



The Role of Nurses in Addressing Climate Change



CANADIAN NURSES ASSOCIATION
ASSOCIATION DES INFIRMIÈRES ET INFIRMIERS DU CANADA

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Introduction

The Canadian Nurses Association (CNA) has identified environmental health issues as a theme of its centennial year. As part of this theme, CNA presents this third and final paper in a series on nursing and environmental health.

In a recent report, the Intergovernmental Panel on Climate Change (IPCC)¹ concluded that there is strong evidence the world's climate is changing in response to human activities (IPCC, 2007a). It is projected that the next few decades will see increases in global warming, extreme weather events, desertification and rising sea levels, as well as shrinkage of glaciers, ice sheets and snow cover and changes in precipitation patterns (IPCC, 2007a). Climate change is already having negative impacts on health, which will increase over time and be more significant in low-income countries (World Health Organization [WHO], Regional Office for Europe, 2005).

Nurses are uniquely qualified to bring information on climate change to the public. They have both the necessary scientific background and the communication skills to get the message across in an understandable way. Their expertise in health promotion and behaviour change also equips them to foster lifestyle choices that will decrease greenhouse gas (GHG) emissions by individuals, families and communities.

Over the past decade, several authors have proposed that nurses become involved in efforts to reduce climate change. Hunt (2006), in an editorial published in *Nursing Ethics*, urged professional associations to engage in the climate change discourse as a “matter of urgency,” by preparing policy documents on the impact of climate change on nursing, advocating for mitigation of the impact of industry and other economic activity on the environment, and including climate change and health in nursing curricula. Bloice and Hallinan (2005), writing in *Revolution: The Journal for RNs and Patient Advocacy*, proposed that health care professionals should be involved in educating the public about global warming and should support mitigation measures. In addition, in an editorial in a community nursing journal published in the United Kingdom, While (2006) stressed the importance of nurses engaging in the climate change debate as part of their role in advocating for the vulnerable.

CLIMATE CHANGE AND SOCIAL JUSTICE

Social justice refers to “the fair distribution of society’s benefits, responsibilities and their consequences” (CNA, 2006, p. 7). Nursing’s commitment to social justice supports their work in climate change. At present, the developed world benefits from the use of carbon-intensive technologies, while the developing world experiences their consequences. For example, it has been estimated that per capita emissions of GHGs in the United States are seven times higher than in China² and 19 times higher than in Africa (International Energy Agency [IEA], 2006). Yet it is Africans and others in developing countries who bear the greatest burden of the reduced precipitation, diminished crop yields and flooding of low-lying areas that result from the changes in climate caused by these emissions (IPCC, 2007b). The *Stern Review of the Economics of Climate Change* (United Kingdom Treasury, 2006) concluded that “developing countries are especially vulnerable to climate change because of their geographic exposure, low incomes, and greater reliance on climate sensitive sectors such as agriculture” (p. 92).

Climate change is not just an environmental issue, as too many people still believe. It is an all-encompassing threat.

–Kofi Annan, Secretary General,
United Nations, 2006



1 The IPCC was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme. Its role is to assess the scientific, technical and socio-economic information available on human-induced climate change, the potential impacts of climate change, and the options for adaptation and mitigation. The IPCC does not itself conduct any research; its assessments are based on peer-reviewed, published scientific and technical literature.

2 As China becomes increasingly industrialized, it is poised to overtake, before 2010, the United States as the single largest emitter of carbon dioxide (CO₂) (International Energy Association, 2006).

RESPONSE OF CANADIAN NURSES

In Canada, professional nurses' associations have been involved in advocacy related to climate change for several years. The Registered Nurses' Association of Ontario (RNAO) has supported government action on GHGs and has lobbied the government of Ontario in this area (RNAO, 2007). In addition, CNA has developed a position statement (*The Environment is a Determinant of Health*) and a backgrounder (*The Ecosystem, the Natural Environment, and Health and Nursing*), both of which identify climate change as an important health issue (available on the CNA website). Future nursing policy work at the national and provincial levels could focus on mitigating climate change by supporting policies to reduce GHG emissions.

PURPOSE

The purposes of this paper are to provide background information on climate change and its impact on health, as well as to identify potential roles for nurses in promoting adaptation and mitigation strategies.

The Changing Climate

The United Nations Framework Convention on Climate Change (UNFCCC) has defined climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (UNFCCC, 1992). These changes were originally described as “global warming,” but the terminology has evolved as meteorologists have increasingly realized that the warming of the earth results in a variety of changes in climate.

ROLE OF GHGS

Climate change is a direct result of human-induced contributions to GHGs (IPCC, 2007a). As indicated in Figure 1, these gases prevent heat from escaping from the earth's atmosphere. CO₂, methane, water vapour and nitrous oxides are all GHGs.³ Of these, CO₂, which is produced by the burning of fossil fuels and, to a lesser extent, changes in land use, is “the most important anthropogenic greenhouse gas” (IPCC, 2007a, p. 2). Land-use changes have reduced the capacity of “carbon sinks,” such as forests and soils, to absorb more CO₂ than they give off. Although GHGs can be generated by natural events such as volcanoes and forest fires, the increased use of fossil fuels for energy since the dawning of the industrial age has led to significant human contributions to these gases. In the pre-industrial age, from AD 1000 to 1750, CO₂ levels increased from 275 to 285 parts per million (ppm), but over the next 250 years, up to 2005, they rose from 285 to 379 ppm, primarily as a result of human activities (IPCC, 2007a). This rapid increase in CO₂ levels has meant that total GHG emissions to the environment increased by 70% between 1970 and 2004 (IPCC, 2007c).

It is now universally agreed that emissions of GHGs must be reduced to lessen the risk of further changes in climate that would lead to increasingly devastating changes to ecosystems around the world (United Kingdom Treasury, 2006; IPCC, 2007c).

