CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES
JCSP 36 / PCEMI 36

Master of Defence Studies Research Paper

Security Implications of Climate Change for Canada

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Word Count: 15 238

Compte de mots : 15 238

CONTENTS

ABSTRACT

From its humble origins as an environmental issue of peripheral concern in the waning years of the Cold War, climate change has emerged as a legitimate security threat in the 21st century. Anthropogenic or human induced greenhouse gas emissions produced by the burning of fossil fuels and changes in land use and agricultural processes have caused more heat to be trapped in the atmosphere resulting in a gradual increase of global temperatures. It is the rate of temperature change which causes concern. If the temperatures increased over a period of several centuries, the impacts would be manageable. However, because warming is happening within the span of one hundred years, it is expected to have profound impacts.

The impacts of climate change will affect people's lives and governments throughout the entire world. Changing weather patterns will decrease crop yields and fish stocks. Drought and melting ice will make it difficult for millions of people to secure access to potable water. Large masses of people will migrate from resource deficit areas in search of basic necessities. Overcrowding and malnutrition will lead to disease. This will generate tensions and place additional strain on governments and social institutions.

Although the effects of climate change will vary greatly, exposure to the risks of destabilization and conflict will not be shared equally among the states and regions of the world. Whether climate change will pose a security threat to a state is largely based on its ability to adapt and resolve the issues of climate change. Canada will experience increased water scarcity, drought, flooding and an increase in disease and has a proven record of overcoming these events. Nonetheless, while climate change will not pose an existential threat, it will create some potential security implications.

INTRODUCTION

Two weeks before the devastating 9/11 terrorist attacks on the United States, a humanitarian crisis was occurring in the South Pacific. An Indonesian ferry packed with people began to sink about halfway between the Indonesian island of Java and Australia's Christmas Island. The Norwegian freighter *Tampa* heard the distress call and rescued 438 persons. The majority of rescued persons were Afghan males but there were also twenty-six women and forty-three children. The migrants asked to be taken to Christmas Island but when the *Tampa* entered Australian waters, the government deployed military forces to prevent the freighter from landing at an Australian port. The Australian Prime Minister's retort to the international outcry was that he was responding to a threat to Australia's national security.[1] As Smith noted, "what was once a social issue had now transformed into a security matter."[2]

Academic debate on the need to broaden the concept of security to include a variety of non-military threats has been ongoing since the waning years of the Cold War. It is within this context that potential threats to security from climate change have entered the security policy debate. The first major international conference on climate change was held in Toronto, Canada in the summer of 1988.[3] Recognition that the effects of

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[1] Laura Neack, *Elusive Security: States First, People Last* (Plymouth: Rowman and Littlefield Publishers, Inc., 2007), 8.

[2] Paul J. Smith, "Climate Change, Mass Migration and the Military Response," *Orbis* 51 (Fall 2007): 628.

[3] The proceedings have been published as *The Changing Atmosphere: Implications for Global Security, Toronto, Canada, 27-30 June 1988: Conference Proceedings* (Geneva: World Meteorological Organization, 1989).

climate change might have security implications was explicit in the subject of the conference, "The Changing Atmosphere: Implications for Global Security." During the conference, Norway's Prime Minister remarked that "we are now realizing that we may be on the threshold of changes to our climate, changes which are so extensive and immediate that they will profoundly affect the life of the human race."[4] While the conference discussed potential security, political and economic consequences of projected increases to temperature and sea levels, only voluntary solutions were considered.[5]

Later that year, the Intergovernmental Panel on Climate Change was established "to be an independent entity to collect and analyze climate information from around the world, identify weaknesses and gaps in climate and environmental knowledge and to identify what scientific evidence government leaders required to make sound policy."[6] Given the results of the Toronto conference, it seemed clear that concrete scientific evidence was needed if climate change was to be taken seriously as a legitimate security threat.

The idea that climate change could have implications for global security received support from research centers such as The Worldwatch Institute. Its 1988 *State of the World* report stated: "for four decades, security has been defined largely in ideological

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[4] Philip Shabecoff, "Norway and Canada Call for Pact to Protect Atmosphere," New York Times, June 28, 1988; available from http://www.nytimes.com/1988/06/28/science/norway-and-canada-call-for-pact-to-protect-atmosphere.html?pagewanted=1; Internet; accessed 10 March 2010.

[5] Ibid.

[6] Kurt M. Campbell and Christine Parthemore, "National Security and Climate Change in Perspective," in *Climatic Cataclysm: The Foreign Policy and National Security Implications of Climate Change* (Washington: The Brookings Institution, 2008), 4.

terms…the threat posed by environmental deterioration is no longer a hypothetical one."[7] Lester R. Brown noted, "Threats to human security are now much more in environmental and economic terms and less in political ones."[8]

As scientists uncovered increasing evidence of the impacts of climate change and the Soviet Union collapsed, there was a growing desire among the academic community to rethink the concept of security. The premise that climate change might have serious implications for national security was thrust into the realm of the foreign policy community and instigated an animated debate.

"The 1990's will demand a redefinition of what constitutes national security," wrote Jessica Tuchman Mathews in the spring 1989 issue of *Foreign Affairs*.[9] "In the 1970's the [security] concept was expanded to include international economics," she noted. "Global developments now suggest the need for broadening the definition of national security to include resource, environmental and demographic issues."[10] According to Mathews the key issue was: "environmental strains that transcend national borders are already beginning to break down the sacred borders of national sovereignty."[11] In a *Foreign Policy* article entitled "Environment and Security," Norman

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[7] Lester R. Brown, *et al*, *State of the World 1988* (Washington: Worldwatch Institute, 1988), 182.

[8] *Ibid*., xv.

[9] Jessica Tuchman Mathews, "Redefining Security," *Foreign Affairs* 68 (Spring 1989):162.

[10] *Ibid*., 162.

[11] *Ibid*., 162.

Myers concluded that there is "a need to incorporate an environmental dimension into security planning."[12]

Counter-arguments have also been made that the linkage between climate change and national security are misleading and analytically weak. While he acknowledged that climate change has possible global implications, Deudney suggests that it does not involve the same dynamics of immediate existential threat as traditional security issues.[13] Ben Lieberman and other analysts maintain that climate change as a threat to global security is mere speculation and question the claim that climate change should be addressed in national foreign and defense policies.[14]

As a result of this debate, the notion that climate change and environmental issues were worthy of national security and foreign policy concern gained widespread attention. In the summer of 1989, the G-7 Summit in Paris made the environment a focal point of discussion for the first time ever.[15] Mainstream media also took notice. The headlines of the October 1989 *Time* magazine revealed which side of the debate was gaining prominence, "A New Item on the Agenda: The Plight of the Planet is Finally Serious International Business."[16]

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[12] Norman Myers, "Environment and Security," *Foreign Policy*, no. 74 (Spring 1989): 41.

[13] David Deudney, "The Case against Linking Environmental Degradation and National Security," *Millennium Journal of International Studies* 19 (3): 461.

[14] Ben Lieberman and Brett D. Schaeffer, "Discussing Global Warming in the Security Council: Premature and a Distraction from More Pressing Crises," Heritage Foundation WebMemo, no. 1425 (16 April 2007); available from http://www.heritage.org/Research/InternationalOrganizations/wm1425.cfm; Internet; accessed 12 February 2010.

[15] Campbell and Parthemore, "National Security…," 6.

[16] Glenn Garelik, "Greening of Geopolitics-A New Item on the Agenda: The Plight of the Planet is Finally Serious International Business," *Time*, October 23, 1989, 60.

Following the events of 9/11, comparison and linkages between climate change and other global threats became commonplace. In 2004, David King, the United Kingdom Government's Chief Scientific Adviser, in an interview for *Science* magazine, warned that "climate change is a far greater threat to the world than international terrorism."[17] In a 2005 article titled "Climate Change Poses Greater Security Threat than Terrorism," Janet Sawin of Worldwatch Institute remarked that the world's water supplies and agricultural activities would be affected by climate change. Moreover, when people become overwhelmed by the resultant drought and famine, they would turn to "extralegal organizations and terrorist groups that can provide for their basic needs better than existing economic and political institutions."[18] Other analysts have made similar remarks on the potential seriousness of climate change. According to Thomas Homer-Dixon, "climate stress may well represent a challenge to international security just as dangerous-and more intractable- than the arms race between the United States and the Soviet Union during the Cold war or the proliferation of nuclear weapons among rogue states today."[19]

Discussions about the impacts of climate change as a national security issue gained further momentum when the Nobel Peace Prize was awarded to former United States Vice-President Al Gore and the Intergovernmental Panel on Climate Change

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[17] Quoted in BBC News. Global Warming 'Biggest Threat'. January 9, 2004; available from http://news.bbc.co.uk/2/hi/science/nature/3381425.stm; Internet; accessed 13 February 2010.

[18] Janet L. Sawin, "Climate Change Poses Greater Threat Than Terrorism," Global Security Brief 3, (Washington: Worldwatch Institute, April 2005); available from http://www.worldwatch.org/node/77; Internet; accessed 10 January 2010.

[19] Thomas Homer-Dixon, "Terror in the Weather Forecast." *The New York Times*, April 24, 2007, A25.

(IPCC). When the world's business and political leaders met at the World Economic Forum in January 2007, it was climate change rather than globalization, nuclear proliferation or the Iraq War that dominated the discussion.[20] The leader of Britain's Conservative Party, David Cameron, explained that climate change was the focal point because "…politicians have a duty to prepare for its consequences in terms of domestic and international security."[21]

On April 17, 2007 the United Nations Security Council held its first ever debate on the issues of climate change, peace and security. More than 50 countries participated in the day long activity and the broad consensus was that a general link existed between climate change and security. [22] Since the debate several countries including the United States, United Kingdom, France, Germany and Australia have conducted assessments of climate change as a security risk. In the United States the Center for Strategic and International Studies and the Center for New American Security concluded from a range of possible climate scenarios that "we already know enough to appreciate that the cascading consequences of unchecked climate change are to include a range of security problems that will have dire global consequences."[23] The United Kingdom's 2008

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[20] John Zarocosta, "World Leaders Rally Around Climate-Change Issue," *Washington Times*, January 29, 2007, A11.

[21] David Cameron, "A Warmer World is Ripe for Conflict and Danger," *Financial Times*, January 24, 2007, 15.

[22] United Nations Security Council, Department of Public Information, "Security Council Holds First Ever Debate on Climate Change, Peace and Security," April 27 2007; available from http://www.un.org/News/Press/docs/2007/sc9000.doc.htm; Internet; accessed 13 February 2010.

[23] Kurt M. Campbell *et al*, *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (Washington, D.C.: Center for Strategic and International Studies, Center for New American Security, 2007); available from

Security Strategy cited climate change as "potentially the greatest challenge to global stability and security."[24]

In short, the notion that climate change may have security consequences is generally accepted. The reality is however, that a great deal of uncertainty exists about the exact nature of those consequences. Chris Abbott explains:

> the difficulty is that analysts are no t just exam ining the direct physical effects of clim ate change-which are themselves hard enough to predict with certainty-but trying to assess th e likely social, political and econom ic consequences of those physical eff ects, and how they might in turn interact with one anoth er and with existing te nsions to c reate in security and conflict.[25]

Analysts acknowledge that the full implications of the multiple different aspects of climate change are difficult to assess. Predictions for the future vary considerably but there appears to be general consensus that temperatures may rise between 1.4 degrees Celsius and 5.8 degrees Celsius by 2100.[26] This is expected to cause more frequent and more severe extreme weather events such as heavy rains, drought, heat waves and storms. Hurricanes, cyclones and typhoons will become more unpredictable. Global warming will transform areas of the world that are presently permanently covered in ice. As ice-sheets melt in Antarctica, the Arctic and the world's highest mountain ranges, flooding of

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http://csis.org/files/media/csis/pubs/071105_ageofconsequences.pdf; Internet; accessed 10 November 2009, 10.

[24] United Kingdom, Cabinet Office, The National Security Strategy of the United Kingdom: Security in an Interdependent World (London: Cabinet Office, 2008), 18.

[25] Chris Abbott, *An Uncertain Future: Law Enforcement, National Security and Climate Chang* (London: Oxford Research Group, 2008); available from http://www.oxfordresearchgroup.org.uk/sites/default/files/uncertainfuture.pdf; Internet; accessed 10 November, 2009.

[26] David Seddon, "Insecure Environment: International Implications of Climate Change," *Jane's Intelligence Review* 19 (May 2007): 7.

lowlands and rising sea-levels are likely to cause unprecedented destruction. Moreover, low-lying and populated areas near the sea such as New York, Tokyo, Amsterdam, London and Sydney could potentially disappear.[27]

These direct impacts will have far-reaching effects on people's lives and governments throughout the entire world. Changing weather patterns will affect crop yields and fish stocks. Drought and melting ice will make it difficult for millions of people to gain access to safe drinking water. Large masses of people will move from resource deficit areas in search of basic necessities, most likely in urban centers. Overcrowding and malnutrition will invariably lead to disease. This will generate tension and place additional strain on governments and social institutions. States that are weak and fragile will find these issues difficult, if not impossible to reconcile.

Although the effects of climate change will vary greatly, exposure to the risks of destabilization and potential conflict will not be shared equally among the countries and regions of the world. The extent of global climate change, its impacts upon societies and regions and their specific capacities to adapt and resolve the issues will determine the thin line between stability and instability and security and insecurity.

It is also important to note that security implications for specific states are difficult to articulate with precision. The bulk of research on climate change and security is broad-based and focuses on global assessments and scenarios of the security implications of climate change. Based on the findings of the IPCC, the direct effects of climate change for Canada in the short term will be warmer temperatures and an increase in extreme weather events.[28] This may lead to increased water scarcity,[29] drought,

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[27] *Ibid*., 8.

flooding, loss of Arctic ice and potentially a small increase in disease. As a wealthy country with strong governance and a proven ability to overcome such events,[30] it is therefore unlikely that climate change will pose a direct security threat to Canada. This essay will argue while climate change will not pose an existential threat to Canada, it will generate some potential security implications. Specifically, this essay will show how climate-induced migration, disease, the opening of the Arctic waterways and the destabilization of regions caused by climate change could provide cause for concern.

This essay is structured in the following way. Chapter one will examine the science of climate change and highlight why climate change presents significant challenges to many regions of the world. Chapter two will demonstrate how climate - induced migration and disease will present security challenges for Canada. In Chapter three an argument will be made that an ice-free Arctic will generate potential security implications for Canada such as increased Arctic access by foreign nations, competition

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[28] D.S. Lemmen, F.J. Warren and J. Lacroix. "Synthesis," *In From Impacts to Adaptation: Canada in a Changing Climate 2007*, edited by D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush, 1-20 (Ottawa: Government of Canada, 2008), 8.

