioxide (CO_2): Carbon dioxide is the most common and most important of the greenhouse gases (other than water vapour). Its pre-industrial level in the atmosphere was about 280 ppmv. Human activity has pushed this concentration to 364 ppmv, as of 1997 (Ledley *et al.*, 1999). The main human sources of CO_2 include the burning of fossil fuels, the production of cement, and the destruction of forests to make room for agricultural land. Carbon dioxide remains in the atmosphere for between 50-200 years.

too serious to wait: in the earth's history, the most recent ice age was initiated by a temperature decrease of three to five degrees. We are already seeing more frequent and more severe episodes of extreme weather, in a pattern that may go beyond natural climate variability. Other consequences will include agricultural disruption, compromised human health, endangered wildlife, and rising ocean levels.

Moreover, as the earth's surface temperature warms, several positive feedback reactions may magnify the warming trend. Melting permafrost in the Arctic will release more methane gas from the frozen wetlands. As Arctic sea ice retreats, the water that takes its place is darker in colour and will therefore absorb more of the sun's energy. Coniferous forests spreading northward will also present a darker surface than snow. At the same time, boreal forests further south may die back, releasing carbon dioxide in the process and eliminating key carbon "sinks" or storage zones. Warmer ocean water may slowly reach its peak capacity to store atmospheric carbon. None of these positive feedbacks has yet been quantified, nor do the IPCC models take them into account. As a species, we may have set in motion a series of global interactions we can barely understand, let alone control.

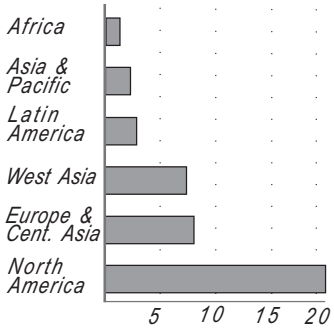


Figure 2:
Per Capita Carbon Dioxide Emissions from Fossil Fuels in 1995 (tonnes/year)
(Source: UNEP, 1999)

Who's Emitting What?

Between industrial sources and individual contributions, developed countries are the biggest culprits when it comes to per capita greenhouse gas emissions (see Figure 2). While Canadians pump out relatively few of the world's greenhouse gases in absolute terms, we are the second biggest contributors on a per capita basis, far outstripping Indians, Chinese, and Europeans.

In Canada, the biggest emitters by sector are transportation, industrial activities (fuel combustion and process emissions), electricity generation, and fossil fuel production and distribution (see Figure 3). Individuals account for about one quarter of Canada's total greenhouse gas emissions, largely through driving our cars and heating and cooling our homes (see Figure 4).

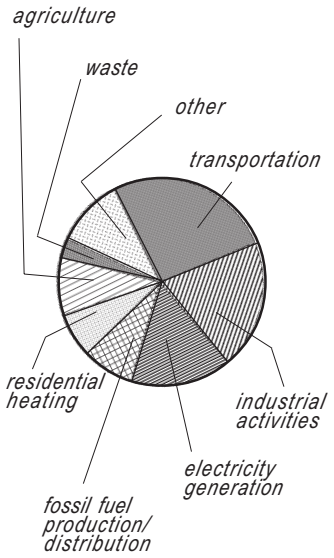


Figure 3:
Canadian Greenhouse Gas Emissions by Sector
(Source: adapted from Neitzert *et al.*, 1999)

Who Will Pay the Price?

Although industrialized countries release disproportionately high emissions, the impact will be felt around the world, and it is the developing countries that will have the least capacity to cope. For example, as surface temperatures go up, the water in the world's oceans expands. Historically, ocean levels have risen at a rate of 10cm per century – that rate has now nearly doubled to about 20cm in the last century (Houghton *et al.*, 1996; Foley, 1999). Currently, scientists predict a 50cm or greater rise by 2070, which would swamp several ocean island states entirely, such as Tokelau and the Marshall Islands, while others will be uninhabitable or too costly to protect (Bruce *et al.*, 1996). Many cities lie at sea level and will be threatened by increased water levels: New York, London, Bangkok and Charlottetown, to

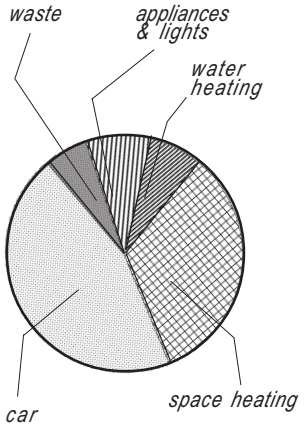


Figure 4: Individuals' Greenhouse Gas Emissions by Source. This graph may not be accurate in provinces (such as BC and Quebec) where a significant percentage of electricity is generated through hydroelectric projects. (Source: Greenhouse Gas Miser Committee, 1993)

Methane: Occurring in much smaller concentrations in the atmosphere (1.7 ppmv), methane's effects are about 20 times stronger than CO_2. This gas is produced when vegetation is burned, digested or rotted without the presence of oxygen. The major natural sources of methane include wetlands, termites, and the ocean itself. About 60-80% of current emissions are generated by human activity: the processing and distributing of fossil fuels; livestock and human digestion; and landfills. Fortunately, the atmospheric lifetime of methane is relatively short, between 12 and 17 years.

name a few. Salt water intrusion may threaten drinking and irrigation water in many delta nations, such as Egypt (Bruce *et al.*, 1996).

In some countries, rising waters are already placing an unbearable strain on the economy. Bangladesh, which regularly suffers from flooding anyway, may lose up to 11% of its land mass if the ocean rises by 45cm, costing the country at least 5% of its Gross Domestic Product and forcing 32 million people to relocate (Bruce *et al.*, 1996). Protection is possible, but increasingly costly, even for developed countries. Tropical storm surges will push water levels still higher, inundating more coastland. With 50% of its population living in threatened areas, Japan estimates that additional coastline protection will cost at least $80 billion. Countries without adequate financial resources, such as India, Indonesia and many African nations, face millions of refugees from coastal inundation.

Because of their very nature, extreme weather events are more difficult to predict and quantify. Worldwide, floods are now the most common and most costly natural disaster (Francis and Hengeveld, 1998). Other types of extreme weather events include tropical cyclones, hurricanes, windstorms, hot and cold spells and droughts. Tragically, those areas with fewer resources suffer disproportionately high fatalities. In 1998, a heat wave in Texas killed 100 people, while a similar spell in India cost 3,000 people their lives (Retallack and Bunyard, 1999). Resources for disaster prevention are also unequally distributed. In Manitoba, the Red River Floodway (built in 1968 for $68 million) protected the city of Winnipeg in the 1997 flood: without it, over 500,000 city residents would have been displaced and 80% of the city would have been submerged (Francis and Hengeveld, 1998). As it was, those outside the protected area were evacuated. Facing similar floods in 1998 and 1999, Venezuela, China and Bangladesh were without such protection, with catastrophic results.

Developing nations will also face more serious food shortages. In both temperate and tropical regions, the major factor affecting crop yields is likely to be rainfall: some areas will not receive enough and others, too much at once. Temperate zones can expect to maintain yields (provided they can sustain adequate irrigation during periods of drought), but tropical regions may be vulnerable to severe food shortages (Rosenzweig and Hillel, 1998). In addition, many pests and weeds may benefit from changing growing conditions, possibly out-competing food crops or forcing farmers to use greater quantities of pesticides. Even the most conservative estimates project a 6% increase in undernourished people by 2060; others forecast an increase as high as 50%, bringing the total number of people at risk from 530 million in 1990 to 941 million in 2060 (Rosenzweig and Hillel, 1998).

Around the world, humans will have to adapt to different living conditions. The infirm, the elderly and children will be most vulnerable to increasing pressure from heat waves, air pollution and other extreme, short-term events.

An increase in pollens due to warmer temperatures will cause more respiratory problems. Vector (or insect)-borne diseases of every kind will likely become more common throughout the globe; Indonesia, for example, is predicting its rate of infection from malaria to increase by about 20%, from 2,700 cases per 10,000 in 1989 to 3,200 cases in 2070 (Bruce *et al.*, 1996). Climate change is also creating a new class of refugees – masses of people forced to flee from devastation in their homelands. The Chinese government reports 30 million refugees from recent climate-related events, particularly flooding (Foley, 1999). By 2050, some scientists predict that 150 million people will be on the move searching for a home (Myers, 1993).

Just as humans suffer from the stress of extreme weather conditions, so too will animal populations. The most important factor affecting animal survival globally will be shifting habitat. For example, while forested areas may shift 160-640km poleward over the next century, most animal species historically migrate only 4-200km per century (Watson *et al.*, 1996). Some species could die out locally; others displaced by habitat change could in turn displace or out-compete resident species. How well and how quickly different species can adapt will determine whether they survive. The additional burden of dry spells, increasing forest fires, and drying aquifers will push many into extinction. For marine life, the most dramatic changes have been a regional die-back of zooplankton and coral reef, both mainstays of their local ecologies. The causes of the die-back remain unclear, although mounting evidence points to global warming (Graves and Reavey, 1996).

Nitrous Oxide:
Ordinarily, nitrous oxide is released by oceans, tropical soils and temperate soils. Its concentrations are very small, on the order of 0.31ppmv, and it remains in the atmosphere for about 120 years. Its effects are 320 times stronger than CO_2. The primary human source of nitrous oxide is agricultural soil (through fertilizing and converting land).

Chlorofluorocarbons (CFCs) and other Halogen Compounds:
Better known as ozone destroyers, CFCs are also pernicious greenhouse gases. Their effect on the atmosphere relative to their concentration is enormous. CFCs occur only in pptv but they are about 10,000 times stronger than carbon dioxide. More than this, they remain in the atmosphere for up to 100 years. The main sources for these gases are refrigeration, air conditioning, industrial solvents and teflon polymers. Other halogen compounds include CFC substitutes, such as hydrofluorocarbons (HFCs), and sulfur hexafluoride. Internationally, CFCs are being phased out under the Montreal protocol.

Implications for Canada

Although Canadians enjoy a relatively stable economy and good food security, climate change will have a dramatic impact over the next 50 years. Some changes, such as extreme weather events, are impossible to predict. Others can be foreseen. Canada-wide, average temperature increases will not be uniform: the northern and central regions are likely to suffer more extreme increases, in some cases up to 8°C. In the Arctic, scientists assume that permafrost melt will continue and that the zone of "discontinuous" or intermittent permafrost will disappear. Coastal communities in the north may be jeopardised by sea level rise, and overall precipitation may increase by 25% (Cohen, 1997; Maxwell, 1997). The Atlantic region may actually become cooler with climate change, but it will suffer from sea level rise, from changing fish habitats, and from unpredictable freezing and thawing in ocean waters, which is hazardous for shipping (Abraham *et al.*, 1997). Ontario and Quebec may have a longer growing season, but this advantage might be offset by the threat of drought in south-central Ontario. Ontarians may suffer from heat stress in addition to worsening air pollution. Great Lakes water levels may decline significantly (Smith *et al.*, 1998). Both Canadian and international studies predict that the Canadian prairies will be at risk from drought and heat, which may lead to crop reductions of as much as 30% (Herrington

et al., 1997; Rosenzweig and Hillel, 1998). Coastal British Columbia and the Yukon could face a sea level rise of 30cm in the south and 50cm in the north over the next fifty years. Flooding, landslides, and hydroelectric energy fluctuations are likely with increasingly intense winter run-off and glacier melt. Central BC, particularly the agricultural regions, faces the same risk of extreme drought as the prairies (Taylor and Taylor, 1997).

Working Together for Change

Ground-level Ozone: Adding as much as 20% to regional greenhouse effects, ozone in the troposphere is a by-product of sunlight and fossil fuel consumption. Its global effects have yet to be quantified.

Clearly, action must be taken worldwide if we are to prevent or lessen these impacts. Determining how quickly each nation must reduce its greenhouse gas emissions has been the focus of major multinational negotiations. These culminated in the Kyoto agreement of December 1997, which called for an overall emissions reduction among developed nations of 5.2% below 1990 levels by 2008-2012. Most developed nations, including Canada, have signed but not ratified the agreement (that is, given it parliamentary assent); Canada's commitment is to a 6% reduction by 2008-2012. The Canadian government has initiated a National Action Program on Climate Change that involves provincial and federal ministers of energy and the environment. A National Secretariat on Climate Change has also been established.

$C0_2$ Equivalency: Since not all greenhouse gases have equivalent effects, we express greenhouse gases in units of released carbon dioxide for convenience. To compare emissions levels, we measure carbon dioxide (or equivalents) by weight, in tonnes or kilograms.

Even though the Kyoto agreement is a good first step, the true ability of the world's nations to enforce the reductions agreed upon is unclear. Furthermore, the 5.2% reduction will not be sufficient to stabilize carbon dioxide levels in the atmosphere, since the target baseline (1990 levels) is still unacceptably high. IPCC scientists believe that reductions of up to 50% may be necessary to limit increases to a doubling of CO_2 in the atmosphere (Houghton *et al.*, 1996).

To make such a substantial reduction requires a restructuring of our daily lives and the way we do business. Still, even the current reduction commitment of 6% is viewed by some Canadians as a potential drag on the economy. IPCC economists rely on estimates that the worldwide costs of limiting emissions to 1990 levels could represent several percent of the world's total economic output, depending on the speed of implementing emissions reductions measures (Bruce *et al.*, 1996). In Canada, a recent cabinet document has called the emissions target "the most profound economic challenge since the Second World War" (National Post, Jan.13, 2000). In fact, Canada's emissions are projected to increase in the coming years. Thus, if no action is taken, the 6% reduction from 1990 will actually represent a cut of approximately 26% in 2010.

However, some emissions can be reduced using so-called "no regrets" or "worth doing anyway" strategies. These are measures – such as energy conservation and energy efficiency initiatives – which are inexpensive to implement and which deliver substantial savings. The IPCC estimates that 10 to 30% of current energy use can be saved at no cost, or even with a

slight economic benefit (Bruce *et al.*, 1995). While Canadian emissions have been rising steadily (despite commitments to the contrary), Europeans have already achieved significant reductions at little economic penalty, primarily through energy efficiency and a reorganization of tax structures. Moreover, there may be indirect economic benefits to reducing emissions such as jobs created in developing new technologies and conservation of energy.

