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MASTER OF DEFENCE STUDIES

THE IMPACTS OF GLOBAL WARMING ON MILITARY OPERATIONS

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CONTENTS

Table of Contents.....		2
1.	Introduction to Global Warming.....	4
2.	Understanding Global Warming.....	5
	a. A Definition	5
	b. The Evidence	7
	c. International Consequences	9
	Climate Changes and Power	11
	Climate Change and Scarcity of Resources	12
	Climate Change and Governments	13
3.	Global Warming From a Canadian International and Domestic Perspective.....	15
	a. Canadian and Military Impacts: the Past, Present and Future	15
	Canada’s Wealth of Natural Resources – Threaten	
	The International Scene Impacts on Canada	16
	The Canadian Arctic...Also Impacted	17
	Earlier Observations are Resurfacing	18
	The Impacts in the North and Potential Military Capabilities	19
	Global Warming Effects on Other Parts of Canada	
	Impacts on Military Operations – Focus on the Navy	20
4.	Global Warming from a US International and Domestic Perspective	21
5.	Global Warming as Seen From Other Parts of the World.....	23

a.	Australia	27
b.	New Zealand	28
c.	European Countries	29
6.	Global Warming and Canadian Policies.....	29
7.	Canada and the Military can Address Global Warming Impacts.....	30
a.	Global Warming – Not a New Issue	31
8.	Recommendations That Will Serve to Cope with Global Warming...	32
a.	Recognizing the Impacts of Global Warming in Planning	33 34
b.	Requirement to Recognize and Redefine the CF’ New Roles	35
c.	The Right Capabilities	
d.	Training and Interoperability	36
e.	An Essential Asset in Fighting Global Warming – Personnel	36 37
9.	Conclusion: Global Warming is no Fiction.....	
	Bibliography.....	37
		40

INTRODUCTION TO GLOBAL WARMING

Global warming has drawn a great deal of attention over the past number of years and especially since the presentation of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2 February 2007. This reality raises the urgent need to consider the true impact of global warming on Canadian military operations, particularly since global warming is not about to disappear any time soon. Today, there are unforgiving disasters, significant data, and events which have demonstrated the devastating effects of global warming on our environment. Those effects unfortunately bring about consequences which are for the most part irreversible and consequently bring instability and disturbance throughout the world. Failing to prepare for the obvious will place society at risk and the military in a position of defeat. Although some argue global warming has limited impact on Canadian and other nations' security, the fact is that those counter-arguments are non-scientific and contradicted by reliable studies which demonstrate global warming is changing the world ecosystem, hence provoking disasters whose consequences will end in adding an immense burden to various government departments, but particularly to the Canadian Forces (CF). While Canada has reached a point in history where it is attempting to adapt its National Security Policy to this new reality, global warming is occurring at such an accelerated rate that there might not be enough emphasis placed on the understanding of the effects of global warming on military operations. *So, is it possible that global warming whether internationally or domestically, will impact on military operations more than has ever been imagined, and that the military will be incapable of reacting effectively to a crisis because it will not have prepared its capabilities for such an eventuality?* It is therefore important to highlight that failing to recognize global warming trends raises serious concerns about Canada's capacity to defend its security and that of its allies.

This paper will demonstrate that global warming has international and domestic consequences, particularly on military operations (US and Canada). This situation may force the government of Canada to expand the role of the CF, as part of its National Security Policy and Defence Policy Statement, to meet the threat of global warming. For Canada to accomplish its goal, it will become necessary to allocate significant additional resources to an armed force, which over the past number of years has seen considerable decreases in its resource allocation, to the point where it is struggling even to meet its current demands.

To fully grasp the extent of the threat, this paper will define global warming, its impact on the planet, and how the problem is being observed and addresses around the world. By comprehending its nature, the government can quickly conclude that global warming is currently affecting and will continue to affect national security and Canadian sovereignty and that there will be an increased need for a continuous military presence abroad and at home. For many countries, including Canada, world peace and the well-being of developing nations is essential in assuring the security of our country. Therefore, Canada needs to support less affluent nations that are already suffering the effects of global warming tragedies, such as African nations like Somalia that have been

living with a deadly lasting drought, causing the starvation of thousands of people,¹ a proof that global warming is indeed affecting Canada and its military operations so as other Government Department (OGD) and is affecting the entire planet.

To place this subject in today's context, it is also essential to demonstrate how the Canadian military and Canada's allies have already been affected by global warming, both in a domestic and international context. Happily, relying on the data provided by the scientific community, future disasters requiring the involvement of the CF are predictable. Already the military forces of many nations have been involved with natural disasters such as hurricanes, heat waves, and droughts, which have resulted in diverting resources from other missions.

What is being done by Canada and other countries such as the United States (US) to address the current and future effects of global warming on military operations is unclear though. But it is still important to highlight what other countries do to address the impact of global warming. It is interesting that there is still much controversy at the center of this sensitive issue, and although the threat is very real, there are countries, such as the US, that have not signed the Kyoto protocol and that debate the validity of the studies on global warming. Even many of those who agree that global warming is an issue have down-played the problem, disclaiming the overwhelming scientific evidence as being alarmist and inaccurate. Focusing predominantly on the current threats of terrorism and weapons of mass destruction does not address Canadian security in its entirety, especially when the effect of global warming is such that the melting Canadian Arctic is fast becoming an invitation to those of ill intent. Further, the focus must also be placed not only on the melting of the Arctic but on the impacts of global warming in other parts of the country. Canadian sovereignty and security are of utmost importance to Canadians, and it is through a better understanding of global warming, which is presented in the following paragraphs, and its impact on the environment that government policy-makers can better define the future role of the CF. There are many challenges ahead for Canada as a result of global warming, and the CF must be fully prepared to face them head-on.

UNDERSTANDING GLOBAL WARMING

A Definition

To make an educated assessment of the impacts of Global Warming on military operations it is important to define what Global Warming is all about as it is a phenomenon that is not well understood by most people. Even the dictionary definition of the term – “global warming is an increase in the average temperature of the earth's atmosphere, especially a sustained increase sufficient to cause climatic change,² - only

¹ Editorial, “African Apocalypse: The Continent Burning into a Desert,” *The Independent*, October 29, 2006.

² *The American Heritage® Dictionary of the English Language*, 4th ed. (Houghton Mifflin Company).
http://www.bartleby.com/cgi-bin/tehis/webinator/ahdsearch?search_type=enty&query=global+warming&db=ahd&Submit=Search ; Internet; accessed 20 March 2007.

hints at its meaning. At least the Intergovernmental Panel on Climate Change (IPCC), which refers to climate change as “any change in climate over time, whether due to natural variability or as a result of human activity”³, highlights the role of mankind in the development of the problem. But global warming is more complex.

Global warming is the increase in temperature caused by the increased production of carbon dioxide (CO₂) and other greenhouse gases. The earth receives energy from the sun in the form of light waves, which heats up the planet’s surface. Under usual conditions, some of that energy gets radiated to the atmosphere in the form of infrared radiation, which gets trapped and helps to warm the planet. But the thin atmosphere becomes thicker with increased quantities of human-created CO₂, to the point where more and more infrared radiation is trapped, causing the temperature of the planet’s oceans and atmosphere to increase significantly.⁴ CO₂ emissions have been associated with an “increasing population that has been burning vast amounts of coal and fuel for most of this century.”⁵ Certainly, fuel is necessary to sustain human life, but burning fossil fuels such as coal, gas and oil and clearing rain forests that would otherwise help to filter much of the CO₂ from the air⁶ have dramatically increased the amount of CO₂ in the Earth’s atmosphere and the vast majority of scientists now agree that global warming is real and happening. Clearly, this naturally occurring phenomenon has been dramatically accelerated as a direct result of human activity. The evidence is overwhelming and undeniable. In fact, some astonishing data reveal that prior to 1990, atmospheric CO₂ had never reached 300 parcels per million. But, unfortunately, that level has now been surpassed and the scientific community predicts that it will increase considerably over the next 50 years. As a result, global surface temperatures have increased about 0.6° C since the late-19th century, with about 0.4° C of that occurring over the past 25 years.”⁷ The IPCC estimates that temperatures will continue to increase from 2-4.5°C. Further, the Panel highlights the fact that the temperatures in the past twelve years have been the warmest since 1850 with a predicted increase of 0.2°C per decade.⁸ In January 2007, prominent scientists moved the famous Doomsday Clock two minutes closer to midnight,

³ Intergovernmental Panel on Climate Change, “Climate Change 2007: The Physical Science Basis,” (Paris: February 2007), 2.

⁴ Al Gore, *An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do About It* (New York: Rodale Books, 2006), 26 and 27.

⁵ Patrice E. Greene, “Military Implications of Global Warming.” (Pennsylvania: UD Army War College), 2.

⁶ John Peterson, *The Road to 2015: Profiles of the Future*, (California: Waite Group Press, 1994), 82.

⁷ National Oceanic and Atmospheric Administration, “Global Warming: Frequently asked Questions,” 3, <http://www.ncdc.noaa.gov/oa/climate/globalwarming.html>; Internet; accessed 31 January 2007.

⁸ Intergovernmental Panel on Climate Change, 9.

to 2355 hours, to represent the threat of global warming as a worldwide cataclysmic danger. The clock was devised in 1945 by *The Bulletin of the Atomic Scientists*, after the US dropped its atomic bombs on Japanese cities, to address the instability of a nuclear age on humanity. At that time, it was set to 2353 hours, but the additional threat of global warming has incited the scientific group to move the clock closer to midnight.⁹

The Evidence

Although the warming of the planet has been generally uniform, there are some areas which have been impacted more than others; there are even variations within the geographic boundaries of Canada. Glaciers are melting, plants and animals are being forced from their habitats, and the number of severe storms and droughts is increasing dramatically. “Over the past 30 years, the annual average sea-ice extent has decreased by about 8%, or nearly one million square kilometers, an area larger than all of Norway, Sweden, and Denmark.”¹⁰ The immediate effect of such melting is the rise of sea level. In fact, if the trend of global warming is as predicted, that is, if global warming is not slowed down or eliminated, then the world could see the oceans rise by as much as three feet with considerable changes in the oceans circulation, resulting in significant climate changes. These changes have been associated with an increase in precipitation and river runoff of fresh water (e.g. from melting glaciers) to the oceans, which has destabilized the salinity balance required for normal circulation of the oceans. There are also climate models used by the Arctic Council which demonstrate that “warming over Greenland is likely to be of a magnitude that would eventually lead to a virtually complete melting of the Greenland Ice Sheet, with a resulting sea-level rise of about seven meters (23 feet).”¹¹ This predicted increase will cause the displacement of hundreds of millions of people worldwide, in major cities such as Beijing (20 million), Shanghai (40 million), and Calcutta and Bangladesh (60 million). In the US, major cities, such as Miami and Fort Lauderdale in Florida, would be completely submerged, as well as most of San Francisco. In the Netherlands, where a rise in sea levels would have an overwhelmingly destructive effect, architects have already been competing in the design and development of floating homes.¹²

There is clear evidence that the number of category-4 and -5 hurricanes has almost doubled in the last 30 years. The scientific community explains that this phenomenon is associated with the rise in ocean temperatures, which increase not only the frequency of storms, but also the intensity. Recent research suggests that, over the past thirty years, tropical cyclones have become twice as destructive. Cold water acts as

⁹ Molly Bentley, “Climate resets ‘Doomsday Clock’,” *BBC News*, <http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/6270871.stm>; Internet; accessed 17 January 2007.