[29] If all the freshwater on the planet were divided equally among the global population, there would be 5 000–6 000 m3 of water available for everyone, every year. As experts consider that people experience scarcity below a threshold of 1 700 m3/person, this global calculation gives an impression of abundance. However, the world's freshwater resources are distributed very unevenly, as is the world's population. The areas of most severe physical water scarcity are those where high population densities converge with low availability of freshwater. Many countries are already well below the threshold value. Jordan, like several other countries in the Near East, is an extreme case with less than 200 m3/person per year. See Food and Agriculture Organization of the United Nations, *Coping With Water Scarcity: Challenge of the 21st Century* (UN-Water, FAO, 2007); available from http://www.fao.org/nr/water/docs/escarcity.pdf; Internet; accessed 20 April 2010.

[30] Although there is no proven linkage between these events and climate change, Canada did effectively respond to the 1996 Saguenay flood, 1997 Red River flood, 1998 Ice Storm and 2003 Hurricane Juan. For more information see D.S. Lemmen, F.J. Warren and J. Lacroix, "Synthesis," 13.

over vast natural resources and the potential for regional instability. Chapter four highlights how climate change can contribute to destabilization in high risk areas, presenting a potential security challenge to Canada and the international community. Most security assessments are based on the linear progression of climate change such as the gradual rise in global temperatures. The risk of additional changes in the climate system and potential global consequences increases however, when global warming climbs beyond 2-3 degrees Celsius. These non-linear responses and the potential security impact for Canada will be examined in chapter 5.

CHAPTER ONE – THE SCIENCE OF CLIMATE CHANGE

The debate on the causes and seriousness of climate change has been waged since the end of the Cold War. Despite the evidence however, some skepticism still remains. This chapter will demonstrate how human activities are contributing to climate change and why the majority of the world's scientists believe that climate change could have significant consequences.

The Science

Climate change is "any change in climate properties that can be measured statistically (such as mean temperature, precipitation or wind) caused by natural internal processes, external forcings or human activities and lasting decades or longer."[31] Throughout the earth's history there has been substantial variation in the global climate. Global climate during the last few decades however, has experienced an unprecedented disruption, "…an exceptionally rapid increase in the global average temperatures of the earth's near-surface air and oceans."[32]

Global climate is determined by a balance between the amount of solar energy that arrives at earth and the percentage that is reflected back as infrared radiation by aerosol particles, clouds or reflective surfaces such as ice and snow. Greenhouses gases such as methane, nitrous oxide and carbon dioxide inhibit the escape of infrared

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[31] United Nations, Intergovernmental Panel on Climate Change, *Fourth Assessment Report: Climate Change 2007, The AR4 Synthesis Report* (New York: UN, 2007), 26.

[32] Commission for Environmental Cooperation, *The North American Mosaic: An Overview of Key Environmental Issues* (Montreal: Canada, 2008); available from http://www.cec.org/files/PDF//Mosaic-2008_en.pdf; Internet; accessed 10 November 2009, 7.

radiation, trap the heat and maintain the earth at a higher temperature. The earth's average temperature would be 30-33 degrees Celsius colder without this natural greenhouse effect.[33]

There is scientific evidence that this natural greenhouse effect is being intensified by human activities. Emissions of carbon dioxide caused by the burning of fossil fuels such as coal, oil and natural gas as well as releases of methane and nitrous oxide resulting from changes in land use and agricultural processes have increased natural levels of greenhouse gases.[34] This has resulted in a significant increase of global greenhouse gas emissions since pre-industrial times. For example, the relatively short period between 1970 and 2004 witnessed an incredible 70 percent increase.[35]

Given the introduction of human-induced or "anthropogenic" greenhouse gases, the present day concentration of global atmospheric greenhouse gases far exceeds pre-industrial levels. In terms of carbon dioxide, atmospheric concentration "has reached a record high relative to the last half-million years and it has done so at an exceptionally fast rate."[36] A higher concentration of greenhouse gases means that more heat is trapped and over time global temperatures will slowly increase. Over the course of the next centuries climatologists anticipate that the atmospheric concentration of carbon dioxide

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[33] *Ibid*., 8.

[34] Tom Wigley, *The Science of Climate Change: Global and U.S. Perspectives* (Washington D.C.: Pew Center on Global Climate Change); available from http://www.pewclimate.org/docUploads/env_science.pdf; Internet; accessed 21 February, 2010; 5.

[35] Commission for Environmental Cooperation, *The North American Mosaic*…8.

[36] *Ibid*., 8.

will double leading to an increase of several degrees in global temperatures.[37] This could have on profound effect on global climate.

Intergovernmental Panel on Climate Change

The link between the effects of increasing levels of atmospheric carbon dioxide and other greenhouse gases on the global climate was first hypothesized in the early 1800s.[38] Until scientific evidence of increased accumulation of carbon dioxide emerged in the 1970s, however, climatologists displayed little interest in the linkage. In 1979, at the inaugural World Climate Conference, it was determined that increases in human activities could result in significant changes to the global climate.[39] Although subsequent meetings of world scientists were held in the coming decade, a lack of concrete evidence meant that a consensus on human causes of global warming could not be reached. Nevertheless, there were enough indicators to merit further research and in 1988 the Intergovernmental Panel on Climate Change (IPCC) was established.[40]

The role of the IPCC is "to assess on a comprehensive, objective and transparent basis the scientific technical and socio-economic information relevant to understanding

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[37] Alan Dupont and Graeme Pearman, *Heating Up the Planet: Climate Change and Security* (Australia: Lowy Institute for International Policy, 2006), 11.

[38] In 1824, Jean Baptiste Joseph Fournier hypothesized that the atmosphere blocks outgoing radiation from the Earth and re-radiates a portion of it back, thereby warming the planet. See Andrew J. Weaver, "The Science of Climate Change," in *Hard Choices: Climate Change in Canada* (Waterloo: Wilfred Laurier University Press, 2004), 13-44.

[39] United Nations, World Meteorological Organization, *Proceedings of the World Climate Conference: A Conference of Experts on Climate and Mankind* (Geneva: World Meteorological Organization, 1979).

[40] Weaver, "The Science of Climate Change…15.

the scientific basis of human-induced climate change and its potential impacts."[41] It is important to note that the IPCC does not conduct any independent research. Moreover, their assessments are based on peer reviewed literature. For these reasons, the IPCC is widely regarded as the "most authoritative source of information on climate change."[42]

To date the IPCC has produced four major assessments: 1990, 1995, 2001 and 2007. Dupont and Pearman remarked that "the 1995 [Second] Assessment [Report] was politically influential because it received widespread international media coverage and shaped the tenor and parameters of today's climate change debate."[43] The Second Assessment Report (SAR) was also significant as it led to the adoption of the Kyoto Protocol, an international agreement among states to reduce greenhouse gas emissions.[44] Moreover, the SAR identified that human activities such as the burning of fossil fuels were in fact contributing to global climate change, "the balance of evidence suggests that there has been a discernible human influence on global climate."[45] As a result of its findings, the IPCC concluded that global temperatures would continue to increase

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[41] United Nations, Intergovernmental Panel on Climate Change, *Principles Governing IPCC Work, 1998*; available from http://www.ipcc.ch/pdf/ipcc-principles/ipcc-principles.pdf; Internet; accessed 07 March 2010.

[42] Dupont and Pearman, *Heating Up the…*13.

[43] Dupont and Pearman, *Heating Up the…*14.

[44] For further information on the Kyoto Protocol see http://unfccc.int/kyoto_protocol/items/2830.php

[45] J.T., Houghton *et al*., *Climate Change 1995: The Science of Climate Change, Contribution of Working Group 1 to the Second Assessment Report of the Intergovernmental Panel on Climate Change* (New York: Cambridge University Press, 1996).

between 1 degree Celsius and 3.5 degree Celsius and sea levels would rise by 15 to 95 centimeters by the end of the twenty first century.[46]

The Third Assessment Report (TAR) released in 2001 provided additional evidence to support the IPCC's earlier findings. It noted that a rise in sea level of 9-88 centimeters was almost certain.[47] Based on scientific observations it increased its earlier prediction of temperature to a range of 1.4 degrees Celsius to 5.8 degrees Celsius. [48] The IPCC acknowledged that variables such as improvements in fuel efficiency, advances in technology and government intervention (or lack thereof) would influence the amounts of future greenhouse gas emissions so accurate predictions would not be possible. In an attempt to offer reliable assessments about the impact of future greenhouse gas emissions, a number of scenarios based on projected levels of emissions were created. The IPCC noted that these scenarios were not predictions or forecasts of future conditions.[49] Dupont and Pearman explained the scenarios best, "[they are] a scoping of what might plausibly occur under a range of different assumptions about the global use of energy."[50]

The IPCC's latest assessment in 2007 involved a group of scientists from 130 countries. According to this assessment, "the understanding of climate change and the

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[46] *Ibid*.

[47] J.T.Houghton, *Climate Change 2001: The Science Basis, Contribution of Working Group 1 to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (New York: Cambridge University Press, 2001).

[48] *Ibid*.

[49] N. Nakicenovic, *et al*, *Special Report on Emissions Scenarios- A Special Report of Working* Group III of the Intergovernmental Panel on Climate Change (Cambridge: Cambridge University Press, 2000).

[50] Dupont and Pearman, *Heating Up the…*15.

human role in it has markedly improved since the Third Assessment Review and there is now a very high confidence that global warming is largely due to human activities."[51] Next, it was deemed very unlikely that the extent of warming could be solely attributed to natural variations.[52] Finally, it asserted that even if greenhouse gas emissions were stabilized to 2000 levels, warming and sea level rise would continue for centuries.[53]

It is the rate of temperature change which causes concern. Analysts[54] remark that if the increase in temperatures occurred over a period of several centuries, the impacts would be manageable. However, because warming is happening within the span of one hundred years, it is expected to have profound impacts. Parts of the world already experience drought and warming will increase desertification in parts of Africa and heavily populated South Asia. Melting of glaciers and ice caps will cause flooding and sea level rise in low lying areas. Changed rainfall patterns will cause greater frequency of cyclones, hurricanes and typhoons.

Despite the observations of the IPCC, however, there are still some skeptics.[55] Leaked emails from the University of East Anglia's Climate Research Unit (CRU) in November 2009 had climate change doubters claiming that the scientific evidence was

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[51] R.K. Pachuri, *et al*, Intergovernmental Panel on Climate Change, *Fourth Assessment Report: Climate Change 2007, The AR4 Synthesis Report* (New York: UN, 2007), 39.

[52] *Ibid*., 41.

[53] *Ibid*., 72.

[54] Alan Dupont, "The Strategic Implications of Climate Change," *Survival* vol. 50 no. 3 (June-July 2008): 31; Dupont and Pearman, *Heating Up the…*15.

[55] An examination of the skeptics of climate change is beyond the scope of this essay. For a general response to specific issues raised by skeptics see The Royal Society, *A Guide to Facts and Fiction About Climate Change*; available from http://royalsociety.org/uploadedFiles/Royal_Society_Content/News_and_Issues/Science_Issues/Climate_change/climate_facts_and_fictions.pdf; Internet; accessed 07 April 2010.

not conclusive, that "tricks" had been employed and that scientists manipulated the data.[56] But as Gary Yohe argues, "even if the data from CRU were dismissed as tainted, it would not matter. CRU is but one source of analysis whose conclusions have been validated by other researchers around the world." [57]

Recent studies support the conclusions of the IPCC. According to research conducted by Sheehan et al, human-induced carbon dioxide gases have risen at or near the levels projected by the IPCC.[58] A study by Easterling and Wehner confirmed that current measurements of temperature increase and sea level rise were consistent with the findings of the IPCC.[59] And as Johannessen noted, the melting of Arctic ice in 2008 and 2009 was proof that warming due to human-induced emissions is affecting the climate system.[60]

Given the findings of the IPCC and the evidence cited above, it is clear that human activities play a significant role in climate change. Moreover, climate change is expected to continue for several centuries and have profound impacts throughout the world. The next chapter looks at two of the projected impacts of climate change, climate refugees and spread of disease, and their potential security implications for Canada.

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[56] David Biello, "Negating Climategate," *Scientific American*, vol. 302 issue 2 (Feb. 2010): 16.

[57] *Ibid*., 16.

[58] P. Sheehan, *et al*, "Climate Change and the New World Economy: Implications for the Nature and Timing of Policy Responses," *Global Environmental Change* 18: 380-396.

[59] D.R. Easterling and M. F.Wehner, "Is the Climate Warming or Cooling?" *Geophysical Research Letters* 36: doi 10.1029/2009GL037810.

[60] O.M. Johannessen, "Decreasing Arctic Sea Ice Mirrors Increasing CO2 on Decadal Time Scale," *Atmospheric and Oceanic Science Letters* 1: 51-56.

CHAPTER TWO – CLIMATE REFUGEES AND DISEASE

Migration is one of the oldest coping strategies for dealing with changes in the environment such as drought, flooding, severe storms or sea level rise. Given the expected intensity and geographical scale of climate change however, the number of potential migrants could reach unprecedented levels. The following section argues that climate-induced migration may pose a potential security implication for Canada.

Climate Refugees

Early in its inception, the Intergovernmental Panel on Climate Change (IPCC) suggested that human migration would be the single greatest destabilizing impact of global climate change.[61] By the close of the twentieth century it was determined that natural disasters, land degradation and drought had been key factors for the displacement of nearly 25 million people. Labeled "climate refugees", this group exceeded the combined total of documented refugees from war and political persecution.[62]

An analysis in 2005 by Norman Myers contended that the number of people forced to move as a direct result of climate change will increase exponentially. He alleged that "…by 2050, there could be as many as 200 million people overtaken by disruptions of monsoon systems and other rainfall regimes, by droughts of unprecedented severity and duration and by sea level rise and coastal flooding."[63] When one considers that The United Nations High Commission for Refugees (UNHCR) global report for

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[61] Steve Lonergan, "The Role of Environmental Degradation in Population Displacement," Environmental Change and Security Project Report, Issue 4 (Spring): 5.

[62] Norman Myers, "Environmental Refugees: An Emergent Security Issue,"13th Economic Forum, May 2005, Prague, 23.

[63] *Ibid*., 25.

2008 listed nearly 25 million people as receiving protection or assistance,[64] this eight-fold increase is cause for concern.

There is some debate however, as to the reliability of Myer's figures. Some analysts have noted that linkages between climate change and population movement have not been well established, conceptually or empirically.[65] Forecasting the effects of climate change is an inexact science and estimates can only be made based on the best available data. Despite the criticisms, however, Myer's figures are widely accepted by the IPCC and the Stern Review on the Economics of Climate Change.[66] There is broad consensus that in the twenty-first century, climate change will likely force tens of millions of people - mainly in Asia, Africa and Latin America - to leave their homes and migrate to other places.