Finally, the costs of reducing emissions must also be weighed against the costs of doing nothing: here, the insurance industry provides a sobering perspective. Worldwide, the Munich Reinsurance Corporation estimates that extreme weather damages in the last three years have cost over $200 billion per year, an enormous increase over previous decades; in Canada alone insurance companies and governments paid out $2.7 billion in 1998 (Francis, 1998; Retallack and Bunyard, 1999).

For Canada to meet or exceed its Kyoto commitments, we must act on several levels. Nationally and provincially, policymakers can choose from among many different strategies to reduce emissions. Some of these measures are regulatory, others encourage compliance, and still others aim to create a "market" for emissions reductions:

- a "carbon" tax, which places a tax burden on emitters
- economic incentives for alternative energy use (such as wind, solar) and use of less damaging fuels
- industry regulation ("polluter pays" principle)
- targeted regulation (phasing out particular gases through bans)
- international/domestic trade in emissions reductions
- reduction or elimination of fossil fuel subsidies
- increased funding for public transit
- more stringent energy efficiency standards for new appliances, equipment and buildings

Selecting the right tool (or tools) to reduce emissions must balance economic and ethical considerations. If Canada were to "buy" emissions compliance from the former Soviet Union, whose coal burning factories now sit idle, the reduction would exist only on paper. If the United States were to load its emissions-producing manufacturing offshore, responsibility must still accrue to the polluter and not to the host country.

At a municipal level, local governments can improve urban planning to reduce car dependence, set aside land for carbon "sinks" to offset emissions, and reduce methane emissions from landfill sites. Partners for Climate Protection, a Federation of Canadian Municipalities initiative, commits members to reducing greenhouse gas emissions by 20% from 1988 levels by 2005. Members include Montreal, Toronto, Ottawa, Regina, Edmonton, and Vancouver.

While governments and corporations must take a leadership role, individual Canadians are vital in reducing national emissions through lifestyle changes

Clarifying some terms:
Ozone depletion is a serious environmental problem, but not dependent on climate change. The stratospheric layer of ozone protects the earth's surface from harmful radiation. It has been threatened, scientists believe, by the release of chemical compounds called halocarbons (among them CFCs, which also act as greenhouse gases). Some of these ozone-destroying compounds are now being phased out across the world under the Montreal protocol.

El Niño events are blamed for some of Canada's unusual weather in recent years, but El Niño is not by itself evidence of climate change. This phenomenon is an infrequent, but regular shift in ocean currents that affects weather systems for about one year. Some scientists think we may be experiencing more frequent and more intense El Niño events because of warming ocean waters.

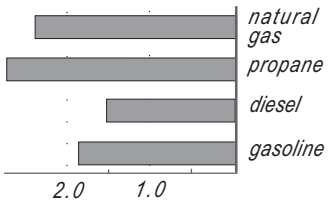


Figure 5:
Emissions Comparison of Transportation Fuels (kg of CO_2 per litre) (Source: adapted from Pembina Institute, 1997)

and participation in public decision making. Transportation choices, energy choices, preservation of greenspace, and other lifestyle choices can be combined with political support for national and global initiatives. Since the single greatest emitter in our daily lives is the automobile, it makes sense to consider how to reduce use, to improve fuel efficiency and to choose the least damaging fuel (see Figure 5). After transportation, heating and cooling our homes and workplaces is the second greatest source of emissions. We can reduce energy consumption in simple ways by switching fuels (from oil to natural gas represents a 20% emissions reduction); by using simple technologies like programmable thermostats and window shades to regulate temperature; by draft-proofing and insulating our homes; by choosing energy-efficient appliances and light bulbs; and by phasing in appropriate structural changes (high performance windows, shade trees to block direct sunlight, etc.).

Preserving greenspace in Canada will give the globe a boost, since greenspace absorbs carbon dioxide. Consumer choices, such as buying fewer, more durable goods; choosing products with less packaging; and purchasing local produce and goods to reduce transportation costs can reduce greenhouse gas emissions. These practical measures are not overwhelming, but they do involve changing the way we think about our daily lives. The Community Success Stories in the section that follows demonstrate practical possibilities for local change.

We must also *adapt* to a changing world: climate change is already upon us, and the benefits of reducing our greenhouse gas emissions will not be felt immediately. For example, we can ensure natural wetlands and floodplains remain intact to help protect us from floods.

In whatever way we choose to take action, we must begin now. It is becoming increasingly clear that we stand on the threshold of creating a catastrophe for our own habitat, the earth. The choices we make today, in both simple everyday life and in society as a whole, are critical. We know the problems, we have the means to deal with them, and future generations will judge us harshly if we fail to act.

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Houghton, J.T. *et al.*, eds. *Climate Change 1995: The Science of Climate Change. Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press, 1996.

Ledley, T.S., *et al*. "Climate Change and Greenhouse Gases," in *EOS* 80:39 (1999), p. 453.

Maxwell, Barrie. *Responding to Global Climate Change in the Arctic (Canada Country Study, Volume II).* Ottawa: Environment Canada, 1997.

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Retallack, Simon and Bunyard, Peter. "We're Changing our Climate! Who Can Doubt It?" in *The Ecologist* Vol 29, No. 2 (March/April 1999), pp. 60-64.

Rosenzweig, Cynthia and Hillel, Daniel. *Climate Change and the Global Harvest: Potential Impacts of the Greenhouse Effect on Agriculture.* New York: Oxford University Press, 1998.

Smith, Jamie *et al. Adapting to Climate Variability and Change in Ontario (The Canada Country Study, Volume IV).* Ottawa: Environment Canada, 1998.

Taylor, Eric and Taylor, Bill. *Responding to Global Climate Change in the BC and Yukon Region (The Canada Country Study, Volume I).* Ottawa: Environment Canada, 1997.

UNEP. *Global Environment Outlook 2000*. London, Earthscan Publications, 1999.

Watson, Robert T. *et al.*, eds. *Climate Change 1995: Impacts, Adaptations, and Mitigation of Climate Change. Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press, 1996.

Glossary

atmosphere: The thin layer of gases and particles that extends above the earth, with most of its total mass in the first 50 km above the earth's surface.

climate: Range of possible weather conditions usual for a particular region.

climate change: Changes in the trends of global weather systems. These include overall temperature (global warming), precipitation, ocean currents, winds and extreme weather events (such as hurricanes and droughts).

enhanced greenhouse effect: The intensification of the normal conservation of heat in the atmosphere due to excess greenhouse gases.

Global Climate Model/ General Circulation Model (GCM): A comprehensive mathematical model that attempts to calculate the movement of many elements of global climate (such as oceans and atmosphere). These models are also used for weather forecasting.

greenhouse effect: The warming function of the atmosphere that regulates temperature on the earth's surface by trapping radiation-absorbing gases.

ppmv: Parts per million by volume, the common unit for measuring carbon dioxide in the atmosphere. Some greenhouse gases are measured in pptv (parts per trillion by volume).

sink: A naturally occurring "storage" for greenhouse gases (particularly carbon dioxide). Oceans and rainforests are two vital sinks.

source: The term source in climate change refers to a greenhouse gas emitter, either from natural processes or human activity.

Purpose

In the following pages, you'll find lots of inspiring "success stories" – descriptions of projects that community groups across Canada and around the world have undertaken to reduce greenhouse gas emissions. We've chosen examples of projects on transportation, energy, industrial emissions, greenspace, agriculture, and education; and everything from small-scale, inexpensive initiatives to quite ambitious undertakings. Read on!

Introduction

We hope you'll find the success stories that follow provide you with inspiration, coupled with plenty of practical, nitty-gritty detail. Each of the profiles outlines the project, who was involved, what it cost, how long it took, what made it successful, what problems the organizers encountered ... all the information you'll need to determine whether your group could undertake something similar.

You'll also find a selection of excellent resources to turn to for more information at the beginning of each section. Below, you'll find some general resources on climate change you may find helpul.

General Climate Change Resources

Canadian Institute for Climate Studies
University of Victoria, 130 Saunders Annex
PO Box 1700, Station CSC
Victoria, BC V8W 2Y2
tel: 250-721-6236 / fax: 250-721-7217
email: climate@uvic.ca
www.cics.uvic.ca

David Suzuki Foundation
#219, 2211 West 4th Avenue
Vancouver, British Columbia V6K 4S2
tel: 604-732-4228
fax: 604-732-0752
email: stopclimatechange@davidsuzuki.org
www.davidsuzuki.org

Greenpeace Canada
250 Dundas Street West, Suite 605
Toronto, Ontario M5T 2Z5
tel: 416-597-8408
fax: 416-597-8422
www.greenpeacecanada.org

The Intergovernmental Panel on Climate Change (IPCC) Secretariat
c/o World Meteorological Organization
7 bis Avenue de la Paix, CP 2300
CH-1211 Geneva 2
Switzerland
tel: +41-22-730-8208
fax: +41-22-730-8025
email: ipcc_sec@gateway.wmo.ch
www.ipcc.ch/

International Council for Local Environmental Initiatives (ICLEI)
World Secretariat
City Hall, West Tower, 16th Floor
Toronto, Ontario M5H 2N2
tel: 416-392-1462
fax: 416-392-1478
email: iclei@iclei.org
www.iclei.org

National Climate Change Secretariat
55 Murray Street, Suite 230
Ottawa, Ontario K1N 5M3
tel: 613-943-2671
fax: 613-943-2694
email: secretariat@ccs.gc.ca
www.nccp.ca

Pembina Institute
Box 7558
Drayton Valley, Alberta T7A 1S7
tel: 780-542-6272
fax: 780-542-6464
email: info@pembina.org
www.pembina.org

Links:
Climate Change Solutions
www.climatechangesolutions.com

Climate Hot Map
www.climatehotmap.org

Climate Institute
www.climate.org

Government of Canada's Climate Change Web Site
www.climagechange.gc.ca
(or call 1-800-622-6232 for information on climate change)

US Environmental Protection Agency Global Warming Site
www.epa.gov/docs/oppeoee1/globalwarming
many publications and reports available for downloading

Transportation

Introduction

As individuals, the greatest way we can reduce personal greenhouse gas emissions is to get out of our cars. Almost half of the greenhouse gas emissions produced by individuals are from transportation, according to Environment Canada (www.climcalc.net/eng/localtravelFAQ_A3.htm). While a diesel city bus produces about 156 grams of greenhouse gases for every passenger travelling one kilometre, and a subway produces only 34 grams, one person travelling in a small car produces about 259 grams. And if the vehicle being driven is a mini-van, sport-utility vehicle or big car, that number jumps to 460 grams.

At a community level, we can help to reduce these emissions by making public transit more appealing (by increasing route frequency and improving transit connections, for example), by providing more facilities for cyclists (such as bike parking and employee changing rooms at workplaces, bike racks on buses and bike lanes on roads), and by planning higher density, mixed-use communities so they're not so car-dependent.

The following profiles describe how one bicycling group in Montreal turned the city into a very bike-friendly place, how a group of employers in Vancouver gave employees better ways to commute, how a group of Vancouverites reduced their car use by sharing a car, how a Quebec company keeps a car-free life possible, even for people travelling to other cities, and how a group of children are powering their own pollution-free school bus.

There are many other worthwhile transportation projects you can undertake to promote alternatives to the automobile, such as encouraging the municipal government to pass bylaws prohibiting drivers from idling their cars excessively or organizing a Bike to Work Week in your community or at your workplace. The resource list below will give you some great places to start.

Resources

Better Environmentally Sound Transportation
822-510 West Hastings Street
Vancouver, British Columbia V6B 1L8
tel: 604-669-2860
fax: 604-669-2869
email: best@best.bc.ca
www.best.bc.ca

The Centre for Sustainable Transportation
15-6400 Millcreek Drive, Suite 309
Mississauga, Ontario L5N 3E7
tel: 905-858-9242
fax: 905-858-9291
email: transport@cstctd.org
www.cstctd.org

Pollution Probe Foundation
625 Church Street, Suite 402
Toronto, Ontario M4Y 2G1
tel: 416-926-1601
fax: 416-926-1607
email: pprobe@pollutionprobe.org
www.pollutionprobe.org
publishes *ProbeAbilities* newsletter bimonthly

Transport 2000 Canada
111 Sparks Street, Suite 102
PO Box 858, Station B
Ottawa, Ontario K1P 5P9
tel: 613-594-3290
fax: 613-594-3271
info line: 613-594-3291
email: t2000@transport2000.ca
www.transport2000.ca
publishes *Transport Action*

Transportation Options
761 Queen Street West, Suite 101
Toronto, Ontario M6J 1G1
tel: 416-504-3934
fax: 416-504-0068
www.web.net/~detour
publishes *TransMission*, Canada's magazine of sustainable transportation, culture and environment

Links:
ecoRide – a Canada-wide internet ride-sharing service
www.ecoride.com

The Carsharing Network
www.carsharing.net

Active and Safe Routes to School (Walking School Bus)
www.goforgreen.ca/asrts
www.goforgreen.ca/active_transportation

Bicycle Crossings
Le Monde à Bicyclette, Montreal

Goal of Project:
To get cyclists across the St. Lawrence River, between Montreal and the South Shore.

Number of People-hours Involved:
Tens of thousands of hours. Most of the work was done by a core group of a few volunteers.

Length of Project:
About 10 years, all told.

Budget:
No specific budget for the project; Le Monde à Bicyclette's annual operating budget has varied widely over the years, peaking at $48,000.

Partnerships Involved:
The bike group South Shore by Bicycle.

Major Funders:
River crossings were paid for by municipal and federal governments.

In 1999, *Bicycling* magazine named Montreal the best cycling city in North America, citing its extensive bike paths, its thousands of convenient bike parking racks, its regulation requiring all new buildings to have bike parking facilities, and the cycling culture in the city (170,000 people in the greater Montreal area use their bicycles as their main means of transport). Montreal has Le Monde à Bicyclette to thank for that award.

1n 1975, remembers Robert Silverman, Le Monde à Bicyclette's cofounder and president, there were no cycling facilities. He and other cycling enthusiasts got together to change that. For 25 years, the group has fought tirelessly to promote and secure facilities for cycling. It won the right for cyclists to bring bikes on the subway, and it worked to have bike paths created. But its greatest achievement, says Silverman, was getting cyclists across the St. Lawrence River so they could travel between Montreal and the South Shore.

