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AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

ARCTIC SECURITY:
AN ADAPTIVE APPROACH FOR A CHANGING CLIMATE

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A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

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April 2009

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE APR 2009		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Arctic Security: An Adaptive Approach for a Changing Climate				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Command And Staff College Air University Maxwell Air Force Base, Alabama				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES The original document contains color images.					
14. ABSTRACT The Arctic is widely regarded as one of the last remaining natural sanctuaries on Earth. Warmer temperatures in the region have opened the eyes of sea-faring nations and motivated the ring of Arctic Nations to officially stake their claims to natural resources, indicating the beginnings of future strife over sovereignty disputes. On the other hand, the outcry of environmental concern for the region has increasingly manifested itself in political discussion, elevating national and regional security concerns to a global level. The research for this paper has shed light on the paths already undertaken toward the security future of the Arctic, and has highlighted the need to focus on future approaches that consider the environmental aspects of inter-connectedness. Unilaterally defending national security interests may lead to further degradation of the natural and political climate in the region with catastrophic consequences. This observation has been the driving force of this paper. We extend special thanks to Lt Col Thomas N. Williams for the initial ideas for this paper, through discussion of energy and environment policy in the United States during his research elective at ACSC. His understanding of the climate change issues helped us see the importance of the Arctic. We also owe much gratitude to Dr. John T. Ackerman for being the guiding hand in our research. His passion for the various facets of climate change and impact on social, political, and ecological systems has helped enrich the research and framework for this paper.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 78	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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Preface

The Arctic is widely regarded as one of the last remaining natural sanctuaries on Earth. Warmer temperatures in the region have opened the eyes of sea-faring nations and motivated the ring of ‘Arctic Nations’ to officially stake their claims to natural resources, indicating the beginnings of future strife over sovereignty disputes. On the other hand, the outcry of environmental concern for the region has increasingly manifested itself in political discussion, elevating national and regional security concerns to a global level. The research for this paper has shed light on the paths already undertaken toward the security future of the Arctic, and has highlighted the need to focus on future approaches that consider the environmental aspects of inter-connectedness. Unilaterally defending ‘national security’ interests may lead to further degradation of the natural and political climate in the region with catastrophic consequences. This observation has been the driving force of this paper.

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Abstract

This research examines the growing geopolitical uncertainty wrought by warming Arctic waters in an attempt to articulate a better US national strategy for the Arctic. It explores solutions to mitigate threats to national security while balancing economic rights and environmental responsibilities. This research uses the problem/solution method and assesses potential solutions based on four criteria for success. This strategy must:

- 1) Peacefully resolve territorial sovereignty issues and promote free trade economics.
- 2) Mitigate risks to human and environmental security in the region and around the globe.
- 3) Provide a long-term solution to the sustainable development of the Arctic.
- 4) Include a mechanism for enforcement and monitoring compliance.

The fundamental finding of this research is that climate change in the Arctic should be seen as a warning and should underpin future security policy decisions. This necessitates a new paradigm in understanding not only the natural environment, but also the basic conduct of economics, politics, and science in developing an appropriate national security strategy. The thematic conclusions of this paper include the need for an ecologically-based economy, cooperative politics, and collaborative science, all of which are in the interests of national and global security.

List of Acronyms

ACIA – Arctic Climate Impact Assessment
AEPS – Arctic Environment Protection Strategy
ANWR – Arctic National Wildlife Refuge
AON – Arctic Observation Network
CAFE – Corporate Average Fuel Economy
CARA – Circum-Arctic Research Appraisal
CIA – Central Intelligence Agency
CLCS – Commission on the Limits of the Continental Shelf
COP – Conference of the Parties
DoD – Department of Defense
EU – European Union
GEO – Global Environment Outlook
IARPC – Interagency Arctic Research Policy Committee
IPCC – Intergovernmental Panel on Climate Change
IPY – International Polar Year
NCAR – National Commission on Arctic Research
NDU – National Defense University
NORAD – North American Aerospace Defense Command
NSF – National Science Foundation
NSPD – National Security Presidential Directive
NSS – National Security Strategy
PDD – Presidential Decision Directive
SEARCH – Study of Environmental Arctic Change
UAV – Unmanned Aerial Vehicle
UN – United Nations
UNCLOS – United Nations Convention on the Law of the Sea
UNFCCC – United Nations Framework Convention on Climate Change
US – United States
USARC – United States Arctic Research Commission
USCGC – United States Coast Guard Cutter
USGS – United States Geological Survey

Introduction

*It is not the strongest of the species that survives, nor the most intelligent;
it is the one that is most adaptable to change.*

—Charles Darwin

This introductory section provides a brief overview of the problem addressed in this paper and the significance of its implications to US national security. It then establishes a baseline of current US strategy and policy. Finally, it explains the research methodology and the basic organization for this paper.

Overview

Climate change in the Arctic has the potential to create severe, long-lasting impacts on global security. As a result, warming Arctic waters present new challenges to US national security interests that can be categorized into three main areas: 1) Heightened sovereignty disputes over access to natural resources, commercial shipping routes, and increased military presence; 2) Environmental security resulting from changing ecosystems; 3) Human security of indigenous Arctic cultures as well as members of the global community due to changing migration patterns. Faced with new resource challenges from climate change, human and animal populations will be forced to adapt, migrate, or face extinction. These three main concerns are inherently interdependent and tied to the interplay of national interests in energy, economy, and environment.

