



THE
Security
OF
Canada
AND Canadians

Implications of Climate Change

The Security of Canada and Canadians: Implications of Climate Change

A Knowledge Synthesis Research Project

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Principal Investigator and Author

G.A. McBean, CM, O.Ont., PhD, FRSC
Institute for Catastrophic Loss Reduction

Research Investigators and Co-Authors

I. Ajibade, Department of Geography
D. Cunningham, Lawrence National Centre for Policy and Management
B. Dowsett, editor
M. Harris, Department of Political Science
R. Lannigan, London Health Sciences Centre
C. Popovich, Department of Political Science
E. Riddell-Dixon, Department of Political Science
C. Rodgers, Department of Political Science
S. P. Simonovic, Department of Civil and Environmental Engineering

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Preface:

This report is the outcome of a Social Sciences and Humanities Research Council - funded Knowledge Synthesis Grant entitled: *Climate Security - the implications of the impacts and response strategies of a changing climate for Canadian health, water, food, economic and social security*. The study looks at both the impacts of climate change, directly and indirectly on Canada, and the implications of response strategies, by all levels of government within Canada and by the global community. Consequently, it is comprehensive in terms of the assessment of impacts of climate change. A Knowledge Synthesis Grant is given to conduct a one-year study of literature and to facilitate interactions with decision-makers across a broad spectrum of society. It is then expected that a synthesis and public policy-relevant recommendations will be provided. It is not a grant to do original research *per se* but instead to synthesize the existing body of research. The academic investigators covered a range of disciplines appropriate for this type of synthesis and the complementary advisory team comprised representatives from the private and non-governmental organizational sectors and all three levels of government.

The preparation of this knowledge synthesis report was completed through three workshops, each with 25-30 participants and held in London, Ottawa and Toronto, Ontario. Although many participants attended all three workshops, some participated only in one or two, so that different perspectives were gained. To support these workshops and the preparation of this final report, there were, in addition to the faculty investigators, research assistants at The University of Western Ontario who prepared, with additional input, the background papers on: vulnerable populations in Canada (Ajibade, Chapter I); water security (Popovich, Chapter II); food security (Harris, Chapter III); personal health security (Harris, Brisbois and Lannigan, Chapter IV); and international stability (Rodgers, Chapter V). An earlier paper, *Addressing Climate Change in the Context of Security Policy: Implications for Canada* (McBean, 2008) is included as an Appendix. The key points of these papers are included in this synthesis report and the papers are attached as subsequent chapters.

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1. Introduction

In December 2009, many national leaders (including Prime Minister Stephen Harper), Ministers, and others, present at the United Nations Framework Convention on Climate Change Fifteenth Conference of the Parties in Copenhagen, agreed to the Copenhagen Accord, with the opening paragraph:

We underline that climate change is one of the greatest challenges of our time. ... We recognize the critical impacts of climate change and the potential impacts of response measures on countries particularly vulnerable to its adverse effects and stress the need to establish a comprehensive adaptation programme including international support.¹
[Underlining added]

In December 2010, the Cancun Agreement² of the United Nations Framework Convention on Climate Change Sixteenth Conference of the Parties adopted similar wording.

Climate change is now an issue on the front pages of most newspapers, discussed on radio and television shows and debated in most parliaments. From an environmental issue of the 1980's and 1990's, it has evolved into a global economic, social and political issue, often pitting energy consumption and development issues against a changing climate. In this Knowledge Synthesis Report, the focus is on security – human security and its relationship to human vulnerability, personal health security, food security and water security. All of these elements of human security are affected by climate change and are interconnected and addressing climate-change impacts on them requires (a) an interdisciplinary approach; (b) a systems (broader) view and (c) mobilization of all involved. Canadian security also is dependent on many international issues. For the purpose of this paper, climate security is defined as: “*that achieved through the implementation of measures that ensure the defence and maintenance of the social, political and economic stability of a country and of the human population, including freedom from fear and want – both state and human security – from the affects of climate change and global-to-local responses to it.*” Since “*providing security for the nation and*

¹ Copenhagen Accord – <http://www.unfccc.int>

² Cancun Agreement - draft decision -/CP.16. Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action under the Convention - <http://www.unfccc.int>

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*for its citizens remains the most important responsibility of government*³ security against the impacts of a changing climate and responses to it must be seen as an integral role of government. This report examines climate change through this broad security lens: the security of Canada and Canadians.

2. A changing global climate and its implications for security

Governments' and public responses to climate change have been, in part, driven by major assessments that have examined the scientific basis for concern. The 1990 assessment of the Intergovernmental Panel on Climate Change (IPCC) provided scientific basis for the United Nations Framework Convention on Climate Change of 1992, while the IPCC 1995 assessment was input to the Kyoto Protocol (Bruce, 2001). In 2007, the scientific assessment of the IPCC (2007) concluded that *“warming of the climate system is unequivocal”* and that *“most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.”* Global mean temperatures have increased by 0.7°C over the past 150 years and over the past 25 years were increasing at 0.18°C per decade. There are no indications of a slowdown or pause in the human-caused climatic warming trend (Copenhagen Diagnosis, 2009). A recent United States National Academy of Science report (Matson et al., 2010) as summarized (National Research Council, Report in Brief, 2010a) stated: *“a strong, credible body of scientific evidence shows that climate change is occurring, is caused largely by human activities, and poses significant risks for a broad range of human and natural systems.”* This Knowledge Synthesis Report takes the view that the principal conclusions of the: IPCC; Copenhagen Diagnosis; US National Academy of Sciences; Arctic Climate Impact Assessment (2005); Canadian National Assessment (From Impacts to Adaptation: Canada in a Changing Climate, Lemon et al., 2008); Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity (Séguin, 2008); and other relevant scientific assessments have been validated by international consensus.

³ The National Security Strategy of the United Kingdom, Security in an interdependent world. Presented to Parliament by the Prime Minister, by command of Her Majesty. March 2008; Newman, 2001- 239; Axworthy, 2001; MacLean, 2000; Ryerson, 2008

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3. International agreements related to climate change

The United Nations Framework Convention on Climate Change (UNFCCC – the Climate Convention)⁴ was signed at the 1992 Earth Summit by most government leaders including Prime Minister Brian Mulroney (assisted by his then Environment Minister Jean Charest). The Climate Convention was ratified by Canada and it formally entered into force in 1994. The objective of the Climate Convention is “... *the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure food production is not threatened and to enable economic development to proceed in a sustainable manner*” (Article 2, underlining added). The Convention also includes in Article 3 the agreement on some principles, including that countries in agreeing to protect the climate system, recognize that they have “*common but differentiated responsibilities*” and the adoption of the precautionary measures such that lack of full scientific certainty should not be used as a reason for postponing action. Under Article 4 on Commitments, Canada as a “*developed country Party and other Parties included in Annex I*” undertook to “*adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs.*”

The Kyoto Protocol⁵ was agreed to by most countries as the instrument to give Annex I countries measurable targets and timetables for reducing greenhouse gas emissions. Its general structure is important in shaping future agreements. Canada accepted a target of 6% emission reductions with respect to 1990 when it signed the Kyoto Protocol in 1997. The Kyoto Protocol was formally ratified by Parliament on 17 December 2002. In June 2007 the Kyoto Protocol Implementation Act was passed by Parliament.