¹⁰ Arctic Council, “Arctic Climate Impact Assessment: Highlights,” (Cambridge University Press, 2004), 3.

¹¹ *Ibid.*, 4.

¹² Gore, 80.

a brake for hurricanes, but global warming's effect on the heat of the ocean has created additional fuel to create powerful hurricanes out of otherwise harmless tropical storms.¹³ Hurricanes Katrina, Ivan and others were tremendously damaging, both in infrastructure and human life. The year of Hurricane Ivan also saw a record number of tornados in the US, and Japan experienced ten typhoons, also a record, up from a normal frequency of seven. In 2004, Brazil experienced its first hurricane, in an area of the world where climatic characteristics do not favour the creation of such phenomena. In 2005, Hurricane Emily and Dennis made news by damaging the world's largest oil platform in the Gulf of Mexico. What was the underlying cause of these natural disasters? Simply, they are associated with the increase of temperature; the warmer the temperature, the more the storms are nurtured and fueled, resulting in more powerful, more frequent, and more damaging storms.¹⁴ The effect is such that Canada is starting to directly feel the impacts of such disasters. For example, in Operation UNISON 2005, three Canadian ships – HMCS Athabaskan, HMCS Ville de Quebec, and the HMCS Toronto – were diverted from normal operations to assist US relief efforts in New Orleans following Hurricane Katrina.¹⁵

Another effect of global warming is an increase in rainfall which is more frequently coming in surges involving high volumes of water, resulting in extensive flooding in some areas. But heavy rainfall is not equally spread around the world, having tended to remain in selected areas. For example, Europe saw a considerable increase of precipitation in the northern part of the continent while the southern part of Europe saw a decrease.¹⁶ In India, 1000 deaths were associated with unusual flooding, while in China, some parts of the country suffered from flooding while others had to deal with serious drought, both of which resulted in a significant cost in human lives. Meanwhile, the rise in sea-level is causing the loss of coastal land at Rufisque, on the South Coast of Senegal. Darfur and Niger have also been suffering from severe drought, which has made the land unusable for agriculture. To make matters worse, Lake Chad, a major source of drinking water, is drying up, decreasing in size from 25,000 sq kms in 1963 to 1,350 sq kms today.¹⁷ It is easy to envision how these effects of global warming could impact on Canada and its military operations.

¹³ Thomas Hayden, "Super Storms: No end in sight," *National Geographic* (August 2006), 76.

¹⁴ Gore, 81, 82, and 89.

¹⁵ National Defence and the Canadian Forces, "Backgrounder: Canadian Forces Support to Relief Efforts in Southern United States," http://www.dnd.ca/site////////newsroom/view_news_e.asp?id=1739; Internet; accessed 26 January 2007.

¹⁶ Union of Concerned Scientists, "The Impact of Global Warming in Europe and Russia," <http://www.climatehotmap.org/euroruss.html>; Internet; accessed 23 January 2007.

¹⁷ Union of Concerned Scientists, "The Impact of Global Warming in Africa," <http://www.climatehotmap.org/africa.html>; Internet; accessed 23 January 2007. 1

Although the hurricanes, floods, droughts and record-breaking forest fires, such as those recently in Florida, Mexico, and Nicaragua,¹⁸ have been receiving much of the press, the evidence of global warming is found in almost all areas of nature and all parts of the planet. In Europe, butterfly ranges have shifted northward by up to 241 kms, birds have extended their ranges northward by 19 kms, toads, frogs, and newts are spawning ten days earlier than even 17 years ago, birds are laying eggs earlier, and growing seasons begin earlier and last longer.¹⁹ In Africa, the “Snows of Kilimanjaro” will disappear within 15 years, 92 percent of Mount Kenya’s largest glacier – the Lewis Glacier – has melted in the last century, malaria has expanded to higher altitudes in Kenya and Tanzania, already resulting in hundreds of deaths, and the coral reefs in the Indian Ocean have become bleached.²⁰ And in North America, dengue fever is spreading to higher elevations in Central America and has been found for the first time in the US,²¹ sea bird populations have declined in Alaska because of melting ice, mangroves are dying in Bermuda, twenty species of frogs and toads have disappeared from Costa Rica because of a reduction in dry-season mists, cherry trees are blossoming sooner in the US, and caribou have been dying off in the Canadian Arctic.²² The evidence is indisputable: global warming is having a significantly adverse effect on the normal functioning of the planet and will consequently impact on military operations as nations and OGD will not be in a position to address the consequences of such phenomenon alone.

International Consequences

The following paragraphs will provide examples that illustrate the direct influence global warming has on world stability. The consequences of global warming cannot be taken lightly since environmental changes have the capacity to be more destructive, for example, than weapons of mass destruction. Indeed it is a threat, no different than the threat of terrorism, according to former US Vice-President Al Gore, in his book and film *An Inconvenient Truth*.²³ Renowned mathematician and cosmologist, Stephen Hawking, supports this view: “Terror only kills hundreds or thousands of people. Global warming

¹⁸ Union of Concerned Scientists, “The Impact of Global Warming in North America,” <http://www.climatehotmap.org/namerica.html>; Internet; accessed 27 January 2007.

¹⁹ Union of Concerned Scientists, “The Impact of Global Warming in Europe and Russia,” <http://www.climatehotmap.org/euroruss.html>; Internet; accessed 23 January 2007.

²⁰ Union of Concerned Scientists, “The Impact of Global Warming in Africa.” 2.

²¹ Judith Randall, “A Paradise for Pathogens – Almost Everywhere,” *USIA Electronic Journals* 1, no. 17 (November 1996), <http://usinfo.state.gov/journals/itgic/1196/ijge/gj-4.htm>; Internet; accessed 27 January 2007.

²² Union of Concerned Scientists, “The Impact of Global Warming in North America,” 2.

²³ Gore, 11.

could kill millions. We should have a war on global warming rather than the war on terror.”²⁴ Furthermore, the Intergovernmental Panel on Climate Change claims that global warming will lead to more human deaths than any other weapon known to human kind.²⁵ Global warming will also have an important impact on national security. This is well reflected in Canada where the melting of the Arctic is opening vast lands which cannot all be secured with the resources Canada and the military own, a fact already recognized by the CDS.²⁶ But what is troubling is that, although climate changes are a real threat to national security, it is not an enemy in the traditional sense, in which a show of military force can reduce or control it. Climate change will not be intimidated by the barrel of a gun.²⁷ Already, it causes social disruptions that may threaten national and international security²⁸ and creates massive destabilization that contributes to the spread of disease.²⁹ Developed nations have long understood that national security starts abroad. Consequently, failing to address the effects caused by global warming on developing nations places the security of more affluent nations at risk. Also of concern is the possibility that damage brought by environmental changes “might increase the gap between rich and poor nations with the poor then violently confronting the rich for a fairer share of the world’s wealth.”³⁰ Environmental hardship could leave poorer countries at risk of being seized by radical groups, who could then gain popular support by directing their anger and military assets toward affluent nations. In addition, given the current world’s situation and observations, divisions between classes and ethnic groups could also initiate revolutions and insurgencies.³¹ Many believe that the degradation of the environment will generally escalate tensions among groups, leading to many different forms of conflict, including trade disputes, rebellion, and even war. Furthermore, environmental changes can encourage powerful groups to take over indispensable resources and persuade marginal groups to migrate to ecologically sensitive areas, hence

²⁴ Associated Press, “New perils nudge Doomsday Clock hand,” *Edmonton Journal*, 18 January 2007, A10.

²⁵ William Moomaw, “Global Warming and National Security,” *Northeast Sustainable Energy Association*, (2001), <http://www.nesea.org/publications/NESun/security.html>; Internet; accessed 30 September 2006.

²⁶ LGen M.J. Dumais, “*Defence Capabilities for Canadian Arctic Sovereignty Conference 25-29 September 2006, Ottawa*,” (Canada Command: 3000-1 (J5-Plans 1), 26 September 2006.

²⁷ Mark Townsend and Paul Harris, “Now the Pentagon Tells Bush: Climate Change will Destroy US,” *The Observer International*, February 22, 2004, <http://observer.guardian.co.uk/international/story/0,6903,1153513,00.html>; Internet; accessed 24 January 2007.

²⁸ Thomas F. Homer-Dixon, “Environmental Scarcity and Global Security,” *Headline Series*, no.300 (Fall 1993): 7.

²⁹ Moomaw, 1.

³⁰ Homer-Dixon, “Environmental Scarcity...” 7.

³¹ *Ibid.*, 8.

creating instability and potential conflicts over scarce resources. It can already be observed how military forces whether Canadian or others have been involved in trying to restore peace.

Climate Change and Power

Global warming is definitely changing the way the world's nations interact and, in fact, many "nations will be forced into a state of strife while coping with these changes, causing tension between countries and providing a destabilizing force in the world stretching to the limits treaties, traditions and relationships between and among nations."³² Further, global warming could have more disastrous consequences if the rogue states, which for the most part are greatly affected by the effects of such warming, threaten their neighbors and developed countries with their access to weapons of mass destruction.

Climate change will become a true challenge as environmental changes shift the balance of power between states, resulting in an increase of fighting and violence over resources such as fresh water and food.³³ Those situations can only lead to regional and world instabilities. Given the circumstances, the instinct of survival will force the poor to take the necessary actions to ensure their survival. Conflicts will be sparked as frustration increases and poor nations feel a state of unfairness. In Africa, for example, increased temperatures have negatively impacted the harvest and decreased accessibility to arable lands, causing food reserves to dwindle and increasing stress on the population. In other situations, the search for resources elsewhere may cause fights "because of dwindling supplies of water and the effects of upstream pollution."³⁴ But there are further consequences. The movement of large populations towards urban centers creates stress as those centers do not possess the resources or the infrastructure to accommodate such an influx of people.³⁵ Predictions are that over 150 million people could become environmental refugees and suffer from conflicts due to a decrease of resources, a situation already observed in Somalia and Darfur.³⁶ Observations are that the movement of a population is not necessarily contained within the borders of a nation but often spills outside its borders in a way that clashes, conflicts, and violence become not only the

³² Wes Clark, "Global Warming is a National Security Issue," *Clark Community Network*, (September 22, 2005). <http://securingamerica.com/ccn/node/1023>; Internet; accessed 30 September 2006.

³³ Homer-Dixon, "Environmental Scarcity..." 10.

³⁴ Thomas Homer-Dixon, "Environmental Change and Human Security," *Behind the Headlines* 49, no. 3 (Spring 1991): 3.

³⁵ *Ibid.*, 3.