What exactly has changed in the Arctic? A steadily changing natural climate has brought a daunting duality of resource competition and environmental concern. A recent report from a conference on the Arctic at the National Defense University (NDU) clearly states, “Climate change is gradually uncovering an Arctic which stands at the crossroads of development and

risk.”¹ The challenge facing the United States as a world leader is how to harness the uncertain future of the Arctic as a possible turning point. The strategic outlook for US national security, therefore, needs to consider both the current political and natural environment with caution for the sustainable future. Past paradigms of political realism and classical economics may not best fit the sustainable development of the Arctic, making traditional sovereignty and resource interests secondary to more important security concerns. Instead, the shared natural environment and its understanding through the scientific community may be the new drivers to shape the political response to climate change. The US must reprioritize its long-term security interests to achieve a sustainable Arctic strategy.

Current US Strategy

The 2006 *National Security Strategy* (NSS) outlines a basic backbone to a strategy for the Arctic: “We choose leadership over isolationism, and the pursuit of free and fair trade and open markets over protectionism. We choose to deal with challenges now rather than leaving them for future generations.”² The NSS also specifically mentions the need to “engage the opportunities and confront the challenges of globalization.”³ Essentially this means that, “Many of the problems we face...reach across borders.”⁴ The Bush administration’s stance was the following: “Effective multinational efforts are essential to solve these problems. Yet history has shown that only when we do our part will others do theirs. America must continue to lead.”⁵ These statements imply that an effective Arctic strategy is one which the US does not pursue alone. More importantly, the changing natural and political environment presents a timely stage for the US to embrace a leadership role to ensure responsible actions by Arctic Nations.

Regarding the Arctic, however, current US engagement policies do not follow the guidance articulated in the NSS. Two key examples of this are the failure of the US to ratify the

United Nations Convention on the Law of the Sea (UNCLOS) and the *Kyoto Protocol* for greenhouse gas emissions. On 12 January 2009, during his final days in office, President George W. Bush released a new *Arctic Region Policy*, replacing the one from 1994. The new policy emphasizes the need to protect US resource interests in the Arctic and to identify new areas for international cooperation. In light of a new Obama administration, the US finds itself in a well-timed position to lead on issues involving the changing climate in the Arctic derived from a perception of new-found American ‘soft power’ appeal.⁶ In addition, a more liberal-minded Congress may be more apt to adopt the new administration’s spirit of change in general and, therefore, to more actively pursue a sustainable multilateral Arctic strategy. A US decision to lead peaceful multinational efforts in the region could also bolster this soft power. If true, as stated in the NDU report that, “policy initiatives in the next 5-10 years will disproportionately influence US strategic posture in the Arctic over the next half century,”⁷ the Arctic should be a high priority for the Obama administration. As suggested in the current NSS, the US must face these challenges now.

Research Methodology

The NDU report highlighted that the biggest challenge in the region is that the US currently has “so far excluded itself from an emerging international framework designed to manage the anticipated changes.”⁸ The report recommends three possible options for US policy makers with varying degrees of multilateral cooperation:

Option 1: Retain current levels of low international involvement (status quo).

Option 2: Pursue ‘limited enhancement’ to US security strategy through more cooperation and specific articulation of US national interests.

Option 3: Pursue ‘enhanced engagement’ which outlines short-term and long-term actions to engage in the region.⁹

This research is in large part a calculated response to the report, as it explores the impact of these three options on US security. The research method used for this paper is the problem/solution method. The problem examined is how US national strategy should address the uncertain future geopolitical environment in the warming waters of the Arctic. This paper explores solutions to mitigate threats to US national security while balancing economic rights and environmental responsibilities, both of which are in the interests of US strategy for future involvement in the Arctic. More specifically, the research process revealed four criteria for comparing potential solutions. US Arctic strategy must:

- 1) Peacefully resolve territorial sovereignty issues and promote free trade economics.
- 2) Mitigate risks to human and environmental security in the region and around the globe.
- 3) Provide a long-term solution to the sustainable development of the Arctic.
- 4) Include a mechanism for enforcement and monitoring compliance.

This paper is organized into four main background areas: natural environment, economics, politics, and science. The research explores these interrelated subjects as they are assessed in the context of US national security and relevance to Arctic strategy. Next, an options analysis compares the three basic options from the NDU report using the criteria for success introduced above. An additional analysis compares current *US Arctic Region Policy* and the 1994 policy using the same criteria. Lastly, the final section summarizes the overall conclusions and makes recommendations.

Natural Environment

This section presents the basis of the natural changes observed in the Arctic. First, it provides the varying definitions for the region from a geographic and climatologic sense. Next, it examines the changing sea conditions and their impact on the global climate system. Finally, it explains the general impact of climate change on Arctic ecosystems and social structures.