3 GHGs are often expressed as CO₂ equivalents, to allow for total or summative measures.

GLOBAL CHANGES IN CLIMATE

Rising global temperatures and sea levels and declining snow cover over the past 150 years (Figure 2) are the result of, and in turn contribute to, a number of long-term changes in climate, including increased arctic temperatures; widespread changes in precipitation amounts, ocean salinity and wind patterns; and more extreme weather events, such as droughts, heavy precipitation, heat waves and intense tropical cyclones (IPCC, 2007a). In particular, changes in precipitation amounts have led to desertification in the tropics and subtropics and flooding in parts of Europe, and have also contributed to an expansion in the ranges of insects and other disease-bearing vectors. It is anticipated that further changes in climate will strengthen these trends (IPCC, 2007b).

Future increases in global temperatures of up to 0.2°C per decade are predicted in a range of emissions scenarios (IPCC, 2007a). Even if GHG emissions remain at today's levels (which is unlikely, given global increases in population and gross domestic product [GDP]⁴), a "further warming of about 0.1°C per decade would be expected" (p. 12). However, even a small alteration in average global temperatures can have a substantial impact on climate.

In countries with temperate climates, increases in temperature will lead to longer growing seasons and a poleward shift in the ranges of both plant and animal species. Conversely, in the Sahelian region of Africa, warmer and drier conditions have already led to a shorter growing season and lower crop yields. These effects can be expected to intensify with further increases in global temperature. By mid-century it is anticipated that water availability will rise by 10 to 40 per cent at high latitudes and decrease by 10 to 30 per cent in dry regions at mid-latitudes. At the same time, flooding will occur more frequently in the mid-latitudes, which will further reduce local crop production. It is projected that by the year 2080, millions of people will be exposed to flooding, particularly those who live in low-lying areas with large populations in areas "such as settlements along the North Sea coast in north-west Europe, the Seychelles, parts of Micronesia, the Gulf Coast of the USA and Mexico, the Nile Delta, the Gulf of Guinea, and the Bay of Bengal" (IPCC, 2007d, p. 399).

With increases in temperature, countries with temperate climates will experience more frequent extreme weather events, such as heat waves and storms (IPCC, 2007b). At this higher frequency, such events will have an increasingly negative impact on the economy through disruptions in communications and other infrastructure as well as increases in insurance and capital costs (United Kingdom Treasury, 2006).

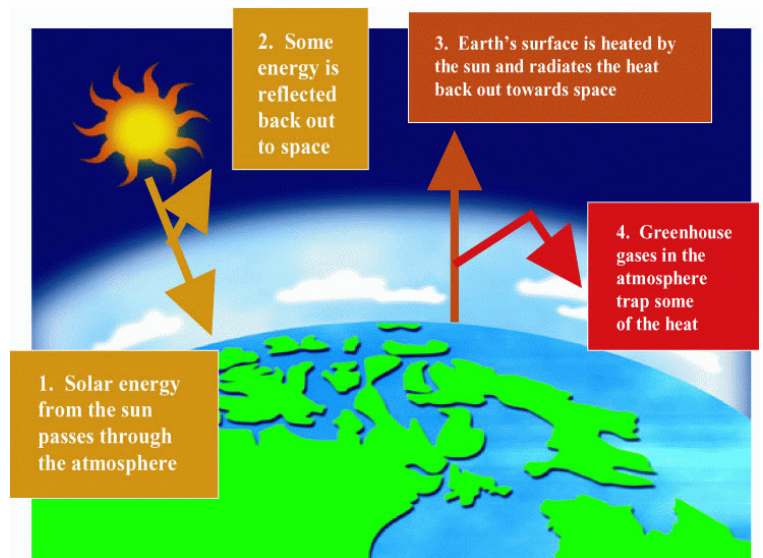


Figure 1: The greenhouse effect

© Environment Canada (reprinted from www.msc.ec.gc.ca/education/scienceofclimate-change/understanding/greenhouse_gases/index_e.html; used with permission)



4 GDP is one of the primary measures used by decision-makers and financial and other institutions to evaluate the health of the economy. An increase in real GDP is interpreted as a sign that the economy is doing well, whereas a decrease indicates that the economy is not working at its full capacity. Real GDP is linked to other macroeconomic variables such as employment, economic cycles, productivity and long-term economic growth (Statistics Canada, 2007).

CHANGES IN THE CANADIAN CLIMATE

On average, Canadian summer temperatures have risen by 0.9°C over the past 60 years, while total precipitation has increased by 12 per cent (Environment Canada, 2007a). Rising summer temperatures have led to a lengthening of the growing season, an increase in forest fires and more pests (IPCC, 2007b). However, these changes in temperature have not been uniform across the country, and the warming trend in the Arctic and in central Canada has been greater than elsewhere (Environment Canada, 2007a). Similarly, changes in precipitation have varied, with amounts increasing in Nunavut and along the east and west coasts but decreasing in central Canada (Environment Canada, 2007a). Overall, Arctic communities have seen greater changes in climate than those south of 60 degrees latitude and will likely experience further “reductions in the extent of sea ice and permafrost, increased coastal erosion, and an increase in the depth of permafrost seasonal thawing” (IPCC, 2007b, p. 15).