³⁶ Howard Berman. "Rep. Berman Calls for Hearings on Global Warming," Letter from Congressman Howard Berman to Chairman of Committee on International Relations. Washington (18 September 2006), http://house.gov/list/press/ca28_berman/Berman_GlobalWarming.html ; Internet; accessed 30 September 2006.

nation's issue, but a concern for the remainder of the world. A security risk in one nation can potentially have a destabilizing effect on many others. It is suggested by scientists that environmental stresses resulting from global warming could cause surging migrations of people from poorer countries to the industrialized world, from Central America to the US and Canada, from the Middle East and North Africa to Europe, and from southeast Asia to Australia. In fact, these migrations have already begun, causing an ethnic balance shift in many cities and regions of affluent countries, where governments continue to struggle with immigration problems, and racial and ethnic strife. As suggested by Princeton political scientist, Richard Ullman, "the image of islands of affluence amidst a sea of poverty is not accurate."³⁷

Climate Change and Scarcity of Resources

And what if food were to be used as a weapon? This would clearly impact on military operations and would force developed countries governments to commit their forces as to ensure world peace and security. As observed, global warming increases droughts or heavy rain falls which reduces accessibility to arable lands. In fact this leads to an environmental degradation which makes food supplies increasingly tight. This situation could then raise the potential for exporters to use food as a weapon. Water scarcity is also becoming a serious environmental problem as nations suffering from water shortages are looking for solutions to this survival issue. There are large variations in the amount of water that is available among different regions of the world. In most of Europe, parts of the United States, and in the Ganges Basin of India, for example, nearly all of the local river run-off is being used. The change in precipitation patterns as a result of global warming may dramatically increase the amount of water available in some of those regions, while causing devastating droughts elsewhere.³⁸ Already, such droughts have been experienced in north-eastern Africa, while surpluses of precipitation have been experienced in many Asian countries.

Conflicts arising from water scarcity are predominant. For example, an ongoing dispute between Syria and Turkey over Euphrates water has been a primary cause of the 1967 Arab-Israeli war.³⁹ In addition to those tensions, water scarcity has hampered agricultural production, consequently affecting the health of large communities such as the population living in the Gaza Strip. In fact, the combination of a fragile ecosystem, declining agricultural production, increasing water shortages, the pollution of existing water supplies, and the growth of the population has contributed to an economic crisis in Gaza. Poor water quality has also affected public health, resulting in outbreaks of infectious diseases and intestinal parasites⁴⁰ not to mention increasing the potential for

³⁷ Homer-Dixon, "Environmental Scarcity...", 47.

³⁸ Homer-Dixon, "Environmental Change...", 8.

³⁹ *Ibid.*, 8.

⁴⁰ Thomas Homer-Dixon and Valerie Percival, *Environmental Scarcity and Violence Conflict: Briefing Book* (Toronto: University of Toronto, 1996), 21.

world epidemics, which could potentially require the involvement of developed countries and likely the support of military forces.

The consequences of global warming are found across all continents. With the link between global warming and environmental scarcity being well established, Rwanda provides an excellent case study in the effects of an insufficiency of renewable resources. Suffering from land and water scarcity, deforestation, and declining soil fertility, the socio-economic well-being of Rwandans was threatened. As a result, already-existing grievances were aggravated and the population began targeting opposition party members and Tutsi in general as being major threats to the nation's security. The result was that, between April and August of 1994, one million people were killed and two million people became refugees, many of these crossing the border into neighbouring nations.⁴¹ Water has been found to also be a source of contention between certain groups and societies, particularly in areas suffering from droughts such as the Middle East. The search for drinkable water is becoming a concern not only for those nations who are in search of clean water sources but for those, such as Canada, who possess large quantities of it. Ultimately, these attractive resources expose the country to security threats from nations trying to access its valuable natural resources. Already, many countries have been paying close attention to activities in the Canadian Arctic, where important sources of fresh water are readily available. Clearly, the impact of global warming warrants careful attention as its implications, such as the shortage of water in depressed and dangerous developing countries, must raise concerns for the security interests of nations, such as Canada, that are affluent in natural resources.⁴²

Climate Change and Governments

Environmental changes and a growing population do not only decrease the availability of arable lands, increase violence, influence the movement of populations, and cause shortages of water and food, but they can have the effect of undermining the moral authority and legitimacy of a nation, whose government then struggles to maintain a sense of fairness and reasonableness to the people it supports.⁴³ In South Africa in 1990, for example, environmental scarcity resulted in mass migration into urban areas. This influx contributed to further movement of blacks within the urban areas themselves. This movement of hundreds of thousands of people into and within urban areas weakened local governments, who were ill-equipped to handle the infrastructure requirements and environmental stresses. As a result, warlords seized local water and land for personal profit, and, because large unemployment rates are partially a result of scarce resources, warlords were easily able to recruit frustrated young men. In the following three years, approximately 12,000 people died as a result of political violence.⁴⁴ Such situations could

⁴¹ *Ibid.*, 29.

⁴² Homer-Dixon, "Environmental Scarcity...", 9.

⁴³ *Ibid.*, 43.

⁴⁴ Homer-Dixon and Percival, 39.

potentially lead to genocides for which world military forces such as the Canada, the US or the UK would be required to contain the violence.

The use of military force to stabilize regions currently suffering from environmental scarcity should alert affluent countries to the threats their governments will face as the adverse effects of global warming begin to accelerate. In addition, nations rich in natural resources, like Canada and the US, must use caution because environmental changes will likely hinder the establishment and sustainment of democracy in developing countries. As developing countries try to institute democracy in the midst of environmental scarcity, the governments are at risk of losing territorial control, particularly over the hinterland. “The regimes that do succeed to power in these territorial fragments will probably be extremist, authoritarian, and abusive of human rights.”⁴⁵

As the biggest contributors to global environment problems, developing countries can be expected to become more belligerent, less willing to compromise with other states, and less capable of controlling their territories in order to implement measures to reduce environmental damage. Furthermore, they may be heavily armed, as the continued proliferation of nuclear and chemical weapons and ballistic missiles suggests. If many developing countries evolve in this direction, the interests of the developed world may often be directly threatened.⁴⁶

As some scientists predict, climate change can lead to anarchy, with countries developing a nuclear threat to obtain or protect vital food, water, and energy sources. The threat of global warming against international stability vastly overshadows that of terrorism.⁴⁷ Recent environmental changes and the subsequent cost in human life must be a cause of concern to the world community. Not only have the severe security breaches that occurred in many nations resulted in conflicts and violence, depleted resources, and the significant movement and displacement of populations, but they have also resulted in the general abuse of human rights and caused other social catastrophes.

Understanding global warming and its impacts on nations is critical to governments in order to develop the proper courses of action and ensure military forces are prepared to support the effects of climate change hence the importance of recognizing the impacts on Canada.

GLOBAL WARMING FROM A CANADIAN INTERNATIONAL AND DOMESTIC PERSPECTIVE

Canadian and Military Impacts: the Past, Present and Future

⁴⁵ Homer-Dixon, “Environmental Change...”, 15.

⁴⁶ *Ibid.*, 16.

⁴⁷ Townsend and Harris, 1.

Previously discussed were the impacts of global warming on the international scene. In order to grasp the complete impact of climate changes the following paragraphs will highlight how this phenomenon impacts on Canada as global warming has raised challenges to government not only from an Arctic perspective but in other parts of country. Further, climate changes are potentially placing the country's resources at risk, as previously demonstrated, impacts already felt by the Canadian society and the CF, a fact already recognized by Prime Minister Harper who has accepted the scientific truth about global warming despite the fact that the Conservative government voted unanimously against a motion to continue to support the Kyoto protocol. His government's belief is that Canada has no chance of meeting the goals set on gas emissions, a position also vocalized by Liberal Leader Stéphane Dion. To date, the government of Canada has not made major progress in reducing the effects of global warming⁴⁸. Although Harper does not support the Kyoto Protocol, he does recognize the threat of global warming. In his address to military troops in Iqaluit, Nunavut on Armed Forces Day in 2006, prior to the commencement of Operation Lancaster, he stated that "the Northwest Passage is becoming more accessible every year: some scientists even predict it will be open to year-round shipping within a decade."⁴⁹ He further recognized, during his trip in the northern communities, that the result of the melting of the Arctic created the need to assert Canada's sovereignty and to take action to protect the country's territorial integrity. He also recognized the "potential threat to Canadian safety and security".⁵⁰ The position taken by the Prime Minister highlights the threat of global warming on Canada's security, but without necessarily demonstrating the country's motivation to reduce the causes of global warming. Notwithstanding the government's position on the issue of global warming, the evidence suggests that global warming is having a detrimental effect on Canada. The effects are many and varied, and will result in a greater threat to Canada and the military. Although the melting of the Arctic icecap is drawing most of the attention from a political, military and media standpoint, the fact is there are other threats that must also be seriously considered in other areas of the country, such as floods. Clearly, global warming must be fully appreciated to understand how it will impact on military operations. It is consequently important to place into context the effects of environmental changes, not only in an international perspective, but also in a Canadian domestic context. In accordance with IPCC, "there is an urgent need for a national impacts and adaptation assessment for Canada."⁵¹ The impacts of climate change on Canada are of two kinds: the direct impacts upon the Canadian environment and

⁴⁸ CBCNews, "House Motion Passes Supporting Kyoto", (Ottawa, 5 February 2007); <http://www.cbc.ca/Canada/story/2007/02/05/Kyoto-vote.html> Internet; accessed 5 February 2007.

⁴⁹ Prime Minister Harper, *Securing Canadian Sovereignty in the Arctic*, speech given at Iqaluit, Nunavut, August 12, 2006.

⁵⁰ Dene Moore, "Canadian Military will Defend Claim Over Arctic Waters: Prime Minister," CBC News, (13 August 2006).

⁵¹ Canadian Climate Program Board and Canadian Global Change Program Board, "Implication for Canada of Recent IPCC Assessment Report," <http://www.cics.uvic.ca/climate/change/cimpact.htm> ; Internet; accessed 29 January 2007.

society, and the indirect effects that will be felt by Canada as a result of impacts elsewhere in the world.”

Canada's Wealth of Natural Resources – Threatened

The impacts of global warming are disturbing and Canada is not exempt from them. In addition to Canada's position on the emission of CO₂, it is also recognized the US's CO₂ production is detrimental to global warming and being a neighbor of the US, Canada can expect to continue suffering from warmer temperatures, unless the US and Canada take global warming seriously and partake into initiatives to reduce its effects such as by supporting and adhering to the reduced emission targets of the Kyoto protocol. Failing to take robust action, Canada can expect to see the Arctic melting even further and consequently making the country more vulnerable and accessible.⁵² The melting of the Arctic icecap results in an increased sea level and has already spawned many problems which have directly impinged on the nation's security and sovereignty. The natural consequence is that the demand for military operations and interventions will increase exponentially with more severe climatic change. This demand serves not only to address the impacts of global warming as a society but to address the issue of the security of the Arctic. The protection of valuable resources, which have been attractive to other countries, will continue to become more of a challenge. For example, oil and gas are in great demand in the US to support the economy of the country. Certainly, “the US sees those reserves with envy and the pressure of their energy needs has already generated a massive amount of activity in the Mackenzie Delta and the Beaufort Sea.”⁵³ Not only are gas and oil valuable resources but the recent discovery of diamonds mines in the north has attracted investors from all across the world. Consequently, Canadian security and sovereignty may be exposed to a greater threat now that the North-West Passage is becoming more accessible.