At the time, bicycles weren't allowed on the bridges and tunnels crossing the river, which the group thought was unacceptable. At first it staged "cyclodramas" to draw people's attention to the issue. Once, the group attempted to fly across the water with fake wings on their bikes. Once the group put bikes in a canoe and paddled across the water. One Easter Sunday a group member dressed as Moses and the rest of the group stood at the riverbank, asking Moses to part the water for them so that they could cross. Such dramas drew great media attention and public awareness. But they didn't get bicycles across the river.

So the group changed its tactics, and began getting letters of support. These proved surprisingly easy to obtain, remembers Silverman, because the idea of bicycle access wasn't a threat to cars. The group had a great cause, found sympathetic councillors, and presented civil liberty as well as ecological, economic and health benefit arguments.

Ultimately, the letters succeeded and resolutions were passed in support of a connection from Notre Dame Island to the South Shore by all 14 South Shore municipalities and by 18 provincial MNAs and 17 federal MPs in the region (there already was a bridge leading to Notre Dame from Montreal that cyclists could use). The City of Montreal and the provincial Ministry of Sports, Recreation and Fishing constructed a $600,000 causeway for cyclists and pedestrians connecting Notre Dame Island to the South Shore, which opened in May 1990 – nine years after the group started lobbying for it.

Cyclists are now also able to cross the river at Nuns Island, using Champlain Bridge, and money has been allocated for a bike lane on Jacques Cartier Bridge. As well, there are two privately run pedestrian/cyclist ferries that take people across the river.

Those wins required thousands of hours of effort, over many years. The struggle consumed the small core group of activists. "It was our life," recalls Silverman. "We were boiling mad all the time." To fund its activities, the group got some government grants and sold t-shirts and calendars. Over the past few years, the group has become smaller, largely because it has achieved many of its initial goals and many bicycle commuting facilities now exist.

The greatest roadblock to these changes, according to Silverman, was government opposition at the time, based on resistance to seeing the world in a different way. Slowly, attitudes began to change. Government officials started to see more people biking, including their own children. As well, they began to see the tourist value of having bike facilities and bike lanes. As society's attitudes changed, so did the officials'. Now, the government is much more progressive and the current mayor is himself a cyclist.

But what hasn't changed is Silverman's dedication to the cause. While he feels good about the accomplishments the group has had, he's not satisfied. He wants to increase bike access on the commuter train and get bike racks on buses. How does he keep going? "Cyclefrustrations – that's the fuel."

Contact Information:
Le Monde à Bicyclette
11 Jean-Talon est, bureau 135
Montreal, Quebec H2R 1V5
tel: 514-270-4884 / fax: 514-270-9190
email: lemab@cam.org
www.cam.org/~lemab/

Transportation Demand Management
Cambie Corridor Consortium, Vancouver

Goal of Project:
To reduce by 20 percent the number of single-occupancy vehicles commuting in the Broadway-Cambie corridor of Vancouver.

Number of People-hours Involved:
Volunteers worked 300 hours to get the project off the ground, and a paid co-ordinator currently works about 40 hours a week to maintain it. A volunteer board of 12 meets monthly to oversee the project.

Length of Project:
Work began on the project in 1993. The project officially got underway in 1995 and is ongoing.

Budget:
About $45,000 a year.

Partnerships Involved:
In-kind contributions and support from the members of the consortium.

Major Funders:
Environment Canada supplied start-up funding, and the City of Vancouver funded the production of educational material.

A few years ago, employers in Vancouver's central Cambie-street area looked out their windows and didn't like what they saw. The area is a growing business district and every day, 10,000 cars commute into the area, 80 percent with just one person in them. The result is clogged streets, polluted air and traffic noise.

So employers and staff from six major workplaces in the area got together and formed a transportation management association, the first in Canada, called the Cambie Corridor Consortium. The group met monthly for almost two years to set up the non-profit organization. After securing start-up funding, it launched the program in September 1995.

The consortium now has 20 member organizations, representing 25,000 employees. Bett Lauridsen is the Transportation Management Co-ordinator and the sole paid staff. She is aided by a board of directors and by volunteer "go green co-ordinators" at each member organization. "Everything I do is to try and help somebody see there's another way to get to work," says Lauridsen.

The consortium works to make it easier for employees to use alternative transportation. It has set up an information kiosk at one of the work sites where people can access information on alternative modes of transportation, pick up consortium brochures and ask Lauridsen questions. The consortium

brings together interested car-poolers and also offers bus passes at a 15 percent discount, deducting the cost from employees' paycheques. Some of the consortium members provide secure bike lockers and showers for cyclists. The consortium prepares transportation demand management plans for its member organizations and holds transportation fairs at each site at least once a year.

One of the group's most successful ventures is its interhospital shuttle. Every half-hour between 7 a.m. and 5 p.m. Monday to Friday, three seven-passenger vans and two 15-passenger vans run between the hospitals in Vancouver, carrying staff, physicians and students, who often have to go to different hospital sites during the day. There are four shuttle routes, each running between two major hospitals, with stops at other hospitals along the way. The shuttle is free for employees, but costs employers about $3.40 for each trip, $10 less than they pay for employees who drive between sites. The vans also carry equipment and other courier items, for free, between hospitals, saving employers courier costs.

Vada White, a Patient Services Manager at the Vancouver General Hospital and the hospital at the University of British Columbia, uses the shuttle two or three times a week to get between job sites. "It's wonderful, I couldn't function without it," she says. If the shuttle wasn't around, she says, she'd either be driving or taking taxis between locations.

While the consortium hasn't met its target of reducing the number of single-occupancy vehicles in the Broadway-Cambie corridor by 20%, it can still be considered a success. The interhospital shuttle carries 150,000 passengers a year, people who would otherwise be driving their cars to and from work sites. According to a survey conducted for the consortium, 85 percent of shuttle passengers who drove to work now leave their cars at home because of this service. The shuttle has couriered 43,000 items between hospitals since beginning in 1998, taking thousands of courier trips off the road. Since the consortium began its work, commuting via transit, walking and cycling has increased in the Cambie corridor. A Vancouver Hospital survey reveals the percentage of their commuters walking to work has increased over the past couple of years and is now more than double the regional average. The percentage who cycle to work has also increased and is now about three times the regional average, due in large part to the consortium's programs.

Contact Information:
Cambie Corridor Consortium
c/o Vancouver General Hospital
First Floor, Centennial Pavilion
899 12th Avenue
Vancouver, British Columbia V5Z 1M9
tel: 604-875-4118
fax: 604-875-4608

Railway Branch Line Preservation
Magyar Közlekedési Klub (Hungarian Traffic Club), Hungary

Goal of Project:
To save Hungary's railway branch lines from closing

Number of People-hours Involved:
The group itself spent thousands of hours working on the project, and the country's seven railway unions each had office staff committed to this issue.

Length of Project:
The project began in 1993 when the government announced plans to close the branch lines. A year later the government ended its plans, but the traffic group continues to this day to work on this project, as the topic resurfaces from time to time.

Budget:
There was no separate budget for this particular project, but costs included staff time, printing and distributing flyers and posters, and travelling.

Partnerships Involved:
The group worked with the seven railway unions, the railway workers and their affected families, and local governments.

Every day, 300,000 cars flow into downtown Budapest from the city outskirts and surrounding towns and villages. Although the Hungarian Traffic Club isn't happy about that number, the group knows it could be even greater.

In 1993, the national government announced plans to close 3,000 km of railway lines in Hungary, almost 50% of the railway network. Commuting students, workers, and people travelling from isolated areas of the county used the lines, but passenger traffic was generally light and there was no freight traffic. Most of the lines were not maintained well.

The Hungarian Traffic Club didn't want to see the branch lines closed, recalls Ferenc Joo, the national secretary. "We thought that it doesn't make sense to close the lines, both from an environmental and a sociological perspective. The environmental reasons are quite clear: the railways are more efficient, they pollute less, their capacity is bigger, their consumption of space and energy is less than roads." They also wanted to preserve the railway's rights of way for any future rebuilding. The group felt there was a need to preserve even the less busy lines, since they provide a crucial service to those people who do use them.

"Once trains are gone, people get more dependent on their cars, which increases car culture and that has an overall adverse effect on the environment," Joo explains. Since 1989, when Hungary's political and economic transition began, transportation habits have shifted towards a greater reliance on private vehicles. The number of motorcars has tripled in Hungary in the

last 20 years, according to the national statistics agency. In many places in Budapest, the level of air pollution is much higher than permitted by the Hungarian health standards, and the number of people suffering from asthma and lung cancer has risen 12-fold and threefold, respectively, since 1980.

Luckily, the Hungarian Traffic Club wasn't the only group that felt the lines should be preserved, recalls Joo. "Even the people who like to drive a car, they thought that closing half of the railway lines was senseless."

The group, working with railway unions and railway workers, tried to mobilize people around the issue. They wrote articles, conducted interviews, approached decision-makers in the government, media, and schools, and put up posters. They also contacted other European NGOs for support. The group issued common statements with its partners to create a strong, united front. Although they didn't encounter any big roadblocks, the group did have to work hard to make its point. In the end the government decided not to close 95% of the lines. Joo is still justifiably pleased with such a significant accomplishment: "We feel proud and I feel excited, as I love the railways very much."

The Hungarian Traffic Club was created in November 1991 by the Clean Air Action Group, a national umbrella of Hungarian environmental NGOs, to promote transportation solutions that are better for the environment and human health. Through the fight against branch line closures, the traffic group learned how strong the road lobby is and how much control big national companies, such as the state railway company, can wield, says Joo. They have also learned that democracy doesn't guarantee that decisions will be made in the public interest.

The group continues to push for sustainable transportation by publishing 4,000 copies of its magazine *Breath* every month, regularly participating in government committee meetings, and organizing meetings, press conferences, campaigns, and transportation conferences.

And they continue to fight the threat of railway line closures. The number of rail passengers has stayed more or less the same since the 1990s, so the threat of shutting down less popular lines remains. The group is pushing for the government to improve the train infrastructure and make train travel more attractive, for example by coordinating bus schedules with train schedules so commuters aren't faced with lengthy waits for connections.

Contact Information:
Ferenc Joo, National Secretary
Hungarian Traffic Club
H-1465 Budapest, Pf. 1676.
tel: 36-1-361-3630 / fax: 36-1-365-0438
mkk@levego.hu

Ride-Sharing between Cities

For people without a car, travelling between cities can be a hassle (and an expensive one at that!). In Quebec, people would often "auto stop," or hitchhike. But now there's Allo Stop, an organization that links up passengers and drivers who are going to the same destination. The process is simple. Passengers and drivers submit ride requests or offers to Allo Stop. Allo Stop connects the people and off they go! There are always at least two passengers in the car with the driver to ensure personal safety. Passengers benefit because the ride is cheaper than other modes of travelling (a trip to Ottawa from Quebec costs just $29). Drivers benefit because they receive money for the trip ($51 for three passengers from Ottawa to Quebec, for example). Allo Stop opened its first office in 1983 in Montreal. There are now nine more – in Quebec, Sherbrooke, Rimouski, Chicoutimi, Jonquiere, Toronto and Ottawa – and 60,000 members take advantage of its services.

Contact Information:
email: info@allostop.ca
www.allostop.ca
Each Allo Stop office has own phone number.

Car-Sharing

Studies have shown that people who share a car use it less than people who own one outright. The Co-operative Auto Network, which began in Vancouver in 1997, has used that knowledge to free 450 people of their car dependence. These co-op members share 26 cars between them, mostly sedans but also some mini-vans and a truck. The cars are located in neighbourhoods across the city (as well as in two locations on Vancouver Island). The cars are kept in parking lots and people simply call the co-op to book a car. Keys are kept in a special lock box attached to the car. The group plans to purchase more cars this spring to bring the driver-car ratio down to eight-to-one. Co-op members pay a $500 refundable member share plus a monthly fee, and are billed for each kilometre driven. The co-op received start-up funding from the federal government and from the local credit union, but it is now self-sufficient. Car-sharing programs also operate in Montreal, Quebec City, Victoria, Kitchener/Waterloo, Toronto, and are in the works in several other cities.

Contact Information:
Co-operative Auto Network
209-470 Granville Street
Vancouver, British Columbia V6C 1V5
tel: 604-685-1393
www.cooperativeauto.net

Walking School Bus

According to an Environics survey, 68 percent of Canadian children have a walk to school of 30 minutes or less, but only 36 percent actually do walk. Thanks to Greenest City, this percentage is growing. Greenest City started the Walking School Bus program in Toronto several years ago and the program is spreading across the country. A walking school bus works just the way it sounds: one or more parents walk a designated route to school every day. They pick up children along the way and escort them safely to school. For safety and security, the ratio of children to adults is kept at four-to-one or lower, and the "drivers" wear a yellow scarf to identify themselves. The program provides children with safe, active, sustainable transportation to and from school. For those interested in starting a walking school bus program in their community, Greenest City has prepared a guide explaining how to go about it.

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Energy

Introduction

Energy production and energy use are two of Canada's biggest sources of greenhouse gas emissions.

At home and in the workplace, conserving energy is a question of turning down the thermostat, keeping the house well insulated, insulating hot water tanks, turning off unnecessary lights and choosing energy-efficient appliances. Homeowners can switch to energy sources that produce lower greenhouse gas emissions by converting to natural gas from oil or by choosing renewable sources of electricity, such as wind or solar power, where the option exists (residents in Alberta, for example, can purchase "green" electricity from their utility for a small premium).

The following profiles look at how Toronto retailers are becoming "atmosphere-friendly," how Saskatchewan schools are reducing their energy use, how Edmonton is heating homes with landfill gas, how Cornwall residents have spent millions making their homes more energy efficient and how Yukon is taking advantage of the wind. Other worthwhile projects you could undertake to reduce your greenhouse gas emissions from energy use include promoting wind energy in provinces like Alberta and Ontario that are deregulating their electricity markets.

There are lots of resources available to assist you in becoming more energy efficient. In addition to the organizations listed below, many communities offer some kind of home green-up program, and your local utility company is a good source of information.

