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Climate Change and *Health & Well-being:* A Policy Primer



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CLIMATE CHANGE
AND
HEALTH & WELL-BEING:
A POLICY PRIMER

**Climate Change and Health Office
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This document was developed by the Climate Change and Health Office for the First Annual Climate Change and Health & Well-being National Policy and Planning Conference which was held September 5-7, 2001 in Canmore, Alberta.

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CLIMATE CHANGE AND HEALTH & WELL-BEING: A POLICY PRIMER

Executive Summary

Climate Change and Health & Well-being in Canada

Scientists, governments and international bodies have recognized that greenhouse gas accumulations in the atmosphere will change the global climate, and will affect the environment and human health and well-being. The range of potential health effects from this phenomenon is quite broad. Some communities will be more vulnerable than others, for geographic reasons, due to health status or because of limited resources.

Although many successful mitigation measures to reduce the impact of greenhouse gas emissions are already underway under the First National Business Plan, it is also recognized that mitigation efforts will not totally eliminate the risk of climate change. Even if the provisions of the Kyoto Protocol are fully met by all participating countries, the date at which CO₂ will double in the atmosphere will simply be pushed back, but this will still occur. Canada will have to cope with, and adapt to, the many climate-related environmental changes which have already begun, particularly in the North, and which will affect the future health and well-being of Canadians.

Health Canada has identified eight significant climate change induced health effects which are expected to increase in the future in this country. They include health and well-being issues related to increased smog episodes, heat waves, water and food borne contamination, vector-borne diseases, stratospheric ozone depletion and extreme weather events. These effects are expected to be particularly severe for vulnerable populations such as children, the elderly, the poor, disabled people, immigrant populations and Aboriginal Canadians. A host of broad socio-economic issues related to climate change are also of considerable concern including changed determinants of environmental health and well-being, health and social co-benefits of climate change mitigation actions along with the attendant risks (next page).

CANADA'S HEALTH IMPACTS FROM CLIMATE CHANGE AND VARIABILITY

Health Concerns	Examples of Health Vulnerabilities
Temperature-related morbidity and mortality	<ul style="list-style-type: none"> - Cold and heat related illnesses - Respiratory and cardiovascular illnesses - Increased occupational health risks
Health effects of extreme weather events	<ul style="list-style-type: none"> - Damaged public health infrastructure - Injuries and illnesses - Social and mental health stress due to disasters - Occupational health hazards - Preparedness and population displacement
Air pollution-related health effects	<ul style="list-style-type: none"> - Changed exposure to outdoor and indoor air pollutants and allergens - Asthma and other respiratory diseases - Heart attacks strokes and other cardiovascular diseases - Cancer
Water- and food-borne contamination	<ul style="list-style-type: none"> - Enteric diseases (diarrhea, vomiting, etc.)
Vector-borne infectious diseases	<ul style="list-style-type: none"> - Changed patterns of diseases caused by bacteria, viruses and other pathogens carried by mosquitos, ticks and other vectors
Stratospheric ozone depletion and increased exposure to ultra-violet radiation	<ul style="list-style-type: none"> - Skin damage and skin cancer - Cataracts - Disturbed immune function
Population vulnerabilities in rural and urban communities	<ul style="list-style-type: none"> - Seniors - Children - Chronically ill - Low income and homeless - Subsistence populations - Disabled - Recent immigrants
Health and Socio- Economic Impacts on Community Health and Well-being	<ul style="list-style-type: none"> - Changed determinants of health and well-being - Global burden of disease - Vulnerability of community economies - Health co-benefits and risks of GHG reduction technologies

As part of this effort, Health Canada held its **First Annual Climate Change and Health & Well-being National Policy and Planning Conference (September 5-7, 2001)** involving policy analysts and practitioners from federal health programs, provincial and territorial Ministries of Health, community health programs, and health and environmental non-governmental organizations. **The goal of the conference** was to coordinate the development of collaborative policy networks, provide information about the development of Canada's health impact assessment guidelines and begin addressing priority health issues which will help Canada successfully adapt to climate change.

The Climate Change and Health Office at Health Canada will facilitate policy development and planning by providing the following services:

- Inventory of climate change and health funding sources
- Inventory of climate change and health policy analysts and practitioners
- Inventory of potential adaptation measures and current activities
- Facilitate climate change and health policy research activities
- Coordinate climate change health policy issue seminars and workshops

Managing the Risks to Human Health and Well-being from Climate Change

Adaptation to the health effects of climate change and variability involves the management of an inter-related set of risks. Of particular importance for decision makers is the identification of how vulnerable specific communities and regions of Canada are to the possible effects of climate change. This is a function of existing sensitivities (e.g., vulnerable populations) and the adaptive capacity (e.g., resources, technology, knowledge, institutions, etc.) of the communities.

The risk management process provides a framework for selecting adaptation strategies which are best suited for a community's infrastructure, operations, economy or populations. In collaboration with Health Canada, an expert panel from the University of Ottawa has developed a formal risk management framework, the *Health Canada Policy Framework for the Management of Global Climate Change Issues*. The framework will undergo further development to suit the needs of communities in Canada.

Assessing the Impacts of Climate Change on Human Health

Sound adaptation policies should be based on sound knowledge of the impacts of climate change, the vulnerability and sensitivity of Canadians to it and existing options for adaptation that are effective in reducing the risks.

For that reason, in March 2001, Health Canada hosted, in partnership with the Canadian Climate Impacts and Adaptation Research Network (C-CIARN) of Natural Resources Canada, the First Annual National Health and Climate Change Science and Policy Research Consensus

Conference. The conference involved a wide spectrum of national and international researchers and policy analysts. By identifying current gaps in knowledge the conference produced a climate change and health research agenda to guide future scientific efforts.

Populations in all countries will be affected by climate change. International and bi-national cooperation will be needed in efforts to adapt to the impacts of climate change on health and well-being. For that reason, Health Canada, helped the WHO European Centre for Environment and Health, the United Nations Environment Programme and the Pan-American Health Organisation to develop guidelines for assessing climate change human health impacts guidelines that will identify the sensitivity and vulnerability of populations for a range of health issues to guide policy makers in efforts to protect human health. The first draft of the guidelines is expected to be available in late 2002, at which time a WHO/UNEP/WMO review process with a broad coverage of expertise and countries will be initiated. Health Canada is also working with the United States Environmental Protection Agency on these issues.

Ultimately, these guidelines will be used by public health decision makers in Canada, in their collaborative efforts to protect Canadians from such risks.

Integrating Climate Change Considerations into Public Health Policies

The wide range and potential magnitude of the effects of climate change on human health & well-being means that both public and private decision makers should begin now integrating such considerations into public health promotion and protection activities through targeted adaptation initiatives. Canadians have always found ways of coping with climate change and variability and extremes. Our experience over the course of history indicates that adaptive measures and policies sensibly and consistently applied over the long-term can produce excellent results and enhance health and well-being.

Although the climate is changing at an unprecedented rate and scientific uncertainty about the various processes exists, we can make progress in a manner that is affordable and that is protective of human health & well being. We need to clarify what the risks are and who will be affected to inform adaptation planning and policy development in public health and related sectors. Policy options based on the “precautionary principle” or “no-regrets” actions are available to public health decision makers which respond to concerns about the costs of action, possibility of maladaptation and scientific uncertainty. These might include increased monitoring and surveillance of vector-borne infectious diseases, the use of climate forecasting in water infrastructure planning, or improved housing and sanitation practices to protect vulnerable populations (Annex 3 - List of Climate Change and Health & Well-being Adaptation Measures). Some communities in Canada have already begun integrating climate change considerations into their public health activities and decision makers would benefit from the sharing of knowledge and experiences in this regard. For example, the City of Toronto has developed two extreme weather alert plans: Extreme Cold Weather Alerts and Heat-Health Alerts (Annex 4: Climate Change and Health & Well-being Adaptation Case Studies).

In addition, a number of national and bi-national government authorities have begun including climate change into their discussions. For example, bi-nationally, the Conference of the New England Governors and Eastern Canadian Premiers and the International Joint Commission have had focused discussions on climate change. Nationally, the National Air Issues Coordinating Committee - Climate Change has been engaged on this issue since 1997.

First Annual Climate Change and Health & Well-being National Policy and Planning Conference

To provide adequate opportunity for discussion and analysis, the Policy and Planning Conference (September 5-7, 2001) will not address the entire 8 health and well-being concerns. Rather, discussions in the breakout groups will focus on climate change effects related to **air quality, water and food-borne contaminants, vector-borne infectious diseases and vulnerable populations**. The other concerns including temperature-related morbidity and mortality, the health effects of extreme weather events, stratospheric ozone depletion and increased exposure to ultra-violet radiation, and the socio-economic impacts on community health and well-being will be the focus of future conferences and workshops.

The wide range of health issues associated with climate change require the collaborative involvement of actors at the federal, provincial, territorial levels and especially with municipalities where many public health programs are delivered. For this reason, an important part of the Policy and Planning Conference will be the use of breakout sessions on the second day to identify current policy gaps and how Health Canada might provide support to address these issues. One option to be considered will be the use of policy networks to facilitate effective approaches to policy development.

The breakout sessions will involve participation by a range of public and private decision makers from one of 6 regions (North, British Columbia, Prairies, Ontario, Quebec, Atlantic). The groups were identified by ecozone or by climate region based upon the expectation that they will share similar climate change and health & well-being problems in the future (e.g. Atlantic Canada). The breakout session groups will be tasked with launching the development of collaborative policy networks, or alternative cooperation mechanisms, to begin addressing the health effects of climate change related to air and water quality, infectious diseases and vulnerable populations. Each group will define the scope of the policy gaps which need to be addressed and the required activities to move forward with action.

Moving Forward

The results of the National Policy and Planning Conference and the Research Conference will inform Climate Change and Health Office efforts to collaboratively assess and manage the health & well-being issues in Canada through two key oversight committees. These committees will address policy and research issues respectively and include the *Climate Change and Health & Well-being Executive Policy Committee* and *Climate Change and Health & Well-being Technical Program Committee*. Both committees will be comprised of federal and provincial/territorial representatives of Ministries of Health, other federal climate change partners, the Climate Change Secretariat, and representatives from a sample of health, environmental and non-governmental organizations such as stakeholders. They will also include a representative from the health research funding community. Policy networks which do arise during the course of the Policy Conference will provide an advisory function to the Executive Policy Committee and will constitute the primary implementation mechanism at the community level.

Introduction: Climate Change and Health & Well-being in Canada

The Changing Climate System

Scientists, governments and international bodies have recognized that greenhouse gas accumulations in the atmosphere will change the global climate, and will affect the environment and human health and well-being.¹ The range of potential health effects from this phenomenon is quite broad. Some communities will be more vulnerable than others, for geographic reasons, due to health status or because of limited resources. Much is already being done to better understand the causes and long-term patterns of climate change and climate variability in Canada.