⁴ <http://unfccc.int/resource/docs/convkp/conveng.pdf>

⁵ <http://unfccc.int/resource/docs/convkp/kpeng.pdf>

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In 2009 and 2010 there were three important meetings with respect to climate change. The UNFCCC 15th Conference of the Parties was held in 2009 in Copenhagen. What happened at Copenhagen? At the Conference per se, not much, but the Conference of the Parties took note of the Copenhagen Accord of 18 December 2009. The Copenhagen Accord, which was primarily negotiated (Antholis and Talbot, 2010) by the leaders of the United States, China, India and few others – not including Canada – states:

1. We underline that climate change is one of the greatest challenges of our time. We emphasise our strong political will to urgently combat climate change in accordance with the principle of common but differentiated responsibilities and respective capabilities. To achieve the ultimate objective of the Convention to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, we shall, recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius, on the basis of equity and in the context of sustainable development, enhance our long-term cooperative action to combat climate change.

2. We agree that deep cuts in global emissions are required according to science, ... peaking of global and national emissions as soon as possible,

3. Adaptation to the adverse effects of climate change and the potential impacts of response measures is a challenge faced by all countries. Enhanced action and international cooperation on adaptation is urgently required

9. To this end, a High Level Panel will be established under the guidance of and accountable to the Conference of the Parties to study the contribution of the potential sources of revenue, including alternative sources of finance, towards meeting this goal.

12. We call for an assessment of the implementation of this Accord to be completed by 2015, including in light of the Convention's ultimate objective. This would include consideration of strengthening the long-term goal referencing various matters presented by the science, including in relation to temperature rises of 1.5 degrees Celsius.

The Copenhagen Accord has now been endorsed by most countries including Canada. The assessment of the Climate Group⁶ is that having the US, China, India and other major developing countries sign a joint climate agreement and for the first time make pledges towards limiting temperature increases to 2°C or less, are significant steps forward. In addition, the Accord broke an earlier deadlock on monitoring, reporting and verification. It also includes a developed country commitment to provide US\$30 billion of short-term funding through to 2012, and US\$100 billion per annum of long-term

⁶ The Climate Group, London, United Kingdom: Issue 58: Viewpoints, Post COP 15

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funding by 2020, although no information is given in the Copenhagen Accord on where the money will come from. The Accord does not include an emission reduction goal for either 2020 (for developed countries) or 2050 (for all countries). There is also no timetable for concluding a legally binding agreement. The Accord, as a side agreement of the UNFCCC, leaves uncertainty over the future of the UNFCCC process. Overall the Accord represents an important political step but is conditional on immediate, concrete and ongoing commitments from all major economies beginning in 2010.

In 2010 Canada hosted the G8-G20 meetings and there was pressure on Canada to put the environment issue on the agenda.⁷ The G20 Toronto Summit Declaration⁸ (June 26 – 27, 2010) was focussed on the Framework for Strong, Sustainable and Balanced Growth. It did include:

Other Issues and Forward Agenda

41. We reiterate our commitment to a green recovery and to sustainable global growth. Those of us who have associated with the Copenhagen Accord reaffirm our support for it and its implementation and call on others to associate with it. We are committed to engage in negotiations under the UNFCCC on the basis of its objective provisions and principles including common but differentiated responsibilities and respective capabilities and are determined to ensure a successful outcome through an inclusive process at the Cancun Conferences. We thank Mexico for undertaking to host the sixteenth Conference of the Parties (COP 16) in Cancun from November 29 to December 20, 2010 and express our appreciation for its efforts to facilitate negotiations. We look forward to the outcome of the UN Secretary-General's High-Level Advisory Group on Climate Change Financing which is, inter alia, exploring innovative financing.”

The UNFCCC 16th COP, held in Cancun⁹ in December 2010 did come to some agreements which included the following key elements. The goal of limiting global warming to below 2 degrees and possibly 1.5 degrees, subject to science review, was confirmed. Quantified economy-wide emission reduction targets by developed countries are to be communicated and listed and developing countries “will” take mitigation actions. A Green Climate Fund, at least initially, with the World Bank is to be funded at a level of \$30 billion for 2010-12 and \$100 billion per year by 2020. The Cancun

⁷ Put environment on G20 agenda, UN chief tells Harper, Secretary-General Ban Ki-moon says Canada has essential role to play in fighting climate change. Mike Blanchfield, Ottawa, The Canadian Press Published on Wednesday, May 12, 2010.

⁸ The G20 Toronto Summit Declaration. <http://www.g20.utoronto.ca/2010/to-communicue.html>

⁹ Cancun Agreement. <http://unfccc.int/resource/docs/2010/awglca13/eng/107.pdf>

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Adaptation Framework includes an Adaptation Committee which will be established to help countries adapt to the negative impacts of climate change. The agreements did not specify global emissions targets for 2020 or for 2050 nor determine legally binding outcomes of the negotiations.

The 1992 Earth Summit also led to two other international agreements that are indirectly related to climate change. The United Nations Convention to Combat Desertification (UNCCD) was adopted in June 1994 and entered into force on 26 December 1996 and now has been ratified by 193 countries, including Canada (in 1995). The UNCCD objective is: “...to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification.” The connections between climate change and droughts and desertification make this largely unknown Convention relevant in this context. Desertification has been among the factors causing destabilization of some African countries and other states.

The UN Convention on Biological Diversity (UNCBD) was ratified by Canada in 1992 and entered into force at the end of 1993. The UNCBD objectives: “...are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources” and again is connected to climate change.

Thus, important international legal instruments exist to address many of the crucial issues raised by climate change. Furthermore, Canada is a party to them: hence, it is legally bound to comply with their provisions. Yet implementation remains a major challenge for Canada.

4. Climate change directly impacting Canadians

Climate-related events, floods, storms and drought, are directly affecting Canadians. In 2010 Canadians experienced Hurricane Igor, the dry to then drenched Canadian Prairies, BC’s expensive forest fires and a \$400 million hailstorm in Alberta.¹⁰ A single

¹⁰ Canada’s Top Ten Weather Stories for 2010 <http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=53E29740-1>

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heavy rain in Toronto in August 2005 cost the insurance companies approximately \$500M (Sandink et al., 2010). Tragic events or disasters result when there is the interaction between a hazard such as storm or flood and a vulnerable community (Mileti, 1999). A systems view of disasters involves complex interactions within and between the natural environment (represented by natural systems, human population (represented by human activity systems that frame actions, reactions and perceptions), and built environment (represented by human-made systems) (Simonovic, 2011). During the period 1980-2005, there were 430 disastrous events (Public Safety Canada, 2009) in Canada with 311 (72%) being storms and floods, resulting in over 460 deaths and hundreds of thousands of people evacuated from their homes. The Canadian National Assessment stated that: *“impacts of recent extreme weather events highlight the vulnerability of Canadian communities and critical infrastructure to climate change”* and *“the impacts of changing climate are already evident in every region of Canada; climate change will exacerbate many current climate risks, and present new risks and opportunities, with significant implications for communities, infrastructure and ecosystems”* (Lemmon et al., 2008, underlining added).

The vulnerability of Canadians is dependent on three primary attributes: 1) their exposure to threats associated with climate change; 2) their sensitivity to those threats; and 3) their capacity to resist impacts, cope with losses and/or regain functions when exposed to climate change (Ajibade, Chapter I; Adger et al., 2007). Assessments have identified several vulnerable groups in Canada including the elderly, infants and children. Single women are disproportionately vulnerable due to unequal access to, and control over resources. The poor, unemployed, homeless, recent immigrants, resource-dependent, Aboriginal communities and those with pre-existing health conditions are among the most vulnerable. In total, large sections of Canadian society are vulnerable to climate change and its associated threats as can be seen in the following examples of climate-related hazards that have already occurred.