Resources

The Pembina Institute
Box 7558
Drayton Valley, Alberta T7A 1S7
tel: 780-542-6272
fax: 780-542-6464
email: info@pembina.org
www.pembina.org

Canadian Renewable Fuels Association
31 Adelaide Street East
PO Box 398
Toronto, Ontario M5C 2J8
email: publicinfo@greenfuels.org
www.greenfuels.org

Canadian Wind Energy Association
3553-31 Street NW, Suite 100
Calgary, Alberta T2L 2K7
tel: 800-922-6932
email: canwea@canwea.ca
www.canwea.ca

Green Communities Association
432 George Street North, Box 928
Peterborough, Ontario K9J 7A5
tel: 705-745-7479
fax: 705-745-7294
email: cmaynes@gca.ca
www. gca.ca
published *How to Grow a Green Community* by Clifford Maynes, 1997, Green Communities Association

Office of Energy Efficiency (Natural Resources Canada)
580 Booth Street, 18th Floor
Ottawa, Ontario K1A 0E4
fax: 613-943-1590
email: general.oee@nrcan.gc.ca
oee.nrcan.gc.ca

The Solar Energy Society of Canada Inc.
PO Box 33047
Cathedral PO
Regina, Saskatchewan S4T 7X2
email: info@solarenergysociety.ca
www.solarenergysociety.ca

Links:
Renewable Energy and Sustainable Energy Systems in Canada
www.newenergy.org

U.S. Department of Energy, Energy Information Administration
www.eia.doe.gov

U.S. Environmental Protection Agency's Global Warming Site
www.epa.gov/docs/oppeoee1/globalwarming
many publications and reports available for downloading

Publications:
Greenhouse Gas Miser Committee. *Greenhouse Gas Miser Handbook.*
Downsview: Canadian Climate Centre, 1995.
available online at www.ns.ec.gc.ca/co2.greenhouse1.html

No Energy to Waste
Greenest City, Toronto

Goal of Project:
To develop incentives, services and programs that address and overcome barriers to retailer participation in energy management initiatives and to promote "atmosphere-friendly" environmental citizenship.

Number of People-hours Involved:
A paid co-ordinator works two days a week on this project (prior to January 2000, she worked one day a week). Greenest City's program co-ordinator spends between 1/2 and 3/4 of a day each week working on the project.

Length of Project:
The project began at the end of 1998. It was on hold during the summer of 1999, restarted in the fall of 1999, and is scheduled to finish in June 2000.

Budget:
$29,000 in cash from funders, for 1.5 years, $8,000 of which is set aside to advertise the retailers once they've completed the project.

Partnerships Involved:
City of Toronto's Energy Efficiency Office has provided information and training on audits. Kendall-Wright Interior Design will show retailers how to make their doors and windows more appealing while reducing energy use.

Major Funders:
City of Toronto's Atmospheric Fund and the Climate Change Action Fund.

It started out with an observation: retailers keep their doors open year-round to entice customers inside. Air-conditioned cool air ends up blowing outdoors in the summer; heated air blows out in the winter. What a waste! This observation has led to the creation of a pilot project called No Energy to Waste to involve retailers in energy reduction by addressing behaviour changes, store policies, equipment retrofits and symbolic gestures.

The project is being run by Greenest City, a grassroots environmental organization in Toronto. The project has three components. In the first part, Greenest City contacts retailers and performs energy audits. In the second, it provides retailers with information documenting their energy use, suggests ways to reduce energy use and estimates the potential greenhouse gas reductions these changes would achieve. In the third, retailers sign an agreement with Greenest City to make at least three of the recommended changes.

There are many possible ways retailers can improve energy efficiency, says project co-ordinator Melanie Sherwood. These range from replacing old fluorescent or incandescent lights with energy-efficient and compact fluorescent lights, to insulating ducts on hot water tank, to using bike couriers, to keeping the door closed during heating and air conditioning seasons.

Sherwood calculates retailers can reduce electricity bills by at least 10%, with most hardware changes involving a payback period of a couple of years.

Greenest City has contacted 40 retailers so far. Fifteen have had preliminary audits and are continuing through the rest of the program. Most participants are in stage two, and one has completed a lighting retrofit. The group hopes to have 15 retailers through the project by June 2000 and to reduce each retailer's greenhouse gas emissions by approximately 15,000 kilograms annually. Sherwood says there's been a great deal of interest in the free audit, but the group has been hampered in its efforts by its lack of staff.

So far, Sherwood has advertised the program by popping into stores and by cold-calling retailers. She has also talked to many business improvement associations and written letters to municipal councillors, asking them to suggest retailers in their ridings. She is currently training several volunteers to talk to retailers about the program.

While there's been interest in the audits, there are some barriers to participation. Some retailers are very concerned about the importance of store lighting in attracting customers and don't want to save a couple of dollars if it will hurt their sales. For some, the cost of the changes is prohibitive. In general, things are complicated by the fact that many retailers rent their space. Retailers usually pay the utility bill, so they have a direct interest in reducing lighting costs, but heating costs are usually rolled into the monthly lease rate, so it's harder for a retailer to see the savings benefits.

Sherwood is trying to overcome these barriers by working to convince retailers there are highly effective lighting systems that are more energy-efficient, trying to find ways to help them finance energy-saving changes, and offering to act as a liaison with landlords to help work out energy-reduction solutions. Greenest City rewards participation by giving retailers who complete the project a colourful "Atmosphere-Friendly Retailer" sign to hang in their window and free advertising promoting their involvement in the project.

Sherwood notes that one of the primary goals of the pilot project is to identify these barriers. That was why funders supported the project. "It was new, it was different, it was targeting a new area," says Sherwood. "It is a difficult sector and funders are interested in seeing how retailers can be approached and what works."

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www.greenestcity.com

Destination Conservation
Saskatchewan Environmental Society, Saskatchewan

Goal of Project:
To reduce energy and resource wastage in school buildings; to increase awareness of the schools' energy and natural resource requirements as compared to actual consumption; to increase awareness of how energy and natural resource use affects the environment.

Number of People-hours Involved:
The environmental society employs a co-ordinator who works between 1/4 and 1/2 time, depending on the number of school divisions involved at any given time. A school's custodial and technical staff are busy implementing changes in the first year of the program. A private company spends a day at each school conducting an engineering audit. The time teachers and students spend on the program varies.

Length of Project:
The society has run the program since 1991. The program at each school lasts three years.

Budget:
The program carries a price tag of $1,500 to $2,000 in start-up costs for each school in the first year. Those costs – borne either by the society or by school divisions – are recouped in energy savings.

Partnerships Involved:
Partnerships with schools and school divisions, ongoing assistance and mentoring from the Destination Conservation Program in Alberta, SaskPower's Energy Solutions.

Major Funders:
Saskatoon Foundation, the Molson Companies Donation Fund, Petro-Canada, Estevan Coal, Prairie Coal, SaskEnergy, and the Saskatchewan Outdoor and Environmental Educators Association helped fund the program in the past. Currently, the program is self-financing.

In Saskatchewan, the Three Rs of education – reading, 'riting and 'rithmetic – have joined forces with the Three Rs of ecology – reduce, reuse and recycle. Destination Conservation is a three-year program run by the Saskatchewan Environmental Society that works with schools to reduce their energy, resource and water use, both through education and technical assistance.

On the technical side of things, a private company conducts an engineering audit of a school's energy and water conservation potential, identifying potential conservation measures. The changes suggested for the first year of the program involve little or no cost – switching to lower-wattage bulbs or manually controlling the heating and ventilation systems, for example. Year-one savings help to pay for retrofits in year two. Year two involves more

expensive changes such as purchasing timers for electric hot water tanks and insulation blankets for gas tanks. A significant portion of year-two savings are then invested into retrofits in the third year of the program. A small percentage of the savings each year helps pay the Society for administration.

"Once people figure out that getting savings from energy conservation is a lot simpler than they think, they tend to get very enthusiastic," says Margret Asmuss, Destination Conservation Co-ordinator. People then begin to look at the big picture of reducing their use of resources, she says.

The program also offers educational assistance, working with a teacher to involve a conservation club or class in activities to promote conservation. The society provides lesson plans that can be integrated into science classes, and materials to help students conduct water, energy and waste audits and determine what type of behavioural changes they wish to promote. Students can put up "lights-out" stickers, do presentations at assemblies, write articles, set up education bulletin boards and conduct "waste-free lunch" campaigns.

The society established a pilot program in 1991 with eight schools after observing Destination Conservation's success in Alberta. (The program began in Alberta and is now running across the country.) Now, almost 70 schools have finished Destination Conservation, attracted by word-of-mouth advertising, and it's one of the society's biggest programs.

And it's certainly made a difference. Reductions in electrical consumption range between eight and 10 percent in the first year of the program. Further reductions of between 10 and 15 percent are achieved in years two and three. The 67 schools that had completed the three-year program by January 1999 had saved a cumulative total of $564,884 and 4,632 tonnes of CO_2.

It may have even more impact in the near future. SaskPower's Energy Solutions has committed to working as partners with Destination Conservation, offering school divisions the option of having their schools audited and retrofits financed through the Energy Solutions Program. The society will continue to provide the educational part of the program. Asmuss is excited about this new direction, because it allows the society to expand into larger schools divisions and potentially into commercial and institutional facilities – taking education out of the classroom and into the workplace.

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Saskatchewan Environmental Society
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email: saskenv@link.ca
www.lights.com/ses

Home Tune-Ups
Cornwall Energy Efficiency Team, Cornwall ON

Goal of Project:
To reduce the community's overall energy consumption by 15 percent.

Number of People-hours Involved:
The program involved a volunteer eight-member board that met every two weeks and a volunteer environmental committee that met monthly. At the program's peak, there were 16 staff doing home tune-ups, an administrator and a co-ordinator working full-time. As well, one person was paid part-time to give presentations at schools.

Length of Project:
The program was launched in the fall of 1991 and finished in January 1999.

Budget:
$4.5 million over the course of the program. One year, the annual budget hit $1 million. On top of this cash, there were many in-kind donations.

Partnerships Involved:
Partnerships with Cornwall Electric, Centra Gas (the local gas company), City of Cornwall, the Kiwanis Club, the Rotary Club, the Catholic School Board, the Public School Board and the Chamber of Commerce.

Major Funders:
The Ontario Ministry of Environment and Energy (through its Green Communities Fund) and Human Resources Development Canada.

There can't be many people left in Cornwall who don't know how to cut their energy consumption. Over a period of eight years, Cornwall's Energy Efficiency Team conducted "home tune-ups" on almost 70 percent of the homes in this Ontario community of 60,000. In doing so, it reduced the community's overall energy demand by over 15 percent. In addition, the tune-ups on more than 15,000 homes have so far generated over $20 million worth of renovation work.

"It's mind-boggling. People are still working on the menu of activities that we suggested they carry out to upgrade their homes six or seven years ago," says Ron Eamer, Cornwall Electric's Superintendent of Customer and Energy Services and the project initiator. "We've changed the attitude in the community to the point where people do understand energy efficiency." The program was terminated in January 1999 due to a lack of funds.

Eamer organized the energy efficiency team. He brought together a local group made up of people from the gas company, school boards, service clubs, the Chamber of Commerce and the City to work as partners with Cornwall Electric on this project. The partners offered financial support and he found matching funding from the provincial government to get the project started.

Home Tune-Ups
Cornwall Energy Efficiency Team, Cornwall ON

The Energy Efficiency Team was successful from the word go. A small article in the local paper announcing the launch of the home tune-up program brought in 1,200 calls in 48 hours.

Throughout the life of the program, the energy efficiency team didn't have any problem finding interested homeowners. Word-of-mouth was a very important component of advertising. The team did advertise in the paper from time to time, securing funds from its suppliers to help pay for the ads. In addition, the team celebrated every milestone it had, says Eamer. The group held Breakfasts of Champions with civic leaders, which always created media publicity. As well, the team brought the issue of energy efficiency into the schools by hiring a teacher-in-training to take her old dollhouse into classrooms and talk to students about reducing home energy use.

For the free home tune-up, a two-person team went into homes, auditing energy use and making recommendations on how to reduce that use. The team always sat down with the homeowner and explained the recommendations' rationale and payback period. The team installed new showerheads, tap aerators, a water heater blanket, pipe insulation, high quality weather-stripping on doors, and air seals on outside-wall receptacles during the tune-up. Eamer felt strongly that it was necessary for the team to "do something" for the homeowner, not just leave them a list. He is a hands-on person and felt that if the team started the energy reduction work, homeowners would carry on with it. His strategy worked. Comment cards left with the homeowners were sent back with positive feedback, and follow-up surveys found that homeowners were carrying out the recommended work.

And not only did homeowners respond strongly, funders did too. Eamer recalls one year when he went to the provincial government asking for $300,000. The government gave him $700,000.

The energy efficiency team was a separate entity from Cornwall Electric, although it received strong in-kind support from it. Cornwall Electric supplied the team with office space, workshop space, vehicle storage and access to office machines and postage.

Eamer feels the program was such a great success because it operated in a small town, where it could easily gain a high profile. It was also successful because it had a committed team of partners and because Eamer continually championed the program.

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Landfill Gas Recovery
EPCOR, Edmonton

Goal of Project:
To use landfill gas to generate electricity.

Number of People-hours Involved:
This project was one part of several people's jobs.

Length of Project:
EPCOR began generating electricity with landfill gas in 1992. The project is expected to continue until 2011.

Budget:
About $3.5 million.

Partnerships Involved:
Environmental Technologies, Inc., a Calgary firm, originally approached EPCOR with the landfill-to-energy idea in 1991 and the two companies worked in partnership to make the project happen. EPCOR bought the collection, purification and distribution system from Environmental Technologies in 1996.

People in Edmonton believe in reincarnation – of garbage.

Since 1992, Edmonton's old garbage has been given "a new life" as electricity. The city has been using the methane gas in its landfill – produced from rotting materials – to generate electricity. The project has greatly reduced greenhouse gas emissions and created a transferable model other cities can adopt.

Opened in 1975, the city's landfill is an active, partially capped landfill that today holds over 12 million tonnes of waste. Methane gas from the capped section of the landfill is piped into the natural-gas-fired Clover Bar Generating Station, which is just three kilometres away. The station is owned by EPCOR, Edmonton's power utility.

With the landfill so close to the station, the project was a great idea, says Doug Heaton, EPCOR's Manager, Project Development, who was involved with the project from its beginning. The project made perfect sense because methane is the primary constituent in natural gas. The methane gas, derived primarily from the breakdown of cellulose products like paper and lumber, is collected from a series of wells joined to a collection system that takes the gas to a purification plant. Following purification, the gas is delivered to the generating station.