Average temperatures over Canada have increased in the past century with the largest increases in central, northwest and northern regions. At the same time, there were decreases in temperature in some eastern regions. There will also be an increase in climate variability and we can expect more extreme weather events. Much of central and northern Canada may experience a mean temperature increase of 5°C, or more, by the second part of this century while the waters off the coast of Labrador and Newfoundland and nearby coastal areas are projected to continue cooling. The rest of Canada, including most of the larger communities, is in the 3°C to 5°C temperature rise range.²

The *Canada Country Study*, completed by Environment Canada in 1997, reviewed the scientific and technical literature to identify the current knowledge of the potential impacts of climate change on Canada along with possible adaptive responses. The *Canada Country Study Climate Impacts and Adaptation - National Summary for Policy Makers*, which can be viewed at http://www.ec.gc.ca/climate/ccs/policysummary_e.htm, highlights a number of projected physical changes for Canada including:

- An increase in the occurrence of extremely hot days, and a decrease in the occurrence of extremely cold days.
- More severe droughts and/or floods in some locations in Canada.
- More intensive and violent summer storms and winter storms.
- Increases in frost heave, thaw settlement and slope instability associated with permafrost melting in the North, which could damage structures including airports, roads, railways, buildings, waste dumps, water diversion channels, utility lines and pipelines.

¹McMichael et al., 1996; Inter-governmental Panel on Climate Change, 1996.

² Bruce et al., no date.

- Impacts on lifestyles in the North due to possible changes in the availability and distribution of wildlife and related food resources.
- Longer and warmer frost-free periods across Canada which may improve conditions for commercial agriculture, if the soil moisture is sufficient.
- Increases in sustainable marine fish harvests for most of the Arctic, and for northern freshwater fish, while there may be general decreases for Pacific (e.g., southern salmon, cod), and Atlantic marine and southern freshwater fish (e.g., trout, whitefish, grayling).
- Forests are expected to shift northward in Canada due to climate change, but may experience increased drought stress, an increase in frequency and severity of fire, more frequent and severe storm and wind damage, especially in coastal regions.

Current mathematical climate models cannot yet reliably predict the impacts of climate change on specific regions in Canada. However, the effects of climate change will likely vary considerably across the country. Natural Resource Canada's (NRCan) document *Sensitivities to Climate Change in Canada* provides a series of maps which show some of the environmental changes that could occur in Canada due to a doubling of CO₂. For example, the Sensitivity to Sea Level Rise map shows that rising water levels could impact a wide range of human structures and activities in the Maritimes, along portions of the Beaufort Sea coastline, and around the urbanized Fraser Delta near Vancouver. The maps can be viewed at: <http://sts.gsc.nrcan.gc.ca/adaptation/sensitivities>

Human Health & Well-Being Impacts of Climate Change

Much is being done in Canada to better understand the causes and long-term patterns of climate change and climate variability, and to reduce greenhouse gas emissions through the development and use of cleaner technologies. The Federal Government's recently announced Action Plan 2000 on Climate Change focuses primarily on greenhouse gas emissions reductions by committing \$500 million over 5 years for initiatives targeted at specific sectors.

Although many successful mitigation measures to reduce the impact of greenhouse gas emissions are already underway, it is also recognized that mitigation efforts will not totally eliminate the risks of climate change. Even if the provisions of the Kyoto Protocol are fully met by all participating countries, the date at which CO₂ will double in the atmosphere will simply be pushed back. Therefore Canada will have to cope with, and adapt to, the many climate-related environmental changes which have already begun, particularly in the North, and which will affect the future health and well-being of Canadians.

The *Canada Country Study* briefly describes some of the impacts climate change will have on health arising from thermal extremes, extreme events, environmental contamination and other occurrences. Health Canada recently identified eight significant climate change induced health effects which are expected to increase in the future in this country. They include health and

well-being effects related to increased smog episodes, heat waves, water and food borne contamination, vector-borne diseases, stratospheric ozone depletion and extreme weather events. These effects are expected to be particularly severe for vulnerable populations such as children, the elderly, the poor, disabled people, immigrant populations and Aboriginal Canadians. A host of broad socio-economic issues related to climate change are also of considerable concern, including changed determinants of environmental health and well-being, vulnerability of community economies and the health and social risks of climate change mitigation actions (below).

CANADA'S HEALTH IMPACTS FROM CLIMATE CHANGE AND VARIABILITY

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Stratospheric ozone depletion and increased exposure to ultra-violet radiation	<ul style="list-style-type: none"> - Skin damage and skin cancer - Cataracts - Disturbed immune function
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Health and Socio- Economic Impacts on Community Health and Well-being	<ul style="list-style-type: none"> - Changed determinants of health and well-being - Global burden of disease - Vulnerability of community economies - Health co-benefits and risks of GHG reduction technologies

The effects of climate change will vary by region, with considerable regional differences in patterns of warming, precipitation and extreme events. The climate impacts will vary across demographic groups and the effects may be more severe on children, elderly, and poor. Some areas or population groups may be able to adapt more easily than others.

Although it is not possible to ascribe recent severe weather-related events directly to climate change, examples of such events help to provide an indication of the risks to health and well-being that may face Canadians in the future. For example, the Assiniboine, Red and Winnipeg river flood of May 1997 caused the evacuation of over 25 000 people and resulted in \$815 million in damages. The southern Ontario, Quebec and New Brunswick Ice Storm in January 1998 resulted in massive power outages affecting 4.7 million people. Over 600 000 people had to be evacuated, and 28 deaths and 945 injuries occurred. Total damages were about \$5.4 billion. In July, 2000 a tornado hit Pine Lake causing 12 deaths, 14 injuries and displacing close to 1000 people.³

The Climate Change and Health Office (CCHO) at Health Canada is the focal point for the federal government for health and climate change issues. The role of the CCHO is to collaboratively develop Canadian health policies for assessing and managing the risks to health from climate change and climate variability. The CCHO also facilitates the development in Canada of a foundation of interdisciplinary evidence, including inherent uncertainties, to support health policy development. In addition, it facilitates processes for open dialogue that include all stakeholders, as well as access to the knowledge generated by these activities.

³ Emergency Preparedness Canada, 2001.

Recognizing that climate change may pose serious impacts to the health and well-being of Canadians, Health Canada sponsored a workshop of internationally recognized experts in January, 1999. The purpose of this workshop was to begin the process of ensuring that health science informs decision makers of national policies and priorities involved in selecting climate change adaptation and mitigation options. Some key policy related recommendations followed from this workshop including the need for interdisciplinary approaches to science and policy development, the enrichment of current public health infrastructure, strengthening of existing surveillance and monitoring systems and continual consultation and dialogue involving all stakeholders. The workshop document *Capitalizing on Science: Report of a Workshop on Climate Change, Science and Health* can be obtained by contacting the Climate Change and Health Office.

Health Canada also has now organized its **First Annual Climate Change and Health & Well-being National Policy and Planning Conference (September 5-7, 2001)** involving policy analysts and practitioners from federal health programs, provincial and territorial Ministries of Health, community health programs, and health and environmental non-governmental organizations.

The goal of the conference was to coordinate the development of collaborative policy networks, or alternative cooperative mechanisms, to assist in the development of Canada's health impact assessment guidelines, and to begin addressing priority health issues which will help Canada successfully adapt to climate change. **The purpose of this document** is to provide participants of the conference with information on the possible health effects of climate change and potential adaptation measures to facilitate discussions in the breakout groups and plenary discussions.

National Climate Change Process: The Human Health & Well-being Dimension

At the third meeting of the Conference of Parties to the United Nations Framework Convention on Climate Change at Kyoto in 1997, Canada agreed to reduce emissions of greenhouse gases to 6% below 1990 levels by 2008 - 2012.⁴ Canadian federal, provincial and territorial leaders agreed to work together on the implementation effort towards this goal. With this commitment, First Ministers directed federal, provincial and territorial Joint Ministers of Energy and Environment (JMM) in December 1997 to establish a national process to examine the impacts, costs and benefits of implementing the Kyoto Protocol and the various implementation options open to Canada.

Central to this process was the creation in April 1998 of 16 Issue Tables consisting of 450 experts from government, industry, academia and non-governmental organizations. These groups provided expert advice and detailed input into the identification, analysis, and assessment of implementation options and have produced extensive reports identifying a full range of

⁴ Annex 1 provides a summary and chronology of key international climate change events. Source: Bruce et al., no date.

options. The Issue Tables covered a wide range of sectors and cross-cutting issues (e.g., transportation, energy, municipalities etc.). However, there was no Issue Table formed to look specifically at the impacts of climate change on human health and well-being, and therefore, the provision of advice and analysis in this regard was quite limited.

The Government of Canada Climate Change Action Fund (CCAF) was established to provide funds (\$150 million over three years) to support the work of the Issue Tables and other activities to help meet the Kyoto commitment. This process culminated in the First National Climate Change Business Plan (FNBP) which was announced in October, 2000. As noted above, Action Plan 2000 is the Federal Government's contribution to the FNBP and will contribute \$500 million over five years for specific actions to reduce greenhouse gases. Canada continues to be a participant in the international negotiations which are aimed at forging agreement on rules and mechanisms for implementing the Kyoto Protocol.

Managing the Risks to Human Health and Well-being from Climate Change

Adaptation to the health effects of climate change and variability involves the management of an inter-related set of risks. Of particular importance for decision makers is the identification of how vulnerable specific communities and regions of Canada are to the possible effects of climate change. This is a function of existing sensitivities (e.g., vulnerable populations) and of their adaptive capacity (e.g., resources, technology, knowledge, institutions, etc.). The risk management process provides a framework for selecting adaptation strategies which are best suited to a community's infrastructure, operations, economies or populations.

Municipalities, with their high population densities and complex infrastructure are particularly sensitive and vulnerable to increases in climate-related disasters, as recent trends of rapidly increasing disaster losses in Canada (and worldwide) indicate. From 1960 to 1996 worldwide economic losses due to natural disasters jumped from \$5 - \$8 billion (US dollars) per year to \$60 - \$100 billion per year.⁵

At the local level where risk exists, or is perceived, and where there are concerns over vulnerabilities it may be prudent for key decision-makers to initiate a risk management process. This is especially needed where extreme weather-related disasters can result in large scale impacts on health & well-being, either through direct effects (e.g., injuries and deaths) or through indirect socio-economic impacts. To be better prepared for these and other climate change impacts such as increased smog and heat episodes, or incidences of infectious diseases which may affect vulnerable populations, municipalities should set objectives (including actions, measures, strategies and policies) that offset or reduce the effects and impacts of the changing climate.

⁵ Maxwell et al., 1997.

Governments and firms routinely manage risks by reducing the vulnerabilities associated with climate change or uncertain events. Dams and flood control structures are designed for extreme rainfall patterns, sea walls are designed for extreme storm surges, crop insurance compensates for losses due to unusual weather conditions. Public health authorities specify immunization programs and other measures to limit the spread of communicable diseases, forest services use the available resources to minimize loss due to fires, and standards are established for automobiles and aircraft to manage the risks of accidents in harsh weather conditions.⁶ Policy makers must ensure that their strategies for reducing vulnerabilities are flexible enough to account for possibly significant changes in the climate system in the future. Public health policies informed by such approaches will be as protective of human health and well-being as is possible.

To facilitate the adoption of risk management approaches for climate change and health & well-being issues by government decision makers, Health Canada contracted an expert panel from the University of Ottawa to develop a formal risk management framework. The goal of the *Health Canada Policy Framework for the Management of Global Climate Change Issues* is to integrate the different scientific disciplines to guide Health Canada and its provincial, territorial and municipal partners in their risk management activities related to climate change and health and well-being. With resources from the Climate Change and Action Fund, a preliminary assessment report and a formal risk management framework have been developed. The framework will undergo further development to suit the needs of communities in Canada.