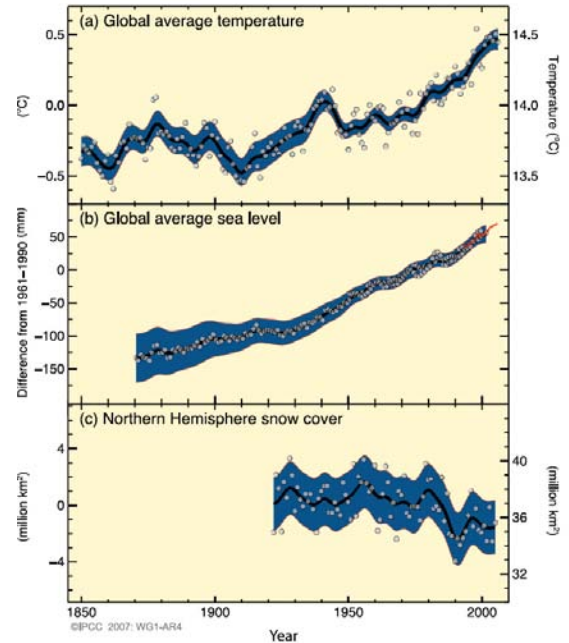


Figure 2: Changes in temperature, sea level and snow cover in the Northern Hemisphere since 1850 (reprinted from IPCC, 2007a; used with permission).



Impact of Climate Change on Health

GLOBAL IMPACT

The World Health Organization ([WHO], 2002) estimated that in the year 2000 climate change was responsible for 154,000 deaths and 5.5 million disability-adjusted life years (DALYs)⁵ through diarrheal disease, malaria, fatal unintentional injuries related to coastal and inland flooding, and malnutrition, mostly in low-income countries. The projected future burden of disease attributable to climate change relates primarily to increases in diarrheal disease and malnutrition in these countries (IPCC, 2007b). Increases in the number of people with malaria are predicted for countries at the boundaries of the disease’s current distribution rather than in countries in which malaria is already endemic (IPCC, 2007b). Dengue is a vector-borne disease that is sensitive to climate change and is largely confined to urban areas in the tropics and sub-tropics (IPCC, 2007d). It has been estimated that more people will be at risk of dengue as a result of both climate change and population increases in these areas (IPCC, 2007d). In addition, the range of tick-borne encephalitis and Lyme disease are both expected to expand in North America and Europe in response to climate change (IPCC, 2007d).

The risk to vulnerable populations of extended episodes of hot weather was highlighted in France in 2003 when 14,800 people, mainly seniors living in Paris, died during a record heat wave (Koppe, Kovats, Jendritzky, & Menne, 2004). Adaptation measures are being introduced in temperate, industrialized countries to reduce the health burden of heat waves (Health Canada, 2005), but there is less capacity to adapt to heat waves in countries in the mid-latitudes (IPCC, 2007d). Furthermore, there are no projections of future ozone concentrations for cities in low- or middle-income countries, even though such countries tend to have far worse outdoor air quality than industrialized nations (IPCC, 2007d). In general, cardio-respiratory diseases are expected to increase worldwide in response to worsening air quality, including increases in ground-level ozone (IPCC, 2007b). Increased mortality and morbidity can also be expected because of more frequent floods, storms, fires and droughts, particularly in countries with low incomes and adaptive capacity, many of which also have limited public health systems (IPCC, 2007b).

⁵ DALYs = Disability-Adjusted Life Years: The sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability (WHO, 2008).

IMPACTS IN CANADA

Canadians are accustomed to dealing with extremes of weather and have developed strategies to stay healthy, including insulating their homes and wearing clothing appropriate to the weather. However, as weather patterns change, the adaptive strategies of individuals, communities and populations may not keep pace, which could lead to negative health effects. Health Canada (2005) has proposed that climate change affects the health of Canadians through temperature extremes, extreme weather events and natural disasters, poor air quality, water- and food-borne illnesses, vector-borne diseases, and stratospheric ozone depletion, as well as having negative socio-economic impacts on community health and well-being (Table 1).

In addition to a stable government and a publicly funded health-care system, most Canadians have access to a level of income, employment, education and housing that will assist them in adapting to a changing climate. However, some Canadians are especially vulnerable to climate change, including people with low incomes, children and seniors, individuals with pre-existing health conditions and Aboriginal peoples, particularly those living in the North⁶ (Health Canada, 2005). Aboriginal residents of Arctic Canada are dealing with such rapid changes in climate that their adaptive capacities are being stressed. The traditional ways of life of these populations are being threatened at the same time as they are dealing with the costs of relocating and rebuilding physical structures in response to melting permafrost (Nickels, Furgal, Buell, & Moquin, 2005).

Additional information on the health effects of climate change in Canada is presented in the appendix.

Table 1: Health concerns related to climate change in Canada (paraphrased from Health Canada, 2005)

HEALTH CONCERN	EXAMPLES OF HEALTH VULNERABILITIES
Temperature-related morbidity and mortality	<ul style="list-style-type: none"> • Cold- and heat-related illness • Respiratory and cardiovascular illness • Increased occupational health risks
Effects of extreme weather events	<ul style="list-style-type: none"> • Damage to public health infrastructure • Injuries and illnesses • Social and mental health stress due to disasters • Occupational health hazards • Population displacement
Effects related to air pollution	<ul style="list-style-type: none"> • Exposure to outdoor and indoor air pollutants and allergens • Asthma and other respiratory diseases • Heart attack, stroke and other cardiovascular diseases • Cancer
Effects of water- and food-borne contamination	<ul style="list-style-type: none"> • Diarrhea and intoxication caused by chemical and biological contaminants
Effects of exposure to ultraviolet rays	<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 people • Low-income and homeless people • Northern residents • Disabled people • People living on the land
Socio-economic impacts on community health and well-being	<ul style="list-style-type: none"> • Loss of income and productivity • Social disruption • Diminished quality of life • Increased costs for health care • Health effects of mitigation technologies

⁶ The Canadian North is usually interpreted as encompassing the Northwest Territories, Yukon Territory, Nunavut, Nunavik and Nunatsiavut.

Adaptation to Climate Change

Adaptation to climate change has been defined as “an adjustment in human systems in response to actual or expected climatic stimuli or their effects, which reduces the associated risks to population health through preventive measures” (Fussel, Klein, & Ebi, 2006, p. 44). Although humans have always adapted to the climate in which they live, what has changed is the scope of adaptation required in response to a climate that is much warmer, wetter or drier, and more unpredictable, than “usual” and that is changing very rapidly. Some adaptation measures that individuals, families and communities can take to reduce risks to their own health are presented in the appendix, while this section focuses on system-wide changes to support adaptation by populations.