Technically, the process was pretty straightforward. But, says Heaton, there were other stumbling blocks – namely, people's attitudes about the gas. The generating station objected to the impurities in the gas. It disliked the presence of hydrogen sulphide, even though the hydrogen sulphide wouldn't

affect gas production, because it was worried sulphuric acid might form and corrode equipment. After Heaton agreed to purify the gas and reduce the hydrogen sulphide level to that of natural gas, the generating station agreed to take it.

The station takes basically all the accessible gas the landfill produces, and while the gas makes up only one to two percent of the plant's power, the amount is large enough to have resulted in some substantial greenhouse gas savings. At 75,000 cubic metres a day, the landfill gas is supplying enough energy for 4,000 homes. That's taking the equivalent of 155,000 tonnes of carbon dioxide out of the atmosphere each year.

EPCOR has received a great deal of interest in its project from the public and from governments. Heaton has given many talks about this project to schools and professional associations. "People are quite fascinated that it's even happening. When they hear what we're doing, how it's a win-win situation, they're intrigued, they're very, very supportive," he says. EPCOR's project is unique in Canada. While there are 33 projects across Canada collecting landfill gas, almost all of these projects flare the gas; a few are generating power, but none are adding landfill gas to a natural-gas-fired generating station.

EPCOR hasn't yet helped anyone else to set up a similar gas-to-electricity project because right now the project is only viable for the country's few large landfills. The project cost EPCOR about $3.5 million, a cost it has just now recouped. The payback period for a project like this depends on the cost of natural gas, as the gas is sold to the generating station at a percentage of the price of natural gas. Currently the scheme isn't financially viable for smaller landfills because they wouldn't produce enough gas to pay for the project in a reasonable amount of time. But the proposed CO_2 credit program might make this project more attractive to smaller landfills, because landfills could apply the credits to their income statement once the rules determining tradable credits, and the commodities markets, have been established.

Heaton is a strong advocate of this project. "It's one that you can feel proud of being part of, because you're actually doing something. I sure am glad we're doing what we're doing."

Contact Information:
Jeff Bradshaw, Manager, Landfill Gas Services
EPCOR Technologies Inc.
13410 St. Albert Trail
Edmonton, Alberta T5L 4P2
tel: 780-412-3847 / fax: 780-412-3804
email: jbradsha@epcor-group.com
www.epcor-group.com/Environment/default.htm

Solar Electrification Pilot Project
Solar Electric Light Fund, Uganda

Goal of Project:
To install solar home systems in 100 homes in rural Uganda

Number of People-hours Involved:
Unknown

Length of Project:
After the homes were built in 1996, they were fitted with solar home systems.

Budget:
Unknown

Partnerships Involved:
Habitat for Humanity International built the homes in which the solar home systems were installed; Solar Energy for Africa, a Ugandan company, supplied the systems; Energy Alternatives Africa, a Kenyan company, provided technical assistance and project monitoring.

Things are looking bright for a group of homeowners in Uganda who have traded expensive, polluting energy sources for solar electric power.

In a pilot project, 100 rural Ugandan homes were equipped with solar home systems financed by the Solar Electric Light Fund (SELF), an American charitable organization. Rural homeowners, being off the power grid, normally rely on kerosene, candles, and dry-cell batteries for power. "In some cases, they're using car batteries to watch television," says Bob Freling, SELF's executive director.

The new solar home systems have a 50-watt solar panel that converts sunlight to clean electricity. They have a battery that stores the electricity, a charge controller that protects the battery from being overcharged or over discharged, lighting, and switches. Solar systems today are cheap, efficient, dependable, environmentally friendly, and cheaper to maintain than fuel and thermal generators.

The project has benefited homeowners in several ways. Because solar power replaced kerosene, it has improved people's health. Burning kerosene hurts the lungs and the eyes and is a major reason respiratory illnesses are so common in the developing world. The project also has had social benefits, because having electric light enables people to gather with friends in the evening, read with their children, or even work.

Of course, the project has had a strong environmental benefit as well. "We're using what is arguably the cleanest source of electricity: solar electricity. There's no burning of fossil fuels, so it is really allowing these people to participate in a higher quality of life without damaging the environment," says Freling.

The program was funded by a grant from the U.S. Department of Energy's office of solar energy conversion, but it relied on local partnerships for success. Habitat for Humanity International built the homes. Solar Energy for Africa trained technicians, educated homeowners, and installed and serviced the systems. Energy Alternatives Africa provided technical assistance, training, and project supervision and monitoring. SELF trained Habitat for Humanity International's Uganda personnel in solar pilot project management, financed the technical training and co-ordinated the project.

"We could never had achieved the success we have without having the community involved, both in terms of fiscal responsibility and in terms of technical ownership," Freling says.

It was important to SELF that the systems were made affordable. Because each system cost the equivalent of about $600 Cdn, people were given three- to five-year loans where monthly payments were the same as what a family would spend on other energy sources. Habitat for Humanity's Uganda office, which operates a home-building credit program, collects monthly installment payments from the users. That money goes into a revolving credit fund to purchase additional solar systems, and help even more people.

Today, the project's impact has gone well beyond the initial 100 homeowners. Not only have additional households purchased systems from Habitat for Humanity, but the Ugandan government has launched a national solar electric lighting program. Freling isn't too surprised; the group is often a catalyst for further action, he says.

At the same time, photovoltaic rural electrification is becoming a commonly accepted idea: the World Bank, USAID, the U.S. Department of Energy, European development agencies, the Asian Development Bank, and numerous donors and commercial lending institutions worldwide are all launching solar initiatives.

The Solar Electric Light Fund was founded in 1990 to promote, develop, and facilitate solar rural electrification and energy self-sufficiency in developing countries. The group has developed pilot projects in China, India, Vietnam, South Africa, Brazil, Indonesia, Sri Lanka, Nepal, Uganda, Tanzania and the Solomon Islands.

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www.self.org

Wind Energy, Whitehorse

Most of Yukon's electricity is produced from hydropower, but about 20 percent is from diesel oil. Thanks to some retired engineers in Whitehorse, the territory is lessening its diesel dependence. Several years ago the engineers started the Boreal Alternate Energy Centre, a non-profit society. In 1990, with funding from Yukon Energy Corporation, the centre set up a wind monitoring station on top of Haeckel Hill, at Whitehorse's city limits, to research the viability of wind power. Based on the monitoring results, Yukon Energy purchased a 150-kilowatt wind turbine in 1993. The turbine now generates 270,000 kilowatts of power a year. That's about 0.5 percent of Yukon's energy needs, or enough energy for about 25 homes. The turbine has been hampered by ice buildup on its blades, but Yukon Energy has been impressed enough with the results to plan to install a much larger turbine this year.

Contact:
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Yukon Energy Corporation
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Whitehorse, Yukon Y1A 5L6
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Industrial Emissions

Introduction

According to Environment Canada, 20 percent of greenhouse gas emissions come from industrial activities. Currently, Canadian companies are not required to reduce these emissions; instead, the federal government is encouraging companies to voluntarily develop and implement climate change action plans through the National Climate Change Voluntary Challenge and Registry Program (VCR).

While individuals and communities can do little directly to reduce industrial greenhouse gas emissions, we can urge stricter government regulations on emissions and for government ratification of the Kyoto Agreement. We can also put pressure on local industries to participate in the VCR.

The following profile describes how a refinery in Montreal reduced emissions, improved its efficiency and reduced costs.

Resources

Canadian Centre for Pollution Prevention
100 Charlotte Street
Sarnia, Ontario N7T 4R2
tel: 800-667-9790
fax: 519-337-3486
e-mail: info@c2p2online.com
c2p2online.com

National Climate Change Voluntary Challenge and Change Registry Program
170 Laurier Avenue West, Suite 600
Ottawa, Ontario K1P 5V5
tel: 613-565-5151
fax: 613-565-5743
email: info@vcr-mvr.ca
www.vcr-mvr.ca

Pembina Institute
Box 7558
Drayton Valley, Alberta T7A 1S7
tel: 708-542-6272
fax: 708-542-6464
email: info@pembina.org
www.pembina.org

Pollution Probe Foundation
625 Church Street, Suite 402
Toronto, Ontario M4Y 2G1
tel: 416-926-1907
fax: 416-926-1607
email: pprobe@pollutionprobe.org
www.pollutionprobe.org
publishes *ProbeAbilities* newsletter bimonthly

Sites:
Climate Change Solutions
www.climatechangesolutions.com

Environmental Protection Agency Global Warming Site
www.epa.gov/globalwarming/actions/industry/index.html
many publications and reports available for downloading

Publications:
Nattrass, Brian and Altomare, Mary. *The Natural Step for Business*. Gabriola Island: New Society Publishers, 1998.

Heat Recovery System
Petro-Canada, Montreal

Goal of Project:
To create a system that processes more crude oil while reducing emissions.

Number of People-hours Involved:
As part of their regular job duties, a senior process engineer worked with a team of people to design and implement this project.

Length of Project:
The installation itself only took a couple of days, but the project was in the works for about three years. The approval process was a long one, due to the high cost of the project.

Budget:
$3.6 million.

Partnerships Involved:
No partnerships; this project was planned and implemented in-house.

His boss laid the problem on his desk one day: the process used to refine crude oil at the mid-sized Montreal refinery was too inefficient. Improving the system wasn't going to be a small task for Huy Nguyen, Senior Process Engineer at the refinery. The refining process in place was about 50 years old and a few minor adjustments wouldn't greatly change its efficiency.

So, pencil in hand, Nguyen began designing something more ambitious. By looking at newer processes, and by working collaboratively with a team of engineers, he was able to make significant improvements. His configuration, installed in October 1998, is saving the refinery about 220,000 gigajoules of energy a year – enough energy to heat more than 2,500 homes for a year. In doing so, it's reducing the equivalent of 11,350 tonnes of CO_2 emissions annually.

To refine oil, Petro-Canada heats it to very high temperatures until it turns into vapour. This process separates the different components of the crude oil because they turn to vapour at different temperatures. These different components are than used to make different oil products, such as jet fuel and heating fuel.

At the Montreal refinery, the process consists of two heaters, many heat exchangers (which circulate the heat produced in the refining process) and three towers where the oil is heated. Nguyen increased the system's heat efficiency by installing more heat exchangers in the system. More exchangers keep the oil 10% to 15% hotter throughout the process, depending on the particular stage of the process, which reduces the amount of fuel the company has to burn to heat the oil. This translates into a direct saving in energy and emissions.

The new system cost Petro-Canada $3.6 million, which it expects to recover through fuel savings in just 2.5 years. And not only is the system cutting fuel costs, its increased efficiency allows the company to process more crude oil. Nguyen notes the technology used is transferable to other refineries with older systems.

The project is part of Petro-Canada's ongoing efforts to reduce emissions in all aspects of its operations, both through capital-intensive projects like this one and through smaller projects. The company has an energy conservation team that works to make energy conservation an integral part of the company culture and to facilitate energy conservation projects. Since 1990, Petro-Canada has eliminated the equivalent of more than 1.3 million tonnes of annual emissions, reducing its total greenhouse gas emissions to within one percent of 1990 levels, despite production growth.

Reflecting on the success of his heat recovery system, Nguyen says it feels great to have been involved in a project that was able to reduce greenhouse gas emissions, especially one that is such an important part of the refining process.

Contact Information:
Huy Nguyen, Senior Process Engineer
Petro-Canada
11701 Sherbrooke Street East
Montreal, Quebec H1B 1C3
tel: 514-640-8000 / fax: 514-650-4984
www.petro-canada.ca

Greenspace

Introduction

It's time we all started seeing green. Greenspace – such as woodlots, meadows and wetlands – reduces carbon dioxide levels, because trees take in carbon dioxide and land can act as a carbon sink.

We need to create more greenspace in our communities by planting trees, setting aside space for parks in new developments, and leaving riverbanks and ravines in a natural state. We also need to ensure the greenspace that's already there stays that way, by turning it into official parkland or placing a land covenant on it.

The following profiles describe how schools in Halifax are greening their playgrounds, how a Victoria group created a provincial park, and how 4-H groups in Manitoba manage to save trees and make a bit of money at the same time. There are other projects that can be undertaken to preserve and create greenspace. You might also consider strategically planting trees in your yard to provide shade in the summer, or naturalizing your backyard.

Resources

Evergreen Foundation
355 Adelaide Street West, Suite 5A
Toronto, Ontario M5V 1S2
tel: 416-596-1495 or 888-426-3138
fax: 416-596-1443
email: info@evergreen.ca
www.evergreen.ca

Land Trust Alliance
1319 F Street NW, Suite 501
Washington DC 20004
tel: 202-638-4725
fax: 202-638-4730
email: lta@lta.org
www.lta.org

Land Trust Alliance of BC
#204-338 Lower Ganges Road
Saltspring Island, British Columbia V8K 2V3
tel: 250-538-0112
email: sheila@landtrustalliance.bc.ca
www.landtrustalliance.bc.ca

The Nature Conservancy of Canada
110 Eglinton Avenue West, Suite 400
Toronto, Ontario M4R 1A3
tel: 416-932-3202 or 800-465-0029
fax: 416-932-3208
email: nature@natureconservancy.ca
www.natureconservancy.ca

Tree Canada Foundation
220 Laurier Avenue West, Suite 1550
Ottawa, Ontario K1P 5Z9
tel: 613-567-5545
fax: 613-567-5270
email: tcf@treecanada.ca
www.treecanada.ca

Gowlland Range
Citizens Action to Save the Environment Society, Victoria

Goal of Project:
To preserve an area of land outside Victoria, British Columbia.

Number of People-hours Involved:
Thousands of hours on CASES' part alone.

Length of Project:
Initial work on the project began in the 1970s, and CASES became involved in 1988. A provincial park to protect the area was created in 1994.

Budget:
It cost $17.7 million to buy the land in order to create the park. The provincial government paid the bulk of this.

Partnerships Involved:
Sierra Club of BC helped with lobbying and public efforts, the Capital Regional District donated a 65-hectare portion of a regional park to the provincial park, the provincial government donated lands to the regional government for the creation of another regional park, and the Nature Conservancy of Canada aided in the negotiations.

Major Funders:
The provincial government; the Nature Conservancy of Canada contributed $2 million, made possible by a major donation from Westcoast Energy Inc.; FAMA Estates Ltd. donated $1 million worth of property; the Capital Regional District gave $750,000; the District of Central Saanich gave $250,000.

Just outside Victoria, BC, there's a special place that is home to cougars, blacktailed deer, killer whales, river otters, seals, cloud sponges, and over a hundred bird species, including blue herons, bald eagles, and peregrine falcons. It's an area of grassy meadows, rocky knolls and old-growth forest.