There have been several billion dollar impact events in Canada. Droughts on the Prairies are the most frequent major events with the 2001-2 drought estimated to have cost \$5.8 billion loss in Gross Domestic Product and loss of 41,000 jobs. The Eastern

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Canada ice storm of 1998 interrupted electricity and left millions without power resulting in at least 28 deaths and over 900 injured. Insured losses were greater than \$1.4 billion (the largest loss for any single event in Canadian history) with estimated total costs exceeding \$5 billion (Public Safety Canada, 2007). The economic impacts of these events are the same magnitude of some recent failures in the manufacturing sector. Severe flooding in the Saguenay-Lac-Saint-Jean region (Brooks, 2008) in 1996 and in the Red River in Manitoba in 1997 (Morris-Oswald and Sinclair, 2005; Simonovic, 2011) are examples of other close to \$1 billion events with thousands of residents being evacuated. The longer-term tragic effects of these types of storms have been documented showing that children whose mothers experienced high stress during this ice storm scored lower on IQ and language performance tests than those whose mothers had not.¹¹

The wildfires in British Columbia in the summer of 2003 (British Columbia, 2004) led to the evacuation of tens of thousands of people and destroyed more than 300 homes with resulting total losses near \$1 billion. Climate change with more frequent summer thunderstorms and lightning is projected to increase the frequency and areal extent of wildfires and lengthen the wildfire season (Flannigan et al., 2005).

Climate-related hazards can directly and indirectly impact health through exposure to extreme weather events, through increased air pollution and through food-, water-, vector- and rodent-borne diseases. Harris, Brisbois and Lannigan (Chapter IV) explore fully the personal health security issues. The frequency of hot days (above 30°C) is projected to increase in most parts of Canada, such that the number of hot days, by 2050, will quadruple in Calgary, and at least triple in Winnipeg, Toronto and Fredericton (Hengeveld et al., 2005). Summer heat poses a significant risk to public health and safety, as was starkly demonstrated by the 2003 heat wave in Western Europe, which was associated with more than 70,000 deaths (Robine et al., 2008). Actions to better design structures and cities, with use of more green space, shade, passive cooling and implementation of heat alerts and responses with supporting medical advice are necessary.

¹¹ Professor S. King, Director of the Psychosocial Research Division at the Douglas Institute and associate professor of the Department of Psychiatry at McGill University: Climate change and the unborn: Douglas Conference examined the consequences. Press Release, McGill Douglas. 2009/02/03

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Extreme heat events can also have indirect negative health impacts since hot summer days are usually smoggy days. The Canadian Medical Association (CMA¹²) has estimated that, in 2008, 21,000 Canadians died from the effects of air pollution with economic costs exceeding \$8 billion and projected that by 2031, almost 90,000 people will die from the acute effects of air pollution with the number of deaths due to long-term exposure to air pollution being 710,000 and economic costs accumulating to over \$250 billion. CMA estimates do not factor in that both heat waves and smog episodes are likely to become more frequent under a changing climate (Lemmen et al., 2008). Approaches that reduce smog by limiting emissions of smog-creating pollutants can also reduce greenhouse gas emissions since the processes that result in air pollution are much the same as those that produce greenhouse gases.

To manage the health risks and safeguard human security, assessments are needed of the vulnerability and planning capacity of health facilities and services to climate change impacts and of the effectiveness of current measures to adapt to the health impacts of climate change. Estimates are needed of the economic costs of the projected health impacts and, overall, how climate-related threats to the human security of people living outside of Canada may impact the health security of Canadians.

Critically important to our health is our food. The interactions of climate change and food, from the food security perspective are discussed by Harris (Chapter III). In some regions of Canada, particularly the north, climate change may enhance opportunities for small-scale agriculture. However food transportation will become more difficult and more expensive in remote communities with the loss of winter roads. The relationship between climate change and food accessibility will depend on the vulnerability of populations. In 2005, more than 30 percent of single-parent families and 20 percent of Aboriginal families in Canada had inadequate access to food.¹³ Additionally, more than 1.1 million Canadian households were food insecure at some point during 2008.¹⁴

¹² Canadian Medical Association (CMA) August 2008 No Breathing Room. National Illness Costs of Air Pollution

¹³ Statistics Canada, 2005

¹⁴ Agriculture and Agri-Food Canada (AAFC), 2008: Follow-up to the Implementation of the World Food Summit Plan of Action: Canada's Fifth Progress Report on Food Security. Ottawa: Government of Canada. p. 4

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Despite the possible opportunities, residents in northern communities are the most likely to experience food insecurity, with the rate in Nunavut being four times higher than the Canadian average. Changes in snow cover and sea-ice conditions, along with ecosystem impacts, are affecting access to traditional food supplies of peoples of northern Canada and environmental stress and water scarcity issues caused by climate changes can exacerbate political, social, and economic issues related to food security for Canadians.

The myth of Canada's water abundance juxtaposed against a changing climate underlies the threats to what is perhaps Canada's most important resource - water. Popovich (Chapter II) further examines the issues of water security. While 20 per cent of the world's total supply of freshwater is within Canada's borders, only one-third of that is renewable. While two-thirds of Canada's water flows northward, most of its population lives in Canadian southern urban centres and along coastlines. These fundamental challenges provide a backdrop to a changing water reality in Canada. Understanding what percentage of water is renewable and the full amounts and location of freshwater is critical in managing and adapting to the challenges of climate change.

Climate change water issues for Canada are, first, changes in water supply. There will be reduced water levels in lakes and rivers. Droughts in the Prairies region, interior British Columbia and eastern Canada will become more of a threat while, the second issue will be increased frequency and severity of floods at inland (e.g., Red River Basin) and coastal locations. Disaster mitigation and climate change adaptation are inherently linked. Water infrastructure in Canada is aging and often outdated, making it vulnerable to hazards, especially given the expected increase in extreme weather events (Simonovic, 2008). In Canadian urban centres there are increasing water demands, water pollution and in some places a heavy reliance on water-based transport for goods and services. Deteriorating water quality in major water bodies impacting people, industries, energy supply, the ecosystem and human health with special focus on urban areas and Great Lakes is the third issue. Fourth, water is an economic issue. More than half of Canadian electrical energy¹⁵ comes from hydropower which although not consuming water is

¹⁵ Some references from the Commission on Environmental Cooperation that provide further information are: <http://www.cec.org/Page.asp?PageID=924&ContentID=2845>; and <http://www.cec.org/Page.asp?PageID=924&ContentID=2849>

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entirely dependent on its availability. British Columbia, Manitoba and Quebec generate more than 75% of their electric power through hydropower. The main consumptive water uses in Canada include (a) thermal power production (60%); (b) manufacturing (18%); (c) municipal (10%); (d) agriculture (8%); and (e) mining (4%). Water use in nuclear energy production is for cooling only which makes it consumptive through evaporation. The high consumptive use of water for oil comes only from oil sands extraction as conventional oil production has a much lower use. Understanding which percentage of water is renewable and the full amounts and location of freshwater is critical in managing and adapting to the challenges of climate change. While water quantity issues in relation to climate change have been studied extensively there is a lack of adequate research about groundwater and its recharge, water quality issues and climate change.

In the Great Lakes Basin, where only 1% of the water is renewed annually, there are concerns about the potential for decreasing water levels and very high usage rates; appropriately there are significant concerns about large-scale water diversions. The International Joint Commission, a 100-year old institution, serves in many ways as an example to the world for dealing with trans-boundary issues. But there is need for improvement and further institutional development. If any province enters into a water exporting scheme, national control of our water resources would be lost and it could not be reclaimed under international trade agreements. There is a close connection between water and energy that links together the concerns over water security and energy security. Canada's lack of a national water policy is a major institutional threat.

For Canada's East Coast, an increasing threat is the occurrence of intense hurricanes that new analyses of observational data confirm has increased in the past three decades (Trenberth et al., 2007) in line with rising tropical ocean temperatures. Additionally, rising sea levels associated with thermal expansion of the oceans and melting of the Greenland and Antarctic ice sheets, as well as the accelerated loss of glaciers and ice caps, threatens both coasts. Global average sea-level has gone up by 3.4 millimetres a year in the last 15 years and by 2100, global sea-level, for unmitigated emissions, will possibly rise more than 1 metre with an upper limit estimated at 2 metres sea-level rise

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(Copenhagen Diagnosis, 2009). There are implications for low-lying areas along the East Coast as well as the Fraser River delta near Vancouver and the coast lines of Hudson Bay. Flooding of Arctic communities is also a concern and some have had to be relocated.