Definition

Perhaps indicative of the challenge to fostering true international cooperation in the Arctic, one finds the very definition of ‘Arctic’ still subject to debate. The region around the Earth’s North Pole bounded by the Arctic Circle (66° 33’N) is the most widely accepted definition. The Arctic Circle circumscribes the Earth through the eight ‘Arctic Nations’ of Russia, Finland, Sweden, Norway, Iceland, Denmark (Greenland), Canada, and the United States. Defined as the southernmost latitude which experiences the phenomena of midnight sun and polar night, the Arctic Circle defines a definite geophysical boundary. Other boundaries are recognized however, based on ecology and climate, for example the 10°C (50°F) July isotherm. [See Appendix A.](#) This climatologic definition roughly corresponds to the ecological boundary formed by the Arctic tree line. Until recently, this defined where life transitioned from more temperate sub-Arctic plants and animals, to the treeless frozen tundra and polar ice cap with their unique and delicate Arctic life forms. As global warming pushes temperate species steadily northward the size of the Arctic is decreasing.¹⁰ Effectively, the Arctic climate and the Arctic species that thrive within it are being steadily pushed off the planet. It was precisely this realization that prompted former US Interior Secretary, Dirk Kempthorne, to announce in May 2008 that “the drastic loss of Arctic sea ice had forced him to list the polar bear as an endangered species because their populations could collapse within a few decades.”¹¹

The most dominating physical feature of the Arctic is the Arctic Ocean and here again one finds debate. Geologically unique, it is commonly recognized as the smallest and shallowest of the world's oceans. However, oceanographers define it as a 'mediterranean' sea, defined in oceanographic terms as "a mostly enclosed sea that has limited exchange of deep water with outer oceans and where the water circulation is dominated by salinity and temperature differences rather than winds."¹² Still other dissenters see it as the northernmost lobe of a single World Ocean. While 'Arctic Sea' may be a more geologically accurate term, to avoid confusion, this research will use the term Arctic Ocean.

Sea Change

A sea change is taking place in the Arctic, both literally and figuratively, with profound geologic, climatic, economic, commercial, environmental, and political implications. Largely covered by sea ice a majority of the year, global warming induced melting has increased the extent to which the Arctic Ocean is ice free, particularly in the summer months. Earth's climate varies gradually over long periods of time with cooling and warming periods evidenced by cyclical glacial formation and retreat. However, without including a component for human-induced variations, climate models cannot account for the rapid pace of Arctic sea ice melting.¹³ This human warming component is due to increased atmospheric carbon dioxide levels from human activity such as fossil fuel (oil, coal, and natural gas) usage and deforestation.¹⁴ September 2007 witnessed a new record minimum Arctic summer ice cover of just 4.3 million square kilometers which was 39% below the long term average from the 1979-2000.¹⁵ This was nearly repeated again in September 2008 with just 4.7 million square kilometers of ice cover.¹⁶ Professor Wieslaw Maslowski, a researcher from the Naval Postgraduate School in Monterey, California believes the pace of melting has quickened to the point where the Arctic could be ice

free in the summer as soon as 2013.¹⁷ Presciently, his prediction was made *prior* to the drastic new record minimum set in 2007 using data from 1979-2004.

The Arctic is warming at a significantly faster rate than the rest of the planet. According to United Nations (UN) Intergovernmental Panel on Climate Change (IPCC), “The warming in the last 30 years is widespread over the globe, and is greatest at higher northern latitudes...Average arctic temperatures have been increasing at almost twice the rate of the rest of the world in the past 100 years.”¹⁸ Scientists believe one reason for this uneven warming has to do with Arctic albedo. Albedo refers to how well a surface reflects solar energy. Snow covered ice is highly reflective, reflecting roughly 90% of solar energy. As snow and sea ice melt, the darker ocean left behind reflects just 6% of this energy, absorbing 94% into the water.¹⁹ This solar absorption causes ocean water to warm, melting more ice, exposing additional ocean surface to solar absorption and thus creating a self-reinforcing melting cycle commonly known as an ‘Albedo Feedback Loop.’ As if not enough, a similar feedback loop is believed to occur on land as the Arctic tree line slowly advances northward and the darker trees absorb more solar energy than the snow covered tundra they replace. Further still, as permafrost thaws, large amounts of carbon dioxide and methane trapped in the permafrost are released into the atmosphere, producing yet another feedback that increases warming and thaws more permafrost. In this way, it is believed that the Arctic has been acting as a ‘heat sink’ for a warming world. The melting of sea ice and warming of frigid Arctic waters absorbs a tremendous amount of heat energy, which thus far has had a mitigating effect on heat rise globally. Predictions of this sea ice heat sink disappearing in the summer foretell a future where rates of global temperature rise may increase sharply. Dr. Mark Serreze, a geographer at the National Snow and Ice Data Center has stated, “We could think of the Arctic as the refrigerator of the northern hemisphere climate

system. What we're doing by getting rid of that sea ice is radically changing the nature of that refrigerator. We're making it much less efficient. But everything is connected together so what happens up there eventually influences what happens in other parts of the globe."²⁰

The profound changes occurring in the Arctic Ocean could have catastrophic effects on global climate by affecting a mechanism known as thermohaline circulation. Thermohaline circulation refers to the ocean temperature and salinity variations that help drive the conveyor of ocean currents. Ocean currents are known to play a critical role in determining regional and even global weather patterns. A radically changed ice-free Arctic, coupled with runoff from a thawing Greenland ice sheet, could alter the current temperature and salinity balance of the North Atlantic Ocean enough to slow or even collapse the thermohaline circulation.²¹ The effects would be rapid, global, and catastrophic. Estimates are that England and northwestern Europe would be most affected, becoming colder, drier, and windier, much like Siberia.²² This scenario is not as unlikely as it sounds. Climatic records obtained through Greenland ice core samples indicate at least eight abrupt cooling episodes documented in the geological record going back 730,000 years. The most recent event occurred 8,200 years ago, lasted for roughly 100 years, and resulted in an average annual temperature decrease in Greenland of 5° F.²³ By historical standards, this was a relatively minor event and more likely involved just a slowing of ocean circulation. More dramatically, roughly 12,700 years ago, an event known as the Younger Dryas appears to have been precipitated by a total collapse of thermohaline circulation. The effects were much more severe, with a cooling of over 27° F in Greenland which lasted over 1,000 years.²⁴

Geologically speaking these are recent events, yet modern human civilization has never been subjected to weather conditions so persistently disruptive. Dr. Robie Macdonald, a leading

Canadian oceanographer who has worked with the IPCC worries, “The Arctic really can feed back into the global climate system. You know what happens when you get feedbacks – you get surprises and we don’t like surprises.”²⁵ Clearly, mankind would be ill advised to assume global warming will continue progressing gradually. Changes in the Arctic could have profound effects upon Earth’s climate and the creatures depending on those climates for survival.