Long-term resident and former Highlands District Mayor Bob McMinn and his wife Nancy began trying to interest the Directors of the Capital Regional District in preserving the Gowlland area in the 1970s. It took more than twenty years and the threat of development to move area residents, governments and environmental groups to create a provincial park.

In 1980, First National, the developer that owned the land, put in a proposal to build a 650-unit subdivision on 1,467 acres. Residents were not happy about it. "We felt that it was a valuable ecosystem and should be preserved. And the only way we could see that happening would be to make it a provincial park," recalls Derrick Mallard, co-founder of Citizens Action to Save the Environment Society (CASES). It took many years, but the combined effort of Mayor McMinn and the Highlands Council, some provincial politicians, CASES, and other environmental groups, proved successful.

It was a long battle. While proponents were able to garner public support through public awareness campaigns, media coverage and numerous public meetings, the project was complicated by the number of players involved. A substantial portion of the land in question was owned by First National, so in order for the area to become a park, they would have to sell the property.

In the end, after much negotiation, letter-writing and committee meetings, that's what happened. The provincial government contributed most of the funds to purchase the land from the developer, although the Nature Conservancy of Canada and local governments also made significant contributions. The creation of Gowlland Tod was also helped by a bit of good timing. The provincial government had committed to establishing a Commonwealth Nature Legacy to commemorate the Commonwealth Games held in Victoria in 1994; the park accounted for the bulk of that legacy. Several MLAs, including the Environment Minister, also rallied support for the park.

According to Bob McMinn, the use of the Nature Conservancy as a negotiator was a new development in this type of action, and pioneered the use of Third Party Covenance to create parkland. The Capital Regional District relinquished part of a regional park and received another parcel of land in exchange from the provincial government. The municipalities of Central Saanich, Saanich and Highlands District made changes to zoning densities.

The final result was a 1,200-hectare park, smaller than the proponents originally hoped to preserve, but still a great achievement. First National's subdivison proposal was scaled back substantially, and the balance of the land became park. The key to success was cooperation between local governments, residents and environmental groups, according to Mallard: "The avoidance of confrontation helped to win the day." McMinn credits receptive politicians and active citizens, and says the story "reinforces the notion that people should get off their butts and take action."

The fight to create the provincial park was a very public effort for all. But it had a personal element for those who lived in the area and fought to maintain the landscape. Says Derrick Mallard, "We used the area ourselves to observe the plant life there, the mushrooms, the fish trying to get up Tod Creek. We would sit for hours watching the eagles, and the turkey vultures when they were around. We just enjoyed it as a peaceful area." And now future generations can enjoy it as well.

Contact Information:
CASES is no longer active. For information on the Gowlland Range, contact:
Nature Conservancy of Canada, British Columbia Region
202-26 Bastion Square, Victoria, British Columbia V8W 1H9
tel: 250-479-3191 / fax: 250-479-0546
email: bcoffice@natureconservancy.ca
www.bc.natureconservancy.ca

Model Schools Project
Ecology Action Centre, Halifax

Goal of Project:
To restore habitats, to develop local communities and to enhance the health of school children.

Number of People-hours Involved:
A co-ordinator was paid for 14 hours a week over the course of the program. A volunteer steering committee helped promote and oversee the program, and 6,000 people worked on the school projects.

Length of Project:
The project began with 12 schools in 1996. In January 1997, working with Evergreen Foundation, Ecology Action Centre added 13 more schools. The program officially ended in December 1998.

Budget:
$83,000 in cash for the 24 months between January 1, 1997 and December 31, 1998. The project received $234,000 in in-kind contributions, ranging from volunteer work by landscape architects to discounted or free materials.

Partnerships Involved:
Partnerships with local businesses and professionals as well as the Evergreeen Foundation, the Halifax Regional School District, Ecology Action Centre's Board of Directors, Home and School associations and Dalhousie University.

Major Funders:
Environment Canada (Action 21), The Chawkers Foundation, Imperial Oil (Esso) Charitable Foundation, The T.R. Meighen Foundation, Nova Scotia Department of the Environment, Friends of the Environment Foundation, Nova Scotia Sport and Recreation (Go for Green fund) and Clearwater Fine Foods Inc.

It put the ground back into playground. The Model Schools Project was organized by Ecology Action Centre – a leading, long-time environmental organization – and co-ordinated by Rhea Dawn Mahar to help schools in the greater Halifax region to naturalize their schoolyards.

Initial work on the project began in 1995 and wound up in 1998. Ecology Action Centre partnered with Evergreen Foundation in 1997 to deliver the program to more schools and to secure more funding. By the time it wrapped up, 25 schools had naturalized schoolyards.

The program was led by a steering committee made up of a public health nurse, two teachers, a librarian, a representative from one of the school boards and a representative from Ecology Action Centre. The steering committee met with principals and told them about the program. If schools were interested, Model Schools would help guide them and give them some finan

cial suppport, but the project was led by a teacher or a parent and supported by a school naturalization committee made up of parents and teachers. Each school received $1,000 to purchase plants and tools, and the program helped to secure outside support such as a backhoe donated free of charge to schools for an hour by a local construction company.

The schools came up with some very creative ideas. Many planted native trees and set up teaching gardens, some built window boxes, many set up outdoor composting programs, one dug a vegetable garden, another restored a polluted pond. Gorsebrook Junior High School set up a scent garden for the school's visually and physically challenged students and a medicinal garden to teach students about native herbal remedies. South Woodside Elementary planted a windbreak of native trees to help filter air pollution from a major traffic artery and an oil refinery next to the school.

Strong community-school involvement was critical to the program's success, says Mahar. Each school took ownership of its project and as a result, naturalized areas were tended during summer holidays and there was little vandalism. This element of community involvement was what won the school board's support. At first, the board was reluctant to endorse the program, fearing extra maintenance work for custodial workers. But Mahar promised – and delivered on her promise – not to burden the custodial staff: at each school the naturalization committee takes responsibility for maintenance.

In the end, 1,209 native trees, 79 native shrubs and 1,778 native wildflowers were planted along with 6,600 non-native trees, shrubs and flowers. The plants have had an 87 percent survival rate, after one year. In addition to the environmental benefits of cleaner air and a more diversified school ground, the project created self-esteem and pride at the schools and improved the economic value of the surrounding homes, says Mahar.

The program officially wrapped up at the end of 1998, but its effects continue to be felt. Teachers of all subjects use the naturalized areas as outdoor classrooms. The schools are still actively carrying out naturalization projects and the projects continue to evoke a sense of community focus, stewardship and creativity. Schools that were not part of the program have started working on their own naturalization projects. Additionally, the provincial ministry of education has adopted the idea of a natural school ground, and it is working with Mahar to ensure its new schools contain natural areas.

Contact Information:
Ecology Action Centre
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Halifax, Nova Scotia B3J 2B3
tel: 902-429-2202
email: at420@chebucto.ns.ca
www.chebucto.ns.ca/Environment/EAC/

Rescuing Trees, Dauphin MB

Trees growing in roadside ditches clog drainage ways. In most areas, they are either cut down or sprayed with herbicide. But in the Dauphin area of Manitoba, 4-H groups dig up the young spruce trees in the ditches and offer them free to local residents. Since 1996, the 4-H groups – with the help of their friends and family – have been carefully uprooting the trees and bagging the roots with mulch. They take the trees to the Dauphin municipal yard where their "new owners" pick them up. Landowners adjacent to the chosen sites are informed in advance of the project and give their consent before the trees are taken. In 1998 alone, the program "rescued" nearly 1,200 trees, which have had a 90 per cent success rate after transplantation. The 4-H groups receive one dollar for each tree, and the total cost of the project – about $3,000 after supervisory costs, office expenses and truck and trailer costs are added in – is shared equally between the federal government's Soil and Water Conservation Program and the Dauphin-Ochre Weed Control District.

Contact Information:
Eric Richardson
Weed Inspector for the Dauphin-Ochre Weed Control District
tel: 204-638-9859

Minjiang River Reforestation Project, China

Through a partnership with indigenous farmers in Sichuan province, the Chinese government has learned that ecological restoration and economic sustainability go hand in hand.

The Minjiang River watershed is a degraded area in the mountain valleys of Sichuan and home to the Qiang people. In the middle of the 1980s, the government launched a reforestation project on clear-cut sites and barren slopes to prevent further soil erosion in the watershed. But the government learned that these methods were not enough: for the project to be successful, local people had to be involved. Beginning in 1990, the government began integrating the needs of the local medicinal plant industry which relies on indigenous species and is an important source of income for the Qiang.

The government planted trees in terraces, leaving horizontal bands of original shrubs and grasses between replanted strips. Indigenous species were preserved in the bands of original vegetation, allowing farmers to continue to cultivate medicinal plants and other cash crops. Farmers were given responsibility for managing the replanted forests, which meant the project had local support and participation. The results? Less soil erosion, increased diversity of species in forest stands, and the development of agroforestry on steep slopes. The project totalled about 10,000 hectares and involved 350 households.

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Academia Sinica
Chengdu Institute of Biology
Center for Ecological Restoration and Development Studies
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tel: 86-28-522-9783
fax: 86-28-522-2753
email: wuning@public.cd.sc.cn

Agriculture

Introduction

Agriculture practices produce greenhouse gases. Farmers produce carbon dioxide when they use fossil fuels to run their tractors, combines and other machinery. Tilling the soil also releases CO_2 by oxidizing the soil's carbon. Nitrous oxide is created when nitrogen fertilizers are added to the soil and when land is converted to pasture, while methane is produced by animal digestive systems and by rotting manure. Environment Canada states agriculture contributes nine percent of Canada's greenhouse gases, and that doesn't include nitrous oxide from soils and manure. About half of that is methane from animals and manure, 29 percent is carbon dioxides from fuel combustion, 6 percent is carbon dioxide from soil and 11 percent is nitrous oxide from fertilizers.

Farmers can reduce greenhouse gases by changing farming practices (such as reducing the tillage of soils, as they're doing in the Prairies, or improving manure handling and storage systems) and by making their farming operations more energy efficient (by switching to more efficient farm equipment, insulating hot water pipes and reducing lighting demands, for example).

But you don't have to be a farmer to help reduce agricultural greenhouse gases. We all eat, and our food purchasing habits impact the environment. Storing food and shipping it from around the world to our kitchen tables takes a great deal of energy and produces lots of greenhouse gas emissions. At a community level, we can help reduce these greenhouse gases by purchasing local products at farmers markets or through community shared agriculture programs. Or you could grow some of your own food: many cities have community gardening plots available to local residents. Some urban dwellers even convert their rooftops into garden plots – growing their own veggies and creating greenspace at the same time.

The following profiles describe how a group of gardening enthusiasts in Whitehorse turned an abandoned plot into a gardening oasis and how Nova Scotia farmers are helping to create better farming practices.

Resources

American Community Gardening Association
100 N 20th Street, 5th Floor
Philadelphia, PA 10103-1495
tel: 215-998-8785
fax: 215-998-8810
email: smccabe@pennhort.org
www.communitygarden.org

Canadian Organic Growers
Box 6408, Station J
Ottawa, Ontario K2A 3Y6
tel: 613-231-9047 / fax: 613-256-4453
email: info@cog.ca
www.cog.ca

Ecological Agriculture Projects
McGill University (Macdonald Campus)
Ste-Anne-de-Bellevue, Quebec H9X 3V9
tel: 514-398-7771 / fax: 514-398-7621
email: info@eap.mcgill.ca
www.eap.mcgill.ca

Farm Folk / City Folk
106-131 Water Street
Vancouver, British Columbia V6K 4S2
tel: 604-730-0450 / fax: 604-730-0451
email: office@ffcf.bc.ca
www.ffcf.bc.ca

Sites:
Agriculture and Agri-Food Canada
www.agr.ca/policy/environment/eb/public_html/ebe/climate.html

Community Supported Agriculture of North America
www. umass.edu/umext/csa/

The Rooftop Garden Resource Group
www.interlog.com/~rooftop/

Publications:
Roberts, Wayne; MacRae, Rod; Stahlbrand, Lori. *Real Food for a Change*. Toronto: Food Policy Consulting, 2000.
To order, contact:
Food Policy Consulting, 603-31 Adelaide Street East
Toronto, Ontario M5C 2J8
tel: 416-465-1011 / fax: 416-465-3277
www.realfoodhome.net

Berman, Laura. *How Does Our Garden Grow? A Guide to Community Gardening Success*. Toronto: FoodShare, 1997.
To order, contact:
FoodShare Metro Toronto, 238 Queen Street West
Toronto, Ontario M5V 1Z7
tel: 416-392-1668 / fax: 416-392-6650
email: foodshare@web.net

Whitehorse Community Garden
Downtown Urban Growers Society, Whitehorse

Goal of Project:
To give people who wouldn't otherwise have the opportunity the chance to grow their own food and learn basic gardening skills; to grow organic food; to enable local self-sufficiency; to provide food for "food security" groups in Whitehorse; to give downtown residents a focus for gathering together.

Number of People-hours Involved:
It took 1,500 volunteer-hours over six months to set up the garden and takes about 1,000 volunteer-hours throughout the year to maintain the project. Gardeners spend about four hours a week working in their garden plot.

Length of Project:
Organizers began meeting in January 1998. The garden has been in use since the summer of 1998.

Budget:
No fixed budget. The group secures grants for various capital and project expenses every year, between $10,000 and $20,000 a year.

Partnerships Involved:
Partnerships with and in-kind donations from local businesses and the City of Whitehorse.

Major Funders:
Yukon government (Yukon Youth Conservation Corps, Community Development Fund, Education Awareness Fund); Recreation & Parks Association of the Yukon (Go for Green Fund); Agriculture Canada (Canadian Adaptation and Rural Development Fund); Environment Canada (Environmental Action Fund); the Yukon Foundation's Jan Montgomery Fund.

"It's surprising to people to know they can grow their own food," says Spence Hill. Surprising because they are in Whitehorse, a city north of 60 with only 81 frost-free days a year and a summer sun that shines at midnight. Surprising, but definitely possible, and Hill, along with about 10 other gardening proponents, set out in January 1998 to create an organic community garden so their neighbours would have the opportunity to grow their own food. With hundreds of hours of volunteer effort and support from local businesses and governments, they succeeded.