First Annual Science and Policy Research Conference (March, 2001)

Sound adaptation policies should be based on sound knowledge of the impacts of climate change, the vulnerability and sensitivity of Canadians to it and existing options for adaptation that are effective in reducing the risks. If Canada is to develop effective public health policies and strategies that will help its citizens to cope with climate change, Canadian researchers and policy-makers need to assess now the likely public health implications of climate change and variability at the national, regional and local levels.

As highlighted in the above chart, Health Canada has identified eight health and well-being issues, and their related vulnerabilities which need to be assessed to protect the health of Canadians from the possible effects of climate change. As part of this effort, in March 2001, Health Canada hosted, in partnership with the Canadian Climate Impacts and Adaptation Research Network (C-CIARN) of Natural Resources Canada, the First Annual National Health and Climate Change Science and Policy Research Consensus Conference involving a wide spectrum of national and international researchers and policy analysts. By identifying current gaps in knowledge the conference produced a climate change and health research agenda to guide future scientific efforts. Additional future climate change and health & well-being

⁶Bruce et al, no date.

conferences on research and policy will enhance the ability of all jurisdictions in Canada to address the risks to the public associated with climate change.

To provide adequate opportunity for discussion and analysis, the Policy and Planning Conference (September 5-7, 2001) focused on a limited number of health concerns including air pollution, water and food-borne contaminants, infectious diseases and vulnerable populations. For this reason only the results from the Research Conference related to these specific issues are provided below. The other health and well-being concerns related to climate change including temperature-related morbidity and mortality, the health effects of extreme weather events, stratospheric ozone depletion and increased exposure to ultra-violet radiation, and the socio-economic impacts on community health and well-being will be the focus of future workshops and conferences.

Research Conference Results:

Health Concern: Air pollution

In urban environments, the formation of secondary air pollutants, such as ground-level ozone is enhanced at high temperatures. Climate change could accelerate the atmospheric chemical reactions that produce secondary air pollutants. As well, smog concentrations are highest on hot, sunny days when its components (ground-level ozone, NO_x and VOCs) react in sunlight. This is due in part to higher temperatures that increase evaporation of volatile liquids such as gasoline and organic solids.

An increase in asthma, allergic disorders, and cardio-respiratory diseases could result from climate-induced changes in the formation and persistence of pollen, spores and other air pollutants. Climate change may also affect the amount of time which individuals spend indoors, thus resulting in changes in exposure to indoor air pollutants and allergens. The trend towards more tightly sealed buildings and energy conservation measures has been followed by an increase in the number of complaints related to indoor air quality.

Key research gaps related to this health concern include the need for comprehensive information on the health implications of measures to mitigate greenhouse gas emissions. (e.g., indoor air quality in energy efficient homes) and longitudinal population health studies to determine objectively the impacts of climate change and the value of mitigation strategies. We need to know whether the expected higher temperatures might help to produce more smog, or more biologic air contaminants such as pollens or mold spores, and how this might affect human health.

Health Concern: Water and food-borne contamination

Climate change and weather variability in Canada pose threats for water-borne diseases, some food-borne diseases and marine and coastal issues, including harmful algal blooms and ecological disruption. Changes in precipitation, temperature, humidity, salinity, and wind have a

measurable effect on the quality of water used for drinking, recreation and commerce. Heavy rainfall has been associated with water-borne disease outbreaks in Canada such as that at Walkerton, Ontario.

Temperature also influences the occurrence of bacterial agents, toxic algal blooms (red tides), and survival of viral pathogens that cause shell-fish poisoning. In addition, any existing deficiencies in watershed protection and storm drainage systems can increase the risk of contamination events if rainfall increases as projected with climate change.

Key research gaps related to the water and food-borne contaminants health concern include the need for increased knowledge and understanding of the contaminants or pathogenic agents in food and water as well as improved knowledge of the impacts of climate change on food and water production. In addition, there is a need for identification of regions and sub-populations potentially more susceptible to food and water-related illnesses because of climate change (e.g., urban, coastal and northern areas, First Nations peoples, elderly, immuno-deficient persons). Increased communication between government agencies and other researchers to avoid duplication of effort and keep the public informed is also required.

Health Concern: Vector-borne infectious diseases

Vector-borne diseases result from infections transmitted to humans and animals by blood-feeding insects, such as mosquitoes, ticks, and fleas. Most vector-borne diseases exhibit a distinct seasonal pattern, which clearly suggests that they are weather sensitive. For example, St. Louis encephalitis outbreaks in the have been associated with a pattern of warm, wet winters, cool springs, and hot dry summers.

Rodent-borne diseases are less directly affected by temperature. However, the impact of weather on disease-carrying rodent populations (for example, increased food supply or exposure during flooding) can affect transmission of diseases such as hantavirus and flea-borne plague.

Key research gaps related to this health concern include the need for a baseline of data and other information through integrated multi-disciplinary approaches to track disease trends. There is also a need for improvement of research and methods to address the identification and control of vector-borne diseases and to understand the interactions between vectors and their environment. Also, public health measures need to be enhanced for the identification of vector-borne diseases and for vector and disease surveillance and control.

Health Concern: Population vulnerabilities in cities and communities

Elderly

The elderly constitute one of the sub-populations that is increasing in sizes and that is particularly vulnerable to the effects of climate change. Aging is often accompanied by chronic illnesses that may increase susceptibility to infectious diseases or to extreme health and other environmental conditions (e.g., smog, water contamination). Poverty, which increases with age among the elderly, may add to this group's risk from severe weather.

Children

Children are one of the sub-populations that is particularly vulnerable to the effects of climate change. (e.g., increased smog, water contamination, infectious diseases, etc). The factors that may affect children's special vulnerability to possible future climate change include poverty, access to medical care, and children's susceptibility to environmental hazards because of their size, behavior and the fact that they are growing and developing.

Low- Income Individuals

Poverty is a risk factor for heat-related illnesses and deaths because low-income individuals are more likely to live in urban areas (where summer temperatures are often highest), are less likely to be able to afford air-conditioning systems, and may have less access to health care.

Immuno-compromised Individuals

Many illnesses such as cancer, AIDS, and diabetes, compromise immune systems. Individuals affected in this manner may be more susceptible to water-borne and vector-borne diseases and to physical stresses, such as those experienced during heat waves or floods. Adequate protection from those stresses is important and includes access to air conditioning, sanitation, and safe drinking water.

Aboriginal Populations

Many Aboriginal people live in Canada's North which is expected to experience great climatic changes over time. Many communities in the North may be highly vulnerable to the effects on human health & well-being from environmental disruptions such as a loss of wildlife and other resources. The needed financial, technological, institutional and knowledge based resources for rapid adaptation are quite limited for many of these communities. Such vulnerabilities are also shared by Aboriginal populations living in other locations in Canada.

Key research needs related to the issue of vulnerable populations include development of a comprehensive approach to identify and address climate change impacts and adaptation problems facing vulnerable populations. In addition, standardized data collection is needed so

that a baseline can be established to determine the relationship between weather and health and who is vulnerable. Specific priority research questions also exist including: What will vulnerable communities look like in twenty to thirty years? How will future environmental changes affect the social and economic disparities that exist today? What health indicators do we need to explore the relationships between climate change and health & well-being? Who is best qualified to assess the impacts of environmental change on population health and well-being?

The results of the Climate Change Science and Policy Research Consensus Conference are being used by various research funding agencies in Canada to formulate research proposals. The products of this research will then be available to public health decision makers in Canada, in their collaborative efforts to address the risks to human health & well-being from climate change.

Climate Change Human Health Impact Assessment Guidelines

Every country will have to adapt to changing climatic conditions. To do this successfully, the potential impacts of climate variability and change must be identified, along with barriers to successful adaptation and the means of overcoming such barriers. The United Nations Framework Convention on Climate Change, and provisions of the 1997 Kyoto Protocol, oblige signatory countries to carry out national assessments of the potential impacts of climate change. In addition, the 3rd Ministerial Conference on Environment and Health in London in 1999 also called for national health impact assessments.

Various methods have been developed for the quantitative estimation of health impacts of future climate change. All rely on the study of climate effects on health in the past, in the present (e.g., climate as a determinant of current disease distribution), or on components of disease transmission cycles described in the laboratory. Global or regional models exist mainly for predicting changes in the distribution and seasonality of the vector-borne diseases malaria and dengue.

A global health impact assessment was carried out as part of the Third Assessment Report (TAR) of the IPCC. However, these are no uniform methods for such assessments, and therefore comparisons between countries or regions are difficult. This could be a significant impediment during international negotiations on climate change mitigation, as well as effective international efforts to strengthen adaptive capacity in developing countries.

To address this difficulty, the IPCC developed methodological guidelines to enable generic Climate Change impact assessments which are broadly comparable. However, these guidelines are insufficient for assessing future impacts on human health & well-being.

Health Canada, the World Health Organization (WHO) European Centre for Environment and Health, and the United Nations Environment Programme (UNEP) have taken up the challenge of developing climate change human health impact assessment guidelines that will identify the

sensitivity and vulnerability of populations for a range of health issues and ensure the necessary transfer of knowledge among countries. The Pan-American Health Organization (PAHO) and WHO Geneva also participate in this project. The health impact assessment guidelines will be usable at a national and regional level.

At the first planning meeting for these Guidelines it was agreed that the guidelines should have the following key components/characteristics:

- Stakeholder-driven.
- Engagement of multiple disciplines, peer review process and protocol for conducting a literature review.
- Establishment of a baseline of current weather-sensitive diseases and conditions, review of other stressors (so that climate variability and change can be put into context), determination of the potential incremental effect of climate variability and change to existing conditions.
- Adaptation assessment, including response strategies (both risks and opportunities), adaptive capacity and institutional barriers, tools (generic and problem specific) including comparative risk assessments, integrated assessment, and problem specific assessment tools.
- Data and information management and strategic communication plans.

The guideline development is being guided by a Steering Committee composed of various international organizations and interested member states, and a Technical Guideline Development Team. The first draft of the guidelines is expected to be available in late 2002, at which time a WHO/UNEP/WMO review process with a broad coverage of expertise and countries will be initiated.

The climate change human impact assessment guidelines will provide policy makers with an excellent tool for gauging the vulnerability of populations in Canada to the effects of climate change. They will also provide needed information on possible adaptation strategies. Once the guidelines become further developed, CCHO at Health Canada will facilitate the exchange of information and the training of key policy makers on the use of the impact assessment guidelines.

By providing tools for the investigation of national and regional human health & well-being vulnerabilities in Canada to climate change, the impact assessment guidelines will also improve on the limited analysis provided by the *Canada Country Study* and the Issue Tables Process. In this regard, the guidelines will be useful for the conduct of future national assessments of climate change impacts and adaptation issues in Canada.

Integrating Climate Change Considerations into Public Health Policies: Obstacles and Opportunities

The wide range and potential magnitude of the effects of climate change on human health & well-being means that both public and private decision makers need to integrate such considerations into public health promotion and protection activities through targeted adaptation initiatives.