SYSTEMIC ADAPTATION TO CLIMATE CHANGE

Some populations are far more vulnerable than others and will need additional resources to deal with the changing climate (Fussel et al., 2006). In general, populations that are already under significant stress are more vulnerable. Such factors as “population density, level of economic development, food availability, income level and distribution, local environmental conditions, pre-existing health status and the quality and availability of public health care” (McMichael, 2003, p. 12) all decrease the population’s capacity to adapt. Improvements in these areas will increase adaptive capacity and will provide other benefits to these populations, regardless of future changes in climate. These types of adaptation strategies are considered “no regret” strategies, since they lead to improvements in a population’s situation in a way that neither disregards climate change nor makes it the determining factor in decision-making (WHO, n.d.). For example, it has been proposed that reducing poverty will increase a population’s capacity to cope with many aspects of climate variability (Burton, Smith, Ebi, & Scheraga, 2005).

Within the Canadian context, reducing income and education inequities, ensuring the availability of appropriate housing and making sure that no particular group falls behind the rest of the country in economic development are key strategies in promoting adaptation to climate change. Internationally, development funding can increase the capacity of populations to adapt to climate change by strengthening public health systems, improving economic development and increasing access to education.

CANADIAN ADAPTATION MEASURES

Strengthening public health infrastructure, surveillance, emergency planning and protective technologies are all effective adaptation measures for climate change. There is evidence that progress is being made in Canada in each of these areas. For example, the federal, provincial and territorial governments are working together to address recommendations from a report by the National Advisory Committee on SARS⁷ and Public Health (Health Canada, 2003a), including:

- improving communication between the levels of government responsible for public health;
- developing protocols for sharing information and uncertainty about ownership of data;
- building surge capacity;
- coordinating business processes across jurisdictions for emergency response; and,
- strengthening links between public health and personal health services.

Surveillance assists in identifying patterns of responses to climate change. In the past, Canadian surveillance systems have been characterized by a lack of coordination among the different levels of government involved



7 SARS: Severe Acute Respiratory Syndrome

in public health (Health Canada, 2003a). Since the SARS epidemic, the federal, provincial and territorial governments have committed to working together on a system called “Panorama” (the Pan-Canadian Public Health Communicable Disease Surveillance and Management Project) that will manage surveillance for a number of key public health issues, including disease outbreaks. As such, Panorama will provide information on the health effects of climate change and could also be correlated with climatic conditions (Pan-Canadian Public Health Surveillance Project, 2007). This type of information will alert health authorities to unexpected increases in the occurrence of adverse outcomes and allow for greater understanding of the impact of weather on health.

All three levels of government (federal, provincial or territorial and municipal) have recognized that strong emergency preparedness plans incorporating a multi-hazard approach are best to support individuals, families and communities during emergencies caused by extreme weather events and other crises. The National Framework for Health Emergency Management provides a consistent, pan-Canadian approach to health emergencies (Public Safety Canada, 2005). Nurses can expect to be called upon as resources during emergencies and should therefore be engaged in planning for the response to such events with the jurisdictions in which they work.

Protective technologies can be used in various ways to support adaptation to climate change. For example, municipalities on the east and west coasts are building more extensive seawalls to deal with rising sea levels. In Calgary, plans are being drawn up for the utilization of ground water, as projections indicate that river flow may decline because of climate change (Natural Resources Canada, 2007a). Northern municipalities are trying to determine and plan for the extent of melting of permafrost.



THE ROLE OF NURSES IN ADAPTATION

Adaptation to climate has always included “physiological acclimatization, behavioural strategies (such as clothing, scheduling daily work, and seasonal migration), technical measures (such as building design and air-conditioning), and institutional mechanisms (such as establishing disaster preparedness schemes)” (Fussel et al., 2006, p. 42). What is changing now is the pace of climate change, which may overcome the capacity of populations to adapt.

Nurses have a role to play in advocating for action to reduce societal inequities, strengthening public health infrastructure and promoting behavioural strategies that foster adaptation to climate change (as outlined in the appendix). They have a long history of promoting positive adaptations to major life changes, such as the birth of a child or the diagnosis of a chronic illness. Nurses working in communities have also worked with others to increase community capacity to address various stressors. This same expertise can be used to support adaptation to climate change in a way that promotes and maintains the health of individuals, families and communities.

For more information

Public health renewal: <http://www.phac-aspc.gc.ca/publicat/sars-sras/naylor/>

Surveillance and the Panorama system: <http://www.epanorama.ca/en/faq.htm>

Emergency preparedness: <http://www.phac-aspc.gc.ca/ep-mu/index.html>

Case studies on adaptation projects that have been undertaken by municipalities:

http://ess.nrcan.gc.ca/2002_2006/rcvcc/j32/index_e.php

Mitigation Strategies

Mitigation of climate change refers to reducing GHG emissions to reduce the hazard (McBean, 2005). In effect, this means reducing consumption of fossil fuels and promoting forestry and agricultural measures that increase the uptake of CO₂ by carbon sinks. Burton et al. (2005) have proposed that “the extent to which society is willing to expend resources to avoid the effects of climate change will depend in part on its perceptions of the risks posed by climate change, the perceived costs of the effort, ability to pay, and how much it is willing to risk possible negative consequences” (p. 283). It may be that the perceived risks of climate change are now so great that more significant approaches to mitigation are more acceptable than they would have been even a few years ago.