The group began by asking the City for some land for their proposed community garden. The City was happy to "lease" the group some land for free, because the area it offered – nine empty city lots downtown – was greatly in need of some looking after. It was littered with smashed glass, syringes, old car parts and even dumped asphalt. "It was not really a place where people wanted to go," recalls Joan Craig, another of the original organizers. But now

that the area is cleaned up and filled with plants, people enjoy walking through the garden and the daycare centre brings children there for walks.

It's not hard to see why. Gardeners' plots burst with cauliflower, spinach, peas, herbs and other veggies. Sunflowers tower above the vegetables. The garden's fence is covered with raspberry bushes, from which the public may – and does – pick fruit. A wooden shed sits on the lot, filled with communally shared tools, and a gazebo shelters several picnic tables.

After securing the land, the group's main challenges were obtaining soil and water. The 400 cubic metres of soil required for the raised beds were bought from a local company for a couple thousand dollars. To get water, they paid to have the city's main water line extended into the garden site.

The garden occupies about a quarter of the donated land. Currently there are 18 individual beds, about 4' by 10', and three communal plots, each 30' by 30'. The communal plots supply food for local "food security" groups in Whitehorse – a food bank, a soup kitchen and the Salvation Army – producing, among other things, 250 pounds of potatoes last year!

The garden has been full for both seasons, with about two-thirds of the gardeners returning after the first season. Many of the gardeners feel very committed to the garden and keep a close watch on it. Several live across the street from the garden and informally patrol the area. Such dedication has paid off, and the garden has experienced only minor vandalism.

A core group of about a dozen people did and still do most of the work. The board of directors is assisted by a paid co-ordinator working at least part of the summer, writing grant applications, overseeing volunteers and the communal garden and acting as a public liaison.

In many ways, however, the garden involved a real community effort. Landscape companies gave the group yard waste, schools gave them food waste and 17 horse owners in the area supplied about 80 cubic metres of fresh manure for compost. The shed was unused when the group took it over, while the chain link fence came from a schoolyard that was being converted into a public park. Many of the tools were donated. A cement company contributed ready-mix concrete to build a sloping step up to the shed, and a local businessman helped level and terrace the site with his front-end loader. The City provides the water for free. "People were glad to support this," says Craig. And now the community is reaping the harvest.

Contact Information:
Downtown Urban Growers Society c/o Joan Craig
32 Sunset Drive North
Whitehorse, Yukon Y1A 4M8
tel: 867-668-5774

Annapolis Atmosfarm Outreach Pilot Project, NS

The Annapolis Atmosfarm Outreach Pilot Project is helping farmers in Nova Scotia to identify ways to reduce their greenhouse gas emissions and to increase carbon uptake. It's being run by the Clean Annapolis River Project (CARP), a charitable, community-owned corporation. The project is looking at all aspects of small- to mid-sized farming, ranging from how hot water tanks and pipes are insulated, to different manure handling systems, to tractor efficiency. The group is bringing in specialists to conduct audits at farms and to hold workshops where ideas can be exchanged. CARP is able to do this through its partnerships with various governmental, research and technical organizations. The project began at the end of 1999 and isn't expected to be completed until March 2001, but so far, farmers have been showing interest in the project and especially in how it will save them money. CARP expects the lessons learned in the Annapolis Valley will be transferable to agricultural areas across Canada.

Contact Information:
Stephen Hawboldt, Program Director
Clean Annapolis River Project
PO Box 395
Annapolis Royal, Nova Scotia B0S 1A0
tel: 902-532-7533
fax: 902-532-3038
email: carp@fox.nstn.ca
http://fox.nstn.ca/~carp

Mayan Forest Resource Management, Guatelmala

Farmers in Guatemala often clear the surrounding forests to create land for agriculture, but the environmental consequences of this practice aren't always good. The large-scale removal of trees leads to soil erosion and air and water pollution.

Since 1996, a joint American-Mayan initiative has been developing a better approach to agriculture. EcoLogic Development Fund, an American conservation organization, and the Mayan Forestry Action Plan (PAF-Maya) have been collaborating with the residents of San Mateo Ixtatan, the Maya Chuj, to help them manage the forests in their municipality and address their concerns about food security.

The project, now running in 15 communities, focuses on soil conservation, sustainable agriculture, reforestation, and agroforestry, says EcoLogic's director Shaun Paul. PAF-Maya has trained local farmers in no-till farming, terracing, and other more efficient agricultural practices that conserve topsoil. In some areas, agricultural productivity has increased by 300%, and people's incomes have been raised an average of 10%. The Chuj are now growing pine and fruit trees, which will yield fruit and fuel wood, and they recently planted 80,000 shade coffee seedlings, in addition to cultivating seedlings in village nurseries to replant logged areas. Paul credits the project's locally driven nature and its comprehensive approach for its success.

Contact Information:
Shaun Paul, Director
EcoLogic Development Fund
PO Box 383405
Cambridge, MA USA 02238-3405
tel: 617-441-6300
fax: 617-441-6307
email:enews@ecologic.org
www.ecologic.org

Education

Introduction

Across the country, Canadians are feeling confused about what climate change really means, and overwhelmed by the scope of the problem. Too many don't fully understand what climate change involves, what causes it, and what the consequences could be, both here in Canada and internationally. Increasing knowledge and awareness of climate change issues is thus a critical component of any action on climate change.

Through education, we can increase public understanding of the scope and importance of this issue and create the will to meet our Kyoto commitments. Education must also provide the tools for action – information on *how* to effectively reduce greenhouse gas emissions at the individual, community and national levels.

The following pages describe projects aimed at educating school children, the general public, and the scientific community.

Resources

See "General Climate Change Resources" on pages 18-19, in addition to the resources for students and teachers listed below.

Links:
Climate Change Youth Café
http://iisd.ca/youth/internetcafe/

Publications:
Andrews, William. *Understanding Global Warming*. Toronto: DC Heath Canada Ltd., 1997. 94pp.
A very comprehensive, well-organized and attractive text for Grades 9-12.
Available from:
DC Heath Canada Ltd.
200 Adelaide Street
Toronto, Ontario M5H 1W7
tel: 800-268-2222

Green Teacher. *Teaching About Climate Change: Cool Schools Tackle Global Warming*. 2001. 80pp.
A framework for teaching fundamental concepts and a variety of activities that can be undertaken in school, at home or in the community. Suitable for grades K-12.
Available from:
Green Teacher
95 Robert Street
Toronto, Ontario M5S 2K5
tel: 416-960-1244
fax: 416-925-3474

Pembina Institute. C*limate Change Awareness and Action: A High School Education Kit.* Drayton Valley: Pembina Institute, 1999. 162pp.
A multimedia kit containing a comprehensive teacher guide, overhead transparencies, and a video with accompanying booklet. Designed for use in grades 9-12.
Available from:
Pembina Institute
Box 7558
Drayton Valley, Alberta T7A 1S7
tel: 780-542-6272
fax: 780-542-6464
email: info@pembina.org
www.pembina.org

Videos:

The Climate Report. The Climate Institute / Sierra Club. 15:30 min.
An excellent introduction to climate change, including its causes and impacts, featuring interviews with leading IPCC scientists.
Available from:
Sierra Club, Global Warming and Energy Program
408 C Street NE
Washington DC 20002
tel: 202-547-1141
email:jeffrey.bourne@sierraclub.org
www.sierraclub.org

Rising Waters. Torrice Productions: 2000. 57 min.
Climate change from the perspective of island states threatened by sea level rise.
Available from:
Bullfrog Films
Box 149
Oley, Pennsylvania 19547
tel: 800-543-3764
www.bullfrogfilms.com

Silent Sentinels. Australian Broadcasting Corporation: 1999. 57 min.
A compelling examination of the effect of global warming on coral reefs around the world. Suitable for grades 7-12, college and adult audiences.
Available from: Bullfrog Films (see above)

Our Changing Climate

Get 'em while they're young is the thinking behind "Our Changing Climate", a proactive climate change curriculum for school-age youth. The project, created by Toronto Environmental Alliance and their youth wing, Youth Educators for Environmental Action, is designed to reach out to students in grades 4 to 7 in a fun and educational way. "Our Changing Climate" looks at climate change from a range of subject areas, with a variety of approaches and active-learning exercises. The aim is to reach tomorrow's consumers before they develop ingrained habits – promoting lifestyle choices and awareness to combat carbon dioxide and other greenhouse gas emissions, and empowering them to make real changes in their homes and communities.

Contact Information:
Toronto Environmental Alliance
30 Duncan Street, Suite 201
Toronto, Ontario M5V 2C3
tel: 416-596-0660
fax: 416-596-0345
email: tea@web.net
www.torontoenvironment.org

Climate Change Calculator

Ever wondered exactly how many kilograms of greenhouse gases you generate each day? The Climate Change Calculator was developed by the Sustainable Development Research Institute and the David Suzuki Foundation to allow individuals to calculate their personal emissions. The Calculator prompts you to input where you live and information on your key daily activities, such as driving to and from work, taking a shower and heating your home, and then generates a personal "scorecard" of your greenhouse gas emissions. According to its creators, the Calculator drives home the personal elements of climate change by illustrating how everyday choices affect the environment and Canada's overall emission levels. It is available in both official languages on CD-ROM or on the internet.

Contact Information:
Sustainable Development Research Institute
UBC - B5 2202 Main Mall
Vancouver, British Columbia V6T 1Z4
tel: 604-822-8198
fax: 604-822-9191
email: sdri@sdri.ubc.ca
www.climcalc.net

Inuit Observations on Climate Change

On Banks Island in the High Arctic, Inuit hunters and trappers live in close harmony with their surrounding environment, sensitive to even subtle shifts. Recently, they have noticed some worrying changes: sea ice forming later in the autumn, new insect species appearing in the spring, and salmon and grizzly bears moving further north in the summer to escape the heat. In a unique project that acknowledges these non-scientific observations, the International Institute for Sustainable Development is cooperating with the Inuit community of Sachs Harbour. Together, they are producing a video to document local climate change phenomena, viewed through Inuit eyes. In addition, scientists associated with the project will write a technical report on the contribution traditional knowledge can make to climate change research.

Contact Information:
International Institute for Sustainable Development
161 Portage Avenue East, 6th Floor
Winnipeg, Manitoba R3B 0Y4
tel: 204-958-7700
fax: 204-958-7710
email: info@iisd.ca
http://iisd1.iisd.ca/casl/projects/inuitobs.htm

Climate Change Cheat Sheet

Purpose

The following "Cheat Sheet" provides a snapshot of climate change: what it is, what's causing it, and what the consequences may be. The information is presented in graphical form and in bullet points for quick reference. Some of the information you'll have seen in Climate Change Overview, but the Cheat Sheet also provides facts and figures from key sectors: industry, transportation, energy and agriculture.

If you are using this *Climate Change Profile* in conjunction with our *Community Action Workshop Manual*, the Cheat Sheet is an excellent handout to provide participants in Module 2, Activity 2: Analysing Our Issue. Consider it a part of the Participant's Workbook that you distribute to participants in advance of the Workshop.

Climate Change Cheat Sheet

What Is It?

< a global shift in the general patterns in our climate

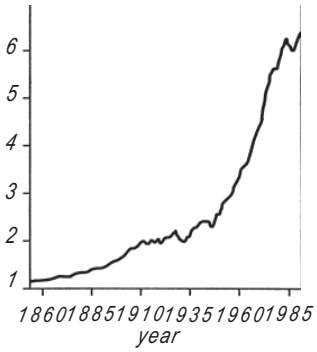
< an average rise in worldwide temperature and changes in wind and ocean currents

Is It Really Happening?

< the 1980s and 1990s are the warmest decades on record, and ten of the 15 hottest years have occurred since 1990[1]

< the global average temperature is 0.8°C above pre-industrial levels according to the International Panel on Climate Change

< worldwide, extreme weather damages in the last three years have cost $200 billion per year[2]

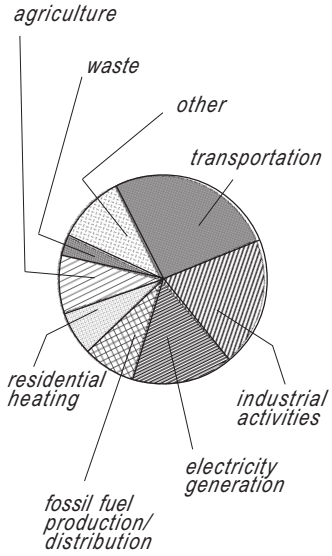


Global Carbon Dioxide Emissions Since 1860[3]

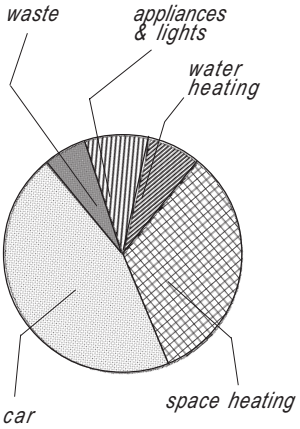
What's Causing It?

< by burning fossil fuels, humans have been contributing to the level of greenhouse gases (such as carbon dioxide, methane, nitrous oxide, and halogen compounds) in the atmosphere

< by cutting down forests, we also reduce the earth's capacity to absorb greenhouse gases



Canadian Greenhouse Gas Emissions by Sector[4]



Individuals' Greenhouse Gas Emissions by Source[5]
This graph may not be accurate in provinces (such as BC and Quebec) where a significant percentage of electricity is generated through hydroelectric projects.