Adaptation refers to actions, measures, strategies and policies that offset or reduce the effects of climate change and variability. As the adaptive capacity of the country, region or community increases, the vulnerability to climate change lessens, resulting in smaller costs associated with impacts. Successful adaptation will depend upon, among other factors, technological capability, institutional arrangements, availability of financing, and exchange of information.⁷

Over the course of history, human societies have successfully adapted to climate in all its varieties. Canadians have always found ways of coping with climate change and variability and extremes. We have built a large and powerful country in an area subject to a very harsh climate. Adaptation to our current climate has, over decades and centuries, been carefully and painstakingly built into virtually all our designs and practices so gradually that it is scarcely recognized. The design of highways, bridges and culverts, residences, all industrial and commercial structures, airports, coastal ports and harbour installations, drainage systems, communications cables and transmission lines, are all designed and built to suit the present climate and to withstand most extremes. Similarly, our farming practices, our water resources and river basin management, forest practices, health standards, land use planning, power supply, and insurance policies are designed and carried out in a way that provides effective protection from the existing climate. The Canadian experience over the course of history indicates that adaptive measures and policies sensibly and consistently applied over the long-term can produce excellent results and enhance health and well-being.⁸

Obstacles

Maladaptation

Maladaptation can result in serious negative impacts. Non-climate related side effects can have adverse consequences (e.g. fish farms may lead to impoverished biodiversity instead of increased fish stocks). In addition, adaptive responses vary in effectiveness. Current efforts to cope with climate stresses, such as heat waves, illustrate some effective and non-effective adaptation measures (e.g. deaths and illnesses). The systematic nature of climate impacts complicates

⁷ Bruce et al, no date.

⁸ Bruce et al., no date.

adaptation. Simultaneous impacts have wide ranging effects and adaptation measures may create other problems (e.g. sea walls may damage wetlands).⁹

Costs

The costs associated with adaptation can be high and can only be very roughly estimated at the present time. The incremental costs (financial and political) of some risk management options may limit the options available to some jurisdictions in Canada.

However, as noted above, the costs associated with weather variability and extreme events (e.g. Red River flood 1997, Quebec ice storm 1998) and other impacts will remain significant and are likely to increase over present levels as recent trends already indicate. For example, from 1983 to 1987 Governments paid \$131 million for weather-related disasters in Canada. In 1998 they paid \$1.27 billion.¹⁰

Scientific Uncertainty

As noted above, policy deliberations regarding the needed actions to protect health and well-being from a changing climate should be informed by sound scientific information concerning the impacts of climate change, the vulnerability and sensitivity of Canadians to it and existing options for adaptation that are effective in reducing the risks. Currently, there are gaps in knowledge along all of these dimensions due to uncertainty about future climatic processes, especially at the regional level, and the related potential health effects. With such scientific uncertainty the risk of maladaptation, or an inefficient deployment of scarce resources, is a possible outcome of targeted initiatives to protect Canadians from the effects of climate change.

Opportunities

Although the climate is changing at an unprecedented rate and there is scientific uncertainty about the various processes, the opportunity exists to make progress in a manner that is affordable and that is protective of human health & well being.

With the aid of such organizations as the International Council for Local Environmental Initiatives and Partners for Climate Protection program, municipalities have begun to address climate change issues through the development of policies and plans, training, educational seminars, information tools and project advice to local authorities. In addition, municipalities are indirectly acting upon climate change and greenhouse gas

⁹ Bruce et al, no date.

¹⁰ Angus Ross, Sorema Reinsurance.

reduction by ‘co-benefit’ actions currently underway, such as the reduction of local air pollution, efficient use of energy and water, coping with natural disasters and development of treed streets and areas.¹¹

A number of funding programs exist to alleviate some of the cost pressures related to adaptation measures. For example, the Federal Government announced the Infrastructure Program which commits \$2.65 billion over six years to projects that support clean air and water, transportation and affordable housing. Funding programs that provide direct support to public health activities also exist such as the \$7 million that Health Canada has committed to spend over the next three years for community health initiatives (e.g., Aboriginal health, health information technology, health promotion, primary health care, etc.) in Vancouver. This announcement is in the spirit of the Vancouver Agreement - a five-year partnership between the Government of Canada, Province of British Columbia and City of Vancouver to implement a coordinated strategy for sustainable social, economic and community development in Vancouver. For a list of other funding programs which may be useful in offsetting some of the costs of climate change and health and well-being adaptation measures see Annex 2, and the Health Canada Web site.

The current scientific uncertainty surrounding the nature and magnitude of the health impacts of climate change suggest that integration of climate change considerations into public health policies needs further vulnerability risk assessment. However, we can take some actions now. Various types of policy options available in this regard are listed below. In addition, Annex 3 provides an overview of a wide range of adaptation measures that decision makers might consider for addressing the impacts of climate change on air and water quality, vulnerable populations, and infectious diseases. These health concerns will be the focus of discussions at the Policy and Planning Conference (September 5-7, 2001).

Impacts and Adaptation Policy Options in the face of Scientific Uncertainty

1. New policies/actions to address climate change and health that have little cost/risk associated with them (e.g., actions to facilitate information exchange).
2. New “no-regrets” policies or actions. No-regrets policies have costs associated with them but are justified by a wide range of factors and not just climate change and health considerations (e.g., enhanced urban planning). Regardless of what changes occur (e.g., climatic changes), these strategies will provide a net benefit to human health, society, the environment and the economy.
3. Current policies that may be revised or altered with little cost/risk to integrate climate change and health considerations. This may include policies that undergo revision due to reviews/critiques (e.g., toxics management, pesticides, air quality, water quality, public health infrastructure, etc.).

¹¹ Bruce et al, no date.

4. New policies or actions that may have higher costs or risks but are based on the Precautionary Principle. The Precautionary Principle states that “...where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (Canadian Environmental Protection Act, 1999). This principle would therefore legitimate the use of higher cost actions to protect human health from serious threats such as climate change even in the face of significant uncertainty about the causes and effects of this phenomenon.

Many communities and commercial operations have already adapted successfully and economically to warmer climates than Canada’s. They can offer valuable lessons, processes, procedures and experiences for Canadian municipalities and businesses for integrating climate change considerations into public health activities.¹² Given the importance of using the experience of others to advance adaptation without making costly mistakes, Annex 4 provides a number of case studies of current adaptation efforts in Canada which either directly or indirectly relate to human health and well-being.

Roles and Responsibilities - Building Collaborative Partnerships

The wide range of health issues associated with climate change necessitates the collaborative involvement of a broad spectrum of decision makers, especially at the municipal level where many of the public health programs are delivered.

A particularly useful framework for the facilitation of collaborative approaches to policy development is a policy network. The six Policy and Planning Conference breakout sessions involved participation by a range of public and private decision makers from a specific region and will be tasked with launching the development of collaborative policy networks, or alternative mechanisms, to begin addressing the health effects of climate change related to air and water quality, vector-borne infectious diseases and vulnerable groups. Each breakout session defined the scope of the activity of its respective group based on the following key guiding questions:

2 Questions Per Health Issue to Be Answered During Breakout Sessions

Question 1: What are you currently doing to address this health issue? What are the current policy gaps (public and private sector) with respect to this health issue?

Question 2: What are the priority actions that can be taken now by a collaborative network to begin addressing the policy gaps?

¹² Bruce et al, no date.

2 Questions Per Breakout Session Group

Question 1: How would you make a collaborative network function (i.e., who would lead it, who should be involved, linkages, resources, communications)?

Question 2: What help would you require from Health Canada to enable a network to achieve its goals? (e.g., roles of members, facilitation, coordination, information management, etc.) What help would you require from other federal partners?

Some of the possible functions of a policy network include:

- Contribute to the coordination and interaction of the climate change and health & well-being impacts and adaptation policy community to provide greater visibility and understanding of the issues and needs.
- Integrate of climate change considerations into a range of relevant public health policies to manage risks to Canadians.
- Provide a mechanism for stakeholder involvement in impacts and adaptation policy development and in the identification of priority adaptation actions.
- Participate in climate change health impact assessments, and liaise with the research community to identify policy related needs and gaps.

The results of the National Policy and Planning Conference and the Research Conference can inform efforts to collaboratively assess and manage the health & well-being issues in Canada. Health Canada has established a *Climate Change and Health & Well-being Technical Program Committee* to oversee and to coordinate the research work needed to fill the present knowledge gaps. The committee is comprised of federal and provincial/territorial representatives of Ministries of Health, other federal climate change partners, the Climate Change Secretariat, and representatives from a sample of health, environmental and non-governmental organizations such as stakeholders. It also includes a representative from the health research funding community.

ATTACHMENTS

Annex 1: Summary and Chronology of Key International Climate Change Events

Annex 2: List of Funding Sources

Annex 3: List of Climate Change and Health & Well-being Adaptation Measures

Annex 4: Climate Change and Health & Well-being Adaptation Case Studies

Summary and Chronology of Key International Climate Change Events

The Road to Kyoto and Beyond (A timeline of scientific research and conferences that led to the Kyoto Protocol)

- 1896 Svante Arrhenius, a Swedish chemist, predicts carbon dioxide emissions from burning of coal will lead to global warming.
- 1957 Revelle and Seuss, scientists with the Scripps Institute of Oceanography, report that much of the CO₂ emitted into the atmosphere by industrial activities is not absorbed by the oceans, as some researchers had proposed. They described the build-up of carbon dioxide in the atmosphere as “a large-scale geophysical experiment” with the earth’s climate.
- 1958 Keeling, a scientist with the Scripps Institute, initiates the first reliable and continuous measurements of atmospheric carbon dioxide at Hawaii’s Mauna Loa Observatory.
- 1972 Stockholm: first U.N. Conference on the Human Environment where human induced climate change was identified as a pressing issue. The United Nations Environment Programme founded.
- 1979 Geneva: first World Climate Conference: launched the World Climate Program to coordinate global research on climate and climate change and collect meteorological and related oceanographic and hydrologic data.
- 1985 Villach (Austria) Conference: issued a warning that “Many important economic decisions are based on the assumption that past climate is a reliable guide to the future. This is no longer a good assumption.”
- 1988 The Intergovernmental Panel on Climate Change (IPCC), made up of the world’s leading climate scientists, is established by the U.N. Environment Programme and the World Meteorological Organization to assess the scientific research on climate change and its environmental impacts and remedial measures.
- 1988 Toronto: The Conference on the Changing Atmosphere calls for a 20 percent reduction in carbon dioxide emissions.
- 1990 Geneva: First assessment report of the IPCC is endorsed at the Second World Climate Conference by more than 500 scientists and world leaders. A call is issued for an international agreement to mitigate global warming.