In summary, Canada and Canadians are being impacted by climate-related events, such as storms, floods, sea-level rise and droughts. The research papers prepared as part of this project and the existing literature including the Canadian National Assessment (Lemmen et al., 2008), the Arctic Climate Impact Assessment (2005) and the appropriate chapters of the 2007 Assessment of the IPCC have documented the past and projected future events and their impacts and the overall vulnerability of Canadians. The Executive Summary of the North American Chapter of the IPCC 2007 (Field et al., 2007) states (all conclusions were at the highest IPCC level of confidence):

- *North America has experienced locally severe economic damage, plus substantial ecosystem, social and cultural disruption from recent weather-related extremes, including hurricanes, other severe storms, floods, droughts, heat waves and wildfires.*
- *The vulnerability of North America depends on the effectiveness and timing of adaptation and the distribution of coping capacity, which vary spatially and among sectors.*
- *Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution.*
- *Climate change will constrain North America's over-allocated water resources, increasing competition among agricultural, municipal, industrial and ecological uses.*
- *Climate change impacts on infrastructure and human health and safety in urban centres will be compounded by ageing infrastructure, maladapted urban form and building stock, urban heat islands, air pollution, population growth and an aging population.*
- *Without increased investments in countermeasures, hot temperatures and extreme weather are likely to cause increased adverse health impacts from heat-related mortality, pollution, storm-related fatalities and injuries, and infectious diseases.*
- *Disturbances such as wildfire and insect outbreaks are increasing and are likely to intensify in a warmer future with drier soils and longer growing seasons.*

There is now strong scientific guidance on how Canadians will be impacted by a changing and this can form the basis for the development of policies.

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5. Canadian Security Implications of Climate Change in Other Countries

Canada and Canadians will also be impacted by a changing climate beyond our borders. There is need to know how climate change will drive international markets and security issues of most relevance to Canada and where the international “hotspots” are with direct or indirect implications for Canada. A changing climate will impact on migration to and from Canada. The broad scope of these issues is addressed by Rogers (Chapter V). The Canadian National Assessment stated: “*climate change impacts elsewhere in the world, and adaptation measures taken to address these, will affect Canadian consumers, the competitiveness of some Canadian industries, and Canadian activities related to international development, aid and peace keeping*” (Lemmon et al., 2008, underlining added).

The global impacts of climate-related hazards that have already happened demonstrate the concern. “*Over the last two decades (1988-2007), 76% of all disaster events were hydrological, meteorological or climatological in nature; these accounted for 45% of the deaths and 79% of the economic losses caused by natural hazards*” (Wahlström, 2009). During the period 2000-2008 more than 220 million people were victims of the about 360 climate-related disasters per year (Rodriguez et al., 2009). A disaster category 5 event is defined as one with more than 500 deaths and/or overall losses of more than \$US 500 million. Whereas in the 1980s there were between five and fifteen category 5 events per year, this number has increased to 15-25 events per year in the period 1990-2005 and is currently 28-41 events per year in the 2006-2008 period (MunichRe, 2010a). Combinations of increases in population, poverty, valuable and vulnerable infrastructure and a changing climate have led to these increases. Nearly 260,000 people died in natural disasters in 2010 (through Nov. 30) (Borenstein and Reed Bel, 2010) compared to less than 115,000 deaths from terrorism in total for the 40-year period 1968 to 2009. Both scientists and insurers expect that as the climate changes, there will be more frequent and intense extreme weather events, resulting in more costly disasters in the years to come (MunichRe, 2010b). UN ISDR Global Assessment Report on Disaster Risk Reduction (UNISDR, 2009) concluded that:

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- *Weather-related disaster risk is expanding rapidly both in terms of the territories affected, the losses reported and the frequency of events.*
- *Climate change is already changing the geographic distribution, frequency and intensity of weather-related hazards.*

While the impacts of these hazardous events are felt globally, the impacts are particularly significant for developing countries. The UN ISDR Report also concluded that:

- *Climate change threatens to undermine the resilience of poorer countries and their citizens to absorb and recover from disaster impacts.*
- *Global disaster risk is highly concentrated in poorer countries with weaker governance.*
- *The governance arrangements for disaster risk reduction in many countries do not facilitate the integration of risk considerations in development.*

These developing countries have low adaptive capacity, poor physical infrastructure, weak governance, poverty and inadequate disaster response capacity. With this increasing burden, the economic and social systems of developing countries are being stressed and the possibility of state failures has become more likely.

In the next few decades, as the climate warms there will be more impacts. Some will be positive but most will not. For example, in some African countries yields from rain-fed agriculture could be reduced by up to 50% by 2020 (Parry et al., 2007). As the temperature warms further, any increase in temperature above 3°C is expected to result in significant global average yield reductions with disastrous implications for food security worldwide (Parry et al. 2007, 11-13). With climate zones shifting and droughts worsening, crops that were previously grown and relied on for local consumption or export may no longer thrive. There is also concern that the nutritional value of crops could suffer in a high-production environment and could result in significant soil degradation and loss of soil fertility (Stafford 2007, 526). Elevated CO₂ levels will also affect fish stocks and currently more than 2.6 billion people rely on fish for at least 20 percent of their protein needs. Ocean acidification has detrimental effects on fish growth and development (Carius et al., 2008, 27; Stern 2006, 56). With continued warming, local extinctions of certain fish species, especially freshwater species, will occur (Easterling et al. 2007, 300). These issues will be compounded both by the current over-fishing practices in numerous countries and the increasing demand for food. It is

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projected that population growth combined with higher living standards will result in a 55 percent increase in global food demand by 2030 and 80 percent by 2050 (Carius et al. 2008, 28). Consequently, more agricultural land and water will be required at a time when both are increasingly scarce. The United Nations Food and Agricultural Organization (FAO) and the IPCC, among others, have identified sub-Saharan Africa and south Asia as hotspots for food insecurity exacerbated by climate change (FAO, 2006; Easterling et al. 2007, 297).

In February 2009, the Government of Canada identified twenty countries based on their current needs and their anticipated capacity to use aid effectively that would become the focus for Canadian bilateral aid (CIDA, 2009a). The majority of these countries are also expected to experience the worst effects of climate change (CIDA, 2009b; Parry et al., 2007). Some of these countries are trading partners, while others are important sources of Canada's immigrants; consequently the impact of climate change on their food security, stability and well-being is of strategic interest to Canada (Statistics Canada, 2004; CIDA, 2009a).

With related and important impacts on water resources, conflicts linked to climate change may develop (Gleditsch et al., 2007). Environmental migration, linked to the search for new and available resources or the escape from a disastrous event, also has the potential to cause conflict and could put intense pressure on an already fragile state (CNA, 2007). The German Advisory Council on Global Change (2007) refers to climate-induced conflict constellations as '*hotspots*,' caused by degradation of freshwater resources; decline in food production; increases in storm and flood disasters; and environmentally-induced migration. It concluded that "*without resolute counteraction, climate change will overstretch many societies' adaptive capacities within the coming decades*" which could result in destabilization and violence, jeopardizing national and international security to a new degree.