Canada possesses a wealth of natural resources, some that are economically attractive, such as oil, gas, and diamonds, and some that can provide for the survival of humankind, such as fresh water. The value of water is increasing and will raise the likelihood of illegal export or theft. Clearly, water is essential to human life and with the world population increasing, bodies of water becoming more and more polluted, and the shortage of fresh and drinkable water in other parts of the world increasing, Canadian basins of water are an attractive resource that could cause the nation's security to be threatened as developing countries and those in search of fresh water turn towards affluent Canada to fulfill their primary needs.⁵⁴ One particularly troubling scenario would be as follows: “a pirate ship stealing water could release ballast containing a foreign

⁵² Pierre Leblanc. “Canada and the North: Insufficient Security Resources.” U:\JCSP\FSE\Arctic FSE\Presentations not given on FSE\Arctic Strat WG 25Sep06_Briefs\Arctic Strat WG pre conf reading; Intranet; accessed 07 September 2006. 1.

⁵³ *Ibid.*, 1.

⁵⁴ Leblanc, 2.

species such as the zebra mussel in the fragile arctic eco-system.”⁵⁵ The melting of the Arctic icecap offers easier access to the Northwest Passage and therefore requires Canada to develop plans which will provide for an increase in control over its lands. Logically, such a plan would result in additional responsibilities for the military.

The International Scene Impacts on Canada

Considering the impacts of global warming on the international scene in relation to the melting of the Arctic, access to Canadian natural resources is not the only area of concern for the government and the military. Widespread drought, particularly in areas of Africa and the Middle East, can result in mass migrations to areas of greater affluence. The use of the Arctic as a gateway to Canada becomes very attractive to those in despair, particularly if the normal methods of entry into Canada are blocked or slow in responding to the needs of the international community. Further, open waterways in the North provide an opportunity for smugglers to bring all sorts of products into Canada without the knowledge of officials, although illegal drugs are probably the greatest hazard to Canadians. In fact, the rigid approach adopted by the US military to block illegal drugs from entering the US through the easier routes, such as ports, has forced smugglers to look at other routes to enter North America. Given the difficulty of enforcing Arctic security because of the vastness of the land and lack of military and Other Government Departments (OGD) resources, smugglers and illegal immigrants may see the north as their gateway to opportunity.

The melting of the Arctic unquestionably brings about a wide array of problems for Canada. The opening of waterways provides an open door for the illegal entry of immigrants, access to terrorists groups, and access to Canadian water by illegal ships, thus threatening Canadian sovereignty.^{56,57} Consequently, illegal access of immigrants to Canada brings an array of problems to the society, ranging from conflicts to increasing pressure on the social system. Or worse, terrorist groups may directly impede on the nation’s security, requiring the involvement of military forces and OGD. Not taking action to enhance the security of the north has already been seen by Canada’s neighbors as an opportunity to test Canada’s resolve in maintaining a claim to the north. For example, the US sailed the Northwest Passage in the *Manhattan* in 1969, escorted by two icebreakers, without notifying Canadian authorities.⁵⁸ With the opening of the northern waterways, the presence of the US Navy is increasing with more frequent deployments

⁵⁵ *Ibid.*, 2

⁵⁶ Rob Huebert, “Renaissance in Canadian Arctic Security?,” *Canadian Military Journal* (Winter 2005-2006): 27.

⁵⁷ Department of National Defence, *Arctic Capabilities Study* (Ottawa: Public Works and Government Services Canada, 2000), 2.

⁵⁸ Rob Huebert, “Northern Interests and Canadian Foreign Policy,” U:\JCSP\FSE\Arctic FSE\Presentations not given on FSE\Arctic Strat WG 25Sep06_Briefs\Arctic Strat WG pre conf reading; Intranet; accessed 07 September 2006, 4.

for both the surface and subsurface fleet. Consequently, increasing the presence of the US Navy in the North will logically raise the need for the Russians to also be present in that part of the world if they see improvement in their economic circumstances.

The Canadian Arctic...Also Impacted

The opening of the Northwest Passage has also allowed the free movement of commercial ships and cruise ships. In fact, the opening of the Passage not only offers a route for increased commercial purposes but it also offers a means of avoiding storms in the open ocean.⁵⁹ Concerns about Arctic ice-melting are well recognized. A member of the Canadian Polar Commission declared that: "Canada's northern waters would become increasingly navigable, bringing security and sovereignty questions down like a sledgehammer on a Canada that needed to be prepared."⁶⁰ There have been a number of episodes in the last decade of foreign crafts traversing the Passage, such as a Russian dry dock, which transited the Passage in 1999. Also, the presence of cruise ships in the Passage have increased exponentially, and it is now popular to travel through the Arctic aboard refinished Russian icebreakers.⁶¹ Furthermore, in the spring 2001, the US Navy held a symposium on operation in an ice-free Arctic⁶² that discussed the possibility of increasing the frequency and length of operations in the Arctic waters as a result of climate change. The problem does not only lie in accessing Arctic waters but in the four disputes that pertain to the Canadian sovereignty in the Arctic. The disputes are based on "the ownership of Hans Island with Denmark, the status of the Northwest Passage with the US, the EU, Russia and Japan; the Canada/US boundary line extension into the Beaufort Sea; and the defining of the outer limits of Canada's Arctic continental shelf."⁶³ The opening of the Arctic water has generated lately a great deal of discussion at the government level and in the military about northern security.

Earlier Observations are Resurfacing

Little has been done to date to deal with potential threats resulting from the melting of the Arctic icecap. Certainly, there have already been studies commissioned that highlighted the need for the CF to be prepared for the opening of the North, such as the report completed in 2001 by Pierre Leblanc which made recommendations on how to monitor and enforce Canadian sovereignty. Leblanc identified the requirement to

⁵⁹ Rob Huebert, "Climate Change and Canadian Sovereignty in the Northwest Passage," *Isuma* 2, no. 4. (Winter 2001). http://www.isuma.net/v02n04/huebert/huebert_e.shtml; Internet; accessed 19 October 2006, 2.

⁶⁰ Franklyn Griffiths, "The Shipping News: Canada's Arctic Sovereignty Not on Thinning Ice," *International Journal* 58, no. 2 (Spring 2003): 258.

⁶¹ Leblanc, 1.

⁶² Huebert, "Northern Interests...", 16.

⁶³ Dumais, 2.

modernize the Aurora fleet, make use of American assets, improve intelligence gathering and production, and to better position search and rescue assets, to name a few of his recommendations.⁶⁴ Greater considerations to securing the North have appeared more recently with recommended courses of action being developed by Canada COM.

The Impact in the North and Potential Military Capabilities

From a military perspective, it is already recognized that the presence of the CF in the North is necessary to secure the country and maintain its sovereignty. Canada COM has already produced an Arctic Strategy which makes recommendations and highlights capabilities required to secure the Arctic. These are divided into four main areas: awareness, presence, surveillance, and reaction. Within the *awareness* section, consideration is given to improving intelligence collection methods. For example, on the east and west coasts, Recognized Maritime Pictures are maintained, but there is no equivalent system on the northern coast. And even though JTFN is connected to the CFCS, the system contains very little information on the northern areas. Other recommendations include increasing the JTFN HQ capability with additional staff for planning and executing routine and contingency operations, increasing the cooperation between the CF and OGDs, such as the Coast Guard, the Department of Fisheries and Oceans, and the Canadian Ice service, increasing the frequency and length of training in the north with both regular and reserve forces, and the establishment of an Arctic Training Centre in Nunavut, which would be a centre of excellence for Arctic warfare training and exercising. Within the *presence* section of the Arctic Strategy, the focus is on consolidating and increasing the presence and capabilities of the CF in the north, by increasing the number of personnel and building on existing infrastructure, such as bases and airfields. This would be done by creating a balance across the North, such as by developing infrastructure in Nunavut, since most of the northern assets are currently collected in the north-west. Some of the specific recommendations include increasing Ranger activity by providing funding for more Ranger patrols, adding ice-capable ships to the naval fleet, which would enable the Navy to monitor foreign shipping and conduct coastal patrols, establishing forward operating caches to support SAR operations and patrols, and increasing the frequency of Aurora patrols. Within the *surveillance* section, the emphasis is on improving on the capabilities of the North Warning System, which provided information on air traffic, to include surveillance on the north's aerospace, surface and sub-surface areas, with a view to creating redundancy. Specifically, some of the recommendations are to increase the number of maritime patrol flights, make better and more frequent use of Uninhabited Aerial Vehicles, including High-Altitude Long-Endurance Unmanned Aerial Vehicles, install High Frequency Surface Wave Radar sites in order to track surface vessels and aircraft, deploy undersea sensors to monitor and control undersea approaches, tap into space-based assets that could help improve surveillance, and provide better technologies, such as GPS and long-range radios, to Rangers. Within the *reaction* section of the Arctic Strategy, the emphasis is on developing the capability to react to terrorist crises, environmental disasters, and a number of other scenarios that may present themselves in the north as a result of a

⁶⁴ *Ibid.*, 8.

changing international environment and waterways becoming more accessible. Specifically, some of the recommendations are to improve on the current MAJAID plan, enhance search and rescue capabilities, especially by enhancing response times given that most of the current CF SAR capabilities are located below the 60th parallel, improve the communication capability in the north, and develop Rapid Reaction Forces for Land, Air, and Maritime.⁶⁵ As suggested, little has been done with regard to Leblanc's suggestions or the recommendations made under Canada COM's Arctic Strategy. However, as part of the communication plan, these recommendations were presented at the *Defence Capabilities for Canadian Arctic Sovereignty Conference* in Ottawa in September 2006.

Global warming has been found to also affect the ecosystem in the north. Aside from influencing changes in plant and animal migrations and behaviors, the change in climate affects the northern infrastructure where road and runway conditions are severely deteriorating.⁶⁶ The increase in temperature has resulted in communities injecting more funds into the reconstruction of their infrastructure, as the permafrost continues to warm and the treeline moves steadily north. This situation also impacts the government as providing infrastructure is an essential requirement to support diverse governmental programs in the enhancement of national security. Certainly, to carry out the task of national security, it becomes crucial to have the infrastructure in place to support either the military or OGDs. Military aircraft, whether used in a security fashion, for search and rescue matters, or for transferring supplies, must be able to access operational runways. Given the current situation of deteriorating and sagging runways, the military will have challenges fulfilling its role.

Global Warming Effects on other Parts of Canada

Global warming can also be found in other areas of Canada. As discussed, the increase in temperature is raising the sea-level, causing, in some areas, flooding and more severe storms. Global warming also causes erosion which contributes to deteriorating infrastructure, such as roads, and landslides, with the corresponding risks to life and property. It is further believed that severe storms will require additional navigational aid support. Environment Canada also predicts that warmer temperatures will be the cause of more severe events such as an increased frequency of tornadoes; indeed, such an increase has already occurred over the past few years in Canada, particularly in the Prairies. Those natural events have resulted in severely damaged personal homes, damaged public property and infrastructure, and loss of human life. Further, warmer temperatures cause more forest fires. And in the Prairies, increased temperatures, an earlier melt season for a smaller snow pack, and a more vigorous hydrological cycle are expected to increase the frequency and intensity of floods and droughts. The Prairie drought of 1988 reduced

⁶⁵ Dumais, 5-10.