- 1992 Rio de Janeiro: One of the results of the United Nations Conference on Environment and Development (UNCED) was that 154 nations signed the U.N. Framework Convention on Climate Change, voluntarily agreeing to stabilize greenhouse gas emissions at 1990 levels by the year 2000.
- 1995 The IPCC, representing the consensus of the world's climate scientists, concludes that "...the balance of evidence suggests that there is a discernible human influence on global climate." It also concludes that the net benefits of greenhouse gas mitigation exceed the costs in many countries at least for the initial reductions.
- 1997 Warmest year on record since scientists began keeping accurate meteorological logs in 1860. The next two warmest years are also in the same decade: 1995, 1990.
- 1997 Kyoto, Japan: 159 nations negotiate a protocol to the UNFCCC setting out legally binding reduction targets for six greenhouse gases averaging 5.2% below 1990 levels for industrialized countries by 2008 - 2012.
- 1998 Measurements indicate that 1998 is the warmest year on record in Canada and globally, even warmer than 1997.
- 1998 Parties to the UNFCCC in Buenos Aires agree to a plan to work towards the goals of Kyoto.
- 2000 Canadian Federal Government announces its Action Plan 2000 on Climate Change.
- 2001 Kyoto Agreement reached in Bonn, Germany.

List of Funding Sources

Name	Description	Sponsor
Climate Change Action Fund - Public Education and Outreach Program	<p>The goal of the CCAF Public Education and Outreach Program is to build public awareness and understanding about climate change and provide Canadians with the information they need to take action to reduce greenhouse gas emissions and adapt to climate change.</p> <p>Open to non-profit, non-governmental organizations, First Nations, community groups, government agencies (all levels), and businesses and industries</p>	<p>Climate Change Secretariat www.climatechange.gc.ca</p> <p>Climate Change Secretariat 55 Murray Street, Suite 600 Ottawa, Ontario K1N 5M3</p> <p>Phone: 613-943-2671 Fax: 613-943-2694 E-mail: ccaf@climatechange.gc.ca</p>

<p>Climate Change Action Fund - Impacts and Adaptation</p>	<p>The goal of the CCAF Impacts and Adaptation Program provides funding for targeted research to better understand Canada's vulnerability to climate change, both regionally and by social and economic sector, and to provide information necessary for the development of adaptation strategies.</p> <p>Eligible recipients include members of Canadian organizations such as: educational and academic institutions; government agencies (federal, provincial, territorial, regional, municipal); businesses and industries and their professional associations; not-for-profit, non-governmental organizations; community groups (aboriginal communities or organizations, voluntary groups, community organizations, associations and institutions).</p>	<p>Climate Change Secretariat</p> <p>www.climatechange.gc.ca</p> <p>Climate Change Secretariat 55 Murray Street, Suite 600 Ottawa, Ontario K1N 5M3</p> <p>Phone: 613-943-2671 Fax: 613-943-2694 E-mail: ccaf@climatechange.gc.ca</p>
<p>EcoAction Fund</p>	<p>Projects must result in positive, measurable environmental benefits and build public awareness of priority environmental issues such as clean air, climate change, clean water and species at risk.</p> <p>Open to non-profit, non-government groups.</p>	<p>Environment Canada</p> <p>http://www.ec.gc.ca/eoaction</p> <p>eoaction@ec.gc.ca</p> <p>Inquiry Centre 351 St. Joseph Boulevard Hull, Quebec K1A 0H3</p> <p>Phone: 819-997-2800 or 1-800-668-6767 Fax: 819-953-2225 E-mail: enviroinfo@ec.gc.ca</p>

<p>Great Lakes Sustainability Fund</p>	<p>Assists with the remediation and eventual delisting of Canada's remaining 16 Areas of Concern (AOC) by supporting remedial programs and techniques to restore water quality and other AOC beneficial uses. Priorities include urban stormwater and wastewater treatment, rural nonprofit source pollution control, and others.</p> <p>Open to government organizations, conservation authorities, non-government organizations, environmental groups and universities.</p> <p>Program is \$6M annually for 5 years starting in 2000.</p>	<p>Environment Canada</p> <p>http://sustainabilityfund.gc.ca/</p> <p>Inquiry Centre 351 St. Joseph Boulevard Hull, Quebec K1A 0H3</p> <p>Phone: 819-997-2800 or 1-800-668-6767 Fax: 819-953-2225 E-mail: enviroinfo@ec.gc.ca</p>
<p>Moving on Sustainable Transportation Program</p>	<p>Supports projects that produce the kinds of education, awareness and analytical tools needed to make sustainable transportation a reality.</p> <p>Open to non-profit, non-governmental organizations, community organizations, labour organizations, businesses (if non-profit in nature) and industries and their associations.</p>	<p>Transport Canada</p> <p>http://www.tc.gc.ca/envaffairs/</p> <p>Office of Environmental Affairs Sustainable Development Division Transport Canada 330 Sparks Street, Place de Ville, Tower C, 18th Floor Ottawa, Ontario K1A 0N5</p> <p>Phone (613) 998-6607 Fax (613) 993-8674 E-mail: MOST@tc.gc.ca</p>

<p>North American Fund for Environmental Cooperation (NAFEC)</p>	<p>Supports community-based projects in Canada, Mexico and the United States that promote the goals and objectives of the Commission for Environmental Cooperation including (1) environment, trade and economy, conservation of biodiversity (2) pollutants and health (3) law and policy.</p> <p>Grants up to \$40,000.</p>	<p>Commission For Environmental Cooperation</p> <p>http://www.cec.org</p> <p>North American Fund for Environmental Cooperation c/o North American Commission for Environmental Cooperation 393 St. Jacques West, Suite 200 Montréal, Quebec H2Y 1N9</p> <p>Phone: (514) 350-4357 Fax: (514) 350-4314 E-mail: NAFEC@ccemtl.org</p>
<p>CanAdapt Program</p>	<p>Funds targeted to projects that foster long-term growth, financial self-sufficiency and competitiveness for Ontario's agriculture, food and rural communities. Areas of investment include food safety, environmental sustainability and others.</p> <p>Open to non-profit organizations, for-profit organizations, corporations, businesses and individuals.</p>	<p>Agriculture and Agri-Food Canada</p> <p>http://www.adaptcouncil.org/</p> <p>Agricultural Adaptation Council 192 Nicklin Rd., Guelph, Ontario N1H 7L5</p> <p>Phone: (519) 822-7554 Fax: (519) 822-6248 E-mail: canadapt@adaptcouncil.org</p>

<p>Canadian Rural Partnership Pilot Project Initiative</p>	<p>Supports rural Canadians as they pursue creative community-based responses that promote strong, sustainable community development in rural and remote areas.</p> <p>Open to rural residents, stakeholder organizations, community development associations and rural non-profit organizations.</p> <p>Funding is \$3M over 2000-2002 period.</p>	<p>Agriculture and Agri-Food Canada</p> <p>http://www.rural.gc.ca</p> <p>The Rural Secretariat Room 4112, Sir John Carling Bldg. Ottawa, Ontario K1A 0C5 Phone: (613) 759-7112 Fax: (613) 759-7150 E-mail: rs@em.agr.ca</p>
<p>Canadian Agricultural Rural Communities Initiative</p>	<p>Supports rural Canadians with projects which respond to the needs of the agriculture and agri-food sector in such areas as agricultural production, marketing of agricultural products, food safety, research and development of new products and processes and farm management.</p> <p>Open to rural residents, stakeholder organizations, community development associations and rural non-profit organizations.</p>	<p>Agriculture and Agri-Food Canada</p> <p>http://www.agr.ca/carci/</p> <p>The Rural Secretariat Room 4112, Sir John Carling Bldg. Ottawa, Ontario K1A 0C5 Phone: (613) 759-7112 Fax: (613) 759-7150 E-mail: rs@em.agr.ca</p>

<p>Toronto Atmospheric Fund</p>	<p>Created to help Toronto meet its goal of reducing greenhouse gas emissions by 20% by 2005. In 2000, TAF's mandate was expanded to include air quality as well as climate change.</p> <p>Open to community and environmental groups, schools, utilities, businesses, trade associations, and all levels of government.</p>	<p>City of Toronto http://www.city.toronto.on.ca/taf</p> <p>The Board of Directors Toronto Atmospheric Fund 75 Elizabeth Street Toronto, Ontario M5G 1P4</p> <p>Phone: (416) 392-0271</p>
<p>Tree Canada Foundation</p>	<p>Provides education, technical assistance and financial support to encourage Canadians to plant and care for trees in an effort to help reduce the harmful effects of carbon dioxide emissions.</p> <p>Open to any group that is planting trees for non-commercial purposes.</p>	<p>Natural Resources Canada http://www.treecanada.ca</p> <p>Tree Canada Foundation 220 Laurier Avenue West, Suite 1550 Ottawa, Ontario, K1P 5Z9</p> <p>Phone: (613) 567-5545 Fax: (613) 567-5270 E-mail: tcf@treecanada.ca</p>

<p>Green Municipal Enabling Fund</p>	<p>The Green Municipal Enabling Fund (GMEF) is a \$25 million Fund that provides grants to support feasibility studies. Operating from 2000 to 2005, GMEF expects to support up to 150 studies a year to assess the technical, environmental and/or economic feasibility of innovative municipal projects. Grants cover up to 50 per cent of eligible costs to a maximum grant of \$100,000.</p>	<p>Federation of Canadian Municipalities</p> <p>http://www.fcm.ca</p> <p>Federation of Canadian Municipalities Green Municipal Funds 24 Clarence Street Ottawa, ON K1N 5P3</p> <p>Phone: (613) 241-5221, ext 355 Fax: (613) 244-1515 Email: greenfunds@fcm.ca</p>
<p>Green Municipal Investment Fund</p>	<p>GMIF is a \$100 million permanent revolving fund that supports the implementation of innovative environmental projects. Through GMIF a municipal government or its partner can borrow at competitive rates for up to 15 per cent (exceptionally 25 per cent) of capital costs. GMIF can also provide loan guarantees. Project payback periods may range from four to ten years.</p> <p>GMIF expects to support 15 to 20 projects a year.</p>	<p>Federation of Canadian Municipalities</p> <p>http://www.fcm.ca</p> <p>Federation of Canadian Municipalities Green Municipal Funds 24 Clarence Street Ottawa, ON K1N 5P3</p> <p>Phone: (613) 241-5221, ext. 355 Fax: (613) 244-1515 Email: greenfunds@fcm.ca</p>

<p>National Child Benefit Program</p>	<p>This joint initiative provides families with the supports and services, outside of social assistance, they need to provide a better life for themselves and their children.</p> <p>Provides the flexibility and variability for First Nations and Aboriginal communities to design and develop innovative, community-based programs that are culturally relevant and responsive to their specific and unique needs.</p>	<p>Department of Indian Affairs and Northern Development http://www.ainc-inac.gc.ca/</p> <p>Children's Programs Social Policy and Programs Branch INAC 19th floor, 10 Wellington Street Hull, QC K1A 0H4</p> <p>Phone.: (819) 997-8146 Fax: (819) 953-9139</p>
<p>Technology Partnerships Canada</p>	<p>Technology Partnerships Canada (TPC) is a technology investment fund. TPC advances and supports research, development and innovation in: environmental technologies; enabling technologies (advanced manufacturing and processing technologies, advanced materials processes and applications, applications of biotechnology, and applications of selected information technologies); aerospace and defense.</p>	<p>Industry Canada http://tpc.ic.gc.ca</p> <p>Technology Partnerships Canada Industry Canada 10th Floor 300 Slater Street Ottawa, Ontario K1A 0C8</p> <p>Phone: 1-800-266-7531 Fax: (613) 954-9117 E-mail: tpc@ic.gc.ca</p>