The UNHCR defines migration as any displacement or flight that takes places voluntarily or involuntarily and across or within national boundaries.[67] If it is feasible to do so, many climate refugees will simply move to a different location within their home country.[68] Wealthy and technologically advanced countries such as Canada should not experience a large degree of destabilization as a result of climate-induced internal migration, but they will be affected.

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[64] United Nations High Commissioner for Refugees, *2008 Global Trends: Refugees, Asylum Seekers, Returnees, Internally Displaced and Stateless Persons* (New York: UN, 2009); available from http://www.unhcr.org/4a375c426.html; Internet; accessed 11 January, 2010.

[65] Stephen Castles, "Environmental Change and Forced Migration: Making Sense of the Debate," *UNHCR New Issues in Refugee Research*, UNHCR Working Paper No. 70, 2002, 1-2.

[66] Nicholas Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2006), 3.

[67] United Nations High Commissioner…

[68] German Advisory Council on Global Change, *World in Transition: Climate Change as a Security Risk* (Berlin: German Advisory Council on Global Change, 2007), 118.

The most likely threat to Canadian security will come from large scale population movements from outside its borders. Studies by the International Organization for Migration, International Alert and the German Advisory Council on Global Change suggest that climate refugees are likely to cross international borders.[69] An argument can be made that Canada's geographic location precludes it from being largely affected from international migration. It should be noted however, that Canada receives 250 000 immigrants per year- the highest rate of immigration per capita of all industrialized nations.[70] Next, Canada has linkages with many of the countries who are assessed as being vulnerable to the impacts of climate change. Finally, there is evidence to suggest that populations tend to migrate along pre-existing plans and that they will seek out locations where they have existing cultural or ethnic ties.[71] China, India, Pakistan and the Philippines are currently the four largest sources of immigration to Canada.[72] Canadian families have also originated in Algeria, Sri Lanka, Columbia, Iran, Lebanon and Somalia.[73]

In 2007, the IPCC assessed that the severity and frequency of extreme weather events would increase and would vary significantly throughout the various regions of the

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[69] Oli Brown, *Migration and Climate Change* (Geneva: International Organization for Migration, 2008), 18; Dan Smith and Janani Vivekananda, *A Climate of Conflict: the Links Between Climate Change, Peace and War* (International Alert, November 2007), 15; German Advisory Council…124.

[70] Statistics Canada, *Canada's Ethnocultural Portrait: The Changing Mosaic* (Ottawa: Canada Communication Group, 2003), 6.

[71] Oli Brown, *Migration and Climate Change* (Geneva: International Organization for Migration, 2008), 23.

[72] Citizenship and Immigration, *Facts and Figures: Immigration Overview Permanent and Temporary Residents* (Ottawa: Canada Communications Group, 2008), 22.

[73] *Ibid*., 23.

world.[74] A slight increase of 1-2 degrees Celsius in global temperatures could result in storm surges and impact as many as 103 million people per year.[75] The damage caused by storm surges could be further exacerbated by rising sea levels, especially in low-lying coastal areas. The effects of climate change will force large populations to move as places become less and less viable to live. Continents such as Asia, with densely populated areas, low-lying coast lines and a high susceptibility to cyclones are especially vulnerable.[76]

Climate change may also affect food supplies as heavy rains and flooding erode agricultural lands. Analysts predict that the South East Asian monsoon season will intensify with amounts of 20 per cent more rain expected to fall on eastern India and Bangladesh by 2050.[77] As glaciers experience increased melting, flooding will become more commonplace. For one-sixth of the world's population in India and parts of China who depend upon glacier melt for fresh water, there is increased risk of water scarcity.[78] It is important to note that climate events such as monsoons and glacier flooding tend to be sudden and extraordinary and thus force people to flee extremely fast. In other words, it is conceivable that such events would result in an immediate displacement of millions of people. The Canadian government would face increasing pressure to provide refuge to

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[74] IPCC. Chapter 9.

[75] Rachel Warren, *et al*, *Understanding the Regional Impacts of Climate Change*, Tyndall Centre Working Paper 9 (Norwich, UK: Tyndall Centre for Climate Change Research, 2006), 67.

[76] IPCC. Chapter 9.

[77] John Houghton, *Global Warming: The Complete Briefing* (Cambridge: Cambridge University Press, 2005), 15.

[78] Stern, *The Economics*…56.

these displaced populations. As the following paragraphs will attest, excessive immigration could create a significant security concern.

As seen earlier, Canada received one quarter of a million immigrants per year over the past decade.[79] The Canadian government, however, lacks the resources to conduct thorough checks of this number of people.[80] Moreover, it does not have the capacity to screen immigrants who arrive from terrorist producing regions.[81] In an address to the Senate National Security Committee in 2006, the deputy director of the Canadian Security and Intelligence Service, Jack Hooper conceded that "20,000 people had come to Canada from the Pakistan-Afghanistan region since 2001 and because of a lack of resources, no security checks whatsoever had been conducted on 90 percent of them".[82] Members of the terrorist organization Tamil Tigers were able to enter Canada because automatic immigration status had been offered to anyone who claimed to be a Tamil from Sri Lanka. What is more alarming is the fact that "claimants didn't even have to prove they had ever been to Sri Lanka."[83] When one considers this laxity coupled with

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[79] Citizenship and Immigration, *Facts and Figures: Immigration Overview Permanent and Temporary Residents* (Ottawa: Canada Communications Group, 2008).

[80] Daniel Stoffman, "Truths and Myths about Immigration," in *Immigration Policy and the Terrorism Threat in Canada and the United States* (Vancouver: Fraser Institute, 2008), 3-20.

[81] Pakistani President Asif Zardari admitted that his country created terrorists to help achieve its foreign policy goals. He also confirmed that many of these same terrorists are now waging war against his government. See Dean Nelson, "Pakistani President Asif Zardari Admits Creating Terrorist Groups," *Telegrapgh.co.uk*, July 8, 2009; available from http://www.telegraph.co.uk/news/worldnews/asia/pakistan/5779916/Pakistani-president-Asif-Zardari-admits-creating-terrorist-groups.html; Internet; accessed 16 April 2010.

[82] Gordon, James. "CSIS Admits Security Shortcoming." *National Post*, May 30, 2006; available from http://www.canada.com/nationalpost/news/story.html?id=306b2a86-a000-4c92-9adc-366ce1f40be7; Internet; accessed 20 March 2010.

[83] Daniel Stoffman, "Open Door Travesty," *Saturday Night* (November 1994): 52-60.

the fact that climate change could add the pressure of four times the number of annual applicants, the security implications are alarming.

Stoffman suggests that the Canadian government has repeatedly turned a blind eye to the potential security implications of immigration because politicians view immigrant communities more in terms of votes than as potential terrorists. He noted that successive federal governments since the late 1980s have supported high immigration levels despite the fact that many immigrants come from countries with ties to known terrorist networks, "federal Liberal governments were so eager to cultivate support among the fast growing Tamil community that they refused to ban the Tigers as a terrorist organization, even though the United States and United Kingdom had already done so."[84] Politicians maintain that by supporting permissive immigration policies they are promoting goodwill amongst immigrant communities who in turn will show their gratitude by voting for their party at the polls. This obsession with ethnic votes has often blinded politicians from seeing the potential security implications of their actions. Although the terrorist group Babar Khalsa had been implicated in the 1985 Air India bombing, it is likely the Liberal government did not place the organization on the terrorist list because they did not want to alienate the support of the large and growing Sikh community, "known supporters of the federal Liberal party."[85] Stoffman has also implied that politicians seeking re-election might manipulate the immigration process.[86] To make his argument, he cited an internal report that originated from the diplomatic

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[84] Stoffman, "Truths and Myths…15.

[85] James Bissett, "Security Threats in Immigration and Security Policies," In *Immigration Policy and the Terrorism Threat in Canada and the United States* (Vancouver: Fraser Institute, 2008), 79.

[86] Stoffmann, 4-5.

offices in India. The report provided details, including key decisions taken, to open a Canadian immigration office in Chandigarh in 2004.[87] In essence, the office was opened as a sign of goodwill to a Punjabi-Canadian community. As Richard Kurland, a Vancouver immigration lawyer remarked, the "Liberals yearned for Indo-Canadian votes, and even though officials advised that Chandigarh was a hotbed of false documents, Liberal politics trumped logic."[88] Kurland's allegations were later proven true by an advisor to Prime Minister Jean Chrétien. In 2004, Raj Chahal told *The Vancouver Sun* that the Chandigarh office had been opened "despite the objections of both Citizenship and Immigration Canada and the Department of Foreign Affairs."[89]

An influx of immigrants from the same nations also creates a potential security problem. When people who share the same language and observe the same culture settle in the same neighborhoods, large self-contained communities often take root and continue to attract immigrants of similar backgrounds. While the majority of immigrants are law-abiding, such large communities provide opportunities for groups who resent Western states such as Canada to operate in secrecy and develop support networks. The Tamil Tigers provide an interesting case study. A large transnational community exists between Canada and Sri Lanka, primarily Sri Lankans of Tamil origin.[90] Within the

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[87] Peter O'Neil, "Nannies Exploit Visa Office to Come to Canada," *National Post*, October 19, 2007; available from http://www.canada.com/nationalpost/news/story.html?id=1f4a6265-6e8e-46d7-829c-89547220f22e; Internet; accessed 20 March, 2010.

[88] *Ibid.*

[89] *Ibid.*

[90] Robert McLeman and Barry Smit, "Assessing the Security Implications of Climate-related Migration." Paper for Human Security and Climate Change Workshop (Oslo, Norway, 21-23 June 2005), 15; available from http://www.onerc.org/dataweb/documents/mcleman_.pdf; Internet; accessed 10 January 2010.

Tamil community in Canada there are organizations such as the Tamil Relief organization that actively raises funds for the Liberation Tigers of Tamil Eelam, an organization that has actively waged a war against the Sri Lankan government.[91]

It has also been suggested that Canada's multicultural policy of "treating people of all backgrounds with courtesy and respect" has made law enforcement officials overly sensitive to linking immigration to potential security issues.[92] Martin Collacott, a former diplomat with the Department of Foreign Affairs who worked with Canada's counterterrorism policy alleged that Canada's commitment to multiculturalism played a contributing role to the success of the 1985 Air India bombing.

> Official multiculturalism policy, with its privileging of tolerance above all else, prevented our authorities from fully investigating and thwarting the terrorists' plot … The governm ent's look the other way policy allowed Sikh militants to intimidate the Sikh community at large … Even during the Air India trial, supp orters of th e accused were still a ble to threa ten witnesses for the prosecution.[93]

The case of the alleged terrorist cell in sub-urban Toronto provides a second example. Despite the fact all the suspects for the Toronto terrorist plot were Muslim, immigrants or sons of immigrants, male and in their early to late teens, the statement issued by the Assistant Commissioner of the Royal Canadian Mounted Police reported that the suspects "represent the broad strata of our society. Some are students, some are

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[91] *Ibid*., 15.

[92] Stoffmann, 13.

[93] Collacott, Martin, "The Perils of Multiculturalism at 31,000 Feet," *National Post*, May 8, 2007; available from http://www.nationalpost.com/news/story.html?id=abff3264-91a0-4d5c-b118-ba4ba1f43ce3; Internet; accessed 19 March, 2010.

employed, some are unemployed."[94] The terminology "broad strata of our society" would imply that the suspects came from all walks of life: different ethnicity, different religious background, perhaps men and women of a wide range of ages. The point is however, they did not represent the broad strata of society. The Toronto suspects shared the same narrow profile as the terrorists who conducted the attacks in London and Madrid: Muslim, male, early to late teens, born in their respective countries.[95] It is evident that officials responsible for the safety of Canadian citizens were unwilling to state the obvious for fear of being accused of racial stereotyping. The consequences are clear, "more than twenty years after the bombing of Air India 182, [Canadian intelligence and security agencies], have not learned how to confront the radicalism hatched within Canadian minority communities."[96]

Fear of speaking about the potential dangers posed by immigrants has also been witnessed in the Canadian media. One of the questions asked by an Environics poll in April 2007 was if Muslims were satisfied with their lives in Canada and 80 percent replied in the affirmative. Another question asked whether the respondents felt the planned terrorist attacks by 18 Muslims in Toronto was justified. Of the respondents, 73% of Muslims thought that the terrorist activities were not justified however, even when the margin of error of 4.4 percent is applied, the results indicate that as many as 20

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[94] Ian Austen and David Johnston, "17 Held in Plot to Bomb Sites in Ontario," The New York Times, June 4, 2006; available from http://www.nytimes.com/2006/06/04/world/americas/04toronto.html?_r=1; Internet; accessed 19 March, 2010.

[95] Stoffman, 14.

[96] Collacott.

percent of respondents welcomed the attacks.[97] Corbella contends that the Canadian Broadcasting Corporation downplayed the story by reporting the results as "Glad to be Canadian, Muslims Say" in an attempt not to embarrass the Muslim community. [98]

Climate change has the potential to force millions of people from their homes and many of them will consider Canada as a potential haven. As the previous paragraphs have shown however, Canada lacks the necessary resources to effectively screen the numbers of immigrants it currently receives. Moreover, Canadian politicians have been reluctant to address security issues that might result in lower electoral support from immigrant communities. Of greater consequence is the fact that the agencies responsible for the safety of Canadian citizens feel they do not have the freedom to investigate the security threats associated with particular ethnic groups. Even the media has shown a reluctance to provide all the facts. In short, climate-induced immigration presents a real security challenge for Canada. While one solution may be to limit the number of immigrants, the evidence suggests that Canada would still be susceptible to illegal immigration.

Paul J. Smith argues that international migration caused by climate change will present a security concern because it has the potential to create a multi-billion dollar industry for transnational organized crime networks.[99] If climate change forces millions of people from their homelands, countries may impose restrictive policies to counter the swell of climate refugees. These restrictive policies would allow criminal entrepreneurs

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[97] CBC News, "Glad to Be Canadian , Muslims Say," February 13, 2007; available from http://www.cbc.ca/canada/story/2007/02/12/muslim-poll.html; Internet; accessed 17 March 2010.

[98] Licia Corbella, "Disturbing Reality Buried," *Calgary Sun*, February 18, 2007.

[99] Paul J. Smith, "Climate Change, Mass Migration and the Military Response," Orbis 51 (Fall 2007): 620.

to take advantage of climate refugees and support an already prosperous migrant smuggling industry. As a wealthy and developed nation, Canada presents an attractive emigration destination. For a vast country with the world's longest shoreline at 243,000 kilometres,[100] Canada offers an opportune location for illegal immigration. This would pose a significant security threat as it provides an alternative for individuals who otherwise would not meet immigration eligibility requirements such as persons with prior criminal records or known ties to terrorist groups.