The ultimate goal of mitigation is stabilization, which “requires that annual emissions be brought down to the level that balances the Earth’s natural capacity to remove greenhouse gases from the atmosphere” (United Kingdom Treasury, 2006, p. 193). To achieve this goal, an absolute worldwide reduction in GHG emissions is needed within the context of growth in GDP and population worldwide in both developed and developing countries. This will require international commitment to new technologies and new ways of doing business. In Canada, the increasing proportion of economic development that comes from the production of fossil fuels will continue to pose particular difficulties in reducing overall emissions.

In a recent report, the IPCC (2007c) identified strategies that could be undertaken by various sectors of the economy (including energy supply, transport, buildings, industry, agriculture, forestry and waste) to reduce GHG emissions. Some of these involve the use of new technologies – for example, fuel-efficient cars and lighting – whereas others are intended to increase the effectiveness of carbon sinks. Although most of the strategies proposed will save money in the long term, they all require up-front investments, which are often costly and will thus reduce short-term profitability. Effective use of policy tools will be required to increase the likelihood that the industrial and manufacturing sectors will make these types of investments.

POLICY TOOLS TO SUPPORT MITIGATION

The IPCC (2007c) has reviewed a number of policy tools to support industrial, manufacturing and other sectors as they make investments to reduce their overall emissions.

- **Regulations and standards** on levels of emissions offer some certainty and predictability in business planning. The government of Canada has proposed regulations on emissions in its climate change plan: *Turning the Corner: An Action Plan to Reduce Greenhouse Gases and Air Pollution*.⁸
- **Tradeable permits** can be used within a cap-and-trade system, as proposed in the *Turning the Corner* plan. In this type of system, a total emissions level (or cap) is established for a sector, and the cap is divided into individual permits, which are distributed to the plants or units within that sector. The permits can be sold, which means that a plant that does not have a permit large enough for the emissions it produces can either pay for the technology to reduce its emissions or buy additional emissions permits from others in the same sector. In theory, this system assigns a cost to emissions, which fosters investment in technology to reduce them.
- **Financial incentives** can also be used to encourage businesses, industries and consumers to adopt more energy-efficient technology. Such incentives are already being used in Canada; for example, the federal government provides subsidies to owners of older buildings to retrofit them for increased energy efficiency.

⁸ For more information on this plan please see <http://www.ecoaction.gc.ca/turning-virage/index-eng.cfm>.

- **Taxes on emissions** can set a price for carbon but cannot guarantee a particular level of emissions, as some businesses may choose to pay the tax rather than take the potentially more costly step of investing in energy efficiency.
- **Voluntary emissions agreements** between governments and industries generally have not been effective, largely because energy efficiency is costly, and it is difficult to convince businesses to reduce their profits in the absence of a regulatory framework.
- **Information instruments** or awareness campaigns may be effective in contributing to behavioural change; however, their impact on emissions has not yet been measured. This is an area where Canada has already been active and where nurses could become directly involved in promoting mitigation efforts by consumers and the health-care sector.
- **Research and development** can stimulate technological advances to support increased energy efficiency. Canada has taken a number of actions in promoting research in this area, for example, through the ecoEnergy Technology Initiative, which invests in clean energy science and technology (Natural Resources Canada, 2007b).



Regulations that have recently been introduced to reduce Canadian GHG emissions have focused on the intensity, rather than the absolute quantity, of emissions. Thus, even if industries reduce the emissions associated with manufacturing a given amount of whatever is being produced, increased production will be associated with greater emissions. A focus on intensity will not lead to the stabilization of emissions needed to achieve a balance between CO₂ released into the atmosphere and that absorbed by the earth.

Although there may be a reluctance to adopt an absolute cap on emissions because of the potential impact of this measure on GDP, there is some evidence that such caps may actually increase economic growth by promoting more advanced technologies, which have additional economic benefits (IPCC, 2007c). It is also important to note that efforts to reduce GHG emissions improve outdoor air quality by lowering the amount of particulate matter and ground-level ozone and so will have early health benefits. Supporting the movement toward an absolute cap on emissions within Canada could be a policy goal for nurses.

LIFESTYLE CHANGES TO PROMOTE MITIGATION

One of the areas where Canada's nearly 300,000 nurses can have enormous influence is in promoting behavioural changes to reduce GHG emissions. Emissions from the transportation, heating, and consumer and commercial products sectors can be reduced by the choices that consumers make (IPCC, 2007c). The World Wildlife Fund's (WWF) list of activities by which consumers can reduce their GHG emissions could serve as a useful guide for nurses working in this area (please see <http://www.wwf.ca/AboutWWF/WhatWeDo/ConservationPrograms/GlobalWarming/takeaction.asp>).

THE ROLE OF NURSES IN MITIGATION

Nurses can act on climate change by providing a handout on the subject as part of discharge planning, mentioning climate change and what can be done during prenatal classes, raising the issue at team or staff meetings, joining the workplace health and safety committee to support operating choices that lower GHG emissions, sitting on urban planning committees to reduce the trend to development of suburbs and exurbs and becoming involved in climate change discussions in their communities. It is also important to stress that many consumer choices intended to produce fewer GHGs are also good for health. For example, walking or biking to work rather than driving promotes cardiovascular fitness, driving at the posted speed limit is safer than speeding, and insulating homes properly means mould is less likely to grow.

INTERNATIONAL AGREEMENTS TO REDUCE GHG EMISSIONS

There is good evidence that international agreements can be very effective in reducing emissions to the atmosphere. For example the Montreal Protocol on Substances that Deplete the Ozone Layer, which came into force in 1989, outlined controls for the emission of ozone-depleting substances, and by 2004 emissions of these gases were at about 20% of their 1990 levels (IPCC, 2007c). Conversely, the Kyoto Protocol, signed by Canada in 1997 and ratified in 2002, has not had such a positive outcome to date. Through the Kyoto Protocol, 38 developed countries committed to reducing their GHG emissions, within the period from 2008 to 2012, to 5.2% below 1990 levels (Environment Canada, 2007b). However, worldwide emissions have continued to rise, both in developed countries and in developing countries such as India and China.