<p>Federal Government Infrastructure Program</p>	<p>In partnership with provincial, territorial and local governments and the private sector. Infrastructure Canada will help to renew and build the physical infrastructure that supports and connects our economy, our communities, our culture, and our country.</p> <p>Commits \$2.65 billion over six years to projects that support clean air and water, transportation and affordable housing.</p>	<p>Treasury Board Secretariat http://publiservice.tbs-sct.gc.ca/ Phone: 1-800-622-6232 E-mail: ino-bni@tbs-sct.gc.ca</p>
<p>Supporting Communities Partnership Initiative</p>	<p>The program helps communities strengthen their capacity to address the needs of their homeless population; and to improve the social, health and economic well-being of people who are homeless.</p> <p>Not-for-profit organizations, individuals, and municipal governments are eligible to receive funding. Public health and educational institutions may be eligible for funding, with the agreement of the provincial or territorial government.</p>	<p>Human Resources Development Canada http://www.hrdc.gc.ca/homelessness National Secretariat on Homelessness Human Resources Development Canada Place du Portage II 165 Hôtel de Ville Street, 8th floor Hull, Quebec K1A 0J2</p>

<p>Rural Water Development Program</p>	<p>This program is designed to contribute to the stability and development of Prairie rural areas and to ease the impact of drought in Manitoba, Saskatchewan, Alberta and the Peace River region of British Columbia. Projects must benefit the rural agricultural economy by maintaining or enhancing income-generating opportunities and/or encouraging the implementation of environmentally sustainable agricultural practices in the use of water resources.</p> <p>Financial assistance will not exceed one-third of project costs.</p>	<p>Agriculture and Agri-Food Canada</p> <p>http://www.agr.ca/progser/</p> <p>Mark Geremia Program Coordinating Officer Prairie Farm Rehabilitation Administration 1800 Hamilton Street Regina, Saskatchewan S4P 4L2</p> <p>Phone: (306) 780-5653 Fax: (306) 780-6778 E-mail: geremiam@em.agr.ca</p>
<p>New Search and Rescue Initiatives Fund</p>	<p>Funds projects that will improve the National Search and Rescue Program.</p> <p>Funds projects in six categories: further integration of the National Search and Rescue Program; development of Search and Rescue data and information; prevention; research and development; volunteers; and response.</p>	<p>National Search and Rescue Secretariat</p> <p>www.nss.gc.ca/NIF/nif.htm</p> <p>Contact: Kristina Walker E-mail: kristina@nss.gc.ca</p>

<p>Population Health Fund</p>	<p>Funds national projects that apply a population health approach to addressing priorities for one or more of the three life stages: childhood and adolescence, early to mid-adulthood and later life.</p> <p>Some priorities include: creating optimal conditions for the healthy development of young children, creating safe, supportive and violence-free physical and social environments, and action on the leading causes of preventable illness and death.</p>	<p>Health Canada</p> <p>http://www.hc-sc.gc.ca/hppb/phdd/funding/</p> <p>Population Health Approach Health Canada Tunney's Pasture PL 1910A1 Ottawa, Ontario K1A 1B4</p> <p>Fax: (613) 952-6032</p>
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List of Climate Change and Health & Well-being Adaptation Measures

Health Issue	Policy/Action
<p>Air/Water Quality</p> <ul style="list-style-type: none"> - smog - allergens/asthma - indoor air - flooding - scarce resources - toxic substances - food supply - drought 	<ul style="list-style-type: none"> • Increased coordination and information exchange between Regional authorities responsible for public health and Federal authorities, Provincial authorities, other Regions, NGOs and public health professionals regarding policies/actions on the effects of air/water pollution wrought from climate change on the health of Canadians (e.g., impacts of air quality on health, emissions sources, current information on climate change issues, air quality monitoring data). • Annual forum for information sharing among research community and municipal health/environment officials on air issues. • Increased monitoring/surveillance, data collection. • Environmental/pollution management (air, water, toxics), development and enforcement of standards. • Energy efficiency policies (e.g., standards for air conditioners, clothes washers, water heaters, and commercial air conditioning, retrofit programs for residential air conditioning, commercial lighting, and commercial HVAC, improvements in residential and commercial new buildings). • Innovative transportation approaches. • Water demand and use reduced through increased efficiencies of its delivery and utilization (e.g., improving zoning).

<p>Air/Water Quality</p>	<ul style="list-style-type: none"> • Water control structures redesigned to handle greater variability of precipitation, including a possible increase in the intensity of extreme events (e.g., increase size of storm drains, culverts, bridge openings, increase absorbing capacity of urban landscape, storm sewer protection/maintenance programs). • Encourage subwatershed planning. • Increased capacity of existing water infrastructure (e.g., dams, sewers, drainage ditches, floodways). • Public awareness about impacts of climate change and adaptation strategies. • Disaster Preparedness (flood preparation, infrastructure renewal = dams, training, volunteer recruitment, public education, emergency response coordination, resource allocation). • Use climate forecasting in water planning (e.g., planning and development of major infrastructure - reservoirs, transport networks, safety improvements at airports, floodways). • Management of agriculture (food safety - water contamination). • Smog/heat alert and warning systems and Smog Alert Response Plans (e.g., reduce use of gas and diesel vehicles, minimize idling, reduce use of oil based paints, solvents and cleaners).
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<p>Vector-borne Infectious Diseases</p> <ul style="list-style-type: none"> - vector-borne diseases - imported food - immigration - severe weather events 	<ul style="list-style-type: none"> • Increased coordination and information exchange between Regional authorities responsible for public health and Federal authorities, Provincial authorities, other Regions, NGOs and public health professionals regarding policies/actions on the effects of climate change on the incidence of infectious diseases in Canada. • Blood donation/transfusion policies - need for increased information about greater stresses from infectious diseases which become endemic to Canada or are brought to Canada by travelers/immigrants. • Disaster Preparedness - planning for the combat of infectious diseases that arise after natural disasters. • Strengthen public health infrastructure related to the monitoring and control of infectious diseases (e.g., expanded access to medical care, health information capacity, enhanced private well water testing, food surveillance and inspection etc.). • Improved vaccinations and drugs services to combat infectious diseases. • Health promotion, disease prevention and health care of migrant populations and travelers. • International travelers/immigration/refugee disease control. • Enhanced disease control, information dissemination, investigation and consultation, development of standards and communicable disease control guidelines. • Enhanced field epidemiology and surveillance skills training, improved epidemiological methods/models and improved disease surveillance systems. • Integration of climate change and health considerations into food import and regulatory activities.
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<p>Vulnerable Populations</p> <ul style="list-style-type: none"> - Aboriginal Peoples - children - disabled - homeless/poor - immigrants - seniors - rural and urban health 	<ul style="list-style-type: none"> • Increased coordination and information exchange between Regional authorities responsible for public health and Federal authorities, Provincial authorities, other Regions, NGOs and public health professionals regarding policies/actions on the effects of climate change on the health of vulnerable populations. • Review and revise population health assessment practices. • Land use planning. Coastal Zones - the risks associated with inundation and storms might be managed by using protective structures, restrictive land use zoning including setbacks and encroachment limits, development of new wetlands, adoption of building code provisions for structures located in vulnerable areas, and insurance programs for storm damage. • Planting more trees. • Consider adequacy of flood plain zones (sea-level rise). • Emergency preparedness, strengthen emergency communications (flood preparation, infrastructure renewal = dams, training, volunteer recruitment, public education, emergency response coordination, resource allocation). • Diversify power supply (extreme weather events). • Examine public infrastructure and make adjustments to ensure public safety (e.g., dams and weirs, flood channels, dykes, land stabilization works, transmission towers, communication devices and channels, etc.). • Strengthen public health infrastructure (e.g., expanded access to medical care for specific populations including preventative and primary care, disability services, immigrant population services, Aboriginal services, Children services, rural services).
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<p>Vulnerable Populations</p>	<ul style="list-style-type: none"> • Improved housing and sanitation practices to combat infectious diseases for vulnerable populations. • Use climate forecasting in all sorts of planning. • Integration of climate change and human health considerations into current health information initiatives including the First Nations Regional Health Survey and the First Nations and Inuit Health Information System. • Integration of climate change and health policy/actions related to vulnerable groups into efforts by many P/Ts to revise and update public health-related legislation or regulations in order to increase the profile of public health, increase enforcement, and strengthen disease surveillance. • Strengthen the Arctic Land Fast Ice Advisory and Warning Service which rescues hunters on ice floes that are at sea. • Extreme Weather Events - the risks associated with changes in location, frequency, or intensity of typhoons, monsoons, hurricanes, storms floods, droughts, and other extreme weather events could be managed by developing emergency response plans, developing early warning systems, implementing land use controls in vulnerable areas, developing insurance and compensation arrangements, modifying building codes, and international cost sharing mechanisms. • Heat Weather Response Plans (e.g., identification of potential cooling sites, both public and private, (community centres, public pools, libraries) and areas where there are large numbers of seniors, use of a heat index, declaration of heat emergency and response plan at certain Humidex (45 degrees Celsius), hostels asked to stay open, transit tokens distributed to homeless, city nursing staff to visit people at risk, increased public access to drinking water and bathing facilities.
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Climate Change and Health & Well-being Adaptation Case Studies

REGION: NORTH

ISSUE: VULNERABLE POPULATIONS

The Northwest Territories Status Ranks of Wild Species Program

Background:

In 1998, the Wildlife and Fisheries Division of the NWT Department of Resources, Wildlife and Economic Development began a project to monitor the status of wild species throughout the Territory. The program was initiated in response to the Accord for the Protection of Species at Risk in Canada, agreed to in 1996 by the Wildlife Ministers in Canada. The primary goal of the program is “to maintain biodiversity by ensuring that no species become extinct as a consequence of human activity”. The program is designed to monitor the status of all wildlife species in the geographical scope of the territory in order to:

- create a priority list of species that requires further assessment and possible protection efforts;
- increase awareness of the status of wildlife species that are sensitive to anthropogenic activity and require more information;
- encourage public input into a common knowledge base;
- provide a reference tool to be used by decision-making bodies and all northerners when making decisions regarding wildlife.

Although monitoring and information gathering of wildlife species is not new in Northern Canada, this is the first attempt to coordinate the efforts and develop a provincial system that will be of use to all communities and other sectors. The system will aid in setting conservation priorities, throughout the NWT, the North and Canada.

Link to Climate Change:

The socio-economic well-being of Aboriginal populations is critically linked to the health of wildlife species in Northern Canada for food, income and cultural traditions. The Northwest Territories is largely made up of undisturbed habitat, but northern ecosystems are already experiencing pressures from climate change. Increased temperatures resulting from climate change will lead to changes in habitats and shifting population distributions of wildlife

throughout Northern Canada. Monitoring the status of species in the NWT will allow northerners to detect changes in species distribution, populations and threats.

Key Activities:

The intended end result of the program is to suggest candidate species to the federal Committee on the Status of Endangered Wildlife in Canada, for more detailed assessment. This is carried out through the following activities:

- Information is gathered on wildlife species from printed information and knowledgeable persons.
- Information is inputted into the NWT Species Monitoring Infobase.
- The species' status is ranked as undetermined, secure, sensitive or may be at risk, according to seven indicators (population size, number of occurrences, distribution, trend in population, trend in distribution, threats to population, and threats to habitat).
- All species deemed 'May be at risk' have a detailed status report created.
- 'May be at risk' species are then designated as endangered or threatened (at risk) or not endangered or threatened.