Canada's International Policy Statement: A Role of Pride and Influence in the World acknowledged that security in Canada is dependant upon stability abroad.[101] Michael Klare maintains that climate-induced migration has the potential to create instability within the international environment by testing the cohesion of political organizations.[102] The effects of climate change will vary greatly among the member states of the European Union. Malta and Cyprus who joined in 2004 are low-lying coastal areas and expected to suffer greatly from raising sea levels.[103] Greece, a member since 1981, is likely to experience widespread drought and water scarcity.[104] The effects of climate change will prompt large masses of impoverished populations from all three locations to seek out a better quality of life. As members of the European Union, these

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[100] Natural Resources Canada, Coastweb: Facts About Canada's Coastline; available from http://gsc.nrcan.gc.ca/coast/facts_e.php; Internet; accessed 20 March, 2010.

[101] Canadian International Development Agency, *Canada's International Policy Statement: A Role of Pride and Influence in the World, Development* (Ottawa: Canada Communications Group, 2005), 1.

[102] Michael T. Klare, "Global Warming Battlefields: How Climate Change Threatens Security," *Current History* 106 (November 2007): 361.

[103] IPCC.

[104] IPCC.

populations will likely seek refuge with neighboring countries in Western Europe. However, many of the Western Europe states are not yet willing to grant the freedom of full mobility to members admitted in 2004 and 2007.[105] Thus, while displaced persons from Greece would be welcomed in Western Europe, it is uncertain whether climate refugees from Cyprus and Malta would be offered similar refuge. Considering that Cyprus is scheduled to provide the next President of the European Union in 2012,[106] the challenge to maintain political cohesion is substantial.

That is in addition to the fact that immigration already poses serious problems for public order in Western Europe. Muslims represent the majority of immigrants to most West European countries with the largest communities in France, the Netherlands, Germany and Denmark.[107] If the effects of climate change trigger increased migration from South Asia and Africa, the Muslim population in Europe would double by 2050.[108] The integration of Muslims into European society to date has not been seamless. The Paris riots of 2005 and the Danish cartoon of the prophet Mohammed in September 2005 that triggered violent international protests by Muslims and led to the burning of Danish embassies are two noteworthy examples. Klare contends that climate-induced migration could create further anti-immigration backlash and severely test the unity of the European

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[105] EurActiv.com. " EU 25: Member States Grapple with the Free Labour Market." January 29, 2010; available from http://www.euractiv.com/en/enlargement/eu-25-member-states-grapple-free-labour-market/article-117775; Internet; accessed 20 March 2010.

[106] Theodore Panayotou, "Climate Change: an Ideal Issue for Cyprus' EU Presidency," *Cyprus Mail*, February 14, 2010; available from http://www.cyprus-mail.com/opinions/climate-change-ideal-issue-cyprus-eu-presidency/20100214; Internet; accessed 20 March 2010.

[107] Robert Leiken, "Europe's Angry Muslims," Foreign Affairs 84, no. 4 (July/August 2005); available from http://www.foreignaffairs.com/articles/60829/robert-s-leiken/europes-angry-muslims; Internet ; accessed 11 March 2010.

[108] *Ibid*.

Union. He also goes so far as to suggest if the European Union breaks apart, Russia might take advantage of anti-West sentiment to incorporate former Soviet bloc countries into a new military coalition.[109] Not unlike the European Union, the effects of climate change will differ among countries of the Association of Southeast Nations. Political, social and economic conflict could ensue if member states take action against migrants from affected nations.

Climate-induced migration could also destabilize large regions of the world. As rising powers, China and India are viewed as regional anchors of stability. Both countries are expected to be heavily impacted by climate change. While China will face pressures created by internal migration, India will be challenged by the flood of tens of millions of refugees from neighboring Bangladesh. In Africa, water scarcity and drought affects fourteen African countries. As a result of climate change, that number is expected to nearly double in 2030.[110]

Disease

Another potential security implication of climate change for Canada is an increase in the spread of infectious diseases. There is broad consensus that the evolution of new diseases, re-emergence of diseases previously thought to be contained and the redistribution of infectious diseases worldwide is the result of the combined effects of climate change and global mobility.[111] "Due to climate change, regions with moderate

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[109] Klare, 40.

[110] Tearfund, *Fleeing the Heat* (Teddington, U.K.:Tearfund, 2006), 12.

[111] Julio Godoy, "Health: Climate Change Brings New Diseases."*IPSNews.net*, June 19, 2009; available from http://ipsnews.net/news.asp?idnews=47290; Internet; accessed 21 March 2010.

temperatures, that is, most of Europe and North America, are now facing diseases [such as dengue, chikungunya and yellow fever] that were thought completely exotic in these areas," remarks Thomas Mettenleiter, president of the German Federal Research Institute for Animal Health.[112] During a health conference last year, 100 medical experts acknowledged that the effects of climate change are creating favorable conditions for carriers of disease such as rodents, mosquitoes and birds to settle in habitats that were once thought inappropriate.[113] As Canadian winters grow shorter and warmer, there is an increased likelihood that habitats for disease carriers will become more promising.

A report by the University College London titled "Managing the Health Effects of Climate Change," contends that climate change has become the greatest global health threat, particularly in the developing world. "The epidemiological outcome of climate change on disease patterns worldwide will be profound, especially in developing countries where existing vulnerabilities to poor health remain."[114] Scientists predict that climate change will cause densely populated areas such as Africa and South Asia to become breeding ground for disease. Countries expected to experience significant additional rainfall will see a pronounced increase of diseases such as malaria and dengue fever.[115] With annual precipitation levels predicted to increase as high as 20 percent in India, Pakistan and China, three countries that source a high number of immigrants to

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[112] *Ibid*.

[113] *Ibid*.

[114] *Ibid*.

[115] Asaf Anyamba, *et al,* "Developing Global Climate Anomalies Suggest Potential Disease Risks for 2006-2007." *International Journal of Health Geographics*, no.5 (2006); available from http://www.ij-healthgeographics.com/content/5/1/60; Internet; accessed 21 March 2010.

Canada, the threat of these diseases spreading to Canadian soil are high. Outside of Asia, Canada was the hardest hit by severe acute respiratory syndrome (SARS). Other countries with ties to Canada such as Somalia will continue to be subjected to high temperatures and drought, providing optimal conditions for the cultivation of airborne diseases.[116] In both these areas, migration may prove to be a catalyst for a global pandemic.[117]

Of note, in the past forty years developing countries have been the birthplace for nearly 30 previously unknown diseases. At least three of these diseases, Ebola, West Nile Virus and SARS are still incurable. The world has also witnessed the re-emergence and global spread of diseases that were once considered to be under control. Malaria, cholera and tuberculosis have spread beyond the developing world and become more infectious and resistant to antibiotics.[118] "There is a new [tuberculosis] case every six hours in Canada," noted Stacey Guthrie, a Public Health Nurse with an Ontario Communicable Disease Team.[119] According to Public Health Agency Canada, the greatest source of tuberculosis infection comes from immigrants that arrive from developing countries.[120] Because Canadians frequently vacation to developing countries such as Mexico, Cuba

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[116] *Ibid*.

[117] *Ibid*.

[118] United States, National Intelligence Council, *The Global Infectious Disease Threat and its Implications for the United States* (Washington, D.C.: National Intelligence Council, 2000).

[119] Health Unit: Haldimand-Norfolk. "TB Still a Threat In Canada, Health Unit Says," March 13, 2009; available from http://www.hnhu.org/index.php?option=com_content&view=article&id=1217&catid=31&Itemid=46; Internet; accessed 21 March 2010.

[120] Public Health Agency Canada, *Canadian Tuberculosis Standards, 6th edition* (Ottawa: Canada Communications Group, 2007), 5; available from http://www.phac-aspc.gc.ca/tbpc-latb/pubs/pdf/tbstand07_e.pdf; Internet; accessed 21 March 2010.

and the Dominican Republic, they are also susceptible to the threat of diseases such as hepatitis, malaria and dengue which are expected to increase as a result of climate change. Thus, just as immigrants exposed to tuberculosis can transmit disease to Canadians, Canadian citizens who travel to third world locations are at similar risk of being carriers of disease.

The interplay between migration, travel, trade and disease will invariably create tensions within the international community. Understandably, countries will restrict immigration, trade and travel from those areas of the world where there has been a significant outbreak of disease. On the other hand, if a country's policy is perceived to be "discriminatory or motivated by factors other than legitimate health concerns,"[121] political relations may become strained. As evident by the spread of human immunodeficiency virus (HIV) and severe acute respiratory syndrome (SARS) however, globalization has made containment of disease virtually impossible.

Disease also has the potential to create an internal security issue. As indicated above, climate change may contribute to the evolution of new diseases or spread unfamiliar disease to various parts of the world. Experiences of the last two decades illustrate that populations react erratically when faced with threats of new or unfamiliar disease, especially when they perceive the actions of the government to be insufficient. An epidemic of bubonic plague instilled such terror in an Indian city in 1994 that a significant percentage of the population fled. The exodus "fuelled an unprecedented level of anxiety across India…with fear and ignorance…so great… that the government was

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[121] John Podesta and Peter Ogden, "The Security Implications of Climate Change," *The Washington Quarterly* 31:1 (Winter 2007-08):123.

forced to bring in a Rapid Reaction Force to effectively quarantine [city of] Surat."[122] During the SARS outbreak in parts of China in 2003, riots erupted when the local population believed erroneously that the government would establish special isolation wards in their community to quarantine patients.[123] While it is unclear how Canadians might react, it is plausible that severe social disruption could ensue if the national health system became overwhelmed by the demands of an unforeseen pandemic.

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[122] Peter Chalk, "Disease and the Complex Processes of Securitization in the Asia-Pacific," in *Non-Traditional Security in Asia: Dilemmas in Securitization*, ed. Mely Caballero-Anthony, Ralf Emmers and Amitav Acharya (Aldershot: Ashgate, 2006), 127.

[123] Erik Eckholm, "SARS is the new Spark for a Riot in China," *New York Times*, April 29, 2003, A1.

CHAPTER THREE - AN ICE-FREE ARCTIC

For much of its history the Arctic has not been a huge source of concern for Canadians. Manson noted that "Canadians have always felt secure in the knowledge that the Arctic was its own defence by virtue of an inhospitable climate, the huge distances involved and terrain that would surely discourage any serious thoughts of invasion."[124] However, as a recent article in the Canadian Press suggests, that feeling of relative security is fading. According to Canadian Arctic expert, Robert Huebert, "what is happening in the Arctic is a transformation the likes of which we have never seen before."[125] As the Arctic ice cap continues to shrink at an unprecedented rate thereby opening access to some of the world's untapped riches, nations are using military presence to try and position themselves to reap the multitude of economic benefits. "The fact that we're starting to see a really substantial military build-up means we've got a very, very unsettled situation in the Artic right now," added Huebert.[126]

Although military activity in the Arctic subsided significantly at the end of the Cold War, the possibility of increased access to waterways and resources within the next decade as a result of expected climate change, is giving the area a new strategic importance. Woodard noted that "more than 90 percent of the Earth's unclaimed seabed, believed to contain significant amounts of oil, gas and minerals, could become

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[124] Paul Manson, "Foreword," In *Defence Requirements for Canada's Arctic*, ed. Brian MacDonald, 1-2 (Ottawa: Conference of Defence Associations Institute, 2007), 1.

[125] Lee-Ann Goodman, "Arctic: A Growing Security issue for U.S.: CIA Shares Spy Photos of Ice Cap;" *The Canadian Press*, January 12, 2010; available from http://www.thestar.com/news/canada/article/749795--arctic-a-growing-security-issue-for-u-s; Internet; accessed 06 March, 2010.

[126] *Ibid*.

accessible."[127] At a time when the world is experiencing uncertain supply, growing demand and increasing prices, the mere speculation that the Arctic is rich in natural resources suggests that the region could have military and economic significance.

In its assessment of the Arctic climate released in 2004, the Arctic Council determined that, "Arctic temperatures are rising at nearly twice the rate of the rest of the world resulting in drastically declining sea ice coverage."[128] The American Geographic Union suggested that gradual ice thinning will be replaced by sudden ice loss, with the Arctic being ice-free by 2040.[129] Recent studies contend however, that an ice-free Arctic may be possible as soon as 2013.[130] This chapter will examine how an ice-free Arctic could generate potential security implications for Canada such as increased Arctic access by foreign nations, competition over vast natural resources and the potential for regional instability.

Increased Arctic Access

As a result of climate change two potential new sea lanes - the Northern Sea Route and the Northwest Passage - would be possible. As sea ice continues to disappear, a direct route across the North Pole is also anticipated. When compared with current

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[127] Colin Woodard, "Who Resolves Arctic Oil Disputes?" *The Christian Science Monitor*, August 20, 2007; available from http://www.csmonitor.com/2007/0820/p01s02-woeu.html; Internet; accessed 12 January, 2010.

[128] Arctic Climate Impact…, 8.

[129] Marika M. Holland, *et al,* "Future Abrupt Reductions in the Summer Arctic Sea Ice," *Geophysical Research Letters 33*, December 12, 2006: L23503, doi:10.1029/2006GL028024.

[130] Robin McKie, "Meltdown in the Arctic is Speeding Up," *The Observer*, August 10, 2008; available from http://www.guardian.co.uk/environment/2008/aug/10/climatechange.arctic; Internet; accessed 12 January, 2010.

travel times and distances through the Suez and Panama Canals, these new lanes of communication will offer considerable savings. The Northwest Passage is 7000 kilometres shorter than the current shipping route through the Panama Canal resulting in a reduction of two weeks travel time for a trip from London to Tokyo.[131] Borgerson anticipates that such shortcuts "could reduce the cost of a single voyage by a large container ship as much as 20 percent - $17.5 million dollars – saving the shipping industry billions of dollars a year"[132] Mega ships would generate even greater savings. Because these vessels were too large to fit through the Suez and Panama Canals, their only alternative was to travel around the Cape of Good Hope and Cape Horn.[133] Not only would an ice-free Arctic offer another viable option, it would reduce the journey length and thus drastically cut their fuel costs. A route through Arctic waterways is also less likely to be threatened by pirates.[134] Given these reasons, it is not surprising that the world of commerce is showing increasing interest and global shipyards are rapidly building ice-capable ships. George Newton of the Arctic Research Commission noted that corporations worldwide are closely monitoring the Arctic situation. In 2006, he

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[131] CBC News, "Northwest Passage: The Arctic Grail," August 8, 2006; available from http://www.cbc.ca/news/background/northwest-passage/; Internet; accessed 02 March, 2010.