Other governments have also examined the security-related aspects of climate change and their analyses provide useful insights into issues such as international governance stability, migration, international trade and conflicts that provide reference points for framing a Canadian approach. The United Kingdom's National Security Strategy (2008)

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identified drivers of insecurity and security challenges and concluded that climate change is “*potentially the greatest challenge to global stability and security and therefore to national security. Tackling its causes, mitigating its risks and preparing for and dealing with its consequences are critical to our future security, as well as protecting global prosperity and avoiding humanitarian disaster.*” The UK report noted that “*the direct effects (of climate change) are likely to fall most heavily on those countries least able to deal with them, and therefore most likely both to suffer humanitarian disaster but also to tip into instability, state failure, or conflict. ... if the international system fails to respond, the effect on its credibility would have further knock-on effects on security.*” In 2008, the Council of the European Commission adopted a report on the security implications of climate change¹⁶ noting that “*the impact of climate change on international security is not a problem of the future but already of today and one which will stay with us.*”

The United States-based Centers for Strategic & International Studies and for New American Security (2007) concluded that:

- *Perhaps the most worrisome problems associated with rising temperatures and sea levels are from large-scale migrations of people — both inside nations and across existing national borders.*
- *Climate change effects will aggravate existing international crises and problems.*

The United States-based Council for Foreign Relations (2008) stated: “*unchecked climate change is poised to have wide-ranging and potentially disastrous effects over time on human welfare, sensitive ecosystems, and international security.*” The CNA (2007) concluded that “*projected climate change poses a serious threat to America’s national security*” and that “*climate change acts as a threat multiplier for instability in some of the most volatile regions of the world*” (underlining added). In this regard, they noted that climate change has the potential to result in multiple chronic conditions, occurring globally within the same time frame. Food production, health, water and weakened and failing governments were highlighted. For states where ecosystems or sectors of society are already fragile, the additional imposition of a changing climate may overload those systems perhaps beyond their breaking thresholds leading to failed states. A US National

¹⁶ Climate Change and International Security, Paper from the High Representative and the European Commission to the European Council. Paper S113/08, 14 March 2008

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Security Study concluded that “*America is now threatened less by conquering states than we are by failing ones*” where a “*failed state*” is one whose central government is so weak or ineffective that it has little practical control over much of its territory (Chomsky, 2006). The Policy and Fund for Peace (2009) each year produce a failed states index. In commenting on the list, Faris¹⁷ stated: “*if you think these failed states look bad now, wait until the climate changes.*” The sense of climate change as a “*threat multiplier*” and the concern for failed and fragile states appear often in security analyses (McBean, Chapter 6). Climate security can serve as an integrative concept which links local/people (human security), national (national security) and global (international security) levels and brings together mitigation and adaptation as both are essential to security from climate risks (Barnett, 2003).

The Centers for Strategic & International Studies and for New American Security (2007) also concluded that: “*at a definitional level, a narrow interpretation of the term ‘national security’ may be woefully inadequate to convey the ways in which state authorities might break down in a worst case climate change scenario.*”

The national security of Canada must go beyond the narrow definition and it needs to be recognized that it is dependent on security abroad. Issues include potential immigration, trade, conflict resolution pressures and circumpolar Arctic issues (see Crawford et al., 2008 for a more detailed discussion). Strategies are needed to reduce the vulnerability and risk and Canada must consider how to best position itself to be resilient to climate change and related pressures arising from global climate change for the benefits of this and future generations.

6. Adapting to changing climate

Canada needs to adapt to the changing climate while reducing the risks of these hazards. The Canadian National Assessment defines adaptation to climate change as “*making adjustments in our decisions, activities and thinking because of observed or expected changes in climate, in order to moderate harm or take advantage of new opportunities*” (Lemmen et al., 2008). Disaster risk reduction is defined as: “*the concept*

¹⁷ Foreign Policy. http://www.foreignpolicy.com/articles/2009/06/22/failed_states_index_the_last_straw

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and practice of reducing disaster risk¹⁸ through systematic efforts to analyse and manage the causal factors of disasters including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and environment, and improved preparedness for adverse events.”¹⁹ Linking these approaches is necessary.

Viewing adaptation to climate change from a risk management approach offers considerable benefits (Noble et al, 2005). Vulnerability assessment is a central element of risk management and it is increasingly useful for guiding adaptation, since it helps reveal local- and larger-scale system vulnerabilities for which adaptation measures may be necessary to prevent serious adverse consequences. Future climate scenarios, based on climate models, will continue to provide valuable information, but the vulnerability-based approach is critical for helping identify specific risks and potential impacts that reflect the interests and values of people affected.

The concept of “managing risks” seems, from many perspectives, much clearer than the concept of “adapting.” Risk management is a familiar concept, especially in disaster management, whereas the notion of “adapting” is still poorly understood by many. Risk management provides a means for addressing uncertainties explicitly. Uncertainties exist in respect to uncertain future climate conditions and other aspects of climate change adaptation decision-making. Without a risk management view, decision-makers often receive uncertain responses to their question “what are we adapting to?”

Risk management is relatively easy to apply in practice. In Canada, for example, many organizations have developed and accepted generic risk management procedures, and gained first-hand experiences in using risk management techniques (Canadian Standard Association, 1997 - reaffirmed in 2009). Increasingly, these are being applied to manage climate-related risks.

The 2010 Fall Report of the Commissioner for Environment and Sustainable Development (CESD, 2010) to the House of Commons states: “*Government reports have demonstrated that climate change affects all regions of the country and a wide range of*

¹⁸ Disaster risk is “the potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.”

¹⁹ UNISDR, Disaster terminology.

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economic sectors. These impacts and the need to adapt to them touch on virtually all federal government portfolios, with significant implications for policies and programs related to Canadians' health and the country's industry, infrastructure, and ecosystems."

The Report noted the need to adapt to changing climate and that these issues "touch on virtually all federal government portfolios, with significant implications for policies and programs related to Canadians' health and the country's industry, infrastructure, and ecosystems." The report went on to state that the:

federal government is well positioned to help Canadians reduce their exposure to risks from climate change by providing them with information on impacts and adaptive measures. The concerns we have raised in this report are hardly new. About 20 years ago, the federal government acknowledged that the impacts of climate change would pose significant, long-term challenges throughout Canada, from more frequent and severe storms in Atlantic Canada to changes in the amount of rain available to farmers. And today, the federal government still lacks an overarching federal strategy that identifies clear, concrete actions supported by coordination among federal departments.

The report concluded that:

- *The government has not established clear priorities for addressing the need to adapt to a changing climate. Although the government committed in 2007 to produce a federal adaptation policy to assist it in establishing priorities for future action, there is still no federal adaptation policy, strategy, or action plan in place. Departments therefore lack the necessary central direction for prioritizing and coordinating their efforts to develop more effective and efficient ways of managing climate change risks.*
- *Overall, the departments we examined have not taken concrete actions to adapt to the impacts of a changing climate. With few exceptions, they have yet to adjust or develop policies and practices to better respond to the risks. However, Fisheries and Oceans Canada, Natural Resources Canada, Health Canada, and Environment Canada have taken the first steps of risk management by completing assessments of the risks to their mandate areas from climate change, and they have prioritized the risks. Indian and Northern Affairs Canada has initiated but not yet completed a department-wide assessment of climate change risks it must manage.*
- *The four programs we examined have shared information on climate impacts and adaptation in a manner that responds to the needs of their specific clients, stakeholders, and partners. However, the programs cannot meet the increasing demand for information.*

A recent United States National Academy of Science report (Wilbanks et al., 2010) focusing on the needs for climate change adaptation has been summarized (National Research Council, Report in Brief, 2010b) in part as:

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much of the nation's experience to date in managing and protecting its people, resources, and infrastructure is based on the historic record of climate variability during a period of relatively stable climate. Adaptation to climate change calls for a new paradigm—one that considers a range of possible future climate conditions and associated impacts, some well outside the realm of past experience. Adaptation is a process that requires actions from many decision-makers in federal, state, tribal, and local governments, the private sector, non-governmental organizations, and community groups.