⁶⁶ Margaret Munro, "The Big Melt: Canada's North on the Frontline of Change," <http://www.canada.com/victoriatimescolonist/news/story.html?id=979c127c-0bba-4939-aa42-43b018aed2c6&k=57038>; Internet; accessed 04 September 2007.

grain production by 31 percent at an export loss of \$4 million.⁶⁷ This prediction of variability in water availability and soil moisture can logically impact on military operations, particularly in supporting migratory populations. Already in different parts of the country, communities have been displaced as a result of a changing environment. Military assets and personnel have already seen limited use in supporting the movement of populations in natural disasters, such as floods and forest fires. And military assets have been used for more than supporting displaced populations. In 2003, the military was deployed to assist in fighting forest fires in the Okanagan Valley of British Columbia, as the scope of the fire was such that OGDs could not fight such a disaster by themselves. By the middle of the twenty-first century, the severity of forest fires and the length of the forest fire season are expected to increase significantly because of the warming climate. West-central Canada has historically seen most of the forest fire activity for the country, but with a warming climate, high-severity regions will begin to include north-eastern British Columbia, south-western Yukon, and the central Prairies over the next 40-50 years. But the warming climate is expected to have even more severe consequences: fires are expected to be more frequent and severe, there will be shorter growth periods for the forests between fires, the stands will be proportionately younger, and the carbon storage capability of northern Canadian forests will be substantially decreased.⁶⁸

While global warming certainly has an effect on the environments of other countries, Canada and the rest of North America have a greater number of early warning signs, or hotspots. Especially in Canada where the melting of the Arctic icecap brings an array of security and sovereignty problems a situation not experienced in such direct manner thus far by other nations. For example, heat waves have become more prominent over the last twenty years. In Edmonton alone in 1998, temperatures were more than three degrees higher than the 116-year average. In the Canadian Rockies, glaciers have been receding at a dramatic rate, and, of course, the sea ice in the Arctic has been shrinking, by about six percent between 1978 and 1995 alone. The result of increased temperature from global warming has increased the risk of adverse health in human and animal populations. For example, the first genetic adaptation associated with global warming was identified by ecologists in the North American mosquito *Wyeomyia smithii*, which wait nine days more today than they did 30 years ago to begin their winter dormancy.⁶⁹ Further, the climate change is projected to encourage the movement of tropical diseases such as malaria northward, where populations have little or no immunity. Higher temperatures mean that mosquito survival rates, biting rates, and population growth are enhanced. This is a concern not only for Health Canada and local health authorities, but also for the military, given that it may be required to support areas

⁶⁷ Environment Canada, "The Science of Climate Change," http://www.ec.gc.ca/climate/overview_science-e.html; Internet; accessed 20 January 2007.

⁶⁸ Natural Resources Canada, "Projected Forest Fire Severe Level, 2050-2059," <http://atlas.nrcan.gc.ca/site/english/maps/climatechange/potentialimpacts/severityratingsforestfires2050-2059/1>; Internet; accessed 29 January 2007.

⁶⁹ Union of Concerned Scientists, "The Impact of Global Warming in North America," 2.

that have seen an outbreak in disease. Indeed, an outbreak in a military community, or a community hosting an air base for example, could have disastrous effects on security and the military's ability to maintain operations. The military support that has previously been provided to the Winnipeg floods, the central Canadian ice storm, and the British Columbia fires is just a prelude to greater Canadian needs in the future as the climate continues to change. As such, the military is expected to continue providing Aid to Civil Power when so required. Although, "the DCDS directions make a point that except in situations requiring an immediate response to save lives, prevent human suffering and/or mitigate property damage, the decision to employ CF assets for non-defence tasks shall be based on the need for unique military skills and CF capabilities."⁷⁰ However, past experience demonstrates that the military has had to provide support in disasters for which it may not have had the requisite resources or the skills to do so. Fighting forest fires is certainly not a domain in which military personnel excel or in which they have unique skills, yet the demand and the political will were such that the military responded. Given the fact that global warming is and will be having a greater impact on Canada, the demand for military assets will increase. And within the political environment, a political environment that saw military assets in the form of 400 personnel and a number of armoured vehicles from Petawawa being deployed to Toronto to provide aid following a snowstorm in January 1999,⁷¹ demand for support that is outside the unique capabilities of the military will also increase.

Impacts on Military Operations – Focus on the Navy

While military operations will be affected generally by the impact of global warming, the Navy will have some unique challenges. The North Atlantic Ocean circulation is thought to bring an array of problems as the sinking of cold, salty North Atlantic waters is reduced. The most likely results are that there will be a change in the salinity structure and temperature of the water column and that it will lead to significant climate changes.⁷² A change in the water column structure will likely dramatically affect present-day oceanic acoustic propagation pathways, discovered in the late 1940s, which form the basis for all allied and US Anti-Submarine Warfare Sensor Systems. These systems are thought to have significantly contributed to the winning of the Anti-Submarine Warfare battle of the Cold War.⁷³ A change in the ocean environment could

⁷⁰ Department of National Defence, *DCDS Direction for Domestic Operations* (Ottawa: DND Canada, 2005), 1.

⁷¹ CBC Archives, "Toronto Calls in Troops to Fight Massive Snowstorm," http://archives.cbc.ca/IDC-1-69-2013-12772-10/on_this_day/life_society/twt; Internet; accessed 26 February 2007.

⁷² Richard F. Pittenger and Robert B. Gagosian, "Global Warming Could Have a Chilling Effect on the Military," *Defense Horizons*, no.33 (October 2003): 6.

⁷³ Owen R. Cote, Jr., "The Third Battle: Innovation in the US Navy's Silent Cold War Struggle with Soviet Submarines," *Naval War College Newport Papers* 16 (2003); <http://www.nwc.navy.mil/press/npapers/np16/NewportPaper16.pdf>; Internet; accessed 26 February 2007.

invalidate the current acoustic systems, whose calculations of acoustic paths, bottom loss, propagation loss, and ambient noise have been based on historic climatology. Adjustments would be required on all tactical platform sensors, including air, surface, and sub-surface, in the form of redesign, reengineering, and even a relocation of some systems. Climate change can bring other challenges to the Navy. For example, ocean environmental now-casts and forecasts, critical for effective operations, are changing. To operate, the Navy relies on this environmental data and prediction for strategic planning and everyday operations. Abrupt climate change has invalidated existing models and climatology backgrounds, which means that sea and wave heights and directions, ocean current fronts and eddies, marine and aviation weather, and short- and long-range acoustic propagation will be more difficult to identify and predict. Furthermore, climate change can bring more frequent and severe storms in the North Atlantic Ocean, hence affecting the ability of the Navy to operate in this strategically important region. An ice-free Arctic Ocean will result in changes to naval operations. Without the ice-cover traditionally provided, there is no advantage to adversary strategic submarines; the lack of an ice canopy turns the Arctic sea into a traditional open-ocean Anti-Submarine Warfare environment. Detection of foreign submarines, by sonar or acoustic torpedoes, will be much more feasible. However, the increased access means that any submarine force, nuclear, ice-strengthened, or conventional, may take advantage. Evidently, there are many impacts global warming brings upon military operations and military planners cannot ignore those impacts as the CF and other military forces embark into what promises to be one of the greatest wars into human history – a war against global warming.

GLOBAL WARMING FROM US INTERNATIONAL AND DOMESTIC PERSPECTIVE

As Canada's closest neighbor and the planet's only Super Power, the US should be considered closely with regard to global warming. The country experiences many of the same impacts of global warming as Canada, and much can be gained by cooperating in planning and establishing courses of action to deal with them.

The vast North American continent ranges from the lush sub-tropical climate of Florida to the frozen ice and tundra of the Arctic. Within these extremes are two wealthy industrialized countries with diverse ecosystems that are at risk. Yet the United States contributes significantly to the emission of greenhouse gases, which causes an increase in temperature, and already there are many examples of hotspots found in North America ranging from changes in polar warming in Alaska, animal range shifts in California, glaciers melting in Montana and the Canadian Rockies, and swamp loss in the Chesapeake Bay.⁷⁴ Those hotspots are problematic, particularly with regards to water shortages in many areas of the US, including the Great Lakes.⁷⁵ Aside from water shortages, the US also experiences the same difficulties as Canada with regard to having sufficient resources to deal with natural disasters and global-warming-related catastrophes, such as hurricanes, droughts, and forest fires. Hurricane Katrina helped to identify the weaknesses of North America in dealing with large-scale domestic disasters. In the absence of additional funding and policy change, and with current resources being stretched not only domestically, but globally as well, the resources of the US, like Canada, may not be sufficient to face the increasing effects of global warming.

In addition to dealing with its domestic effects of global warming, the US also experiences the aftermath effects of global warming through developing countries. Developing countries are experiencing a growing population that requires ever increasing resources. Growing populations not only require more resources but they become the source of numerous conflicts which are nurtured as a result of lack of food, water, and agricultural lands, a situation already seen in Darfur and the Middle East.⁷⁶ Even in China, global warming and drought have affected the level of the Yangtze River, which provides water for agriculture and human consumption to more than a half-billion people. In Shanghai, a city of 30 million people, more than two million residents are currently without fresh water. The Yangtze River is glacier fed, and the glaciers are diminishing – 2006 saw the lowest water levels since recording began in 1877. Reduced flow has even

⁷⁴ Environment Canada, "The Science of Climate Change," http://www.ec.gc.ca/climate/overview_science-e.html; Internet; accessed 20 January 2007.

⁷⁵ Canadian Climate Program Board and Canadian Global Change Program Board, "Implication for Canada of Recent IPCC Assessment Report," <http://www.cics.uvic.ca/climate/change/cimpact.htm>; Internet; accessed 29 January 2007.

⁷⁶ Berman, 1.

seen numerous boats bottoming out.^{77,78} With a lack of food and water, clashes of civilization occur and terrorist groups grow in such a way that the US has no other choice but to become the world's authority for peace, hence placing more stress on its military. Furthermore, as economies become more global, national borders will collapse under adverse impacts, such as economic shocks, political aftershocks, and human and biotic migration.⁷⁹ The US faces the same challenges as Canada in terms of addressing security issues abroad in order to establish and maintain a high level of security at home. In fact, disruption and conflict will be endemic features of life, concludes a Pentagon analysis. Once again, warfare would define human life.⁸⁰

Security threats can be precipitated by environmental change. Abrupt climate change can adversely affect water and energy resources, agriculture, economic activities, transportation, fisheries, and disaster relief. In addition, rapid climate change can have a devastating effect on public health. Warmer temperatures generally cause an increase in vector-borne diseases, such as cholera and malaria. Consider the effects in South Asia, which contains a population of several billion and a few nations with nuclear arms, of a change in the monsoons, and how quickly a security threat against the US could escalate because of a lack of resources. Or consider how the quality of life would be diminished in the US and Europe by an abrupt cooling of the North Atlantic, which would result in numerous consecutive severe winters, putting a burden on existing resources. Consequently, abrupt climate changes can pose significant consequences to the US military. Without proper planning, training, and adequate resources, the military would not be in a position to respond in a timely fashion to the disasters associated with global warming. To make matters worse, climate change could adversely affect military capability even using existing resources. For example, cooling temperatures on the east coast of the US could cause strategic harbors, such as at the Norfolk naval base, to freeze. In fact, the severe winter of 1976-77 provides a picture of what could be the norm if the North Atlantic region were to abruptly cool. At that time, the Norfolk waterways, including the Chesapeake Bay and Elizabeth and Yorktown Rivers, froze solid. When the ice began to melt and to move, it tore out and displaced most of the navigational aids.⁸¹

Moomaw highlights that climate changes further impact on the country's relationship with its closest neighbour, Canada, and with some European countries, which have reduced support to the US in terms of security and trade issues as a result of the US

⁷⁷ Alexa Olesen, "China to Research Global Warming But Lacks Resources to Cut Critical Emissions," CBC News, <http://www.cbc.ca/cp/world/070206/w020619A.html>; Internet; accessed 01 March 2007.