[132] Scott G. Borgerson, "Arctic Meltdown: The Economic and Security Implications of Global Warming," *Foreign Affairs* vol. 87, issue 2 (Mar/Apr 2008): 65.

[133] *Ibid*., 65.

[134] From their bases along the coasts of Somalia, heavily armed and well organized pirates have proved adept at seizing international freight as it moves through the Gulf of Aden and off the coasts of East Africa, demanding high ransoms in exchange for crew and the cargo. Although a multinational task force has patrolled the region, it has met with limited success. Shipping companies are likely to look to the Northwest Passage as a safer route. See Roger Howard, *The Arctic Gold Rush: The New Race for Tomorrow's Natural Resources* (New York, N.Y.: Continuum Books, 2009), 111.

warned that investment in ice- capable ships by world corporations had exceeded 4.5 billion dollars.[135]

With an Arctic coastline of 156, 029 kilometres,[136] surveillance of increased marine traffic will pose a significant challenge for the Canadian government. An accessible Northwest Passage represents a growing concern for the Royal Canadian Mounted Police, who, according to their website are the "agency that often provides the first line of defence across much of Canada's frozen North."[137] Superintendent Grant St. Germaine confirms "if a ship under foreign flag suddenly shows up in the Arctic and there's a problem with it -customs issues, immigrations issues, a rescue – the RCMP are usually the closest ones out there."[138] Although the role of the RCMP in Canada's North is "to deter activities that threaten border integrity or national security,"[139] resources are limited. St. Germaine notes that "we have Integrated Border Enforcement Team Vessels but we don't have a crew."[140] Inspector Robert Bazin, the RCMP border control officer in Manitoba adds that the biggest challenge to Canadian Arctic security is intelligence. "Right now, we don't have a whole lot of intelligence about what is going on in the North -specifically in a [Churchill] port that is like a back door to the country."[141]

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[135] CBC News, Northwest…

[136] Ross, Caroline. "Protecting Canada's Northern Border." *The Gazette*, vol.1, no.1; available from http://www.rcmp-grc.gc.ca/gazette/vol71n1/c-prot-eng.htm; Internet; accessed 17 March 2010.

[137] *Ibid*.

[138] *Ibid*.

[139] *Ibid*.

[140] *Ibid.*

[141] *Ibid.*

Canada also lacks a robust military capability to ensure full time Arctic security. While the Air Force possesses the Aurora long range patrol aircraft, it has seldom been used to monitor Arctic activity. From 1999 until 2006, a total of four Arctic taskings were executed.[142] Aurora flights to the Arctic did increase in 2007 and there is indication that they will continue to participate as part of the annual sovereignty exercises.[143] However, given the size of the Arctic coastline, their ability to provide full time surveillance is limited.

The Navy also lacks a full time capability to patrol the Arctic waterways as its vessels are currently limited to ice free waters.[144] Through its two Maritime Security Operations Centres (MSOC), however, the Navy is building the "capability to become focal points for the collection, analysis, fusion, and exchange of intelligence, surveillance, and reconnaissance information in support of domestic marine issues."[145] While this offers the potential for continuous surveillance of the North, the MSOC is currently incapable of maintaining a constant information source feed from the Arctic, and thus remains largely ineffective.[146] This is due in large part to intermittent satellite

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[142] Paul Dittmann, "In Defence of Defence: Canadian Arctic Sovereignty and Security," *Journal of Military and Strategic Studies*, Spring 2009, vol. 11, issue 3: 47.

[143] There were seven flights in 2007, see Dittmann. CP 140 Auroras have participated in Canada Command sovereignty exercises Operation NANOOK 2007, 2008 and 2009, see http://www.canadacom.forces.gc.ca/nr-sp/bg-do/07-004-eng.asp; Internet; accessed 07 March 2010.

[144] Kyle D Christensen, "The Navy in Canada's Northern Archipelago," in *Defence Requirements for Canada's Arctic,* ed. Brian MacDonald, 79-95 (Ottawa: Conference of Defence Associations Institute, 2007), 82.

[145] Vice-Admiral Bruce MacLean, "What Canadian Military and Security Forces in the Future World? A Maritime Perspective;" available from http://centreforforeignpolicystudies.dal.ca/pdf/msc2005/msc2005maclean.pdf; Internet; accessed 17 March, 2010, 3.

[146] *Ibid*., 3.

coverage and the fact that a ship can turn off its maritime Automatic Information System. In short, given the limited ability of the RCMP and the military to patrol the Arctic waterways, an accessible Northwest Passage could facilitate the entry of illegal immigrants, criminals or even terrorists into Canada.

New sea lanes of communication such as the Northwest Passage are especially attractive to trading nations such as China. With ever increasing domestic needs dependant upon secure global supply chains, a reliable Arctic passage could have strategic importance. According to Bill Ridly, "China's investment in the development and deployment of ice breaking technology is an indicator of its vision for the future. In 1999, a Chinese icebreaking vessel made an unannounced visit to Tuktoyaktuk in Northern Canada."[147] The Northwest Passage could offer a safer alternative for the large volume of Chinese vessels that regularly transit unstable waters. In 2007, Chinese vessels and vessels carrying Chinese imports and exports accounted for more than 60 percent of maritime traffic that travelled through the strategic straits of Southeast Asia.[148] Other industrial powers such as Japan, Russia, South Korea, and the European Union could consider use of the Northwest Passage as a safer route for movement of energy supplies. Shipyards in Germany, Russia, Finland and South Korea are already building ice-capable vessels to navigate both the Northwest Passage and Northern Sea Route.[149]

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[147] Bill Ridley,"China and the Final War for Resources," *Energy Bulletin*, 08 February 2005; available from http://www.energybulletin.net/node/4301; Internet, accessed 10 March, 2010.

[148] Richardson, Michael. "Northern Exposure," *South China Morning Post*, August 23, 2007, 13.

[149] Margaret Blunden, "The New Problem of Arctic Stability," *Survival* vol. 51, no.5 (October-November 2009): 122.

In addition to increased transit of the Northwest Passage by commercial vessels, unauthorized usage by military vessels, submarines, recreational vessels and cruise liners also provide cause for concern. In 1999, a French submarine was sighted near Iqaluit during Jacques Chirac's visit to Nunavut.[150] Chinese submarines have also been suspected of patrolling Canadian Arctic waters.[151] Even the United States has conducted unauthorized passage of Canadian Arctic waterways. In 2005, it was suspected that the USS Charlotte travelled through Canadian waters en route from Hawaii to the East Coast.[152] As long as Canada proves incapable of monitoring its Arctic waterways, an accessible Northwest Passage remains a security threat.

An accessible Northwest Passage also provides a lucrative opportunity for criminals and non-state actors to travel unnoticed and possibly infiltrate Canada and North America. In 1997 a criminal network tried to smuggle 22 Chinese foreign nationals into Iqaluit via Greenland. "I think that the 22 that tried to come in 1997 is proof that organized crime is looking for the path of least resistance into Canada," remarked Sgt Brine of RCMP's headquarters in Iqaluit. He added, "Iqualuit's secluded setting at the mouth of Frobisher Bay may make it more attractive to human smugglers." In 2006 and 2007, individuals with ties to organized crime, human smuggling and drug trafficking sailed through the Northwest Passage and tried to enter Canada illegally.[153] Federal

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[150] Alanna Mitchell, "The Northwest Passage Thawed," *Globe and Mail*, January 5, 2000, A9.

[151] CdnMilitary.ca. "Arctic/Offshore Patrol Ship;" available from http://www.cdnmilitary.ca/index.php?p=28; Internet; accessed 17 March, 2010.

[152] Dianne Demille and Stephen Priestly, "Stephen Harper Announces the New Defence Policy as Put Forward by the Conservative Party," *Canadian American Strategic Review*; available from http://www.casr.ca/ft-harper1-2.htm; Internet; accessed 17 March 2010.

documents released in 2008 suggested that criminals or terrorists might try to infiltrate Canada's northern diamond industry. According to emails obtained from Canwest News Service, the Privy Council Office was concerned about illegal immigration and smuggling in "the Arctic region and Northern Canada."[154] American intelligence officials have "identified 15 freighters that they believe are controlled by al-Qaeda or could be used by a terrorist network to ferry operatives, bombs, money or commodities."[155] The Northwest Passage could also provide potential opportunities for piracy or the transport of nuclear, chemical or biological weaponry.

Competition over Natural Resources

By accelerating the creation of an Arctic trade highway that is faster and potentially less risky than current routes through the Suez and Panama Canals, climate change has opened up new economic opportunities for members of the 'Arctic Five'- Canada, the United States, Norway, Denmark and Russia. However, as maritime boundary disputes delineating ownership of the resources have yet to be resolved, there exists a potential for conflict.

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[153] On August 23, 2007, a Norwegian sailboat with links to organized crime landed in Cambridge Bay, Nunavut. A year earlier, on September 18, a Romanian man linked to human smuggling and drug trafficking made his fourth attempt to enter Canada illegally, this time by sailing from Greenland to Grise Fiord, Nunavut. See Ross, "Protecting Canada's Northern…"

[154] Canwest News Service. "Blood Diamond Smugglers Threaten Canada's Northern Industry," September 4, 2008; available from http://www.canada.com/topics/news/national/story.html?id=75f447f6-8413-4ec7-96e3-32dece5e5363; Internet; accessed 17 March 2010.

[155] Mintz, John. "15 Freighters Believed to be Linked to Al Qaeda." WashingtonPost.com, December 31, 2002; available from http://www.washingtonpost.com/ac2/wp-dyn/A56442-2002Dec30?language=printer; Internet; accessed 17 March 2010.

Foreign Policy has determined the Arctic to be "the world's most valuable disputed turf."[156] According to geological estimates, the Arctic has an abundance of oil, gas, and mineral reserves.[157] In terms of hydrocarbons, some analysts assess that fifty percent of the world's remaining stock could be located north of the Arctic Circle.[158] Estimates of unexploited resources such as gold, silver, iron and diamonds in Canada's Arctic region are in the trillions of dollars.[159]

While an examination of each of the maritime boundary disputes is beyond the scope of this essay, it is worth noting that resource control, specifically fossil fuels, remains the main source of friction. Canada's dispute with the United States over their maritime boundary in Beaufort Sea is largely based on control of the oil and gas resources.[160] The dispute that is arguably the most contentious and has the greatest potential to develop into a security concern for Canada is the territorial claim of the Lomonosov Ridge.

The Lomonsov Ridge, "an undersea formation which runs 1,800 kilometers from Russia's New Siberian Islands through the center of the Arctic Ocean to Canada's

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[156] ForeignPolicy.com. "The List: The World's Most Valuable Disputed Turf", August 2007; available from http://www.foreignpolicy.com/story/cms.php?story_id=3918; Internet; accessed17 March 2010.

[157] The United States Geological Survey estimates that 90 billion barrels of oil, 1669 trillion cubic feet of natural gas and 44 billion barrels of natural gas liquids may remain to be found in the Arctic. See Geology.com. "USGS Arctic Oil and Gas Report," July 2008; available from http://geology.com/usgs/arctic-oil-and-gas-report.shtml; Internet; accessed 11 April 2010.

[158] Library of Parliament, *Canadian Arctic Sovereignty* and Defence R and D Canada, *Arctic Maritime Security and Defence: Canadian Northern Security Opportunities and Challenges* (Ottawa: Department of National Defence, 2005), 17-21.

[159] Anthony L. Russell, "Carpe Diem: Seizing Strategic Opportunity in the Arctic." *Joint Forces Quarterly* 51 (4th Quarter, 2008): 96.

[160] Telis Demos, "Arctic Circle Oil Rush," *Fortune*, August 20, 2007, 11.

Ellesmere Island in the territory of Nunavut, part of the Canadian Arctic Archipelago," is expected to yield more than 10 billion tons of oil and gas.[161] Both Denmark and Russia have contested claims to the area, and there is indication that Russia might use military force to back up the boundary dispute. In the summer of 2008, Russian military chief, Lieutenant General Vladimar Shamanov emphasized that his armed forces would have to be ready for combat operations in the Arctic, "modern wars are often won and lost before they start," and would fight to defend the areas that Russia claimed formed part of its continental shelf. While it might be simply coincidence, Kristian Atland notes that in the Arctic, "Russian territorial claims seem to go hand in hand with Russian military modernization."[162] As a demonstration of its intent to protect its Arctic economic interests, Russia has established a new Northern fleet and tasked it to patrol the Arctic passageways.[163] Furthermore, a new national security document published by the Kremlin provides key insight into how far Russia might go to secure the Arctic's energy resources. According to the document, *Russian Security Strategy to 2020*, Russia acknowledged that control of energy resources in the Arctic might lead to conflict and that military confrontation should not be ruled out.[164]

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[161] Rick Rozoff, "Militarization of the Arctic. Canada: Battle Line In East-West Conflict Over The Arctic,"GlobalResearch.ca, June 3, 2009; available from http://www.globalresearch.ca/index.php?context=va&aid=13836; Internet; accessed 10 March 2010.

[162] Kristian Atland, *Interstate Relations in the Arctic: Conflict and Cooperation Potential* (Oslo: Norwegian Defence Research Establishment, 2009).

[163] Golotyuk, Yuri. "Safeguarding the Arctic." *Russia in Global Affairs*, no.3, July-September 2008; available from http://eng.globalaffairs.ru/numbers/24/1218.html; Internet; accessed 17 March 2010.

[164] Katarzyna Zysk, "Russia's National Security Strategy to 2020," Norweigan Institute for Defence Studies, Oslo, 2009; available from http://www.geopoliticsnorth.org/index.php?option=com_content&view=article&id=84&Itemid=69&limitstart=1; Internet; accessed 18 March 2010.

Russia's militarization of the Arctic has raised concern over a possible threat to Canada and its NATO allies. Because an ice free waterway is expected sooner on the Russian side than on the North American side of the Arctic, Russia will be better positioned to strategically place military assets and secure their domain of influence. A report in 2007 stated that "amid great secrecy, NATO naval forces are trying to control the Arctic Ocean to continue the military bloc's expansion to[ward] Russia...US Navy, with its British allies, is meeting the challenge of displacing Russian submarines from the Arctic region."[165]

The Russian Air Force has resumed long-range strategic bomber patrol flights over the Arctic and has on numerous occasions been accused of violating a nation's sovereign airspace. Christoph Seidler noted that Russian planes conducted a mock bombing run against Norway's Northern Command Centre and in 2008 Norway scrambled interceptors to intercept Russian bombers 87 times.[166] Russian bombers have also been observed close to Canadian airspace. Days before United States President Barack Obama was scheduled to visit Ottawa in February 2009, Canadian jet fighters intercepted a Russian bomber near Canada's Arctic.[167] Canada's increased emphasis towards Arctic security is a direct result of such aggressive Russian posturing. Prime Minister Harper declared that "…we are concerned [that] Russian actions in other parts

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[165] Rozoff, "Militarization of the Arctic…"

[166] Christoph Seidler, "Who is Winning the Arctic Game of Monopoly?" *Spiegel Online International*, June 11, 2009; available from http://www.spiegel.de/international/world/0,1518,629773,00.html; Internet; accessed 07 April, 2010.