India and China have both ratified the Kyoto Protocol, but neither country has agreed to an amount by which they will reduce GHG emissions from 1990, because their industrial and manufacturing sectors have expanded so much since 1990 that percentage reductions in emissions relative to emissions in 1990 are not possible. However, per capita emissions in these countries are still lower than those in developed countries. Both countries have indicated that international measures promoting “similar commitments” to reducing GHG emissions would ensure that rich countries stay rich and poor countries stay poor (Shah, 2002).

The Conference Board of Canada (2007) has called for developing countries to be included in any plan to reduce GHGs, and the United States has indicated that it will not ratify the Kyoto Protocol unless developing countries have targets to meet (Shah, 2002). On the other hand, the Stern Report (United Kingdom Treasury, 2006) proposes that considerations of equity mean that developed countries need to take the lead in reducing GHG emissions. To this end, Canada raised the issue of a new international agreement on climate change at a recent meeting of the Asia-Pacific Economic Co-operation leaders (Office of the Prime Minister, 2007). Supporting Canadian leadership on an international agreement that includes developing countries in a way that does not stifle their economies (for example, by subsidizing the use of energy-efficient technology) is a policy area for nurses to consider.



Engaging in the Policy Debate

It is a good time for nurses to be acting on climate change policy, given the debates and negotiations on this topic that are occurring in all jurisdictions of Canada. For example, in October 2006, the federal government announced clean air regulations within existing acts such as the *Canadian Environmental Protection Act* (CEPA).⁹ The government set the context of these regulations by indicating that Canada’s performance on air emissions had lagged behind that of most of the other countries in the Organisation for Economic Co-operation and Development for well over a decade. In April 2007 the proposed regulations contained in *Turning the Corner: An Action Plan to Reduce Greenhouse Gases and Air Pollution* were announced – the first time that measures to regulate emissions had been included in efforts to reduce emissions. Several provinces and territories have also been active in this area. For example, British Columbia has joined 30 U.S. states and a Native American tribe in forming the Climate Registry,¹⁰ which will help the province to track its progress in reducing emissions.

Nurses can become involved in influencing policy related to climate change by:

- encouraging their professional associations to support policy efforts to reduce GHG emissions;
- working with coalitions of non-governmental organizations on measures to reduce GHG emissions; and,
- reviewing the progress of the action plan *Turning the Corner* at the Environment Canada website:

<http://www.ecoaction.gc.ca/turning-virage/index-eng.cfm>.

⁹ For more information on the health implications of CEPA, see the Health Canada website: http://www.hc-sc.gc.ca/iyh-vsv/enviro/cepa-lcpe_e.html.

¹⁰ For more information on the Climate Registry, see <http://www.theclimateregistry.org>.

From a policy perspective, nursing associations could consider supporting:

- efforts to move toward an absolute cap on emissions, with subsequent reductions, within Canada; and,
- Canadian leadership of an international agreement that supports developing countries in adopting energy-efficient technologies in a way that does not stifle their economies.

For more information on policy-making

International Council of Nurses statement on the participation of nurses in health services decision-making and policy development: <http://www.icn.ch/pspolicydevo0.htm>

Guidelines for organizations on how to set an environmental policy:

http://www.gov.ns.ca/enla/pollutionprevention/docs/ENV_POLICY_factsheet.pdf

Taking Action! Political Action and Information Kit for RNs (from RNAO):

http://www.rnao.org/Page.asp?PageID=122&ContentID=1448&SiteNodeID=470&BL_ExpandID=

“Nursing and the Political Agenda” (from CNA): http://www.cna-aic.ca/CNA/issues/matters/default_e.aspx



Conclusions

“Climate change threatens the basic elements of life for people around the world – access to water, food, health, and the use of land and the environment” (Dietz, Hope, Stern, & Zenghelis, 2007, p. 129). Our changing climate has led to increases in the malnutrition and diarrhea that already existed in low-income countries. People living in mid-latitude regions are dealing with the effects of climate change even though their per capita CO₂ emissions are far lower than those in the developed world. Vulnerable populations in Canada are also experiencing health effects from heat, poor outdoor air quality, changes in traditional ways of life and extreme weather events. It is likely that these effects will worsen with increasing changes in our climate.

There is strong evidence that early reductions in emissions will be far more cost-effective than carrying on with business as usual, allowing CO₂ levels in the atmosphere to continue to rise and postponing any ameliorative actions (United Kingdom Treasury, 2006). Delaying action on emissions may mean that future efforts will be much more costly and will have an increasingly negative effect on the GDP. Insufficient action on climate change now will also have a deleterious impact on the health status of vulnerable Canadians. In the long term, such delays will increase the number of families living in poverty and will lead to further poor health.

Nurses in Canada face a very real choice between getting involved now in promoting adaptation to and mitigation of climate change or waiting until they face increasingly severe health effects on the individuals, families and communities with whom they work. Nurses, with their long history of focusing on the needs of the individuals, families and communities, represent a trusted source of information which will assist them to support adaptation to climate change. As a profession, they can, and should, make efforts to support the types of policy instruments and lifestyle changes that will reduce GHG emissions and improve the health and well-being of Canadians over the long term.