⁷⁸ China.org.cn, "Plight of Yangtze River Worsened by Water Shortage," <http://www.china.org.cn/english/environment/196669.htm>; Internet; accessed 01 March 2007.

⁷⁹ Pittenger and Gagosian, 5.

⁸⁰ Townsend and Harris. 1.

⁸¹ Pittenger and Gagosian, 5-6.

pulling out of the Kyoto protocol.⁸² In the North, climate change has intensified the dispute over the claim to the Northwest Passage. Canada argues that the Northwest Passage and other Arctic waters constitute internal waters and is therefore under the control and jurisdiction of the Canadian government. However, the European Union and the US claim that these waters constitute an international strait, and that rights of passage should be granted according to international law. With the Northwest Passage becoming more ice-free each year, the demand for transit of larger ships and cargoes, especially those too large to navigate the Panama Canal, will increase.⁸³ The fact that the Arctic is melting as a direct result of global warming has become for the US a real point of concern as the Arctic offers an open door for terrorist groups and other threats that can adversely affect national security. In addition, the US military also faces the same challenges as those described for Canada in terms of the impact of climate change on naval operations. Already, the Arctic offers some challenges to the Navy in terms of capability, where warships will have to be designed to be ice-capable, a task of no small magnitude.⁸⁴

Although the US is concerned with the melting of the northern icecap, the links among open Arctic waters, global warming, national security, and action to reduce emissions have not been made. Indeed, not much has been done by the US authorities to address global warming concerns. The US government continues to be criticized for not taking action about diminishing the emission of CO₂ and further for not having its military forces ready for eventual abrupt climate changes. Generally, military planners do not seem to be concerned about abrupt climate change, at least not in respect to national security. Climate change is treated as a low-level, long-term threat, with implications that are more of a sociological nature than national security. This may be short sighted because an intense and abrupt climate change could easily turn an environmental issue into a security challenge, which could undermine an unprepared military and embarrass the government.⁸⁵ Despite the fact that there has been recognition of the potential problems of climate change by the Environmental Protection Agency, the US Army Corps of Engineers, the Department of Defence, and other agencies, little has been done to deal with the issue. The current attitude of the US military is that a wealthy superpower has the ability, in both time and resources, to deal with climate change. There are further signs that the Department of Defence is not taking seriously the issues of global warming, especially as it concerns the situation with the melting Arctic icecap. For instance, the annual funding allocated to the Office of Naval Research has dropped by \$27 million, while other sections of the Navy have been removed from Arctic research and operations completely.⁸⁶ Meanwhile, despite the risks to national security, the

⁸² Moomaw, 1.

⁸³ Matthew Carnaghan and Allison Goody, "Canadian Arctic Sovereignty," *Parliament Information and Research Service*, (Library of Parliament, 26 January 2006). 3-4.

⁸⁴ Pittenger and Gagosian, 7.

⁸⁵ *Ibid.*, 1.

⁸⁶ *Ibid.*, 8.

primary US military strategy on climate change has followed a different path – to reduce the military’s own contribution to CO₂ emissions and fuel consumption.⁸⁷ Thus far the US military does not allude to global warming or climate changes in its doctrine.

In contrast, the Center for Technology and National Security Policy⁸⁸ warns that the military is not prepared to face the effects of global warming. Researchers claim that the US is vulnerable to climate-related disasters and that military leaders must reduce this by focusing more on monitoring and planning for adaptation to rapid change. In a report written two years prior to the Hurricane Katrina devastation, they emphasized that rapid climate changes, with little warning and serious impact, create environmental security threats. Further, researchers maintain that current policies and planning, which are minimal or non-existent, will prove to be inadequate in a world that is witnessing more rapid and startling climate change.⁸⁹ The Bush administration has been criticized for not reacting more aggressively to the great significance of global warming on the life on its citizens and the world and by pulling itself out of the Kyoto protocol, despite President Bush’s assertion that signing the protocol would have resulted in a downturn to economic growth. Sam Bodman, Secretary of Energy said of greenhouse gases, “we are a small contributor when you look at the rest of the world.”⁹⁰ The truth is, however, that the US is one of the worse emitters of CO₂.

Finally, the Department of Defence does not provide direction, either through doctrine or other directives, on the actions to be taken in addressing how the military is to plan for and respond to the impacts of global warming. Clearly, the US, like Canada, can no longer ignore the problem presented by global warming and will need to increase resources and improve the monitoring and planning activities surrounding climate change. Neither country can afford to underestimate the potential impacts on national security like other countries that are already recognizing global warming as a threat to their security and their welfare. The following section will therefore present elements of comparison with other countries about how global warming affects their environment and in some cases their military operations.

⁸⁷ *Ibid.*, 5.

⁸⁸ The Center for Technology and National Security Policy (CTNSP) examines the implications of technological innovation for U.S. national security policy and military planning. CTNSP combines scientific and technical assessments with analyses of current strategic and defense policy issues, taking on topics to bridge the gap. The Center has produced studies on proliferation and homeland security, military transformation, international science and technology, information technology, life sciences, and social science modeling. <http://www.ndu.edu/CTNSP/home.html> ; Internet; accessed 20 February 2007.

⁸⁹ Alison Walker-Baird, “Military Intelligence – Global Warming Debate Heating Up,” *The Frederick News-Post Online- Frederick County Maryland Daily Newspaper*, (1 February 2007), http://www.fredericknewspost.com/sections/news/reporters_notebooks_display.htm ; Internet; accessed 8 February 2007. 2.

⁹⁰ Bill Gallagher, “First Iraq, Now Global Warming,” *Niagara Falls Reporter*, <http://www.niagarafallsreporter.com/gallagher300.html> ; Internet; accessed 8 February 2007.

GLOBAL WARMING AS SEEN FROM OTHER PARTS OF THE WORLD

Not only does global warming impact on developed countries such as Canada and the US, but much attention has been drawn on climate change in other developed areas, such as Australia and European countries. For example, like other areas of the world, Australia faces coastal flooding and erosion, resulting from rising sea levels. This causes a destabilization of some of Australia's uniquely diverse ecosystems.⁹¹ Conversely, European countries have experienced heavier precipitation and increased temperatures like many areas of Canada and the US.

Australia

Based on the impacts of global warming, Australia is under scrutiny and has been required to take action as it is recognized that global warming is having an adverse impact on its environment and military operations. Geoffrey Till, from the Sea Power Centre in Australia, writes about global warming:

the collapse of the marine environment would be the ultimate disorder, fatally weakening prospects for the stability and security of settled society ashore...the sea slows and masks the effects of global warming because of its immense thermal inertia and its ability to absorb carbon from the atmosphere.⁹²

Further, an Australian report on the Future Environmental Policy Trends to 2020 states that a major risk for the Navy is to be unable or unwilling to recognize, and therefore failing to take action, in ensuring that the environment is included as a significant part of ongoing planning.⁹³ There is recognition that to comply with environmental issues, many environmental aspects must be touched upon, such as ship-board pollution control, use of ports and bases, military exercises and their impacts, and the conservation of natural resources. In addition, public opinion has placed a great deal of pressure on the need to take action to safeguard the environment and reduce the impact of global warming. Consequently, the Australian Defence Force become a leader on matters associated with protecting the sea environment. For example, the Australian Navy developed regulations for ship operations that diminish the risk on the environment, while meeting international conventions for environmental preservation, thereby satisfying domestic regulations and anticipating future changes.⁹⁴ Furthermore, Australia

⁹¹ The Impact of Global Warming in Oceania. <http://www.climatehotmap.org/oceania.html>; Internet; accessed 21 February 2007.

⁹² Geoffrey Till, "Seapower in the 21st Century," *Papers in Australian Maritime Affairs*, no.16, <http://www.navy.gov.au/spc/maritimepapers/piama16/century.html> Internet; accessed; 9 February 2007.

⁹³ *Papers in Australian Maritime Affairs* No 13, "Future Environmental Policy Trends to 2020 - Impact on Ship Design and Operation," *Australia Department of Defence* (2005), 21. <http://www.navy.gov.au/spc/maritimepapers/piama13/piama13.pdf>; Internet; accessed 8 February 2007.

⁹⁴ *Ibid.*, 23-24.

has been working closely with the Bureau Veritas Quality International (BVQI), a world leader in quality management certification and environmental management certification and audit. BVQI serves more than 70 countries. Other measures have also been identified to provide environmental safeguards. For example, anti-fouling paint testing has been initiated, ballast water management procedures are being developed, regulations and equipment related to the control of air emissions have also been developed, and the National Oceans Policy has tasked the Australian Defence Department to safeguard maritime regions such as the South-East Marine Region, to control Maritimes approaches and to exercise and protect Australia's sovereignty and sovereign rights.⁹⁵ There are already many initiatives under way, but there is still some concern that these are not nearly enough to allow the Australian military force to address environmental issues effectively and efficiently. Evidently, commitment from the government and senior military leadership must prevail. The approaches adopted by Australia in terms of addressing environmental changes, through assigning the Australian Defense Force as a leader in sea environmental issues, for example, should be looked at by Canada as a potential initiative in addressing the effects of global warming and to take the necessary actions to prepare its military forces and OGD.

New Zealand

Like Australia, New Zealand faces similar challenges associated with global warming and consequently, the government has developed a long-term strategy to deal with it. New Zealand is looking at global warming from the broader context of national identity, economic transformation, and other social issues, such as flood control and water quality. "Whole-of-government" work programs have been approved to support the strategy, with implementation occurring throughout 2007.⁹⁶

European Countries

European countries are also facing climatic changes that can no longer be ignored. Similar to North America, Europe's fragmented and disturbed natural ecosystems are very sensitive to abrupt climate change. Precipitation has fluctuated dramatically, with increased precipitation in the north and decreased precipitation in the south. But generally across Europe, temperature increases over the last ten years have been greater than the global average. There have been excellent programs in place to monitor and study environmental change resulting from global warming, and warning signs have been making headlines across the continent. As a result, most of the industrialized countries in Europe have taken strong action in developing policies to reduce their greenhouse gas emissions.⁹⁷ These policies have even affected military operations. For example, the replacement of equipment on a ship must adhere to environmental standards although a

⁹⁵ *Ibid.*, 41.

⁹⁶ New Zealand Climate Change, "Climate the Way Ahead," <http://www.climatechange.govt.nz/>; Internet; accessed 29 January 2007.