[167] CBC News, "Russia Denies Plane Approached Canadian Airspace," February 27, 2009; available from http://www.cbc.ca/canada/story/2009/02/27/arctic-russia.html; Internet; accessed 10 March 2010.

of the world…may indicate some desire to work outside the international framework…that is why we are taking a range of measures…including military measures-to strengthen our Arctic sovereignty."[168]

Other states have expressed similar concern over Russian activities in the Arctic. In 2008 the Swedish Defence Minister admitted that despite the relative stability of the Nordic region, "our decision to cooperate [with NATO] more closely is happening against a background in which Russia is raising its foreign policy ambitions."[169] During an address to the Defence and Security Committee of the NATO Parliamentary Assembly in 2009, Norwegian Deputy Minister of Defence Espen Barth Eide remarked, "Russia has shown an increased willingness to engage in political rhetoric and even use of military force....NATO has a very important role to play...we would like to see NATO raise its profile in the High North."[170]

It is clear from the preceding that the Arctic is strategically important to Russia. Control of abundant oil and gas deposits such as those found in the disputed Lomonsov Ridge would undoubtedly help to reassert Russia's great power status. Despite the increased military activity demonstrated by Russia, it is unlikely that a resource war will ensue. However, as Russia continues to extend its military presence to the Arctic and exchange aggressive rhetoric with Canada and other NATO states, it is plausible that

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[168] Canadian American Strategic Review. "Harper Wary of Russia's Unilateral Moves to Secure its Strategic Interests, August 29, 2008; available from http://www.casr.ca/as-arctic-sovereignty-capabilities-1.htm; Internet; accessed 18 March 2010.

[169] Gerard O'Dwyer, "Sweden Pushes for More Nordic Cooperation," Defense News, June 2, 2008.

[170] North Atlantic Treaty Organization Parliamentary Assembly. "NATO Parliamentary Assembly Discusses Alliance Role in the High North," 23 May, 2009; available from http://www.nato-pa.int/default.asp?shortcut=1842; Internet; accessed 18 March, 2010.

given the potential for mistrust, small incidents could spiral out of control into a larger confrontation, creating potential security implications for Canada.

New economic opportunities such as the lure of rich oil and gas deposits have also attracted the attention of non-Arctic states. As one of the largest consumers of fossil fuels, China has a vested interest in global energy supplies. Although China has no Arctic coastline nor is a member of the Arctic council, the country owns the world's largest non-nuclear icebreaker and is actively mapping the Arctic seabed.[171] The European Union fears that "polar ice cap melting will have a large geo-strategic impact with conflicts likely over the vast new mineral resources that will become accessible…rival claims to mineral wealth…will challenge Europe's ability to secure its interests in the region."[172] While conflict with China or the European Union is unlikely, competition over dwindling resources should not be discounted.

As fear of future energy shortages grow and commodity prices rise, there could be temptation for governments to seize the world's diminishing natural resources for themselves. Such a consideration has been expressed by numerous governments. A report issued by the European Union in 2008, *Climate Change and International Security*, expressed concern that climate change might incite disputes over maritime and land borders and other territorial rights. The report stated:

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[171] The StarPhoenix, "China Eyeing Perks of Ice-Free Arctic," March 1, 2010; available from http://www.thestarphoenix.com/technology/environment/China+eyeing+perks+free+Arctic+study/2627909/story.html; Internet; accessed 07 March, 2010.

[172] Ian Traynor, "EU Told to Prepare for Flood of Climate Change Migrants," *The Guardian*, March 10, 2008; available from http://www.guardian.co.uk/environment/2008/mar/10/climatechange.eu; Internet; accessed 07 March, 2010.

> One of the most significant potential conflicts over resources arises from intensified competition over access to and control over energy resources. That in itself…is a cause for instability. Because much of the world's hydrocarbon reserves are in regions vulnerable to the impacts of climate change, instability is likely to increase. As previously inaccessible regions open up due to the effects of climate change, the scramble for resources will intensify.[173]

The report continues to suggest that the Arctic presents one real source of tension because its energy resources "are changing the geo-strategic dynamics of the region with potential consequences for international stability and European security interests."[174]

Regional Instability

The notion that opening of the Arctic passageways will create a security concern by posing a threat to international peace and stability has also been expressed by Roger Howard. As Arctic coastal powers, Russia and the United States will have a keen interest in monitoring which countries transit the waters of the Arctic Ocean. He suggests that activities such as the establishment of a commercial or military presence in the region or the exercise of 'right of innocent passage' by foreign warships or commercial vessels could be construed as a threat.[175] There is also the possibility that foreign-owned vessels could instigate a serious incident if they transited through disputed waters.[176]

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[173] European Union, "Climate Change and International Security," Paper from the High Representative and the European Commission to the European Council, S113/08, March 14, 2008, 5.

[174] *Ibid*., 8.

[175] Roger Howard, *The Arctic Gold Rush: The New Race for Tomorrow's Natural Resources* (New York, N.Y.: Continuum Books, 2009), 21.

[176] *Ibid*., 21.

The conduct of such activities by countries that are viewed as potentially hostile to the United States will undoubtedly provoke the greatest response. This would certainly be the case if Chinese companies establish themselves in Arctic areas such as resource rich Greenland which is deemed to be strategic to the United States.[177] Transit of Iranian warships through the Northwest Passage during periods of heightened tension over Teheran's nuclear ambitions could be considered as a belligerent provocation. When vessels of two countries suspicious of one another manoeuvre in narrow waterways such as the Northwest Passage an accident or misunderstanding could spark a confrontation. Although the accident happened when relations between the United States and Russia were cordial, the serious collision between Russian and American submarines in Kolski Bay could quickly have escalated into a major conflict.[178]

Howard notes that the Arctic region is significant in terms of peace and stability because there are few other places in the world that are strategic to both the United States and Russia where "an enemy force could conceivably establish a landed presence."[179] He argues that either of the two countries could establish a military base on the East Coast of Greenland or project a credible force in the Barents Strait and thus threaten the other in a fashion similar to the Cold War.[180]

Peace and stability could also be threatened if defensive actions taken by the United States or Russia in the Arctic region are interpreted as belligerent by another state.

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[177] *Ibid*., 178-179.

[178] Eugene Miasnikov. "Submarine Collision off Murmansk: A Look From Afar;" available from http://www.armscontrol.ru/subs/collisions/db080693.htm; Internet; accessed 07 March 2010.

[179] Howard, 22.

[180] *Ibid*., 22.

The United States has made it clear that international activity has increased in the Arctic region and this "requires the United States to assert a more active and influential national presence to protect its Arctic interests and to project its sea power throughout the region."[181] An assessment published by the Central Intelligence Agency confirms United States' trepidation about the potential threat to regional stability in the Arctic waters noting that Russia is pursuing a "more proactive and influential foreign policy, reflecting Moscow's re-emergence as a major player on the world stage" and "few countries are poised to have more impact on the world over the next fifteen to twenty years than China."[182] The Arctic region may emerge as the forum where these and other states assert themselves.

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[181] United States, The White House, *National Security Presidential Directive 66*, January 9, 2009; available from http://www.fas.org/irp/offdocs/nspd/nspd-66.htm; Internet; accessed 07 March 2010.

[182] United States, Central Intelligence Agency, "Global Trends 2025: A Transformed World," Central Intelligence Agency Report, November 2008, 32, 49.

CHAPTER FOUR - DESTABILIZATION OF REGIONS

Perhaps the cruelest irony of climate change is the fact that the developed world is largely responsible for climate change but developing countries are predicted to be most at risk. In its Fourth Assessment Report (FAR), the Intergovernmental Panel on Climate Change (IPCC) remarked that "the effects of climate change are expected to be greatest in developing countries in terms of loss of life, and relative effects on investment and economy."[183] Many developing countries already face challenges such as poverty, growing populations, social conflict, unemployment and limited governance capability and climate change may prove to be the catalyst that leads to state collapse. Small variations in the climate are likely to be devastating for developing countries and lead to extreme weather events, water and food scarcity, increased disease, competition for resources and migration. Analysts note that many of theses crises are interwoven and have the potential to spill over borders leading to destabilization in regions or even continents.[184] This chapter examines how climate change can lead to destabilization in two high risk areas, the Middle East and Africa, presenting a security challenge to Canada and the international community.

Middle East

Over the past 60 years the Levant, consisting of Syria, Lebanon, Israel, Jordan and the occupied Palestinian territory, has experienced incessant violent conflict.

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[183] M. Boko, *et al*, *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, U.K.: Cambridge University Press, 2007, 433-467.

[184] A United Kingdom Ministry of Defence document, *Strategic Trends 2030*, contends that water and food scarcity and regional conflict could lead Africa to becoming a failed continent.

Although the 1993 Oslo Peace Accords and the 1994 Jordan-Israel Peace Treaty offered some optimism that a region beset by constant violence could become peaceful, it is unlikely that the conflict will end soon. "A history of conflict and mistrust between and within countries, the ongoing occupation of Palestinian territory and the Golan Heights and periodic hostilities" suggest that the prospect of a lasting peace is still untenable.[185] Climate change will further aggravate the situation.

The Middle East is considered to be the most water-scarce region on the planet.[186] Throughout much of the region, supply cannot keep pace with demand and climatologists predict that climate change will exacerbate the problem. Increasing temperatures in the range of 2.5 to 3.7 degrees Celsius in summer and 2.0 to 3.1 degrees Celsius in winter months mean that the region will become much hotter by the mid 21st century.[187] Warmer temperatures will increase variability in precipitation and cause a rise in global sea levels. There is also a greater likelihood of unpredictable weather events such as extreme rainstorms.[188]

The consequences of these changes will be especially harsh. The combination of less rainfall and warmer temperatures will significantly reduce the flow of rivers and streams. The Euphrates River is expected to decrease by 30 percent while the Jordan

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[185] Oli Brown and Alec Crawford, *Rising Temperatures, Rising Tensions: Climate Change and the Risk of Violent Conflict in the Middle East* (Winnipeg, Manitoba: International Institute for Sustainable Development, 2009), 6.

[186] United Nations Development Program, *Human Development Report 2006 Beyond Scarcity: Power, Poverty and the Global Water Crisis* (New York: U.N., 2006), 135.

[187] R.V. Cruz, *et al*, "Asia," in *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, U.K.: Cambridge University Press, 2007).

[188] *Ibid*.

River will be reduced to 20 percent of its current capacity by 2100.[189] This means that water supplies for the region could be reduced by 60 percent before the end of the century.[190] Declining precipitation will also affect agriculture. As farmlands become more arid, crop yields will inevitably decrease and there will be a greater need for water for irrigation. If temperatures increase as little as 1.5 degrees Celsius, climatologists anticipate that the Mediterranean climate zone would shift 300-500 kilometers north, "making the region as a whole more arid."[191] In addition to increasing coastal erosion, a rise in sea level will impact drinking water in the region. The Gaza coastal aquifer provides potable water for 1.5 million Palestinians and would be compromised by sea-water intrusion.[192]

Of the five countries in the Levant, Jordan, Israel and the occupied Palestinian territory currently experience water scarcity.[193] As populations continue to grow exponentially over the next decades, however, demand is expected to outpace supply leading to widespread water shortages. By 2050, the population in the Levant will swell from 42 to 71 million people.[194] The occupied Palestinian territory will more than double

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[189] V. Mrasek, "Climate Change Threatens the Cradle of Civilization," *Der Spiegel*, April 16, 2008.

[190] Israel, Ministry of Environment, *Climate Change: Israel National Report under the United Nations Framework Convention on Climate Change, Impact, Vulnerability and Adaptation* (Jerusalem: Israeli Ministry of Environment, 2000).

[191] L. Freimuth, *et al*, *Climate Change: A New Threat to Middle East Security*. Amman: Friends of the Earth Middle East, 2007, 13.

[192] Brown and Crawford, *Rising Temperatures*…9.

[193] *Ibid*., 11.

[194] United Nations Population Fund, *State of the World Population 2008: Reaching Common Ground-Culture, Gender and Human Rights* (Geneva: United Nations Population Fund, 2008).

in population while Syria will see an increase of 70 percent or nearly 15 million people.[195]

What further complicates the issue of water availability in the region is the fact that the majority of the water is transboundary. Much of the water for Jordan, Israel and the occupied Palestinian territory is provided by the Jordan River.[196] This river receives much if its water flow from tributaries in Syria and Saudi Arabia.[197] In the case of Syria, "more than four-fifths of the renewable water resources….originate from outside of its borders."[198] Syria also shares the Azraq Aquifer with Jordan.[199] Three basins of the Mountain Aquifer are shared by the West Bank of the occupied Palestinian territory and Israel, "eighty percent of the natural replenishment of the aquifer takes place within the West Bank, but…the majority of water withdrawal takes place in Israeli territory, in addition to the water use by settler communities inside the West Bank."[200] The only source of potable water for the 1.5 million Palestinians living in Gaza is also shared with Israel.[201]

Access to water also poses a source of frustration to countries in the Levant. There is uneven access to water and this most pronounced for the Palestinians. A study by the World Bank noted that Israelis "have access to four times more water than the

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[195] *Ibid*.

[196] Freimuth, *et al*, *Climate Change*…8.

[197] *Ibid*., 9.

[198] N. Raphaeli, "Potential Water Conflicts in the Middle East," *Capitol Hill Briefing*, June 6, 2007.

[199] Freimuth, *et al*, *Climate Change*…9.

[200] *Ibid*., 9.

[201] *Ibid*., 9.

Palestinians" and that Israeli restrictions have "impaired Palestinian access to water resources, infrastructure development and utility operations."[202] Israeli military administration of water resources combined with imposed limitations on the digging of wells by Palestinians has "limited the development of self-supply of water to the Palestinians while demand has increased."[203]

It is clear that there is currently not enough water available within the Middle East to satisfy the internal domestic, agricultural and other needs of each country, not to mention the demands of any transboundary agreements. Tensions over scarce resources are already evident in the region and the impacts of climate change will likely exacerbate the situation.

The notion that a war over water could erupt in the Middle East is not new.[204] Not unlike oil, throughout the Middle East "water is a strategic commodity with a surplus in some countries and a deficit in others."[205] In addition to being a basic necessity for survival water is a critical requirement for agriculture and industry. The importance of water to the Middle East was underscored by King Hussein who warned that "water is the one issue that could drive the nations of this region to war."[206] Cognizant of the importance of water for sustainable development and the maintenance of their country's

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[202] World Bank, *West Bank and Gaza, Assessment of Restrictions on Palestinian Water Sector Development, MENA Region* (Washington, D.C.: World Bank, 2009).