There has been action at the provincial level. In the aftermath of the Saguenay flood of 1996 and the ice storm of 1998, the government of Quebec established the Ouranos²⁰ Program in 2001. Its vision to provide Quebec and all of Canada with an organization capable of meshing climate science with the adaptation needs of society. Ouranos' mission is to acquire and develop knowledge on climate change, its impact and related socioeconomic and environmental vulnerabilities, in order to inform decision makers about probable climate trends and advise them on identifying, assessing, promoting and implementing local and regional adaptation strategies.

The Government of Ontario appointed an Expert Panel on Climate Change Adaptation in December 2007 to provide the government with advice on how best to plan and prepare for the impacts of climate change. The panel engaged 15 ministries and government agencies (including the Climate Change Secretariat) in a process of extensive discussion on a broad range of policy and program areas to develop recommendations culminating in a report to the Minister of the Environment that was presented in November 2009.²¹

Pacific Climate Impacts Consortium was created to quantify the impacts of climate change and variability on the physical environment in Pacific North America.²² The British Columbia government has provided \$94.5 million to create the Pacific Institute for Climate Solutions (PICS),²³ led by the University of Victoria in collaboration with the University of British Columbia, Simon Fraser University and the University of Northern British Columbia. Its objectives are: understanding the magnitude and patterns of climate change and its impacts; evaluating the physical, economic and social implications; assessing mitigation and adaptation options and developing policy and business solutions;

²⁰ <http://www.ouranos.ca/>

²¹ <http://news.ontario.ca/ene/en/2009/12/environmental-experts-submit-report-on-climate-change.html>

²² <http://pacificclimate.org/>

²³ <http://www.pics.uvic.ca/>

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evaluating and strengthening educational and capacity-building strategies to address climate change; and communicating climate change issues to government, industry and the general public. Note that this Institute has objectives related to both emission reduction solutions as well as adaptation options.

7. Perceptions of Canada's role in international dialogue

International assessments of Canada's role, image and contribution towards international climate solutions have become increasingly negative. For example, Germanwatch and Climate Action Network International²⁴ provide an assessment called The Climate Change Performance Index which compares a country's climate change performance, based on climate change policy, emissions levels and trends of the top 10 emitters and the 60 states that together are responsible for more than 90 percent of annual worldwide carbon dioxide emissions. In 2009, Canada was 10th, the poorest ranking, in the top 10 emitters and 59th overall, only ahead of Saudi Arabia. The Climate Action Network also makes awards to countries that, in their opinion, have performed badly in the UN climate change negotiations. Canada has been awarded the "Colossal Fossil of the Year" award for each of the last four UNFCCC Conferences of Parties.²⁵

8. Internal Canadian dialogue and discord on climate change and related energy policy

In the absence of a nationally-agreed climate change strategy on limiting greenhouse gas emissions, there has been discord among the federal government and the provinces. Prior to the Kyoto Negotiations in 1997, Canadian First Ministers (Prime Minister and all provincial and territorial premiers) agreed that the Canadian target for Kyoto Protocol negotiations was to be 0% reduction with respect to 1990 levels. By the time of opening of the Kyoto meetings, the Canadian delegation was negotiating for a Canadian target of 3% reduction in reflection of perceived national interest and image and the understanding that the United States target would be 2% reduction (Simpson et al., 2007). In the end

²⁴ GermanWatch is a German government-supported group and Climate Action Network International is a global coalition of over 450 leading non-government organisations who monitor progress at the UN talks. Climate Action Network Canada is part of CAN International.

²⁵ <http://www.climatenetwork.org/fossil-of-the-day>

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Canada accepted a target of 6% emission reductions with respect to 1990 when it signed the Kyoto Protocol in 1997 and later, the Protocol was formally ratified by Parliament, after a Parliamentary debate, on 17 December 2002.

Canada's total greenhouse gas emissions²⁶ in 2008 were 734 MT (megatonnes) of carbon dioxide equivalent, which is about 24% above the 1990 total of 592 Mt and 32% above Canada's Kyoto target of 558.4 Mt. Approximately 81% of these emissions were generated from energy sources, (includes all energy production and consumption). The remaining 19% was largely generated by agricultural sources and industrial processes, with smaller contributions from waste, solvents and other product uses. Announced in 2006 and maintained until the fall of 2009, the Government of Canada's target had been a commitment to reducing Canada's total greenhouse gas emissions by 20 per cent from 2006 levels by 2020 and by 60 to 70 per cent by 2050²⁷. The 20 per cent reduction from 2006 levels by 2020 corresponds to about 3% reduction compared to the internationally agree reference year of 1990. On January 30, 2010, as part of a commitment under the Copenhagen Accord, the Government announced a new target of 17% reduction from 2005 levels, a target the same as the United States. This target is weaker than earlier and, if implemented, would increase emissions in 2020 by about 2.5%, relative to 1990 levels.²⁸

In some provinces there has been considerable action on climate change. British Columbia, Manitoba, Ontario, and Quebec have joined the Western Climate Initiative,²⁹ (in collaboration with U.S. states: Arizona, California, Montana, New Mexico, Oregon, Utah, Washington) which is committed to working together to identify, evaluate, and implement policies to tackle climate change at a regional level. A regional cap-and-trade program, announced in September, 2008, will, when fully implemented in 2015, cover nearly 90 per cent of the greenhouse gas emissions of the parties in the Western Climate Initiative.

²⁶ Canada's 2007 Greenhouse Gas Inventory http://www.ec.gc.ca/pdb/ghg/inventory_report/2007/som-sum_eng.cfm#s1 (accessed 16 January 2010)

²⁷ <http://climatechange.gc.ca/default.asp?lang=En&n=72F16A84-1> (accessed 16 January 2010)

²⁸ Shawn McCarthy, *Globe and Mail*, 27 January 2010: Tories hedge on emissions targets

²⁹ Western Climate Initiative

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The Ontario government's³⁰ Climate Change Action Plan calls for reducing greenhouse gases by 6% from 1990 levels by 2014, and 15% by 2020. Quebec Premier Jean Charest³¹ announced on November 23, 2009 that, by 2020, the province will reduce its greenhouse gas emissions by 20% below 1990 levels, a goal similar to the target the European Union has adopted. British Columbia³² plans to reduce emissions by 33% below 2007 levels, (about 14% reduction below 1990 levels) by 2020. These targets for 2020, with respect to 1990 levels, of reductions of 15% (Ontario), 20% (Quebec) and 14% (British Columbia) differ significantly from the new federal target of a 2.5% increase.

The Canadian delegation to the Copenhagen Conference of the Parties included Quebec Premier Jean Charest, B.C. Premier Gordon Campbell, Alberta Environment Minister Rob Renner and Ontario Environment Minister John Gerretsen. Toronto Mayor David Miller, chair of the C40 global cities, travelled to Copenhagen to represent urban citizens. It was clear that there were deep divisions among the provinces and between the federal government and some provinces.

In the May 2010 issue of *Policy Options*,³³ a lead article by Geoff Norquay³⁴ (2010) entitled "*the gathering storm in federal-provincial relations*" addressed the theme of the "*Fault lines of Federalism*." These divisions between different levels of government were not only evident within Canada but also to the world community (McCarthy, 2009). Norquay states that the "*second growing flashpoint in federal provincial relations is the environment*" and he notes that in attacking the Alberta oil sands for their greenhouse gas emissions Ontario and Quebec have touched the "*third rail*" of Canadian federalism – equalization. The following article by Robin Sears³⁵ (2010) entitled "*The next federal-*

³⁰ Ontario Releases Second Climate Change Annual Report December 2, 2009 9:16 AM
McGuinty Government Making Progress On Climate Change Goals

³¹ November 23, 2009 Quebec splits with Ottawa on climate change By Rhéal Séguin Globe and Mail Update

³² www.gov.bc.ca/premier/attachments/climate_action_plan.pdf

³³ *Policy Options* is the publication of the Institute for Research on Public Policy and is available at www.irpp.org

³⁴ Norquay is a former senior policy adviser to Prime Minister Harper.