Industrial Emissions

< 'fugitive' emissions released during the production and distribution of fossil fuels (such as natural gas that is flared or vented from oil wells, or small leaks in well heads, pipe fittings and pipelines) account for 21% of industrial emissions[6]

< process-related emissions account for 21% of industrial emissions (for example, the chemical process that produces cement releases CO_2, while the production of aluminum releases perfluorocarbons)[7]

< emissions released through energy consumption account for 58% of industrial emissions – the biggest sources are oil and gas producers; the iron and steel sectors; pulp, paper and sawmills; and chemical industries[8]

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A Few Transportation Statistics:

- every litre of gasoline fuel produces almost 2.5 kilograms of carbon dioxide[9]
- the voluntary fuel efficiency standard for passenger cars is 8.6; for a sport utility vehicle it's 11.4 litres/100km[10]
- from 1990 to 1996, use of public transit dropped 13%,[11] while the number of passenger cars and trucks on the road increased 9%[12]
- high density and mixed-use developments reduce the need for cars
- on average, food on supermarket shelves in North America has travelled 2,000 miles from where it was produced[13]

Greenhouse Gas Emissions by Mode of Passenger Transport[14]

	grams of CO_2 equivalent per passenger kilometre
new catalyst car	197
diesel car	161
bus	69
diesel train	79
electric train	76
aircraft	853

Greenhouse Gas Emissions by Mode of Freight Transport[15]

	grams of CO_2 equivalent per ton kilometre
7.5 ton truck	174
40 ton truck	56
fast rail	39
slow rail	14
aircraft	3414

Energy Sources

- hydroelectric energy, solar energy, wind energy and hydrogen fuel cells generate almost no greenhouse gases
- more than 60% of Canada's electricity comes from hydro power, but less than one percent comes from other renewable sources[16]
- switching your furnace from oil to natural gas will reduce greenhouse gas emissions by 20%[17]

Energy Efficiency

- energy efficiency gains of 10-30% could be achieved over the next 20 to 30 years at no net cost[18]
- air leakage accounts for up to 40% of household heat loss[19]
- replacing an incandescent light bulb with a compact fluorescent saves 125 kg of carbon dioxide over the bulb's lifetime[20]
- it takes 2/3 less energy to make a recycled aluminum can than it does to make it from virgin materials, and 50% less energy to make recycled paper and plastic[21]

Down on the Farm

- methane from animals and manure counts for more than half of agricultural greenhouse gases[22]
- carbon dioxide from fuel combustion accounts for 29% of agricultural greenhouse gas emissions[23]
- 11% of agricultural greenhouse gas emissions comes from nitrous oxide created by fertilizers[24]
- tilling the soil or leaving it bare releases carbon which becomes carbon dioxide in the atmosphere

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What Will Happen In Canada?

- < drought will be more frequent in the Prairies and Central BC[25, 26]
- < Ontario will experience more heat stress and air pollution, and Great Lake levels will drop[27]
- < rising sea levels will threaten the Eastern, Northern and Western coasts, while Arctic permafrost will melt and the Atlantic region will cool[28, 29, 30]

What Are the Worldwide Implications?

- < the average global temperature will rise 1.7 to 4.0°C by the year 2100 if current emission trends continue, according to the International Panel on Climate Change
- < the ocean is predicted to rise 13-94cm over this century, swamping several ocean states and threatening coastal and delta areas[31]
- < weather patterns will shift and extreme weather events, such as hurricanes, tornados, floods and droughts will become more common, causing food shortages, destroying buildings and municipal infrastructure, and threatening human lives[32]
- < malaria and other insect-borne diseases will spread, respiratory problems will become more common, and thousands more people will die annually from heat[33]
- < local ecosystems will change, threatening animal populations[34]

What Are We Doing About It?

- < under the Kyoto agreement, Canada has committed to reducing greenhouse gas emissions by 6% from 1990 levels by 2008-2012

1 National Climatic Data Center. *Climate of 1999 - Annual Review*. Asheville: National Oceanic and Atmospheric Administration, 2000.

2 Retallack, Simon and Peter Bunyard. "We're Changing our Climate! Who Can Doubt It?" in *The Ecologist* Vol 29, No. 2 (March/April 1999), pp. 60-64.

3 Graves, Jonathan and Reavey, Duncan. *Global Environmental Change: Plants: Animals & Communities*. Essex: Longman, 1996.

4 Neitzert, F.; Olsen, K.; and Collas, P. *Canada's Greenhouse Inventory: 1997 Emissions and Removals with Trends*. Ottawa: Environment Canada, 1999.

5 Greenhouse Gas Miser Committee. *Greenhouse Gas Miser Handbook*. Downsview: Canadian Climate Centre, 1993.

6 Hornung, Robert. *Canadian Solutions: Practical and Affordable Steps to Fight Climate Change*. Vancouver: David Suzuki Foundation; Drayton Valley: Pembina Institute, 1998.

7 Ibid.

8 Ibid.

9 Greenhouse Gas Miser Committee. Op. cit.

10 Transport Canada. *Transportation in Canada 1997*.

11 Pucher, John. "Back on Track: Eight Steps to Rejuvenate Public Transport in Canada." *Alternatives Journal* Vol 24:1 Winter 1998, p. 27.

12 Jacques, A.P.; Boileau, P.; and Neizert, F. *Trends in Canada's Greenhouse Gas Emissions 1990-1995.* Ottawa: Pollution Data Branch, Environment Canada, 1997.

13 Pembina Institute for Appropriate Development. *Taking Charge: Personal Initiatives*. Vancouver: David Suzuki Foundation, 1997.

14 Martin, D. and Michaelis, L. *Research and Technology Strategy to Overcome Environmental Problems in Relation to Transport*. UK Atomic Energy Authority, 1992.

15 Natural Resources Canada. *Canada's Energy Outlook — 1996-2020.* Ottawa: Natural Resources Canada, April 1997.

16 Hornung, Robert. Op. cit.

17 Pembina Institute for Appropriate Development. Op. cit.

18 Bruce, James P. et al., eds. Climate Change 1995: *Economic and Social Dimensions of Climate Change. Contributions of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press, 1996.

19 Greenhouse Gas Miser Committee. Op. cit.

20 Ibid.

21 Ibid.

22 Environment Canada

23 Ibid.

24 Ibid.

25 Herrington, Ross; Johnson, Brian and Hunter, Fraser. *Responding to Global Climate Change in the Prairies (Canada Country Study, Volume III)*. Ottawa: Environment Canada, 1998.

26 Taylor, Eric and Taylor, Bill. *Responding to Global Climate Change in the BC and Yukon Region (The Canada Country Study, Volume I)*. Ottawa: Environment Canada, 1999.

27 Smith, Jamie et al. *Adapting to Climate Variability and Change in Ontario (The Canada Country Study, Volume IV)*. Ottawa: Environment Canada, 1998.

28 Maxwell, Barrie. *Responding to Global Climate Change in the Arctic (Canada Country Study, Volume II)*. Ottawa: Environment Canada, 1997.

29 Abraham, Jim; Canavan, Teresa; and Shaw, Roderick. *Responding to Global Climate Change in the Atlantic (Canada Country Study, Volume IV)*. Ottawa: Environment Canada, 1997.

30 Taylor, Eric and Taylor, Bill. Op. cit.

31 Houghton, J.T. et al., eds. *Climate Change 1995: The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group 1 Report*. 1996.

32 Francis, David and Hengeveld, Henry. *Extreme Weather and Climate Change*. Ottawa: Environment Canada, 1998.

33 Watson, R.J., M.C. Zinyowera and R.H. Moss. Climate Change 1995: *Impacts, Adapatatons and Mitigation of Climate Change: Scientific-Technical Analyses: Contribution of Working Group II to the IPCC's Second Assessment Report*. Cambridge: Cambridge University Press, 1995.

34 Ibid.

Purpose

Climate change may be a big issue, but it's not hard to take action. The following "Personal Action Checklist" gives you an excellent starting point for reducing your personal contribution to greenhouse gas emissions. Look over the ideas and decide what changes you can make in your own behaviour. (Most will also save you money!) Never underestimate the difference that one person can make!

Personal Action Checklist

Get around the greener way

- Park the car: walk, cycle, roller blade, car pool or take public transit whenever possible.
- Keep your tires inflated: underinflated tires can increase fuel use by five percent.[1]
- Tune your car regularly to prevent fuel waste.
- Turn off the ignition! Ten seconds of idling uses more fuel than restarting the engine.[2]

Heating water takes energy!

- Turn down the temperature on your hot water tank. 54°C is fine, unless your dishwater needs preheated water (in which case it should be set at 60°C).
- Wash your clothes in cold water: you'll reduce your hot water heating needs by 25%.[3]
- Wrap it up! Insulate your hot water tank (you'll reduce your energy use by 10%), and put pipe wrap on your hot water pipes.
- Install a low-flow shower head: you'll use up to 60% less water for your morning shower.[4]
- Fix that drip! A leaky faucet can waste 11,350 litres or more every year.[5]

Save some kilowatts

- Hang washing out to dry. The average family clothes dryer uses 50kWh of electricity each month.[6]
- Turn down your thermostat to 18°C overnight, and 16°C when you leave the house. For every degree you lower the temperature, you'll save two percent on your heating bill.[7]
- Go fluorescent: a 13 watt compact fluorescent provides as much light as a 60-watt incandescent bulb.[8]
- Make sure your fridge isn't too cold. Set the refrigerator compartment at 3°C and the freezer at -18°C.
- Leave at least 8 cm of air space between the back of the fridge and the wall to allow enough air circulation, and dust the coils every three to six months so it's operating efficiently.[9]
- If you have a dishwasher, use the "no heat" drying option, or switch it off at the end of the rinse cycle and open the door to let the dishes air dry.
- Draftproof your home to save as much as 20% on your heating bill.[10]

Cut the waste

- Compost! You'll reduce methane emissions from landfills (and create great fertilizer for your garden).

Shop smart

- Check out the thrift shop: second-hand goods save energy and money.
- Buy locally: you'll reduce how far goods travel, and you'll support the local economy.

Get political

- Write a letter: let your MP know that Canada needs to meet its Kyoto obligations to reduce greenhouse gas emissions.

[1]Hengeveld, Henry and Anita Krajnc. *Greenhouse Gas Mister Handbook*. Ottawa: Environment Canada, 1993. [2]Global Climate Change. *Taking Action on Climate Change*. Ottawa: Government of Canada, 1999. [3]Hengeveld & Krajnc. [4]Global Climate Change. [5]Power Smart Energy Library. <www.bchydro.ca> [6] Ibid. [7]Global Climate Change. [8]Power Smart Energy Library. [9]Ibid. [10]Global Climate Change.

Major Accomplishments of Harmony Foundation

PUBLICATIONS AND RESOURCE MATERIALS
- Home & Family Guide: Practical Action for the Environment / Guide pour la famille et la maison: la protection de l'environnement au quotidien, *1989*
- Community Workshops for the Environment / Ateliers communautaires au sujet de l'environnement, 1992
- Positive Action for the Environment & Community Action Projects – video kit, *1992*
- Workplace Guide: Practical Action for the Environment / Guide pour le milieu de travail: vers la santé environnementale, *1991*
- Discovering Your Community: A Cooperative Process for Planning Sustainability / A la découverte de votre collectivé: un processus coopératif de planification de la pérennité; a step-by-step workbook to help individuals and groups in the research and development of a sustainable plan for their area, *1994*
- Strengthening Our Communities: A guidebook for Community Youth Programs, *1997*
- Guide to Organic Gardening, *1998*
- Climate Change Community Action Workshop Manual, *2000*
- Community Action Workshop Manual, *2001*
- Climate Change: A Profile for Community Action, *2001*
- Biodiversity: A Profile for Community Action, *Autumn 2001*
- Troubled Waters: A Profile for Community Action, *2002*
- Green Cities: a Guide for Sustainable Community Development, *2005*

INSTTUTE FOR ENVIRONMENTAL VALUES EDUCATION
- professional development, education and curriculum resources for school and community educators

BUILDING SUSTAINABLE SOCIETIES PROGRAM
- leadership building programs for educators and community leaders
- tools for community action: Leadership Training Sessions, the *Community Action Workshop Manual* and the Profiles for Action: Water, Climate Change, Bio-diversity and Green Cities

YOUTH VISION
- Innovative Youth Vision community Programs provide young people with job and life skills through community service projects, career development training and a mentorship program

GROWING UP GREEN – RESOURCES FOR CHILDREN
- Growing Up Green: Environmental Action Wheel / La Roue d'action <La croissance verte>, *1993*
- Earthworms – Nature's Recyclers: An Integrated Unit for Primary and Junior Students, *1992*

GREENWORKS
- training and demonstration programs to improve workplace and community environmental practices
- GreenWorks: Building on success/Pour aller de success, *1993*

NATIONAL AND INTERNATIONAL COOPERATION
- Cooperative efforts involving participants from Harmony Foundation's Programs
- Exchange programs involving educators and community leaders from Canada and around the world

ENVIRONMENTAL LEADERSHIP
- We encourage progressive leadership and work to bring together diverse professionals to find cooperative ways to respond to environment and development issues.
- We advise a number of organizations and encourage the efforts of others while promoting Canadian leadership in the global campaign for environmental progress.

MAJOR AWARDS
- Ethics in Action Award, 1998
- United Nations Environment Programme's Global 500 Award for outstanding achievement in environmental protection, 1992 Earth Summit
- Commonwealth Foundation Fellowship, 1994

EARTH COUNCIL ALLIANCE
- Harmony Foundation is a founding member of the Earth Council Alliance, representing like-minded organizations from around the world. www.earthcouncilalliance.com

Environmental Education in Action!

Harmony Foundation is dedicated to achieving progress through cooperation and education. Harmony's training programs and educational resources encompass environmental values and practical skills for positive action on environment and development issues.

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Once while the sage Choni was walking along a road, he saw a man planting a (carob) tree. Choni asked him, "How many years will it require for this tree to give fruit?" The man answered, "It will require 70 years." Choni asked, "Are you so healthy a man that you expect to live that length of time and eat its fruit?" The man answered, "I found a fruitful world because my ancestors planted for me. So will I do for generations to come."

Harmony Foundation of Canada is a charitable organization dedicated to achieving environmental progress through cooperation and education. Harmony's education activities provide the knowledge and skills needed to help people and organizations achieve their environmental goals and improve their practices.

Harmony's innovative programs have been recognized with a **Global 500 Award** (1992)from the United Nations Environment Programme, a **Commonwealth Foundation Fellowship** (1994), and an **Ethics in Action** Award (1998).

Since 1985, Harmony Foundation has:

Established the *Institute for Environmental Values Education*, which creates educational publications and provides training for educators and community leaders from around the world.

Developed the *Building Sustainable Societies Program* to stimulate community action. It includes Leadership Training that trains participants to lead Community Action Workshops which result in practical community and school projects.

Created a series of *Youth Vision* projects providing young people with life and work skills through community service.

Developed *Green Works*, a ground-breaking training program to assist organizations and communities to develop workplace environmental programs.

Designed *ECOmmunity*, a multi-stakeholder training program to assist communities in the development of a sustainable community plan.

Provided many learning resources for schools, workplaces, community groups and individuals to encourage improved environmental practices.

Harmony
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