⁹⁷ Union of Concerned Scientists, "The Impact of Global Warming in Europe and Russia," 1.

country like the UK does not refer to the impacts global warming in its doctrine and on military operations. Finally, the European countries also face the same impacts of global warming as those experienced from Canada and the US in terms of failed, failing and developing countries. Illegal immigration, shortages of resources and water supplies, formation of terrorist groups, droughts, floods and diverse impacts all have to be considered by the governments and military leaders in order to be prepared to address climate changes. It is clear that when looking at how some European countries fight global warming, such as by putting into place policies that reduce gas emissions, Canada is placed in a position where it must continue working on its own environmental policies, while recognizing the reduction of greenhouse gases may have economic consequences, consequences that are short term compared to the long-term effects global warming will have on the planet and on future generations.

GLOBAL WARMING AND CANADIAN POLICIES

Lack of recognition and acceptance of the threats of global warming by countries such as the US and other developed nations are evident. And Canada is no different. Political debates about the subject and the limited actions taken to address the impacts of global warming, despite having had this phenomenon recognized as a potential threat for many years, have been already noted. Unfortunately the Canadian government and military planners have paid little attention to the impacts of climate change. Although some emphasis has been placed on securing the Arctic because of the melting icecap, documents such as the White Paper, the National Security Policy, and the Defence Statement are still restrictive. Despite highlighting the need for the CF to fulfill a wide variety of roles, including Aid to Civil Power and contributing to humanitarian aid, there is a growing gap between the need and the allocation of resources. To better understand the role of the military, it is important to highlight a few key points regarding the direction the government has given to the military to fulfill its roles. The directives come from three sources: the White Paper 1994, Canada's National Security Policy, and the Defence Policy Statement.

First, the White Paper policy overview recognizes that over the past number of years the world has changed and with this has come a number of challenges, on both a domestic and international scene. The world's population has grown considerably without any signs of a slowdown and this alone brings its arrays of problems. Certainly, failed states are a problem to the world's stability. The White Paper recognizes as well that environmental degradation exists and resources are being depleted. While the CF is expected to respond to emerging situations in the country's areas of jurisdiction – land, sea, and airspace, including the North – the White Paper outlines that cuts will be deeper than in previous periods. It is also expected that the CF will fulfill its role based on the nature of Canada's values and interests. As such, the CF must be prepared to respond to Aid to Civil Power while assisting OGDs and providing support to humanitarian and

peace-keeping operations. Basically, the CF is expected to monitor and control activities in the domestic context while contributing to international security.⁹⁸

Canada's National Security Policy (NSP) recognizes the increase of terrorist threats and the spread of infectious diseases that could potentially impact on Canadian society and the security of the country. It also recognizes natural disasters that have placed people's lives at risk and damaged property, and failed and failing states that have created security issues which have gone beyond their borders, reaching Canada. Finally, the NSP also grants that pandemics can pose a real threat to Canada's security and there could be risks that some groups could deliberately spread diseases.⁹⁹

The NSP focuses on addressing three core national security interests:

- a. protecting Canada and Canadians at home and abroad;
- b. ensuring Canada is not a base for threats to our allies; and
- c. contributing to international security.¹⁰⁰

The NSP stresses the requirement to address threats in order to strengthen the country's security by integrating Canadian efforts through a range of communication means and various organizations.

Finally, the Defence Policy Statement adopts a similar approach, although it strictly focuses on military operations. The Statement defines the role of the military in two contexts: Domestic and International. It recognizes that the CF operates in a very challenging security environment and consequently, must be adaptable. It also recognizes that on the international scene, failed and failing states, like terrorism and the presence of weapons of mass destruction, are potential threats to the nation's security, although it doesn't necessarily place the impact of global warming into context. The Statement discusses the need to provide security in regions of the world which suffer from deep-rooted disputes and for which restoring order is essential for world security. The Statement also highlights the need to secure the Canadian North¹⁰¹ but does not clearly refer to the impact global warming has on the rest of Canada and how the military will face the challenges that disasters from climate change will bring upon the country.

⁹⁸ 1994 White Paper. http://www.forces.gc.ca/admpol/eng/academic/doc/white_e.htm ; Internet; accessed 9 February 2007.

⁹⁹ Privy Council Office, *Securing an Open Society: Canada's National Security Policy* (Ottawa: National Library of Canada Cataloguing in Publication Data, 2004), 6-8.

¹⁰⁰ *Ibid.*, vii.

¹⁰¹ Department of National Defence, *Canada's International Policy Statement: A Role of Pride and Influence in the World. Defence.* (Ottawa: Her Majesty the Queen in Right of Canada, 2005).

Based on the comments provided above, clearly the documents are weak in providing the necessary direction and support to enable the military to adequately address the effects of global warming.

CANADA AND THE MILITARY CAN ADDRESS GLOBAL WARMING IMPACTS

The direction provided through the documents listed above are unfortunately not explicit enough to prepare the military to address the magnitude of disasters expected to be brought upon by global warming, although it is clear that Canada has no other choice but to take action in the event of a catastrophe. But in the interest of lessons learned, and to provide better direction for military training, resources, and activities, how has Canada performed in the past in handling the subject of global warming?

Global Warming – Not Actually New Issue

Although there had been past indications that the North was becoming a security and sovereignty issue, even before the melting of the Arctic icecap became headline news, the Canadian government and the military had not been serious in dealing with it. For example, the DEW line, which was modernized in the mid-1980s, has never been properly manned. Further, when the government decided not to buy or build the 12 nuclear-powered submarines that were highlighted in the 1987 White Paper, it missed an opportunity to better position the military to detect foreign activities in Canadian Arctic waters and therefore provide greater security in the North. By the time the 1994 White Paper appeared, there was only a brief reference made to protecting the Arctic: "...mounting effective responses to emerging situations in our Maritimes areas of jurisdiction, our airspace, or within our territory, including the North."¹⁰² It is almost as if the North were an afterthought. In 2000, an Arctic Capabilities Study recommended short-, medium-, and long-term recommendations that highlighted the need to strengthen inter-departmental cooperation through the participation of various working groups and committees. Other recommendations highlighted the need to increase the number of Rangers and to improve CF capabilities (land and air support).¹⁰³ Although recommendations were made, limited action was taken.

The situation has changed somewhat in the past few years as the effects of global warming become better recognized in the Arctic. There is greater urgency to deal with greenhouse emissions and to prepare for the effects of global warming on Canadian society. Action must be taken and proper resources allocated to the military and OGDs, as applicable.¹⁰⁴ Fortunately, during a speech in August 2006, Prime Minister Harper claimed that he is committed to the security and sovereignty of the country and has already proposed some courses of action to deal with Arctic challenges. For example, the

¹⁰² Huebert, "Renaissance in Canadian Arctic Security," 24.

¹⁰³ *Ibid.*, 22-24.

¹⁰⁴ *Ibid.*, 17.

government is planning to establish an Arctic deep water port to extend the reach of the Navy. To compliment this, the Army's presence will be expanded with a new Arctic Training Centre and a revitalization of the Canadian Rangers. In the air, security will be improved with the addition of long-range unmanned aerial surveillance drones. And undersea surveillance will be enhanced by installing acoustic or movement sensors in order to detect ships and submarines in Canadian Arctic waters.¹⁰⁵ As highlighted in the NSP and Defence Statement, there are good initiatives that have been brought forward by both the government and the Defence Department; however, it does not appear that the necessary capabilities and resources will be allocated to enable DND and OGD to fulfill their roles, roles which need to first be fully comprehended. Global warming can no longer be put on the backburner. Studies have been conducted and recommendations have been made, so the time for planning and action is now. Canada is a large country, so the focus cannot only be placed on the security of the Arctic but also on the other areas of the country which also suffer from global warming and for which aid to civil power could become a normal practice instead of the exception. Canada needs to prepare better to assist in the event of droughts, forest fires, and floods. The need to prepare is not only a question of providing government departments with funding, but of finding solutions to the arising problems of global warming. In addition, the CF must also position itself so it can fulfill all of the mandates the government has assigned. The CF must use a holistic approach to address the challenges that lie ahead, such as simultaneous major operations. Currently, the CF can support a mission in Afghanistan while other major operations cannot be sustained unless the current commitment is either considerably decreased or ended. The military would certainly be stretched given its current international commitments if a major disaster requiring military support were to occur domestically. It is therefore essential that despite starting to recognize that global warming is a phenomenon affecting the country and the planet, the government and the military must quickly adapt to address the impacts of climate changes.

RECOMMENDATIONS THAT WILL SERVE TO ADDRESS GLOBAL WARMING

The international consensus is that the scientific evidence to support the concern for global warming is sound. It is also agreed that climatic change has been dramatically accelerated as a result of human influence, and that the risks of danger are valid and important. As a result, the international community consents to taking action on climate change immediately.¹⁰⁶ Although the Government of Canada is committed to reducing greenhouse gases and providing clean air, water, land and energy for Canadians, and is committed to developing solutions that will enable the country to maintain a strong economy and take advantage of new technologies,¹⁰⁷ there is a requirement to specifically identify how the military will participate in dealing with the impact of global warming.

¹⁰⁵ Harper, 2.

¹⁰⁶ National Resources Canada, "Climate Changes Impacts and Adaptation Program," http://adaptation.nrcan.gc.ca/intro_e.php ;Internet; accessed 29 January 2007.

¹⁰⁷ Environment Canada, "Climate Change," <http://www.ec.gc.ca/climate/home-e.html>; Internet; accessed 29 January 2007.

This is important in particular because armed conflict is usually a result of competition for control of resources. And with climate change, there will be hardship, health threats, and strong competition for the control of resources between and within countries.¹⁰⁸

As Canada has a well-recognized interest in international law and order, and plays a major peace-keeping role around the world, it is necessary to recognize how global warming will affect international security and to anticipate the probable trouble areas and likely outcomes. So based on what Canada and the Defence already use as guidance for its operations, and what other countries are doing about facing the challenges of climate changes, the following are recommendations on how the Government of Canada and the Defence Department can address the impact of global warming. Consequently, the following recommendations provide for a foundation upon which the government and the military should fall back to be prepared for any eventual disasters associated to global warming. These recommendations, as previously highlighted are based on the evidence of global warming on the domestic and international scenes, on what other countries are doing about it, and on the government and military doctrines and statement already available.

Recognizing the Impacts of Global Warming in Planning

The Government must first officially address the impact of global warming in the White Paper, Canada's National Security Policy, and the Defence Policy Statement and provide greater guidance on how the military is to plan, prepare and address the true impact of global warming. Although the Defence Statement identifies the need for the CF to work closely with OGD in ensuring the nation's security and sovereignty and providing the necessary resources to meet domestic roles,¹⁰⁹ there still must be stronger indications on how global warming will change the way the military operates in terms of planning for disasters, and preparing for the secondary effects of global warming that come from, for example, the competition for resources from failed, failing and developing countries. Planning must also identify capabilities that will be compatible with Allies such as the US, Australia and European countries who face the same challenges and obligations as Canada. Furthermore, military planners must work in partnership with OGD such as the RCMP, Coast Guard, Environment Canada, Natural Resources Canada and any department which has an active or indirect role in how disasters are addressed, and which have an influence on how Canada is to reduce the threats of global warming. It is essential those departments work together to develop procedures which will allow for an efficient approach to any domestic disaster. In addition, the government must partake in programs that will help reduce the causes of global warming and provide the military with the direction necessary to partake into programs that will ensure its equipment and capabilities are environmentally friendly.