Climate Change Impacts in the Arctic

The effects of global warming are becoming increasingly difficult for scientists to disprove. To put it in perspective, the earth’s surface temperature has increased approximately 1.4° F on average in the last 150 years and as much as 5° F in certain areas, like the Arctic region.²⁶ More pertinent to the issue, though, is the rapidity of the current temperature increases; most recent scientific studies on Arctic melting highlight that earlier models were much too conservative. In fact, an April 2007 news release from the National Center for Atmospheric Research (NCAR) reported that “September ice actually declined at a rate of about 7.8% per decade during the 1953-2006 period.”²⁷ This was contrasted with earlier model projections from the IPCC that showed a 2.5% average decline per decade for this time period. This is clearly evident in the graphical depiction in [Appendix B](#).

The NCAR news release emphasized that “the shrinking of summertime ice is about 30 years ahead of the climate model projections. As a result, the Arctic could be seasonally free of sea ice earlier than the IPCC-projected timeframe of any time from 2050 to well beyond 2100.”²⁸ More recently, within the current *Global Environment Outlook* (GEO₄) report, the IPCC revealed observations showing an average decline of 8.9% per decade.²⁹ The point is that the global climate is changing more rapidly than anticipated, particularly in the Arctic. As a result, the warming climate in the Arctic is drastically altering the stability of the Arctic’s natural

environment, as clearly indicated in the 2004 *Arctic Climate Impact Assessment* (ACIA), an international effort of hundreds of scientists assisted by the knowledge of indigenous people:

The increasingly rapid rate of recent climate change poses new challenges to the resilience of arctic life. In addition to the impacts of climate change, many other stresses brought about by human activities are simultaneously affecting life in the Arctic, including air and water contamination, overfishing, increasing levels of ultraviolet radiation due to ozone depletion, habitat alteration and pollution due to resource extraction, and increasing pressure on land and resources related to the growing human population in the region. The sum of these factors threatens to overwhelm the adaptive capacity of some arctic populations and ecosystems.³⁰

The key findings of the ACIA are based on a moderate scenario of warming, not a worst-case. Nonetheless, these findings highlight the urgency of acting now to prevent or slow potentially irreversible impacts. Beyond the realization that changes are occurring rapidly in the region, a key finding is that, “Arctic warming and its impacts have worldwide implications.”³¹ These implications are diverse, ranging from the multiplying effect of the Albedo Feedback Loop to rising global sea levels and alteration of biodiversity and migratory habits. In addition, and perhaps an area often neglected by business-minded opportunists, is the fact that thawing ground will disrupt existing infrastructure and prospective building projects like pipelines, airports, roads, industrial complexes, etc. The findings further discuss the cultural and economic disruptions in indigenous communities, an issue which underscores the need to integrate indigenous inputs into evolving Arctic policies. Overall, the ACIA states: “Multiple influences interact to cause impacts to people and ecosystems” and “the total impact is greater than the sum of its parts.”³²

These impacts on natural systems and societies are not mutually exclusive; in fact, the opposite is true. When it comes to climate change, the Arctic is the epicenter. Those who understand this are raising the loudest alarms for action, but the general public that had been geographically distanced from this problem in the past is quickly gaining awareness. The UN

GEO₄ report explains that the “Polar regions influence major environmental processes, and have direct impacts on global biodiversity and human well-being.”³³ This is why headlines like “Arctic Sea Ice at Lowest Recorded Level Ever”³⁴ and “Arctic Land Grabs Could Cause Eco-Disaster”³⁵ have become so commonplace in scientific journals and mainstream media.

One expert in this field is Dr. James Hansen, Director of NASA Goddard Institute for Space Studies and Adjunct Professor of Earth and Environmental Sciences at Columbia University’s Earth Institute. In his opinion, “the greatest threat of climate change for human beings... lies in the potential destabilization of the massive ice sheets in Greenland and Antarctica.”³⁶ For all intents and purposes, this would represent an irreversible consequence of climate change. The ACIA reported that melting of the Greenland Ice Sheet increased 16% from 1979 to 2002, when it broke all previous records.³⁷ Dr. Hansen is one to argue that we have reached the “critical tipping point” and that “we have at most ten years – not ten years to decide upon action, but ten years to alter fundamentally the trajectory of global greenhouse emissions.”³⁸ This decision is of such magnitude that it will impact future generations and escalates the priority of adapting to climate change. Recent IPCC reports demonstrate how the Arctic is a prime example of the challenges of adaptation: “Arctic human communities are already adapting to climate change, but both external and internal stressors challenge their adaptive capacities. Despite the resilience shown historically by Arctic indigenous communities, some traditional ways of life are being threatened and substantial investments are needed to adapt or re-locate physical structures and communities.”³⁹ As Hansen predicts, “If human beings follow a business-as-usual course, continuing to exploit fossil fuel resources without reducing carbon emissions or capturing and sequestering them before they warm the atmosphere, the

eventual effects on climate change and life may be comparable to those at the time of mass extinctions.”⁴⁰ National security, therefore, is becoming subordinate to global security.