This information is then used to further monitor the species and manage human activities. The initial report on the status ranks of wild species, the species monitoring infobase, species at risk fact sheets, and population status reports are made available to the public on the Department's Web site. The report will be updated every five years, with information that will be continuously added to the monitoring infobase.

This program will facilitate the coordination of monitoring between existing, ongoing efforts, and will provide valuable species data to other sectors, such as tourism and forestry. Future plans will encourage and facilitate the use of community-based monitoring and the adaptation of national tools and standards to the northern perspective, as well as the creation of new tools.

Partners:

The Report on the Status Ranks of Wild Species was edited and published by the Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, in collaboration with Sahtu Renewable Resources Board, Gwich'in Renewable Resources Board, Wildlife Management Advisory Council (NWT), Fisheries Joint Management Committee, and the Government of Canada (Department of Fisheries and Oceans, Canadian Wildlife Service, Environment Canada).

There were over 65 individual contributors and participating agencies involved in the project.

References:

For a full list of contributors to the Report and for more information on the project, please visit the Department of Resources, Wildlife and Economic Development's Web site at www.nwtwildlife.rwed.gov.nt.ca

All information for this summary was taken from the following Web site:

www.nwtwildlife.rwed.gov.nt.ca/NWTwildlife/nwtwildlife.htm

REGION: BRITISH COLUMBIA

ISSUE: AIR QUALITY

British Columbia Alternative Transportation Initiatives

Background:

Several initiatives are underway throughout the province of British Columbia to encourage and facilitate the use of alternative transportation methods. This case study will highlight three such initiatives. The City of Vancouver has introduced a *Bicycle Network Rationale*, which has modified Vancouver's road grid system to accommodate cyclists. The Greater Vancouver Regional District introduced an *Employee Trip Reduction Program* in 1996 that encourages the use of public transportation and car pooling for employees. Kamloops has also initiated a city-wide transportation plan, the *TravelSmart Program*, that provides alternatives to new road construction in an expanding community.

Link to Climate Change:

In urban environments, the formation of secondary air pollutants, such as ground-level ozone are enhanced at high temperatures. Smog concentrations are highest on hot, sunny days when its components (ground-level ozone, Nox and VOCs) react in sunlight. An increase in asthma, allergic disorders, and cardio-respiratory diseases could result from climate-induced changes in the formation of smog and persistence of air pollutants. Reducing the use of personal automobiles and encouraging alternative transportation methods will reduce pollutants that cause smog and poor air quality.

Key Activities:

Bicycle Network Rationale:

The goal of the program is to integrate the cyclist into the existing transportation network through the creation of a city-wide bikeway network. The bikeway initiative has introduced bicycle travel on local streets parallel to major arterial roads. Key actions to date include:

- sixteen bikeways have been built that connect to form a network across the City;
- traffic-calming measures such as traffic circles, diverters, and medians have been built into bikeways to discourage non-local automobile use of the routes;
- bike lanes are being introduced to major downtown streets;
- City Council has adopted a set of transportation priorities in the order of: pedestrian, bicycle, transit, movement of goods, and private automobiles, that will guide existing and future development and projects.

The City is also developing bicycle parking and end-of-trip facilities to accommodate cyclists. A bicycle hotline is available and provides information on questions about cycling related issues.

Employee Trip Reduction Program:

The goal of the Employee Trip Reduction Program is to reduce single-occupant vehicle commuter travel for employees of the Greater Vancouver Regional District. The program uses social marketing tools that encourage employees to make a small commitment to reduce their personal vehicle use and then build on their commitment over time. The program consists of six initiatives:

- carpool ride-matching program;
- “vanpool” empty seat insurance;
- cycling safety workshops and work site facility upgrades;
- guaranteed ride home service;
- flex-time;
- subsidized transit program;

Parking subsidies are being phased out, and transit passes are available at a reduced rate. The program realized a more than 10% reduction in single-occupant vehicle use in its first year, and has gone on to serve as a model for other employers throughout the Region. The program “Go Green Choices” provides advice and support to employers implementing trip reduction programs.

TravelSmart Program:

TravelSmart was initiated in response to the increasing population in Kamloops, British Columbia, as an alternative to new road construction. TravelSmart consists of the following initiatives:

- Land use integration—the City’s official plan favours compact development that locates residential areas close to employment and commercial sectors.
- Less expensive road structure alternatives—encourages residents to use arterial corridors and alternatives to the highway.
- Improved public transit—increased frequency of service to outlying communities
- Promoting bicycle use—the City identified additional cycle routes and initiatives for business to provide showers and bike racks for employees.
- Promotional programs—workshops and seminars in schools; “Safe Routes to School” program; “Go Green” billboards on commuter streets; door-to-door education by city staff.

By the year 2000, the program had reduced planned road expenditures by 75% and had improved air quality in the City. The TravelSmart program will be updated every five years as part of the City’s growth management strategy.

Partners:

Bicycle Network Rationale:

City Departments, the Bicycle Advisory Committee of the Vancouver City Council, various community advocacy groups, the Greater Vancouver Regional District, Province of British Columbia, Police Officers and Parking Enforcement Officers.

Employee Trip Reduction Program:

Greater Vancouver Regional District, Go Green Choices, Greater Vancouver Regional District employees.

TravelSmart Program:

City of Kamloops, Ministry of Transportation and Highways, Ministry of Environment, Kamloops Indian Band, BC Transit, University College of the Cariboo, City of Kamloops Engineering and Planning Departments, Urban Systems, Kamloops Residents.

References:

Bicycle Network Rationale:

Information for this summary was taken from the City of Vancouver's Web site at:

<http://www.city.vancouver.bc.ca/engsvcs/transport/cycling/bikepage.html>

and from the Federation of Canadian Municipalities Web site at:

<http://www.fcm.ca/english/national/program/club/cas/vancouver.html>

Employee Trip Reduction Program:

Information for this summary was taken from the Go Green Web site at

<http://www.gogreen.com/choices>

and the Federation of Canadian Municipalities Web site (where it was featured as a case study) at

http://www.fcm.ca/scep/case_studies/transportation/vancouver_trans_sum.htm

TravelSmart Program:

Information for this summary was taken from the City of Kamloops Web site at

<http://www.city.kamloops.bc.ca/transportation/index.html>

and the Federation of Canadian Municipalities Web site (where it was featured as a case study) at http://www.fcm.ca/scep/case_studies/transportation/kamloops_trans_sum.htm

REGION: PRAIRIES
ISSUE: WATER MANAGEMENT

Drought Management in Alberta

Background:

The Province of Alberta has developed a drought management awareness and education program aimed at residents involved in agriculture. The Prairies frequently experience drought conditions. As such, being prepared for, and aware of, water management issues can significantly reduce the vulnerability of farmers. Alberta Agriculture, Food and Rural Development has brought together a wide range of information, partners and linkages to assist local farmers in making informed decisions regarding agricultural management activities that may be affected by drought.

Link to Climate Change:

Climate change is expected to decrease levels of precipitation in the Prairie region and throughout much of Central Canada. A decrease in precipitation will impact the Prairies which already realize significant water shortages throughout much of the growing season. Farmers represent a vulnerable population throughout Canada because of their dependency on a livelihood that is impacted by climate. Learning how to manage water more efficiently and adapt to drought conditions will reduce their vulnerability.

Key Activities:

Alberta Agriculture, Food and Rural Development provides an extensive amount of awareness and education information regarding drought on their Web site, including:

- a drought management checklist
 - ▶ includes drought management decisions that must be made in each season throughout the year
 - ▶ provides key tips and advice on how to make those decisions
- drought resource information
 - ▶ includes links to partner Web sites and climate information centres
 - ▶ includes links to Alberta drought monitoring links, including an agricultural weather summary, weekly water reports, water supply outlooks, advisories and warnings, a Federally organized drought watch, and an Alberta crop report
- a newsletter entitled *Drought, Water, Forages and Cattle* produced by the Alberta Agriculture, Food and Rural Development Department and the Prairie Farm Rehabilitation Administration division of Agriculture and Agri-Food Canada.

Partners:

Alberta Agriculture, Food and Rural Development, Agriculture and Agri-Food Canada, Prairie Farm Rehabilitation Administration, climate centres and other drought mitigation centres.

References:

Information for this summary was taken from the following Web site:

www.agric.gov.ab.ca/navigation/sustain/agdisaster/index.html

REGION: ONTARIO
ISSUE: AIR QUALITY

Ontario's Smog Plan

Background:

In 1998, the Province of Ontario and 44 organizations committed to reducing smog-causing emissions by 45% by 2015. The plan was developed as part of the national smog strategy prepared by the Canadian Council of Ministers of the Environment and includes cooperation from industrial manufacturers and associations, health organizations, government representatives, environmental organizations and members of the scientific and academic communities. The Smog Plan has targeted vehicle emissions and industrial activities as the main sources of air pollution leading to smog. The Smog Plan has five elements:

- reduce emissions;
- involve the community, including the public, business and government in smog reduction activities;
- cooperate with the United States to address transboundary pollution;
- develop strategies to reduce particulate matter;
- measure progress and report annually.

Link to Climate Change:

Smog concentrations are highest on hot, sunny days when its components (ground-level ozone, Nox and VOCs) react in sunlight. Smog aggravates existing health conditions, such as asthma, bronchitis, and cardiac illness, and is of concern for the elderly and children. Climate Change is expected to lead to increased year-round temperatures in Ontario which may result in more smog. Addressing the emissions of smog-causing pollutants will reduce the incidence of smog even in the presence of higher temperatures.

Key Activities:

The goals of the Smog Plan are being carried out through the following initiatives:

- Drive Clean is a mandatory vehicle emissions testing program. Cars and light trucks are required to be tested every two years, and heavy-duty trucks and buses are tested as part of their annual safety inspection.

- The Smog Rover is the educational and public awareness facet of the Drive Clean program. The Smog Rover team conducts roadside emissions testing and provides information about the benefits of lowering emissions.
- Environmental standards for over 70 contaminants that contribute to poor air quality will be upgraded.
- Less polluting gasoline formulas are required during the summer months.
- The air monitoring network in Ontario has been upgraded to ensure that it is modern and well-equipped.
- The Province of Ontario is working with the U.S. to reduce transboundary emissions.
- The Ministry of the Environment issues a provincial smog alert when smog conditions rise to dangerous levels. Many municipalities across Ontario have developed smog alert programs, in response to the Provincial program.

In April 2000, a new Air Quality Ontario initiative was introduced that also addresses smog. As part of the initiative, the Ministry of Environment has introduced a new air quality Web site that provides information to the public and municipalities on air quality readings, forecasts and information on smog-reducing actions that are beneficial when a smog alert is called. A smog alert network provides members with smog watches and advisories through email.

Partners:

Ontario Ministry of the Environment, industrial manufacturers and associations, health organizations, government agencies, environmental groups, scientific and academic communities.

References:

For more information, please visit the Ontario Ministry of the Environment Web site at:

www.ene.gov.on.ca

The new Air Quality Web site can be found at www.airqualityontario.com

All information for this summary was taken from the Ontario Ministry of the Environment Web site.