For more information on climate change

The Pembina Institute has tools to support individuals who are committed to reducing their emissions:

<http://climate.pembina.org/take-action>

Information on the EnergyStar rating program for appliances is available from Environment Canada:
http://www.ec.gc.ca/EnviroZine/english/issues/22/feature2_e.cfm

Information on conserving electricity and reducing energy use in the home is available from the Ontario Ministry of Energy: <http://www.energy.gov.on.ca/index.cfm?fuseaction=english.conservaion>

Environment Canada's "action and learning site" has information about what individuals can do for the environment, with links to several other sites with information on climate change:
<http://www.ec.gc.ca/default.asp?lang=En&n=8B2F9F48-1>

Links to provincial and territorial websites with information on clean air have been collected by Environment Canada: http://www.ec.gc.ca/cleanair-airpur/Provincial_and_Territorial_Governments-WS85AA606F-1_En.htm

Environment Canada offers many other suggestions for reducing energy consumption, and hence GHGs, at home, on the road, at work and at play: http://www.ec.gc.ca/cleanair-airpur/Tips-WS49BCE76D-1_En.htm

The Ontario Public Health Association has a position paper entitled *Climate Change and Human Health*:
http://www.opha.on.ca/ppres/2004-03_pp.pdf



Appendix

HEALTH IMPACTS OF CLIMATE CHANGE IN CANADA

This appendix provides more information about each of the health impacts of climate change that have been identified by Health Canada (2005).

TEMPERATURE EXTREMES

Leimmen and Warren (2004) proposed that climate change in Canada will lead to hotter summers and milder winters with more severe heat waves. This shift will reduce the number of deaths from extreme cold and winter storms (currently estimated at 100 annually) but will increase the number of people who die during heat waves (Pengelly, Cheng, & Campbell, 2005). Excessive heat can result in heat stroke and dehydration, can exacerbate cardiovascular and respiratory disease and diabetes, and can increase the incidence of accidents such as falls (Health Canada, 2005). People with pre-existing health conditions, as well as children and seniors, are especially sensitive to the health effects of extreme heat (Health Canada, 2001; Reidel, 2004). In addition, urban residents are particularly vulnerable to temperature extremes because of the heat island effect (Natural Resources Canada, 2004).

It is generally agreed that plans for responding to heat waves that include systems to warn the population are effective in reducing morbidity and mortality (Kovats & Jendritzky, 2006). Toronto and Montreal have both developed plans to respond to extended hot weather by providing cooling centres, public education and outreach during heat waves (Health Canada, 2005; City of Toronto, 2007). Advice to cope with a heat wave includes staying cool indoors, drinking water or other fluids regularly and seeking advice about any concerns (Health Canada, 2006).

Nurses can:

- counsel vulnerable clients with whom they work about the dangers of heat waves;
- provide information about what should be done during a heat wave; and,
- teach family members about the symptoms of, and assess clients for, heat stroke and dehydration.

For more information

Guidelines for staying cool during a heat wave are available from Health Canada:

http://www.hc-sc.gc.ca/iyh-vsv/environ/heat-chaleur_e.html

EXTREME WEATHER EVENTS AND RELATED DISASTERS

Climate change is likely to result in more extreme weather events, including tornadoes, floods and electrical storms. These events can result in death and injury, as well as displacement of people and damage to property, civic infrastructure and local health services (Health Canada, 2005). Droughts have negative effects on rural economies and increase the number of forest fires, which in turn increases the risk of injuries and loss of life. Floods can also increase the risk of injuries, particularly in communities that rarely experience flooding.

Extreme weather events will become more common with increasing changes in the climate, and nurses will be asked to participate in response efforts. It is crucial that nurses be involved in planning for these events through participation in emergency preparedness activities. Nurses in hospital and community settings must collaborate in emergency planning with municipal workers, police, firefighters and others to ensure that the appropriate levels of expertise and infrastructure are in place to respond to disasters, should they occur. CNA has recently released a position statement on emergency preparedness, available at the association's website, which provides more information on nurses' roles in crisis events (CNA, 2007).



For more information

Emergency preparedness: <http://www.phac-aspc.gc.ca/ep-mu/index.html>

Personal emergency preparedness: http://www.getprepared.gc.ca/index_e.asp

EFFECTS OF AIR POLLUTION

Burning fossil fuels produces not only greenhouse gases (GHGs), but also the ground-level ozone and particulate matter responsible for air pollution (Health Canada, 2005). In addition, climate changes will likely lead to increases in the number of hot, sunny days, when levels of smog are increased. There is strong evidence that exposure to smog leads to increased morbidity and mortality from cardio-respiratory disease (Routledge & Ayres, 2005; Pope & Dockery, 2006), as well as causing eye and throat irritation, shortness of breath, allergies, impairment of lung function and lung cancer (Health Canada, 2005). Exposure to ground-level ozone can reduce lung capacity and worsen asthma and bronchitis (Health Canada, 2005). People with emphysema, bronchitis or diabetes, pregnant women, seniors and children are especially sensitive to the health effects of outdoor air pollution (American Lung Association, 2005).

The Air Quality Index (AQI) is a tool for reporting the condition of outdoor air at a particular place and time. In general, the higher the AQI, the poorer the air quality. Nurses can teach vulnerable clients about the AQI so that they can make choices (such as the following) to decrease their exposure to smog:

- Check the community's AQI, especially during "smog season" (from April to September), and tailor activities accordingly.
- Avoid or reduce strenuous outdoor activities when smog levels are high, especially during the afternoon when ground-level ozone reaches its peak. Choose indoor activities instead.
- Avoid or reduce exercising near areas of heavy traffic, especially during rush hour (Health Canada, 2003b).

For more information

The Canadian Public Health Association has promoted the importance of clean air for many years. Brochures, pamphlets and other resources for raising public awareness about the health effects of air pollution can be downloaded from the association's website: <http://www.cpha.ca/cleanair/>

The Lung Association is also working to reduce outdoor air pollution. Information at the association's website clearly explains the impact of air pollution on health:

http://www.lung.ca/protect-protegez/pollution-pollution/outdoor-exterior/index_e.php

Health Canada is jointly responsible with Environment Canada for managing the *Canadian Environmental Protection Act* (CEPA). Health Canada has information and publications on outdoor air quality (http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/index_e.html), as well as a fact sheet on smog as part of the *It's Your Health* series (http://www.hc-sc.gc.ca/iyh-vsv/environ/smog_e.html).