³⁴ Norquay is a former senior policy adviser to Prime Minister Harper.

³⁵ Sears is a former national campaign director of the NDP during the Broadbent years. An earlier (2006) article by Sears is also interesting in this context: Sears, R., 2006: The politics of climate change: from one government to the next. *Policy Options*, October 2006, 6-11.

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provincial battles: this time it's different," discussed the “*new time bomb, courtesy of the climate change advocates*” in the context of Ottawa-Washington establishing a continental cap and trade or carbon tax regime and the regional winners and losers. Sears also quotes David Emerson (both a former federal Liberal and Conservative cabinet minister)

We continue to be a country without a national approach to the twin issues of energy and environmental stewardship ... [In an] interdependent carbon-dependent world ... a national energy strategy ... would factor in efforts by government and industry to promote energy efficiency through improvements in transportation, building codes, agricultural technologies [and] appliance standards.

A major component of the Canadian economy is presently the oil and gas sector, which has been expanding while traditional manufacturing and some other resource sectors, such as wood, pulp and paper are declining. Some³⁶ view Canada as “*slipping down the development ladder, retreating from a complex, diverse economy towards dependence on a single primary resource, which happens to be the dirtiest commodity known to man*” (Monbiot, 2009).

There are clear economic benefits from having very high oil reserves, in the future primarily due to the oil sands. There have also been statements of concern from provincial leaders about wealth transfers from the oil-producing provinces to others. At the same time, the statements from other provincial leaders have been critical of the impact of the oil sands and other related production in terms of its emissions and potential negative impacts on the rest of Canada, directly and through internationally negotiated climate regimes. From an economics analysis, there are difficulties for countries with a focus on a dominant natural resource. A report of the Parliamentary Research Branch in 2006,³⁷ entitled “*Energy, Resources, Boon or Curse, for the Canadian Economy?*” discusses this phenomenon, commonly referred to as the “Dutch Disease,” which occurs when large exports of natural resources lead to a strong currency which, in turn, hurts the traditional manufacturing sectors, which in Canada have been primarily in Ontario and Quebec. One conclusion of this study is that unbridled

³⁶ George Monbiot Guardian.co.uk, Monday 30 November 2009 19.30 GMT

³⁷ Parliamentary Research Branch report PRB 05-86F, Energy, Resources, Boon or Course, for the Canadian Economy? Prepared by: Philippe Bergevin Economics Division 31 March 2006

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development of the western oil sands will, by keeping the Canadian dollar high, have negative impacts on manufacturing sectors with “*significant wealth transfer*” from one part of the country to another.

A comparison can be made of the situation in Norway, which has vast oil reserves and has experienced a booming economy for two decades. Its strategic macroeconomic policies have made it one of the richest countries in the world in terms of Gross Domestic Product (GDP) per capita. Norway’s decision makers recognized early on the potential side effects of large revenues from natural resources, and acted upon that knowledge. Norway implemented a carbon tax of \$50 per tonne in 1990, its economy and oil production are still moving ahead and its emissions have increased by only 8.8%, while Canada’s emissions have increased three times as much. Sweden, a northern country but not an oil exporting state also has some lessons for analysis. It has reduced emissions by 7.3 percent by implementing a “green tax shift” in 1990 where taxes on energy and on carbon dioxide emissions were raised and other taxes, such as payroll taxes were decreased by an equivalent amount. Canada now uses 50% more energy than Sweden to produce the same amount of goods and services as measured by per capita Gross Domestic Production.³⁸ Canada can learn from these experiences and can manage the current situation in a manner that ensures positive economic and social consequences for the country as a whole.

9. Need for leadership to achieve action

The Copenhagen Accord “*underline(d) that climate change is one of the greatest challenges of our time. We emphasise(d) our strong political will to urgently combat climate change ...*” endorsed the 2 degrees Celsius target and agreed that deep cuts in global emissions are required. Global mean temperature has already increased by 0.7°C, leaving only 1.3°C before a critical threshold is reached. Because carbon dioxide has a long lifetime³⁹ in the atmosphere, and the climate system (including the oceans) is slow to adjust, the IPCC (2007) has projected a warming of 0.2°C per decade for the next 3-4

³⁸ L. Alvin, Swedish Ambassador, “Kyoto critics are wrong: you can get rich by going green. Sweden will happily show you how. *Globe and Mail*, 25 May 2005

³⁹ Carbon dioxide remains in the atmosphere between 50 and 200 years; the oceans can take decades to centuries to warm up.

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decades – a further warming of 0.6-0.8°C. Even if emissions were to stop, the climate system would still be coming into equilibrium for the rest of this century with a warming rate of about 0.1°C per decade; which means at least another 0.5°C by the end of the century. Hence, the globe is effectively committed to at least 2°C warming with the assumption of essentially no emissions following mid-century. And global carbon dioxide emissions (Copenhagen Diagnosis, 2009) from use of fossil fuels are rising more rapidly than ever before and in 2008 were nearly 40% higher (they did drop in 2009 due to the recession) than those in 1990.

The urgency is reinforced by recent re-analyses (Smith et al., 2009) of the growing literature that lead to the conclusion that smaller increases in global mean temperature (i.e., less than 2°C) are now estimated to lead to significant or substantial consequences. The Copenhagen Accord reflects this concern by calling for: *“an assessment of the implementation of this Accord to be completed by 2015, This would include consideration of strengthening the long-term goal referencing various matters presented by the science, including in relation to temperature rises of 1.5 degrees Celsius”* (underlining added). At our current rate of progress, there is no realistic possibility of meeting a 1.5°C target and almost no possibility of achieving the 2°C target.

Canadians collectively seem to understand the threat of climate change. When surveyed⁴⁰ about their perceptions of the threats to vital Canadian interests in the next 10 years, half of Canadians said climate change is a critical threat, making climate change the most important threat in the view of many Canadians. The level of concern varied from province to province, in a way consistent with the way climate change is being treated in the province – from 62% in Québec, down to 28% in Alberta. Overall, another third of Canadians felt climate change was an important but not critical threat, while only about one-in-six felt it was not an important threat at all (CDFAI 2010).

⁴⁰ Canadian Defence and Foreign Affairs Institute (CDFAI) – see www.cdfai.org See also article by Michael Jeffrey, Lieutenant General (Ret'd), Ottawa Citizen Special, January 11, 2010, “Don't underestimate the threats that we face.”

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In the speech from the Throne⁴¹ on March 3, 2010, the position of the Federal Government on many issues was enunciated. These included:

- “Our Government will use its voice to speak on behalf of Canada’s commitment to global security and human rights.”
- “Nowhere is a commitment to principled policy, backed by action, needed more than in addressing climate change.”
- “The Copenhagen Accord reflects these principles and is fully supported by the Government of Canada.”

10. Recommendations

This Knowledge Synthesis Report has been prepared to enable decision makers to be more informed in their choices through a better understanding of the intersections of these broad issues. Decisions made in the context of climate policy will affect, and be affected by, decisions made in other contexts.

Principal Recommendation

Canada should, based on a national, open and publically-informing dialogue, adopt a comprehensive and integrated climate-energy-water national strategy that includes consideration of food, water and health security issues.

As part of adopting this strategy, parties from all levels of government, industry, non-governmental organizations, think tanks, academia, as well as public agencies, should be involved in an open, transparent process with reporting back to Canadians.