Economics

This section discusses the economic significance of Arctic resources and commerce. It highlights the technical pitfalls, administrative obstacles, and environmental dangers of exploiting the Arctic from traditional economic approaches. Economic policy decisions made in the near term will have lasting impacts on the sustainable development of the Arctic. Safe, secure, and responsible development in the Arctic demands cooperation, not competition.

Resources

Scientists have long suspected the Arctic Ocean to hold significant quantities of hydrocarbon and mineral deposits including oil, natural gas, gold, platinum, lead, magnesium, nickel, and zinc. Until recently however, low energy prices and prohibitive costs of extraction effectively limited exploration in the extreme Arctic environment. Recently, climate change and energy scarcity have combined in a kind of ‘perfect storm’ to alter the age-old Arctic economic paradigm. Rapidly receding sea ice and higher energy prices are eroding the historical impediments to development. Exploiting these resources is becoming increasingly viable economically as the likelihood of positive financial returns and accessibility both improve.

The undiscovered hydrocarbon resources locked away beneath the ice are thought to be substantial. The *2008 Circum-Arctic Resource Appraisal* (CARA) from the US Geological Survey (USGS) estimates that “90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may remain to be found in the Arctic, of which approximately 84% is expected to occur in offshore areas.”⁴¹ Similarly, the USGS and the Norwegian company StatoilHydro estimate that the Arctic holds as much as 25% of the world’s remaining undiscovered oil and gas deposits.⁴² Estimates of the dollar value of these resources run into the *trillions*. These are best attempts to estimate what lies beneath an Arctic Ocean

seabed, about which less is known than the surface of Mars.⁴³ The CARA report itself acknowledges this limitation, “Because of the sparse seismic and drilling data in much of the Arctic, the usual tools and techniques used in USGS resource assessments, such as discovery process modeling, prospect delineation, and deposit simulation, were not generally applicable. Therefore, the CARA relied on a probabilistic methodology of geological analysis and analog modeling.”⁴⁴ Regardless of the actual quantity of hydrocarbon resources beneath the Arctic, deciding where to drill would be just the beginning of a bitterly difficult process in a foreboding environment:

Drilling and extracting oil in deep, ice-covered waters, thousands of miles from any tanker port, poses enormous technical challenges. Special equipment and highly trained crews must be brought in and protected in a harsh environment. Thousands of engineering and technical hurdles must be overcome simply to bring the oil to the surface – to say nothing of building the thousands of miles of pipeline that must be laid to get the oil to market. What is more, according to some geologists, once oil companies finally do tap into the Arctic, the formations are far more likely to hold gas than oil.⁴⁵

A twisted kind of triple-irony exists in regard to the Arctic’s suspected energy riches. First of all, as Arctic ice recedes, it increases access to more of the very culprits that precipitated the melting in the first place – fossil fuels. Secondly, for mankind to avoid a worst-case climate change scenario, a ‘bridge’ fuel is needed to minimize carbon emissions in the near-term while transitioning to a long-term, sustainable, carbon-free energy economy. Many have identified this bridge fuel as natural gas,⁴⁶ of which the Arctic may hold vast amounts. Lastly, governments seeking national security may have merging interests with energy companies and environmentalists alike, as the negative effects of climate change become increasingly dramatic. Environmentalists, a group that could grow to include a vast majority of humanity, will demand their energy from cleaner sources, including natural gas. Energy companies will respond in kind by transitioning to these less carbon intensive forms of energy. Governments attempting to

ensure national security will find it increasingly difficult and expensive to unilaterally provide this fundamental governmental function as global environmental security rapidly deteriorates.

To avoid this scenario, visionary governments must recognize that climate change has altered the existing national security paradigm. Long-term national security has become unattainable through unilateral action alone. Multilateral effort to mitigate the effects of climate change will be essential. Wise governments will adopt policies now that encourage transition away from carbon intensive energy sources and build the international frameworks through which the required global response can be achieved. In the Arctic, governments must build the apparatus now to maximize this collaboration while minimizing environmental damage.

Commerce

Arctic sea ice retreat could have its most dramatic near-term effects upon global commerce. The Arctic sea-routes, sought in vain by 19th century explorers, are beginning to open up. Specifically, maritime shortcuts known as the Northwest Passage (over North America) and the Northern Sea Route (over Eurasia), are fast becoming realities. The Northwest Passage first opened in 2007, and in 2008 both passages were ice free simultaneously for the first time in recorded history.⁴⁷ The implications of this are profound as can be seen in [Appendix C](#). As shipping shortcuts, they could reduce ocean distances by thousands of miles saving days of travel time, and potentially a great deal of money. Use of the Northern Sea Route would reduce the distance between Japan (Yokohama) and Europe (Rotterdam) from 11,200 nautical miles (nm) to only 6,500 nm. Shorter by over 40%, it also avoids the time consuming and politically tumultuous chokepoints of the Strait of Malacca and Suez Canal. The Northwest Passage would reduce a voyage from Seattle to Rotterdam from 9,000 nm to 7,000 nm. Shorter by over 22%, it would save additional time and money by avoiding the delays and fees of using the Panama

Canal. Even greater benefits could be realized by megaships which are too large to use the Panama and Suez Canals and are currently making the long treks around the Cape of Good Hope and Cape Horn. Some are merrily predicting a future that can only be described as a panacea of trans-Arctic transportation bliss:

Trans-Arctic shipping will become commercially viable and begin on a large scale. In an age of just-in-time delivery, and with increasing fuel costs eating into the profits of shipping companies, reducing long-haul sailing distances by as much as 40% could usher in a new phase of globalization. Arctic routes would force further competition between the Panama and Suez Canals, thereby reducing current canal tolls; shipping chokepoints such as the Strait of Malacca would no longer dictate global shipping patterns; and Arctic seaways would allow for greater international economic integration. When the ice recedes enough, likely within this decade, a marine highway directly over the North Pole will materialize. Such a route, which would most likely run between Iceland and Alaska's Dutch Harbor, would connect shipping megaports in the North Atlantic with those in the North Pacific.⁴⁸

Significant obstacles will have to be overcome before a future this rosy can be realized however. First, Arctic ice retreat may not make transportation any easier in the near-term. As thick multi-year ice breaks off from high Polar regions, seemingly ice free areas are likely to remain too dangerous for passage by non ice-capable ships for years to come. Second, the myriad critical support facilities and capabilities needed for safe oceanic transit are currently non-existent in the Arctic Ocean. Current inadequacies include search-and-rescue, traffic management, vessel tracking, solid and liquid waste disposal, harbors of refuge for ships in danger, the notices to mariners system, and training for captains and crews of these vessels.⁴⁹ Additionally, highly skilled 'ice pilots' will likely require special training and certification for particularly harrowing sections of the Northwest Passage. Furthermore, codes and methods of code enforcement for more rigorous ship design are needed to ensure vessels transiting the Arctic have thicker hulls, more powerful engines, and special navigation equipment. Lastly, but certainly not least, environmental disasters such as oil spills will have dramatically more severe

and long lasting negative effects in the delicate Arctic environment. Likewise, aggressive spill response capabilities will be of critical importance. As stated in the AEPS:

The Arctic is one of the areas most vulnerable to adverse impacts from chronic and acute oil pollution. This is due to physical environmental conditions such as low temperature, periods with little or no light, ice cover etc. Low temperatures lead to reduced evaporation of the more volatile, toxic oil components. Dark, cold winters in the Arctic lead to reduced ultraviolet radiation and biological decomposition of oil. In areas of drift ice, oil dispersal caused by wave action is also reduced. Oil in iced areas will be trapped between ice floes or under the ice, and only partly transported to the ice surface. These factors result in a generally slower decomposition of oil in the Arctic than in temperate regions. The period in which a particular oil spill can be harmful to wildlife is thus comparatively longer in the Arctic.⁵⁰

The private sector has recognized the potential commercial boom that Arctic shipping could provide. Billions of dollars are being invested to develop fleets of Arctic tankers with cutting-edge ‘double-acting’ ship designs that can sail bow first through open water and then turn around and proceed stern first to break through ice.⁵¹ The US Arctic Research Commission (USARC) anticipates that, “As Arctic seaways become a reliable venue for global trade, the number of ice-class ships, currently around 7,800, will likely grow from 4.5% of the world’s shipping fleet to 10%...Indeed, an accessible Arctic Ocean also means new or expanded routes for the US military sealift to move assets from one part of the world to another.”⁵² Tourism is also on the rise as cruise ships are venturing further north every year. Greater coordination by Arctic Nations will be needed in the future to ensure tourism policies help to minimize impacts on environmental degradation.⁵³ Furthermore, governments must mobilize now to meet these future challenges in terms of safe shipping:

Research, policies, and coordinated investment in infrastructure will ensure safe, secure, and reliable Arctic shipping. Under the principle of freedom of navigation, global shipping can come to our doorstep whether we invite it or not. Whether you envision the Arctic Ocean as a new seaway, for trans-Arctic shipping, competitive with the Panama and Suez Canals, or only foresee an

expansion of the current shipping in and out of the Arctic, the time to prepare is now.⁵⁴

As stated by former Assistant Secretary of State Daniel S. Sullivan, “Having a safe, secure, and reliable Arctic shipping regime is vital to the proper development of Arctic resources, especially now given the extent of Arctic ice retreat...We can have such a regime only through cooperation, not competition among Arctic Nations.”⁵⁵

Politics

Politics remains one of the greatest obstacles to a sustainable national strategy for the Arctic. This section shows that the outward political mindset, or psyche, of Arctic Nations vary somewhat around the region. Nonetheless, several conventions and frameworks exist to help regulate behavior and enforce agreements on Arctic concerns, including the UN *Convention on the Law of the Sea* and various organizations, like the Arctic Council and the International Maritime Organization. With the proper focus, much progress can be made through cooperative politics among Arctic Nations.

Psyche of Arctic Nations

Of the eight Arctic Nations, only the five bordering the Arctic Ocean make up the so called ‘coastal states.’ These include Russia, Norway, Canada, Denmark, and the US. Of these, the US has shown the least interest toward the Arctic.⁵⁶ The United States became an Arctic nation in 1867 after purchasing Alaska from Russia for \$7.2 million, or less than 2 cents per acre.⁵⁷ Just two years removed from the Civil War, many Americans failed to see wisdom in the transaction. Opponents of the deal viewed Alaska as a distant, useless piece of land, nicknaming it “Seward’s Folly” and “Seward’s Icebox” after then Secretary of State William Seward who championed the deal.⁵⁸ Despite becoming the 49th state in 1959, Alaska remains viewed by many Americans as a remote place that merits little attention. Most Americans, by and large, consider the US a bi-coastal nation while in reality the US has four coasts; East Coast, West Coast, Gulf Coast, and the 1,000-mile Arctic Coast.