Pollution Probe and the Canadian Automobile Association have published *Driving Towards a Cleaner Environment – A Healthier Future*:

http://www.pollutionprobe.org/Reports/CAA_Driving_Towards%20Nov-01-06.pdf

Toronto Public Health offers information on reducing air pollution in "20/20 The Way to Clean Air":

<http://www.toronto.ca/health/2020/>

FOOD AND WATER

Although the impact of climate change on food-borne disease is unclear, it is known that “many of the bacteria and viruses that contaminate food grow more quickly in a warmer and moister climate” (Health Canada, 2005, p. 2.5.4). Heavy rainfall can increase the surface discharge flowing into rivers and reservoirs, causing contamination of these waters, which in turn leads to outbreaks of parasitic and bacterial disease. Conversely, drought can increase concentrations of pollutants and pathogens in drinking water (World Health Organization [WHO], 2003). Finally, rising sea levels in coastal areas could contaminate fresh water and disrupt sewage systems (Health Canada, 2005).

With the exception of several First Nations communities, Canadians have access to safe drinking water through municipal water systems or regularly tested wells. Occasionally, an extreme weather event, such as the flooding that occurred in Vancouver in 2006, means that public health agencies must issue boil-water advisories, and these events may become more common with increasing climate changes. Outbreaks of food-borne diseases can be reduced through careful attention to hygiene measures.

For more information

The Canadian Partnership for Consumer Food Safety Education has tips on reducing food-borne illness:

<http://www.canfightbac.org/cpcfse/en/>

Health Canada has detailed information on boil-water advisories:

http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/boil-ebullition_e.html

as well as information about drinking water:

http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/index_e.html

VECTOR-BORNE AND ZOO NOTIC DISEASES

Climate change can influence the number and geographic distribution of animal hosts of diseases (such as mosquitoes and ticks), enhance the growth of disease vectors (such as bacteria, viruses and protozoa) and increase the length of the transmission season (Health Canada, 2005). All of these factors increase the likelihood of human infection. In particular, West Nile virus infection and Lyme disease are both expected to increase in response to global warming.

These two conditions are uncommon in Canada, with 1,130 probable or confirmed cases of West Nile virus infection in 2003 and fewer than 50 cases of Lyme disease reported each year (more than half of these acquired outside of Canada). However, these diseases, when they do occur, can cause prolonged illness. Residents of high-risk regions can be encouraged to take precautions to reduce the risk of being bitten by mosquitoes (West Nile virus) and ticks (Lyme disease), which will reduce the risk of acquiring these diseases (Health Canada, 2005).

For more information

Health Canada has information on reducing the risk of Lyme disease:

http://www.hc-sc.gc.ca/iyh-vsv/diseases-maladies/lyme_e.html

Health Canada also has information on reducing the risk of exposure to West Nile virus:

http://www.hc-sc.gc.ca/iyh-vsv/diseases-maladies/wnv-vno_e.html

STRATOSPHERIC OZONE DEPLETION

Ozone in the stratosphere or upper atmosphere (not to be confused with ground-level ozone, which is a major component of smog) shields the earth from ultraviolet (UV) radiation. Increased exposure to UV radiation has



been linked to skin and eye damage, cancers and impacts on immune system function and immune-related disorders (WHO, 2003). It is anticipated that exposure to UV radiation will increase in Canada, in part because of the longer recreational season resulting from a warmer climate (Health Canada, 2005).

Concerns have been expressed about the impact on health of stratospheric ozone depletion since the 1970s. Accordingly, most Canadians are generally aware of the risks of UV radiation and take steps to protect themselves. Nurses can reinforce these messages, which include recommendations to cover up even on cloudy days and to wear sunscreen and sunglasses that screen out UV radiation.

For more information

Health Canada has information on sun safety:

http://www.hc-sc.gc.ca/hl-vs/pubs/sun-sol/safety-prudence_e.html

The Canada Safety Council has information on sun safety:

<http://www.safety-council.org/info/sport/sunsafet.htm>

Information on sun safety for children is available from the Canadian Cancer Society:

http://www.cancer.ca/ccs/internet/standard/0,3182,3172_1046449084_1049640780_langId-en,00.html

SOCIAL AND ECONOMIC IMPACTS ON COMMUNITY HEALTH AND WELL-BEING

The impact of climate change can already be seen in Canada's North, where warmer temperatures have made it difficult to go out on the land to harvest, fish or hunt (Nickels et al., 2005). Community leaders in the North have reported that the impacts on their traditional way of life posed by climate change have resulted in tremendous stresses in their communities (Nickels et al., 2005; Furgal & Seguin, 2006). In particular, there is concern about the impact of climate change on food security, as hunters are unable to go out on the land because of changes in weather patterns and ice conditions.

Low precipitation in central Canada will affect farming families much as it has done in Australia, where persistent drought has led to mental health issues in farming families who are dealing with greatly reduced crop yields (Morrissey & Reser, 2007). Strategies to mitigate climate change by reducing emissions of GHGs may also lead to job loss and reduced GDP, with concomitant stress on individuals and communities (United Kingdom Treasury, 2006). Nurses can contribute to reducing the impact of climate change on community health and well-being by working with others to strengthen community capacity to cope with stress.

For more information

The Inuit perspective on climate change is described in *Unikkaaqatigiit: Perspectives from Inuit in Canada*:

<http://www.itk.ca/environment/climate-change-book.php>

Community health nursing standards, which include community development approaches, are posted at the website of the Community Health Nurses Association of Canada: <http://www.chnac.ca/>

The Public Health Agency of Canada has materials on mental health promotion:

<http://www.phac-aspc.gc.ca/mh-sm/mhp-psm/index.html>

and information on rural health: <http://www.phac-aspc.gc.ca/seniors-aines/>

Sir Nicholas Stern reviewed the economic impacts of climate change in the United Kingdom:

http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

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