[203] E. Weinthal and A. Marei, "One Resource Two Visions: The Prospects for Israeli-Palestinian Water Cooperation," *Water International* vol. 27, no. 4, December 2002.

[204] A. Wolf, *et al*, "Peace in the Pipeline," *BBC News*, February, 13, 2009.

[205] Raphaeli, "Potential Water Conflicts…

[206] National Environmental Trust, *Global Warming in the Middle East and Central Asia* (Washington, D.C.: 2005), 19.

domestic stability, however, Middle Eastern governments have continuously made strong efforts to achieve agreements over water. In fact, water has been a central theme to all peace talks since the 1950s and is often the deciding factor. The unresolved issue of water access impeded the 2000 Israeli-Syria peace negotiations.[207] Because the Israeli government and the Palestinian authority cannot reach an agreement over the contentious water rights issue, it is unlikely that tensions will subside until a final agreement is reached on the Palestinian state.[208]

Brown and Crawford contend that because climate change will aggravate the existing problems of water scarcity in the Middle East, there is an increased likelihood of regional security implications. First of all, they suggest that climate change will make it increasingly more difficult for countries to satisfy their obligations of water sharing agreements.[209] During a record-setting drought in 1999 Israel declared that it could have difficulty honoring its obligation to provide water to Jordan.[210] Although a compromise was achieved, tensions had elevated between the two nations and could have had severe ramifications for peace and stability in the region. As climate change is expected to further reduce water availability in the coming decades it is plausible that hostilities could erupt if a solution amenable to both parties cannot be found.

Given that the success of peace agreements in the region has been contingent on water issues, climate change also has the potential to hinder future negotiations.[211]

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[207] K.Y.Oweis, "Syria Seen Keen on New Peace Talks with Israel," *Reuters*, 2009.

[208] Brown and Crawford, *Rising Temperatures*…21.

[209] *Ibid*., 21.

[210] *Ibid*., 21.

Currently, neither Israel and Lebanon nor Israel and Syria have any formal water agreements or peace treaty.[212] Turkey, Syria and Iraq continue to have heated discussions about the division of waters in the Euphrates River.[213] If the future supply of water decreases and demand outstrips supply, the willingness of concerned parties to reach a water sharing agreement will be tested and countries may consider the use of violence to secure scarce resources.

Another way that climate change could contribute to regional instability in the Middle East is by affecting food security. Warmer temperatures, reduced rainfall and drought will significantly reduce agricultural yields. The United Nations Food and Agriculture Organization estimates that crop yields could decrease by 25 to 35 percent if temperatures increase three to four degrees Celsius.[214] With agriculture consuming 84 percent of the demand for water in the region, food security is a key political concern.[215]

It is important to note however, that the Middle East is largely dependant upon imports for its food supplies. Allan noted that the Middle East has not been able to produce enough food for its strategic needs since 1970.[216] Although all countries in the region import more food than they export, relatively low food prices has meant that this

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[211] *Ibid*., 21.

[212] Freimuth, *et al*, *Climate Change*…18.

[213] Brown and Crawford, *Rising Temperatures*…21

[214] Cited in Euro-Med, *Integrating the Climate Change Dimension into Water Resources Management in the Mediterranean*, October, 29, 2008.

[215] E. Bou-Zeid and M. El-Fadel, " Climate Change and Water Resources in Lebanon and the Middle East," *Journal of Water Resources Planning and Management* (September/October 2002).

[216] J.A. Allan, "Virtual Water Eliminates Water Wars? A Case Study from the Middle East," *Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade, Value of Water*, Research Report Series no. 12 (Netherlands: UNESCO, 2003).

has been a financial burden that governments could bear.[217] However, climate change has the potential to drastically affect world agricultural production resulting in greater price volatility. The Intergovernmental Panel on Climate Change (IPCC) warns that the implications of climate change for world food prices are clear: "decreased climatic stability will be associated with more frequent spikes in food costs, especially as the increase in extreme events coincides with a decrease in overall climate predictability."[218]

If climate change results in higher international food prices at the same time as crop yields decrease, this could spark tensions in the Middle East. Because the ability to produce food is inevitably linked to land ownership, climate change could intensify the "highly emotive issue of the return or retention of occupied land."[219] As Gwynne Dyer noted, "eating regularly is a non-negotiable activity and countries that cannot feed their people are unlikely to be reasonable about it."[220] Domestic food shortages could prove to be a catalyst for Syria or the Palestinian Authority to use military force to secure what they perceive to be occupied lands.[221] Food security could also be a key consideration in Israel's decision whether to withdraw from the West Bank and the Golan or use military force to retain control.[222]

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[217] *Ibid*.

[218] S. Solomon, et al, *Climate Change 2007: The Physical Science Basis*, *Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (New York: Cambridge University Press, 2007).

[219] Brown and Crawford, *Rising Temperatures*…23

[220] Gwynne Dyer, *Climate Wars* (Canada: Random House, 2008), 106.

[221] Brown and Crawford, *Rising Temperatures*…23.

[222] *Ibid*., 23.

Africa

Another region where the impacts of climate change may lead to regional destabilization is Africa. Garcia notes that there are three main reasons why Africa is one of the most vulnerable continents to climate change. To begin with, Africa's physical location has made it prone to habitually warm temperatures and inconsistent rainfall. As well, the continent possesses large areas of land with poor infertile soil or floodplains.[223] Irrespective of the impacts of climate change, the Sahelian climate can be described as "perhaps the most dramatic example of climatic variability that we have quantitatively measured anywhere in the world."[224] Second, the majority of Africa's economies are intricately linked to climate and thus sensitive to climate fluctuations.[225] Agriculture, for example, accounts for 55 percent of the total value of all African exports.[226] Third, the nature of Africa's socio-economic circumstances: widespread and deeply entrenched poverty; lack of good governance; poor economic development; conflicts; and limited financial and institutional capacities combine and present Africa with an insurmountable challenge of having to cope with the impacts of climate change.[227]

Africa is also experiencing rapid population growth and urbanization. The United Nations Population Fund estimates that Africa's population will double from 987 million

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[223] D. Garcia, "The Climate Security Divide: Bridging Human and National Security in Africa," *The African Security Review* 17:3 (2008): 2-17.

[224] S.P.J. Batterbury and A. Warren, "The African Sahel: Twenty Five Years After the Great Drought," *Global Environmental Change* 11 (1), 2001: 10.

[225] Garcia, 2-17.

[226] Oli Brown and Alec Crawford, *Climate Change and Security in Africa: A Study for the Nordic-African Foreign Ministers Meeting* (Winnipeg, Manitoba: International Institute for Sustainable Development, 2009), 12.

[227] Garcia, 2-17.

to nearly two billion people by the mid 21st century.[228] That means that 22 percent of the global population will be exposed to the effects of climate change in Africa. More and more Africans are moving to urban centers and by the year 2050, 1.2 billion Africans will be city dwellers.[229]

Academics have noted that Africa's history of ethnic, political and resource conflicts combined with its significant reliance on climate-dependant sectors are compelling indicators that the continent is at high risk of conflict due to the impacts of climate change.[230] The Report of the Commission for Africa concluded that "Africa has experienced more violent conflict than any other continent in the last four decades."[231] A study by the Human Security Centre remarked that sub-Saharan Africa is the area where the majority of the world's armed conflicts currently occur and that "at the turn of the 21st century, more people were being killed in this region than in the rest of the world combined."[232] As the following sections will demonstrate, the impact of climate change on water availability and agricultural production has the potential to generate a degree of conflict that parts of Africa could experience significant destabilization.

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[228] United Nations Population Fund, *State of the World.*.

[229] UN-HABITAT, *The State of African Cities: A Framework for Addressing Urban Challenges in Africa* (Nairobi: UN-HABITAT, 2008).

[230] Oli Brown and Alec Crawford, "Climate Change: A New Threat to Stability in West Africa? Evidence for Ghana and Burkina Faso," *African Security Review* vol.17 no.3 (September 2008): 39-57.

[231] Commission for Africa, *Our Common Interest: Report of the Commission for Africa*, London, 2005.

[232] Human Security Centre, *War and Peace in the 21st Century: Human Security Report 2005*, Human Security Report Project (University of British Columbia: Oxford University Press, 2005).

One of the biggest challenges for African countries is access to a reliable supply of potable water. Persistent drought and frequent flooding affects between 25 and 35 percent of all Africans.[233] Climate change will cause temperatures to increase from 2 to 6 degrees Celsius by the end of the century.[234] Because the continent consists of seven distinct climate zones,[235] climatologists cannot predict precipitation amounts accurately. In short, rainfall amounts will vary across the continent and be unpredictable from one season to the next. This extreme variability in rainfall has resulted in numerous natural disasters. African nations that received too little rain such as the Sahel region between 1960 and 1990 and Mozambique in 2000 and 2001 experienced devastating droughts.[236] When a nation received too much rain such as Ethiopia in 2006 and Ghana in 2007, the end result was widespread flooding.[237]

The IPCC remarked in 2007 that "climate change and variability are likely to pose additional pressures on water availability and accessibility in Africa."[238] Because many regions in Africa share transboundary rivers, [239] reduction in the availability of water is

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[233] M. Boko, *et al*, *Climate Change 2007…*

[234] M. Hulme, "Climatic Perspectives on Sahelian Desiccation: 1973-1998," Global *Environmental Change* 11: 19-29.

[235] The seven different climatic zones are: tropical rainforest; tropical wet and dry; tropical dry; mountain; Mediterranean; middle latitude dry; and humid subtropical. See S. Erikson, K. O'Brien and L. Losentrater. "Climate Change in Eastern and Southern Africa: Impacts, Vulnerability and Adaptation." *Global Environmental Change and Human Security*, Report 2008.

[236] Brown and Crawford, *Climate Change and*...10.

[237] *Ibid*., 10.

[238] M. Boko, *et al*, *Climate Change 2007.*

[239] Twenty-five transboundary rivers supply water to 17 West African countries; the Nile Basin extends over 10 countries; and the Nubian Aquifer is shared by four countries. See M. Boko, *et al*, *Climate Change 2007.*

likely to be a cause for tension and conflict. The likelihood of conflict increases if river basins are shared.[240] In Africa, nine river basins including the Nile present a high risk for regional conflict. Shared by ten countries, the Nile Basin has been the source of angry political rhetoric from Sudan, Egypt and Ethiopia. Population growth and climate change have placed new demands on the limited supply of water. When Sudan announced it intended to secure additional water from the Nile to irrigate the Sahel, Ethiopia responded that the activity would provoke a military response. In a similar fashion, Egypt threatened that any attempt by either Ethiopia or Sudan to interfere with the flow of the Nile River would be dealt with by military action.[241]

Food insecurity is another African challenge that could generate regional conflict. More than 200 million African people in 25 different countries were affected by food shortages in the last decade.[242] It is interesting to note that despite a doubling of world food production from 1961 to 2003, Africans have not been able to grow enough food to support the continent's high population growth.[243] Because food production is susceptible to climate fluctuations, it is clear that the effects of climate change will further exacerbate the problem. Climate change is expected to increase the prevalence of arid and semi-arid

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[240] N. P. Gleditsch, *et al*, "Conflicts Over Shared Rivers: Resource Scarcity or Fuzzy Boundaries?" *Political Geography* 25 (4): 361-382.

[241] Kurt M.Campbell, *et al*, *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change*. Washington, D.C.: Center for Strategic and International Studies, Center for New American Security, 2007; available from http://csis.org/files/media/csis/pubs/071105_ageofconsequences.pdf; Internet; accessed 10 November 2009.

[242] Michael Bernard Kwesi Darkoh, "Desertification: The Scourge of Africa,"; available from http://desertification.wordpress.com/2007/10/06/desertification-the-scourge-of-africa-google-alert-environment-south-africa/; Internet; accessed 29 March 2010.

[243] German Advisory Council on Global Change, *World in Transition: Climate Change as a Security Risk* (Berlin: German Advisory Council on Global Change, 2007), 94.

conditions resulting in a loss between 50 and 90 million hectares of productive agricultural land.[244] Many countries such as Egypt, Kenya, Nigerian and Guinea rely on more than 75 percent of coastal agricultural land for their food production. Given that sea levels are expected to rise in the coming decades, crop yields will be adversely affected.

In Africa, climate change is only one factor that affects food security. Poor governance, widespread poverty and inequity among countries are also contributing factors. Nevertheless, climate change may prove to be the catalyst to spark conflict. A report issued by the United Nations Environment Program warned that "a succession of new wars across Africa" could erupt if nothing is done to help developing countries cope with climate change.[245] Homer-Dixon contends that food shortages could trigger regional crises or even generate destabilization or violent conflict.[246] Others have argued that the likelihood of conflict in sub-Saharan African countries increases as reductions in per capita food production approach 12 percent.[247] The past experiences of violent conflict in Darfur, Northern Nigeria, Kenya and Sudan are illustrative of what can happen when climate change affects food supply.[248]

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[244] Brown and Crawford, *Climate Change and*...16.

[245] United Nations Environment Program, *Sudan: Post-Conflict Environmental Assessment* (Nairobi, UNEP, 2007).

[246] Thomas Homer-Dixon, J. Bouthwell and G. Rathjens, "Environmental Change and Violent Conflict," *Scientific American* 268, 1993, 8.

[247] A. Nyong and C. Fiki, "Drought Related Conflicts, Management and Resolution in the West African Sahel," 2005.

[248] It is important to note that climate change alone does not explain the outbreak or extent of violence but it played major role in intensifying grievances because it meant there was less land for herding and farming. See Karim Hussein, James Sumberg and David Seddon, "Increasing Violent Conflict Between Herders and Farmers in Africa: Claims and Evidence," *Development Policy Review*, 1999.

CHAPTER 5 - NON-LINEAR RESPONSES

So far this essay has focused on the potential security implications of a linear progression of climate change such as a gradual rise in global temperatures. The risk of additional changes in the climate system increases however, when global warming climbs beyond 2-3 degree Celsius.[249] These changes or non-linear responses are known as tipping points. Tipping points refer to "the behavior of the climate system when a critical threshold has been crossed resulting in runaway changes that are difficult to bring under control."[250] Broad-scale parts of the Earth's system capable of triggering such instability are called "tipping elements."[251] Examples of "tipping elements" include the West Antarctica and Greenland ice sheets. It is plausible that as global temperatures climb beyond 2-3 degrees Celsius, the critical threshold for the melting of the ice sheets would be crossed. Rahmstorf notes there is historical evidence that the climate system can experience such drastic and rapid changes.[252] It should be emphasized however, that non linear responses are generally difficult to predict and there has not been much research conducted to date.[253] Despite this uncertainty however, it would be prudent to consider the possible impacts of abrupt climate change when making an assessment of the security

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[249] German Advisory Council on Global Change, *World in Transition: Climate Change as a Security Risk* (Berlin: German Advisory Council on Global Change, 2007), 72.