An exception to this pervasive American disregard for Alaska has long been the US military. In 1935, Brigadier General Billy Mitchell recognized Alaska’s strategic potential dubbing it, “The most strategic place in the world.”⁵⁹ World War II saw a massive military

buildup in Alaska. By 1943, 152,000 out of 233,000 people living in Alaska were members of the US armed forces. Though the post-war population would drop to 99,000 in 1946, Cold War military expenditures quickly pushed it back up to 138,000 by 1950.⁶⁰ Alaska gave the US a clear strategic advantage over the Soviets throughout the Cold War. Close to the USSR and distant from the continental US, Alaska provided a priceless offensive and defensive buffer for ballistic missiles and ballistic missile warning systems. Alaska's remoteness, previously viewed as a liability, made it a prized strategic possession. Today, the USAF's decision to station its newest aircraft in Alaska is no coincidence. C-17s were recently relocated to Elmendorf Air Force Base in Anchorage because they, "can reach any critical point in the world in less than 10 hours" according to Lt. Col. Dave Alamand, Commander of Elmendorf's 517th Airlift Squadron, including only eight hours to Germany by flying over the North Pole.⁶¹ Surprising to some, this is roughly the same flight time to Germany as from bases on the US East Coast. In addition to this strategic lift capability, Alaska is one of just two locations outside the continental US to host the USAF's top-of-the line fighter, the F-22A Raptor.⁶² The military is not the only organization to recognize Alaska's importance, however.

Since the early 20th century, energy companies have been interested in Alaska for its oil and natural gas reserves. However, the costs of transportation kept production limited until two key events occurred. First, in 1967 North America's largest known oil field was discovered in Prudhoe Bay on Alaska's Arctic North Slope. Second, the Arab Oil Embargo in 1973 provided the cost incentive and political environment necessary to overcome hurdles of Native land claims and environmentalist objections to approve building the trans-Alaskan oil pipeline. The pipeline, which enables oil from the North Slope to be pumped to the ice free port of Valdez, was

completed in 1977 at a cost of over \$8 billion and has since transported over 15 billion barrels of oil.⁶³

Clearly, Alaska remains vital to US national security both militarily and economically. Despite this, most Americans still view Alaska as an icy and distant land with not much to offer but energy and polar bears. This mentality has been hardened by the highly publicized political debates between energy companies and environmentalists over drilling in the Arctic National Wildlife Refuge (ANWR), a 19 million acre refuge on the Arctic Coast estimated by the USGS to hold between 5.7 and 16 billion barrels of technically recoverable oil.⁶⁴ This amount would optimistically provide for two years of America's energy needs at the current annual usage rate of roughly 7.5 billion barrels of oil.⁶⁵ ANWR's potential resources, though not insignificant, are not a sustainable solution to America's long term energy dependency woes.

Russia and Canada, the two coastal states with by far the largest amount of Arctic coastline, have deeply grounded national psyches as Arctic Nations. Russians in particular consider a majority of the Arctic to belong to them. They believe the Lomonosov Ridge, an underwater Arctic mountain range thought to roughly connect Siberia and Greenland, to be an extension of their continental shelf and thus have laid claim to 460,000 square miles of the Arctic to include the North Pole.⁶⁶ In August 2007, celebrated Russian polar explorer Arthur Chilingarov declared, "The Arctic is ours and we should manifest our presence" after placing a titanium Russian flag on the North Pole seabed 13,200 feet beneath the frozen surface.⁶⁷ The flag planting mission itself was more than just a publicity stunt. It involved a nuclear-powered icebreaker and a research vessel with two mini-submarines on a mapping expedition of the Arctic continental shelf in hopes of bolstering Russia's 2001 continental shelf extension claim which the UN *Commission on the Limits of the Continental Shelf* (CLCS) denied, pending

further geologic evidence. In fact, more recent Canadian scientific mapping from March 2009 suggests that the North Pole may belong to Denmark.⁶⁸

Canadians too have a deeply ingrained sense of Arctic ownership. Canadian Prime Minister Stephen Harper has declared, “Canada has a choice when it comes to defending our sovereignty over the Arctic, we either use it or lose it. And make no mistake; this government intends to use it.”⁶⁹ The Harper administration’s new *Canada First* Defence Strategy makes repeated mention of the Arctic: “Canadian Forces must have the capacity to exercise control over and defend Canada’s sovereignty in the Arctic”⁷⁰ and to “conduct daily domestic and continental operations, including in the Arctic and through NORAD [North American Aerospace Defense Command].”⁷¹ Canada has backed up this rhetoric with plans to open a new cold-weather military training center, acquire six to eight new Arctic/offshore patrol ships, and homeport them at a new deepwater Arctic port. Satellites, advanced radars, and unmanned aerial vehicles (UAVs) are also being procured to “ensure the constant monitoring of Canada’s territory and air and maritime approaches, including in the Arctic, in order to detect threats to Canadian security as early as possible.”⁷² Compare this to the *National Security Strategy*, *National Defense Strategy*, and *National Military Strategy* of the United States, none of which mentions Alaska or NORAD. In fact, the single mention of the Arctic is found in the *National Defense Strategy*, but only when referencing Russia’s resurgence.⁷³

Also part of the Canadian psyche is a strong spirit of cooperation with the US in the mutual defense of North America. *Canada First* has a repeated theme of being “a strong and reliable partner in the defence of North America in cooperation with the United States, Canada’s closest ally. Given our common defence and security requirements, it is in Canada’s strategic interest to remain a reliable partner in the defence of the continent.”⁷⁴ Canada and the US share

the longest non-militarized border in the world and more than half a trillion dollars of annual trade.⁷⁵ The two nations have an extensive history of peacefully resolving differences and working bi-laterally for mutual benefit. Examples are too many to list, but both nations must work together to resolve their ongoing disagreement over the Northwest Passage.