A Canadian strategy should build upon similar strategies of other countries. The United Kingdom’s National Security Strategy (2008) concluded that climate change is “*potentially the greatest challenge to global stability and security and therefore to national security.*” The German Advisory Council on Global Change (2007) security analysis identified climate-induced conflict constellations or “*hotspots*” and identified

⁴¹ Speech from the Throne to Open the Third Session of the Fortieth Parliament of Canada. March 3, 2010. “Now and for the Future”. ISBN 978-1-100-14874-8
Cat. no. SO1-1/20109E-PDF, ISSN 1493-3551. Available at www.pco-bcp.gc.ca

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four specific climate-induced types, namely: degradation of freshwater resources; decline in food production; increase in storm and flood disasters; and environmentally induced migration. The development of a Canadian integrated climate-energy-water national strategy should consider the concept of hotspots, both nationally and internationally, and will also have to broaden the strategic framework to fit the Canadian scene.

Recommended Sub-Components

1. Develop, adopt and implement a national energy-climate strategy

Canada is committed to reducing our total greenhouse gas emissions by 17 percent from 2005 levels by 2020. On April 6, 2010, Environment Canada and British Columbia⁴² agreed in principle on efforts to address climate change noting the need for a national, coherent climate change approach. Most recently, Roger Gibbins⁴³ (*“Creating a Canadian energy framework: if you build, they will come,”* 2010) and Daniel Gagnier⁴⁴ (*“Fault lines or energy lines: Canada’s potential to be a clean energy superpower,”* 2010) have addressed the need for a national energy policy. Gibbins notes that the provinces have been more engaged in energy and climate policy development than the Government of Canada. Although admitting that an intergovernmental engagement on the energy file will not be easy, he concludes that *“there is simply too much at stake.”* Gagnier argues that *“Canada must make the transition to a new, clean energy super power status in order to improve the environment, deal with climate change and continue to grow and prosper. All governments must meet this challenge, but first and foremost, the federal government must meet the leadership challenge.”*

The strategy to achieve Canada’s targets need to be clear. Is it based on absolute targets or intensity targets? Is the reference year 1990, as Canada agreed in 1992, or 2005, as Canadian negotiators now suggest at UNFCCC negotiations in an attempt to mask our increased emissions? There has been a focus on “clean technologies” or

⁴² <http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=AE7A119E-395C-42D8-ABDB-5E45FD1B22B3>

⁴³ Gibbins is president and CEO of the Canada West Foundation in Calgary

⁴⁴ Gagnier is Chair of the International Institute for Sustainable Development and former Chief of Staff to Premier Jean Charest.

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essentially carbon capture and storage (CCS); the economic as well as technical feasibility of that approach has been questioned⁴⁵ and it needs open analysis.

If the targets are based on cap-and-trade, what is included and how will the caps and rules of trade be defined? Pricing carbon is seen by most economists as the most effective, easiest and fairest way to implement emissions reductions. This approach was recently recommended by a report of the United States National Academy of Sciences (Fri et al., 2010). Their report is summarized (National Research Council, Report in Brief, 2010c) as: *“meeting internationally discussed targets for limiting atmospheric greenhouse gas concentrations and associated increases in global average temperatures will require a major departure from business as usual in how the world uses and produces energy. ... Recommendations: 1. Adopt an economy-wide carbon pricing system.”*

An open analysis of the economics of all approaches, including all subsidies, is needed to determine the best approach for Canada as a whole. Canada needs a process to carefully and fully assess all options.

2. Develop, adopt and implement a national adaptation-disaster risk reduction strategy

An outcome of the national dialogue on climate change adaptation and disaster risk reduction should be a national strategy effectively linking climate change adaptation and disaster risk reduction. The Canadian National Disaster Mitigation Strategy (NDMS)⁴⁶ has as its goal: *“to protect lives and maintain resilient, sustainable communities by fostering disaster risk reduction as a way of life.”* It also states that the *“NDMS should leverage, acknowledge and encourage new, developing and existing mitigation activities (e.g. climate change adaptation,...)”* (Underlining added). Protecting Canadians and enhancing our economy will be outcomes of integrated strategies to reduce risk and develop opportunities and these need to be based on strong scientific and technical bases.

3. Build a stronger climate change research enterprise

⁴⁵ Economist March 2009 “Carbon Capture and Storage — Trouble in Store,”

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The National Research Council, Report in Brief (2010a) on advancing the science of climate change (Matson et al., 2010), noted that:

as decision makers respond to these risks, the nation's scientific enterprise can contribute both by continuing to improve understanding of the causes and consequences of climate change, and by improving and expanding the options available to limit the magnitude of climate change and to adapt to its impacts. To do so, the nation needs a comprehensive, integrated, and flexible climate change research enterprise that is closely linked with action oriented programs at all levels. Also needed are a comprehensive climate observing system, improved climate models and other analytical tools, investments in human capital, and better linkages between research and decision making.

Canada also needs a stronger climate change research enterprise.

11. Conclusion

Addressing climate change in the broad sense and for the reasons discussed here, developing, adopting and implementing national strategies for energy-climate and climate change adaptation-disaster risk reduction, built on and supported by a stronger research enterprise, is necessary for our children and grandchildren and those of others around the globe. The legacy of an integrated energy-climate policy, respecting the issues of water-food-health security will leave an enhanced economic and healthy legacy of this generation for the future.

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Climate Security Project Workshops

1. 25-26 May 2009 in London, Ontario.
2. 13-14 October, 2009, in Ottawa. Hosted by Agriculture and Agri-food Canada
3. 29 October, 2009, in Toronto. Hosted by the Institute for Catastrophic Loss Reduction

Participants in Workshops (one or more)

Note: all participants were there in their personal capacity and have not necessarily endorsed this report.

Idowu Ajibade	UWO, Geography
Andrew Archibald	Conference Board of Canada
Michel Beland	Environment Canada
Alan Bird	Natural Resources Canada
Heidi Braun	International Development Research Canada
Michael Brklacich	Carleton University
Michael J Brown	Chair, Chrysalix Energy Ventures
James Bruce	Consultant
Ian Burton	Independent
Adele Buckley	Pugwash Canada
Mel Cappe	Institute for Research on Public Policy
Dawn Conway	Canadian Foundation for Climate and Atmospheric Sciences
Lawrence Conway	Public Safety Canada
Dianne Cunningham	UWO, Lawrence Centre
James Davies	UWO, Economics
Andrew Dawe	Independent
Burt Dowsett	Independent
John Drexhage	International Institute for Sustainable Development
Jimena Eyzaguirre	National Roundtable on the Environment and the Economy
Jennifer Forkes	Clean Air Partners, Toronto
John Godfrey	Toronto French School
Adam Harmes	UWO, Political Science
Melissa Harris	UWO, Political Science
Dan Hefkey	Emergency Management, Ontario
Grant Hopcroft	City of London
Paul Kovacs	Institute for Catastrophic Loss Reduction
Karen Kraft-Sloan	York University
Robert Lannigan	UWO, Medicine
Mario Levesque	UWO, Political Science
Alex Long	National Roundtable on the Environment and the Economy
Gordon McBean	UWO, Geography, Political Science
Linda Mortsch	Environment Canada
Savithri Narayanan	Fisheries and Oceans, Canada
Kathleen O'Neill	Ministry of Environment, Ontario
Chris Popovich	UWO, Political Science

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Elizabeth Riddell-Dixon	UWO, Political Science
James Reinhart	OAG-CESD
Anne Rimmer	Natural Resources Canada
Shane Roberts	Public Safety Canada
Caroline Rodgers	UWO, Political Science
Dan Sandink	Institute for Catastrophic Loss Reduction
Conrad Sauvé	Canadian Red Cross
Susan Shaw	Independent
Slobodan Simonovic	UWO, Engineering
Ian Small	International Affairs
Leah Soroka	Agriculture and Agri-Food Canada