¹⁰⁸ Canadian Climate Program Board and Canadian Global Change Program Board, "Implication for Canada of Recent IPCC Assessment Report," <http://www.cics.uvic.ca/climate/change/cimpact.htm>; Internet; accessed 29 January 2007.

¹⁰⁹ Department of National Defence, *Canada's International Policy Statement*, 7.

There are also many courses of action Canada and the military must adopt to deal with global warming. First, military planners must recognize the impact of climate changes and plan operations and resources accordingly. Military leadership must also consider that global warming is not only an issue of the melting of the Arctic icecap, but an issue that impacts all areas of the country and beyond Canadian borders. Planning must recognize that eventually depleted resources in failed, failing and developing countries which is in part a result of global warming, will cause a significant shift of population towards urban centers and across national boundaries. This shift in population has already resulted in immigrants, legal and illegal, entering or trying to enter more prosperous countries such as Canada and the US. Statistics also indicate that approximately 90 percent of immigrants take up residence in the major cities, thereby creating overwhelming pressures on transportation systems and vital social infrastructures.¹¹⁰ Pressure on transportation systems, for example, may require the military to move some segments of the population in the event of a disaster or major urban crisis. In addition, endemic or pandemic situations will likely create pressure on the military because it could be called upon to relieve some of the challenges associated with management and support, such as transporting medical supplies, providing medevac and medical support, preparing meals, and providing and maintaining facilities such as field medical stations. The level of support required by local or provincial governments in such instances can be substantial; therefore the military should anticipate pandemics as part of its planning process. Consider also the impact on security of a pandemic in a small community such as Cold Lake, where the military presence is significant and where many military personnel and their families may become ill themselves.

Although the actions taken by other countries to address the impact of global warming in a military sense has been limited, Canada should also plan to partner with Australia, the US, and European countries such as the UK to address how the threats of global warming will be addressed jointly. Hurricane Katrina is an example of how challenging it is for a country to deal with a colossal disaster on its own, despite having detailed disaster plans and significant resources for support within the country. Consequently, planning must consider the preparation and training of military forces for any disaster, both in a domestic and joint context.

Requirement to Recognize and Redefine CF Roles

Based on what has been observed over the past twenty years, on what other countries are doing (or not doing), and the threats climate change will bring upon the military, it is clear Canada needs to redefine the roles of the CF. Consequently, the NSP, Defence Statement, and the White Paper must be amended accordingly. There is also a need to look more closely at how the militaries of other countries, such as Australia, are dealing with climate changes. Furthermore, there is a clear requirement to provide the CF with the necessary resources to accomplish the missions it will be called upon to

¹¹⁰ Dick Field, "Interclimatic Immigration, Global Warming, Greenhouse Gases Global Warming - Population Transfers Ignored," *Canada Free Press*, 22 February 2007. <http://www.canadafreepress.com/2007/field022207.htm>; Internet; accessed 22 February 2007, 1.

accomplish. Although the Defence Statement acknowledges the impact of climate change on the security and sovereignty of the nation in a small way, the focus of such recognition must be extended to more than just the impact of global warming on the Arctic. Climate change must be recognized as having direct and secondary effects on the rest of Canada and beyond its boundaries. The CF will be called upon to fulfill missions beyond the traditional roles of symmetric war fighting or peacekeeping. Based on the effects global warming is bringing upon communities within Canada and around the world, it is evident the CF will be called to complete tasks which would have been unthinkable decades ago. CF roles must be redefined. Those already highlighted in the Defence Statement remain valid; however, other roles, such as those required in the event the CF is called upon to support the effects of global warming, must be clearly highlighted and defined.

The Right Capabilities

Given the reality of global warming, Canada must be prepared to adapt its capabilities to the nature of the various threats brought upon by global warming. For example, in all regions of the Arctic, Canada needs to develop better enforcement and surveillance capabilities. Its long-range maritime patrol aircraft capability needs to be developed and it needs to enhance its fleet of ice-strengthened ships and icebreakers, all with a view to improving the capacity of the government to enforce Canadian laws and regulations.¹¹¹ Although the military is starting to take some action in preparing for disasters, such as by staging exercises that would simulate an accident causing environmental damage, there is still not the commitment to assign greater resources to address the potential impacts of global warming.¹¹² Clearly, the attention paid to the melting of the Arctic icecap is an improvement; however, all indications suggest that this will not be sufficient to address the true nature of the effects of climate change. Capabilities must provide for flexibility and adaptability and provide the resources to quickly and effectively support Canadian and worldwide communities. Those capabilities must also provide for interoperability with other military forces as well as OGD, such as the RCMP and Coast Guard. And the three military environments must train and work together, since disasters may require the support of all elements. For example, a hurricane disaster may see the Navy transporting supplies, the Army rebuilding infrastructure, and air assets being used to move populations.

Canada's ground Search and Rescue (SAR) capability will potentially be called upon even more because of disasters associated directly or indirectly with climate change. To have effective ground SAR, there is a requirement to adequately train and equip military personnel in all types of environments. As discussed, the opening of the Arctic due to climate change has increased air and maritime traffic flow, and ultimately increased the risk of accidents. Indeed, the country has seen an increase in the number of

¹¹¹ Huebert. "Northern Interests..." 4.

¹¹² Gary Park, "Canada's Military Taking no Chances", *Petroleum News*, 7, no. 49 (5 December 2004): 1.

disasters requiring SAR involvement. For these reasons, the capability of ground SAR should be expanded to deal with a growing demand.

Training and Interoperability

It is recommended that the way the military forces are trained be reviewed based on the new nature of the threat of global warming. For example, during the recent, post-Cold War era, military planners, whether on the Canadian or American front, have been focusing on training soldiers in a climate similar to that of the Middle East where it is dry, dusty and for the most part, warm. Given the probability of facing operations in colder regions, spanning eastern North America, Europe, and Russia, there is a requirement to train and operate all military elements in harsher conditions.¹¹³ In addition, there is a requirement to train military forces in a joint context, since countries are unlikely to be able to deal with the challenges associated with climatic change on their own. Certainly, there is enough information available from OGD such as Environment Canada and from the environmental departments of other countries to realistically prepare for any disasters associated with global warming. The Intergovernmental Panel on Climate Change is also a source for planners as it provides an appreciation for the climate changes and the trends expected in the years to come. Moreover, training cannot only focus on scenarios associated with the melting of the Arctic icecap. It must be extended to scenarios that include droughts, forest fire, pandemics, immigration influxes, and shortages of resources such as agricultural lands, water, and transportation systems. Military forces must be provided with opportunities to develop their skills in a wide variety of scenarios and be prepared to react quickly.

An Essential Asset in Fighting Global Warming - Personnel

Climate change requires the CF to better plan and train, and to possess the right capabilities to support an expanded role. Having a capable military includes the necessity for the CF to possess the right level of personnel strength. Indeed, personnel remain the most important asset the CF possesses. It must be at such a level to ensure that the military can fulfill the roles already described in the Defence Statement, plus the additional roles the military will be called upon to support during a disaster. The number of personnel required to fight forest fires in British Columbia or to support Hurricane Katrina, for example, are excellent indicators of what the CF can be expected to provide in such circumstances. Already the CF is in need of more personnel to support its existing commitments; the threat of global warming just adds an additional pressure to recruit, train, and task personnel who are expected to complete missions outside of the typical war-fighting, peace-making, and peace-keeping roles.

¹¹³ Pittenger and Gagosian, 6.

CONCLUSION: GLOBAL WARMING IS NO FICTION

Over the past number of years, global warming has drawn more attention than ever before, and the adverse effects of climate change have increased the need for the Canadian government to provide better direction and greater resources to the military. The consequences of global warming cannot be taken lightly, from either an international or domestic perspective. It is evident that environmental changes have the capacity to be more destructive than weapons of mass destruction, as indicated by former US Vice-President Al Gore. Global warming is a threat, no different than the threat of terrorism. Although some are still skeptical about the effects of climate change, the weight of the evidence suggests that climatic changes have already been occurring at an accelerated rate as a result of greenhouse gases, and that this rate of change is directly attributable to human influence. Whether living in Canada, US, Australia, Europe, Africa or Asia, all suffer from the effects of this disastrous phenomenon. This paper has highlighted many of these impacts, such as increases in the following: the number and intensity of droughts and floods, the migration of populations, the number of conflicts resulting from a depletion of resources, and the number of forest fires. There have also, in some areas, been decreases in agricultural lands and drinkable water. Climate change has served to undermine the moral authority and legitimacy of nations, particularly vulnerable nations such as those in the developing stages of democracy, threatened national security and sovereignty, and caused irreparable damages to the ecosystem, often affecting infrastructure. The impact of sudden climatic changes has forced governments to recognize the existence and danger of global warming, prompting them to take action, some more than others. In Canada, although Prime Minister Harper accepted the scientific truth about global warming, the Conservative government voted unanimously against a motion to support the Kyoto protocol, since the belief is that Canada will not be able to reach the targets set on gas emissions.

In a small way though, Canada has, through its Defence Statement, recognized that climate change could have an adverse impact across the Arctic, triggering recommended courses of action developed by Canada COM. This is a step in the right direction. However, global warming is more than just an Arctic issue. As the evidence suggests, the effects of global warming span the entire nation, indeed the entire planet, and must be addressed with a holistic and cooperative strategy.

Global warming issues have become a reality which Canada and other countries, especially developing countries, must be prepared to address. Canada's governmental departments cannot work in isolation. Clearly, climate changes, media influence, and public opinion have already forced governments to pay more attention to the way global warming is impacting the world. As a result, the Canadian government needs to modify its direction and resource allocation to the military and OGD, such as Environment Canada, the RCMP, and the Coast Guard. To win the war against global warming, there is a clear requirement to work in a joint and interoperable environment and develop the necessary courses of action to address the effects of global warming. Clearly, nations or governmental department cannot work in isolation. Canada and the military must include global warming as part of its planning process, and must train and build the necessary

capability to prepare and support the operations associated with the impacts of global warming. Furthermore, Canada must not only amend its White Paper to reflect the new realities of military operations, but there must be clear direction and support through the NPS and Defence Statement to provide the proper resources and tools to the military and other governmental departments that face the task of addressing the effects of global warming. This paper demonstrated that indeed global warming has an impact on military operations; however, its scope does not provide for an in-depth study on how the roles of the CF should be extended and detailed. It provides information to support the requirement to further link the revised and new roles of the CF to the effects of global warming, a task of no small magnitude but one that must be initiated soon. Clearly, the evidence indicates that global warming is impacting on military operations, so the time for action is now. Al Gore's call-to-arms on global warming is a November 12, 1936 statement from Winston Churchill to his House of Commons, as applicable then after Germany's reoccupation of the Rhineland as it is today for climate change: "The era of procrastination, of half-measures, of soothing and baffling expedients, of delays is coming to its close. In its place we are entering a period of consequences."

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