REGION: ONTARIO
ISSUE: VULNERABLE POPULATIONS

Toronto Extreme Weather Alert Plans

Background:

The City of Toronto has developed two extreme weather alert plans: Extreme Cold Weather Alerts; and Heat-Health Alerts. The objective of both plans is to protect vulnerable populations, such as elderly, children and the homeless from adverse health conditions resulting from extreme temperatures. An extreme cold weather alert is pronounced when temperatures drop below –15 degrees Celsius and programs are carried out by a designated alert team.

The heat-health alert program is the result of collaboration between the Toronto Atmospheric Fund and Toronto Public Health with financial assistance from the Climate Change Action Fund. Research was carried out on 17 years of mortality data and 46 years of meteorological data that associated a higher rate of death with specific climatic conditions. Environment Canada monitors for eight climatic factors. When there is a 65% probability that increased mortality will occur because of the weather conditions, the Toronto Medical Officer of Health calls a Heat Alert. It is accepted from health science research that two hours of heat relief per day will prevent deaths from heat stress in vulnerable populations.

Link to Climate Change:

More frequent heat waves are projected to accompany climate change in Canada. Within heat-sensitive regions, urban areas are the most vulnerable and the threat is intensified by the absence of nighttime heat relief. Milder winters could potentially reduce the current level of winter deaths. In general, however, more research is needed to understand the relationship between temperature and winter deaths. Vulnerable populations, such as the homeless, will remain sensitive to cold temperatures even if there is a warming during winter.

Key Activities:

The Key Activities of the Extreme Cold Weather Response Plan include:

- Toronto Hostel Services open extra spaces in shelters if necessary;
- The Out of the Cold volunteer program adds extra space and meals to its overnight program;
- Number of street patrol workers is increased to tell homeless people about the extra services;
- Toronto Transit Commission tokens are given to homeless people trying to reach services/hostels;

- The Canadian Red Cross and Na Me Res provide emergency transportation to homeless people trying to reach services/hostels; and
- Community Information Centre runs a 24 hour a day helpline from November 15 to April 15 to provide information to the homeless on services and overnight shelters.

The Key Activities of the Heat-Health Response Plan include:

- Community Information Toronto contacts over 800 community agencies working with vulnerable populations;
- Red Cross operates a 24-hour help line to answer heat-related questions from the public and requests to check on seniors;
- Red Cross and Out of the Cold coordinate delivery of bottled water to libraries and community centres where vulnerable people may go;
- Shelters will allow people to stay inside during the day; and
- During a Heat Emergency, the City will open cooling centres at the North York, East York, and York Civic centres and at Metro Hall.

Partners:

Extreme Cold Weather Alerts

Toronto Public Health, Medical Officer of Health, Toronto Hostel Services, Out of the Cold volunteer program, Toronto Transit Commission, Canadian Red Cross, Na Me Res, Community Information Centre.

Heat-Health Alerts

Toronto Public Health, Medical Officer of Health, Toronto Atmospheric Fund, Climate Change Action Fund, Environment Canada, Community Information Toronto, Canadian Red Cross, Out of the Cold Volunteer Program, Libraries, Community Centres, Homeless shelters, Metro Hall, civic centres.

References:

Information for this summary was taken from a News Release on June 19th, 2001 titled *Toronto adopts new Heat-Health Alert System*, provided on the City of Toronto Web site, and from a Report titled *Toronto Qs & As: Extreme Cold Weather Alerts* found on the following Web site: www.city.toronto.on.ca/health/index.htm

REGION: QUÉBEC
ISSUE: WATER QUALITY AND QUANTITY

**Integrated Management of Watershed Quality and Water Conservation:
Charlesbourg, Québec**

Background:

In July 1995, city council in Charlesbourg, Québec approved a policy to conserve drinking water and reduce water waste over a five-year period. Charlesbourg is dependent on the Sept Ponts watershed to provide naturally filtered water. A water conservation plan was proposed as a means by which to delay or prevent the need for a \$30 million water treatment plant. The main objective of the program is to maintain a continuous supply of water from the Sept Ponts watershed while reducing water consumption.

Link to Climate Change:

Changes in precipitation, temperature, humidity, salinity, and wind have a measurable effect on the quality of water used for drinking, recreation and commerce. Climate change is expected to decrease precipitation and increase temperature in Quebec. Charlesbourg's water management plan is a proactive measure that will protect against threats to public health resulting from future changes to water quality and quantity.

Key Activities:

The water conservation policy has resulted in the development of municipal regulations on water use, monitoring of water conservation efforts, and public awareness and education on water conservation. An integrated management plan for the watershed was also developed and adopted in July 1998 that ensures:

- excellent water quality that meets new provincial regulations;
- improved service quality;
- best use of existing infrastructure while keeping costs low; and
- a water management plan developed in co-operation with the municipality, users and owners.

Watershed management activities implemented under the plan include aggressive zoning, development and monitoring of water quality indicators and encouragement of low-impact activities to minimize water contamination.

The program has resulted in significant environmental benefits including:

- reduced water consumption by eight per cent;
- avoided tax increase of nearly five per cent by diverting the water treatment plant;
- limited erosion which maintains water quality by modifying forestry methods and natural regeneration;
- connected changes in water quality to environmental events and other causes because of monitoring;
- restoration of damaged aquatic environments, shorelines and forests; and
- increased awareness of residents' responsibility to conserve drinking water.

Partners:

City of Charlesbourg, residents, consulting groups and businesses. For a detailed list of partners and their involvement, please refer to the Report listed below.

References:

Information for this summary was taken from the following Web site and Report:

http://www.fcm.ca/scep/case_studies/water_management/charlesbourg_water_sum.htm

Federation of Canadian Municipalities. "Charlesbourg, Québec: Integrated Management of Watershed Quality and Water Conservation" *Creating a better quality of life through sustainable community development*. Federation of Canadian Municipalities: Ottawa, 2000.

REGION: ATLANTIC
ISSUE: INFECTIOUS DISEASES

Maritime Provinces West Nile Virus Early Detection Program

Background:

Health officials in the Maritime Provinces are working together with Health Canada to develop an early detection and response plan to the West Nile Virus. The Virus is carried by infected birds and can be transferred to humans through the bite of a mosquito. In most cases, no adverse health effects will result, but serious consequences, such as encephalitis (swelling of the brain) may occur in vulnerable populations, such as the elderly and those with weakened immune systems. There have been no reported cases in Canada, but Health Canada and the provinces are conducting early detection systems since outbreaks occurred in New York in 2000. Provinces across the country are involved in conducting early detection systems. The Maritime Provinces, however, have developed a collaborative approach to dealing with the virus.

Link to Climate Change:

The introduction of the West Nile Virus into North America is *not* a result of climate change. However, sporadic outbreaks of other vector-borne infectious diseases similar to West Nile Virus, such as malaria, may appear in Canada as weather patterns change and temperatures increase. Native vector-borne diseases, such as lyme disease in ticks and hanta virus in deer mice may also become more prolific as the climate changes. The West Nile Virus response plan that has happened across Canada provides an excellent example of an adaptation policy suited to dealing with infectious diseases.

Key Activities:

Prince Edward Island, Nova Scotia and New Brunswick have all developed provincial response plans consisting of:

- monitoring bird populations most at risk of carrying the virus, such as crows and blue jays;
- asking the public to report sightings of dead or sick birds;
- increasing communication and dissemination of information to the medical community on how to recognize and report the disease;
- releasing public health notifications on the detection program and mosquito control measures; and
- including extensive information on the virus on provincial and municipal Web sites.

New Brunswick has the most extensive response program that also involves:

- monitoring mosquito populations and sentinel chicken flocks in two regions for the virus; and
- implementing a toll-free line for residents to call in with concerns about the virus or to report a dead bird.

It is hoped that using a multi-jurisdictional approach that involves extensive public awareness and health protection measures will result in early detection and minimal health impact from the virus.

Partners:

Health Canada, Provincial Public Health Departments in New Brunswick, Nova Scotia and Prince Edward Island, Physicians, and residents.

References:

Information for this summary was taken from the three provincial Web sites and their public health departments:

www.gov.nb.ca

www.gnb.ca

www.gov.pe.ca

www.gov.ns.ca/health/

REGION: CANADA

ISSUE: SOCIO-ECONOMIC IMPACTS OF CLIMATE CHANGE

1998 Ice Storm and 1997 Red River Flood

Background:

Canada borders on three oceans, encompasses a wide range of vegetation and geological features and experiences extreme weather patterns that vary over the four seasons. Canadians have learned to expect severe weather and natural disasters. Over the past five years alone, we have experienced tornadoes, floods, forest fires, and ice storms. Two events in particular led to widespread social and economic impacts: The Red and Assiniboine River Floods in 1997 in Manitoba, and the Ice Storm in 1998 that stretched from Ontario to New Brunswick.

Link to Climate Change:

Increased temperatures and more intense *El Nino/La Nina* events caused by climate change may result in an increased incidence of extreme weather events in Canada. Changes in the frequency, timing, intensity, and duration of extreme weather events, such as floods and storms, could have negative health impacts on Canadians. Potential effects from weather disasters could range from acute trauma and drowning to conditions of unsafe water and post-traumatic stress disorder. The health impacts of floods, storms, and other extreme weather events hinge on the vulnerabilities of the natural environment and the local population, as well as on their capacity to recover. The most vulnerable populations during extreme weather events are elderly, children, sick, homeless and lower income peoples.

Ice storms may occur more frequently as temperatures increase throughout Canada. The flow of moisture and resulting precipitation is expected to increase in winter in southern Canada, and temperatures are expected to move closer to freezing levels. Floods may also increase as temperatures warm and lead to increased precipitation in some areas and faster spring thaws in others.

Key Events and Socio-Economic Costs:

Manitoba's Red and Assiniboine River Flood, May 1997:

- flooding occurred because of high amounts of winter precipitation and a rapid spring thaw;
- the Red River rose 12 m higher than winter levels and flooded approximately 2000 square kilometres of land, and 2500 homes;
- efforts were made for over a month by residents, military personnel and volunteers to prevent the flood from affecting local communities;

- 25,000 people were evacuated from dozens of communities;
- estimated damage was \$815 million; and
- the flood was mitigated to a degree from the use of a floodway, built after the 1950 flood, which diverts water around Winnipeg.

Ontario/Quebec/New Brunswick Ice Storms, 6-10 January, 1998:

- between 50 and 100 mm of freezing rain fell on three provinces over a period of five days;
- estimated damage at \$7 billion;
- 200 Quebec communities and 57 Ontario communities declared an emergency;
- 5,000,000 people were left without power, some for days;
- 600,000 people were evacuated from their homes and communities;
- the ice storm resulted in 28 deaths, and 945 injured; and
- livelihoods were greatly affected through: destruction of power lines, telephone cables, transmission towers and wooden utility poles; power outages affected the farming community; Quebec maple syrup production was ruined.

General Costs of Natural Disasters:

- the property and casualty insurance industry in Canada has paid out over \$3.9 billion for damage to homes, businesses and vehicles caused by natural hazards; and
- natural disasters have cost all levels of Government over \$13 billion to repair major infrastructure and uninsured properties after natural disasters.

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