[250] *Ibid*., 72.

[251] T.M. Lenton, "Tipping Elements in the Earth's Climate System," *Proceedings of the National Academy of Sciences (USA)* 105: 1786-1793.

[252] S. Ramstorf, "Ocean Circulation and Climate During the Past 120 000 Years," *Nature* 419: 207-14.

[253] Research has improved over the past several years. See T.M. Lenton, "Tipping Elements…; J.M. Gregory and P. Huybrechts, "Ice-Sheet Contributions to Future Sea Level Change." *Philosophical Transactions of the Royal Society of London*, Series A 364: 1709-1731.

implications of climate change for Canada. This chapter will explore some of the non linear responses of climate change that could have global consequences such as collapse of the thermohaline circulation and loss of glacial and permafrost stability.

Collapse of Thermohaline Circulation

Research conducted by the United States National Academy of Sciences suggests that change to the earth's climate system such as increased warming could trigger abrupt and dramatic events within the span of a decade with effects lasting for decades or centuries.[254] It noted that the destabilization to the climate system presently caused by human-induced greenhouse gas emissions increases the probability of abrupt climate events, "available evidence suggests that abrupt climate changes are not only possible but likely in the future, potentially with large impacts on ecosystems and societies."[255] Abrupt climate change "refers to a large shift in climate...such as marked changes in average temperature over a large area such as a country or a continent that takes place so rapidly and unexpectedly that human systems have difficulty adapting to it."[256]

Thermohaline circulation has a significant role to play in determining global climate.[257] During a period known as the "Younger Dryas" that lasted for 1300 years, a disruption of the thermohaline circulation caused such frigid temperatures that ice bergs

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[254] United States Academy of Sciences, National Research Council Committee on Abrupt Climate Change, *Abrupt Climate Change: Inevitable Surprises* (United States: National Academy Press, 2002).

[255] *Ibid*.

[256] *Ibid*., 564.

[257] For an explanation see Pew Centre on Global Climate Change, "The Day After Tomorrow: Could it Really Happen?"; available from http://www.pewclimate.org/dayaftertomorrow.cfm; Internet; accessed 10 April 2010.

extended as far south as the coast of Portugal.[258] There is speculation that a slow down of the thermohaline circulation was a contributing cause to the "Little Ice Age" that inflicted extreme climatic conditions on much of North America and Europe in the period 1300 to 1850. The impacts of climate change included food scarcity, disease and mass migration. One historian noted, "the Little Ice Age was a chronicle of human vulnerability in the face of sudden climate change."[259] In Ireland, more than 1.5 million died of famine and disease while another million people emigrated. Social unrest, looting and criminal violence throughout Europe prompted governments to deploy militias to restore order.[260]

Increased rainfall and glacier melting caused by climate change has already begun disrupting the thermohaline circulation.[261] A massive inflow of freshwater from the Greenland ice sheet would add further disruption. The International Climate Change Taskforce declared that if average global temperatures were to rise more than 2 degrees the risk of abrupt climate change would increase, " [with] possibilities [that] include reaching climatic tipping points leading for example to the loss of the West Antarctic and Greenland ice sheets [and] …the shutdown of the thermohaline ocean circulation."[262]

It is difficult to predict whether the thermohaline circulation will shut down because it is based on the rate and level of temperature increase. Moreover, there are no

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[258] Robert B. Gagosian, "Abrupt Climate Change: Should We Be Worried?", Woods Hole Oceanographic Institution,; available from http://www.whoi.edu/page.do?cid=9986&pid=12455&tid=282; Internet; accessed 10 April 2010.

[259] Brian Fagan, *The Little Ice Age: How Climate Made History 1300-1850* (Santa Barbara, University of California: Basic Books, 2000).

[260] *Ibid*.

[261] Gagosian, "Abrupt Climate Change…

[262] International Climate Change Task Force, *Meeting the Climate Challenge: Recommendations of the International Climate Change Task Force*, 3.

scientific models that can accurately predict how increases in global temperatures affect the thermohaline circulation although there are indications of a significant reduction before mid-century.[263] Some scientists have suggested there is a 50 percent probability that the Atlantic thermohaline circulation could collapse on the basis of current greenhouse gas emissions.[264] In short, there is still considerable uncertainty whether or not the thermohaline circulation will collapse this century. What is relevant to this paper however, is the understanding that should such an event occur, the consequences for Canada would be significant. The effects of the 1998 Ice Storm was limited to parts of three provinces. An abrupt climate change event could affect the entire country, perhaps all of North America.

Loss of Glacial Stability

One of the truest observations of climate change is glacier melting. As seen in an earlier chapter, temperatures in the Arctic are rising nearly twice as much as the remainder of the planet. Earlier predictions of an ice free Arctic by mid century are no longer valid. Recent studies anticipate that the ice could be completely gone as early as four decades sooner. There are indications that the Greenland ice cap and West Antarctica ice sheet will also experience increased melting. As the following paragraphs will demonstrate, loss of glacier stability could have serious implications.

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[263] Masao Fukasawa, *et al*, "Bottom Water Warming in the North Pacific Ocean," *Nature* 427 (6977), 2004; L. Delworth and Keith W. Dixon, "Implications of the Recent Trend in the Arctic/North Atlantic Oscillation for the North Atlantic Thermohaline Circulation, *Journal of Climate* 13 (21), 2000.

[264] M.E. Schlesinger, "Assessing the Risk of a Collapse of the Atlantic Thermohaline Circulation," in *Avoiding Dangerous Climate Change* (Exeter, U.K.: Meteorological Office, 2006).

Chapter one explained that global climate is determined by a balance between the amount of solar energy that arrives at earth and the percentage that is reflected back as infrared radiation by aerosol particles, clouds or reflective surfaces such as polar ice and snow. Polar ice functions as the "earth's air conditioner".[265] As the ice melts however, the effectiveness of the air conditioner lessens and more heat will be absorbed by the earth. And as seen earlier, with more fresh water disrupting ocean currents, there is an increased likelihood of abrupt climate change.

The melting of glaciers creates another significant concern - a higher probability of rapidly increased sea levels. Gregory and Huybrechts have suggested that the Greenland ice cap could disappear before the end of the century, leading to a sea level rise of seven meters over the course of several hundred years.[266] Other analysts contend that the West Antarctica ice sheet could also melt but it would have to cross a threshold of higher global temperatures.[267] A modest increase of 0.5 meter would result in a dramatic increase in the frequency of storm surges and high tides. Events that currently occur once every hundred years would take place two to three times per year.[268] Such a dramatic increase in the number of events could overwhelm states' capabilities to cope. This could result in greater strain on resources and force more populations to migrate.

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[265] GlobeandMail.com, "Global Warming Worst in Arctic, Report Says", November 8, 2004; available from http://www.ghgx.org/html/news/news_archive/041108_G&M_Arctic_Report.pdf; Internet; accessed 10 April 2010.

[266] J.M. Gregory and P. Huybrechts, "Ice-Sheet Contributions to Future Sea Level Change," *Philosophical Transactions of the Royal Society of London*, Series A 364: 1709-1731.

[267] T.M. Lenton, "Tipping Elements in the Earth's Climate System," *Proceedings of the National Academy of Sciences (USA)* 105: 1786-1793.

[268] Antarctic Climate and Ecosystems Cooperative Research Center (ACE CRC), *Position Analysis: Climate Change, Sea-Level Rise and Extreme Events: Impacts and Adaptation Issues* (Hobart, Tasmania: ACE CRC, 2008).

Loss of Permafrost Stability

In addition to melting ice in Polar Regions, there has been clear evidence that permafrost is losing its stability. This presents a significant danger because greenhouse gases such as methane, nitrous oxide and carbon dioxide which were once trapped will be released into the atmosphere. Estimates of how much gas is actually contained in the permafrost are not definitive; however, it is believed to be a substantial amount. The latest estimate conducted in 2009 is 1.672 billion tonnes which is nearly twice the amount of carbon currently in the atmosphere.[269] Given the vastness of permafrost in northern altitudes and the incidence of accelerated warming in northern regions, release of huge amounts of harmful greenhouse gas could be widespread and rapid. As the IPCC does not consider these gases as part of its estimate for future temperature, it is clear that the doubling of emissions in a short time span could rapidly accelerate global temperatures.

The lesson to be drawn from this chapter is that there is a probability, albeit a low one, that climate change could take place faster than scientists have predicted. If the right conditions that result in loss of glacial or permafrost stability or the collapse of the thermohaline circulation are satisfied, the consequences would be devastating.

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[269] C. Tarnocai, "Soil Organic Pools in the Northern Circumpolar Permafrost Region," *Global Biogeochemical Cycles*, in press.

CONCLUSION

From its humble origins as an environmental issue of peripheral concern in the waning years of the Cold War, climate change has emerged as a legitimate security threat in the 21st century. Based on the findings of the Intergovernmental Panel on Climate Change (IPCC) and research conducted since the release of the Fourth Assessment Report (FAR), it is clear that human activities play a significant role in climate change. Moreover, climate change is expected to continue for several centuries and have profound impacts throughout the world.

Although the effects of climate change will vary greatly, exposure to the risks of destabilization and conflict will not be shared equally among the states and regions of the world. Whether climate change will pose a security threat to a state is largely based on its ability to adapt and resolve the issues of climate change. Canada will experience warmer temperatures and an increase in extreme weather events. Although this may lead to increased water scarcity, drought, flooding and an increase in disease, Canada is a wealthy country and has a proven record of overcoming these events. This essay has argued that although climate change will not pose an existential threat to Canada, it will create some potential security implications.

First, climate-induced migration is a potential security implication. Canada can expect to see a fourfold increase in the number of immigrants who want to move to the state. Many of the states that traditionally source immigrants to Canada such as Pakistan, India, China, Philippines and Sri Lanka are expected to suffer the greatest consequences of climate change. However, because Canada does not have the capacity to screen the current number of applicants it receives, this added burden will likely increase the

probability that criminals or terrorists could gain access. Canadian politicians have also supported high immigration levels because they see immigrants in terms of votes other than as potential terrorists. Despite the fact that the terrorist group Babar Khalsa had been implicated in the 1985 Air India bombing, the Liberal government did not place the organization on the terrorist list because they did not want to alienate the support of the large and growing Sikh community who were well known to be supporters of the federal Liberal Party. Members of the Tamil Tiger terrorist group were able to gain easy access to Canada because the federal government granted automatic immigrant status to anyone who declared they were a Tamil from Sri Lanka. Of greater concern is the fact that none of the immigrants had to prove they were from Sri Lanka. Canada's inability to conduct full time surveillance of its world's longest coastline offers opportunities for illegal immigrants to gain access. If the swell of climate refugees prompts Canada to restrict its immigration policies, it is likely that individuals will try to enter the state illegally. This provides another avenue for criminals or individuals with ties to terrorist organizations to access Canada.

Climate-induced immigration has the potential to create instability with the international system by testing the cohesion of political organizations such as the European Union. In addition to the pressures of accommodating climate refugees from within Europe, climate change will likely force Muslim populations from Africa and Asia to seek refuge in West European states. The European Union has experienced difficulties with the integration of Muslims and this had led to violent riots and social upheaval. Further anti-immigrant backlash could destabilize the European Union which is seen as a source of stability in the region.

The spread of infectious disease is the second potential security implication of climate change for Canada. As climate change leads to shorter winters in Canada, there is an increased likelihood that carriers of disease will settle and for longer periods. The combined effects of globalization and climate change will facilitate the transit of disease from states that source immigrants to Canada. Many of these areas are predicted to see a pronounced increase in malaria and dengue. Because climate change is likely to contribute to the evolution of new diseases, it is plausible that severe social disruption could result if the national health system becomes overwhelmed by the demands of an unforecasted pandemic.

Next, an ice-free Arctic could generate potential security implications for Canada such as increased Arctic access by foreign nations, competition over vast natural resources and the potential for regional instability. With the Northwest Passage predicted to be ice-free by 2013, increased traffic is highly probable. However, because neither the RCMP nor the Navy can conduct full time surveillance, an ice-free Arctic could facilitate the entry of criminals, illegal immigrants or even terrorists. The Arctic is believed to have an abundance of oil, gas and mineral reserves. Maritime boundary disputes delineating ownership of these valuable resources have not been resolved and some countries like Russia have exchanged angry rhetoric with Canada and other NATO states. While it is unlikely that a resource war will occur, it is possible that given the potential for mistrust, small incidents could spiral out of control into larger confrontations creating potential security implications for Canada. The possibility of conflict with other states over diminishing natural resources is a potential security concern, albeit a minor one. The opening of the Arctic passageways will likely result in the transit of foreign warships and

commercial vessels. Because both the United States and Russia view the Arctic as strategically important, there is an increased likelihood that misunderstandings or accidents could trigger defensive actions that are interpreted as belligerent by foreign states. This could have severe implications for international peace and stability.

Climate change could also lead to destabilization in high risk areas such as the Middle East and Africa, presenting a security challenge to Canada and the international community. Water is already scarce in the Middle East and climate change will make it more difficult for states to honor their water-sharing agreements. This could lead to hostilities if states can not find solutions that are amenable to all parties. Moreover, because past peace agreements have been contingent on water sharing, it is plausible that as water supplies decline, the willingness of states to reach an agreement will be tested and states may consider violence to secure scarce resources. Food security will also be affected by climate change and this could contribute to regional instability. Food production is inevitably linked to land ownership and domestic food shortages may prove to be a catalyst for states such as Syria or the Palestinian Authority to use military force to secure occupied lands.

Like the Middle East, water scarcity and food shortages caused by climate change could destabilize the region. Many African states depend upon transboundary rivers for their potable water. Increased demand due to climate change and high population growth could trigger military conflicts. Violent conflict among states is also possible as a result of the demands of food shortages.

This essay also explored the non linear responses of climate change. While the melting of the West Antarctica and Greenland ice sheets and the collapse of the

thermohaline circulation are seen as low probability events, the global consequences of such events would be significant.

Greenhouse gas emissions are a key contributing factor to climate change. While the effects of climate change can not be undone, reducing the amount of emissions will go a long way to minimizing further impacts. Climate change is a shared threat; as one of the top ten emitters of greenhouse gas in the world,[270] Canada must join with the other states of the world to tackle this common challenge. As this essay has shown, failure to do so could have security implications.

[270] Jonathon Gatehouse, "Suddenly the World Hates Canada," *Macleans Magazine*, December 28, 2009, 20.

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