Canada views this fabled waterway through the Canadian Arctic ‘Archipelago’ as internal waters while the US and a majority of the international community see it as an international strait and thus the right of innocent passage should apply. This divide may result from Canada’s self-image as an Arctic nation, and America’s self-image as the universal defender of the high-seas, ensuring freedom of navigation for all nations. This deeply rooted sentiment dates back as early as 1801 when the nascent US Navy defeated the Barbary pirates who were controlling access to the Mediterranean Sea.⁷⁶ The US and Canada should be aware of the passions on both sides of this issue as they work towards a peaceful solution.

According to the NDU report, one of the greatest challenges in the Arctic is that the US, “simply doesn’t understand we are an Arctic Nation. We’re a landowner in the Arctic with unique obligations, environmentally and strategically.”⁷⁷ Today, the US Navy is as powerful as that of the next 17 largest navies combined, yet as further evidence of US inattention in the Arctic, the US has only one operable Arctic icebreaker.⁷⁸ In contrast, Russia has 18 icebreakers, seven of which are nuclear-powered and capable of breaking through ice twice as thick as the US diesel powered ice-breaker.⁷⁹ A wide range of US government officials have recognized that this deficiency of icebreaker capabilities has begun to limit US operations in the Polar regions. This includes Alaska Governor Sarah Palin, USARC Chairman Meade Treadwell and recent commanders of UN Northern Command, US Transportation Command, and US Pacific Command.⁸⁰ Case in point: *USNS Gianella* recently required a rescue from a leased Swedish

icebreaker, after having spent 50 hours in pack ice.⁸¹ On a positive note, this rescue could be indicative of the type of future cooperation that could become the norm for Arctic Nations operating in the challenging polar environment.

The Scandinavian countries (Norway, Denmark, and Sweden) have traditionally viewed the Arctic holistically, especially in terms of environmental and indigenous factors. The psyches of Denmark and Norway as coastal Arctic Nations are particularly relevant. For the case of Denmark, this is because of its extended claims through Greenland. Once again indicative of historically lacking American strategic interest in the region, the US ceded portions of disputed Greenland territory to Denmark in 1917. This settled claims resulting from American expeditions by Robert Peary in the late 1800s. Instead, the US purchased the Danish Virgin Islands, which it considered a more strategic acquisition. More recently, Danish Crown Prince, Frederik Andre Henrik Christian, has outwardly demonstrated interest and concern for the Arctic. For example, he participated in the *Sirius 2000* expedition, a 2,795-kilometer sledge journey in northern Greenland from Qaanaq to Daneborg, showing his commitment to understanding the region and its indigenous peoples.⁸²

Understanding indigenous cultures is a key piece to the psyche of Arctic nations. The region contains a multitude of different indigenous groups spanning across territory held by each Arctic Nation, as shown in [Appendix D](#). According to Dr. Natalia Loukacheva of the Munk Center for International Studies in Toronto, “the evolving security perspective in Greenland and Nunavut is formed by the Inuit tradition which demands cooperation and peaceful conflict resolution rather than military actions.”⁸³ Danish foreign policy emphasizes the key areas of Common Security, Democracy and Human Rights, Economic and Social Development, and the Environment.⁸⁴ Environmental security, defined by the Danes as “the reasonable assurance of

protection against threats to national well-being...associated with environmental damage,” stands as a unifying concept for Greenland and Denmark even in light of possible future independence of Greenland.⁸⁵

Norwegian security policy in the Arctic can be understood historically by its bilateral disputes with Russia, particularly over national interests in Svalbard, and its commitment to the ‘extended security’ concept. Former Foreign Minister of Norway, Bjørn Tore Godal, summarized this post-Cold War Norwegian concept as follows: “Our security rests on many more pillars than the military. This is what the concept of extended security is all about...Our security today can not be attended to by military means alone. A comprehensive and composite number of security challenges demand a much broader set of political and institutional measures.”⁸⁶ Late Norwegian Foreign Minister Johan Jørgen Holst, also spoke of a grander ‘common security’ concept: “The most pressing challenges in the Arctic are not confined to military issues, but include also environmental problems, management and utilization of natural resources, and jurisdictional issues. The end of the Cold War has eliminated many of the obstacles to a common security approach to the challenges of the Arctic.”⁸⁷

Finally, the Norwegian Government’s *High North Strategy* spells out specific areas of emphasis in the Arctic today. These themes are the backbone of this strategy: leadership of international efforts for building knowledge and capacity; stewardship to the natural environment, resources, and wildlife; strengthening cooperation, on a people-to-people basis and internationally, with Russia in particular; safeguarding the livelihoods, traditions, and cultures of indigenous peoples; and overall value creation through the appropriate framework, education, utilization, and management. The strategy also clearly articulates where Norway will stand on Arctic issues:

The last large wilderness-like areas in our part of the world are to be found in the High North. The natural environment and cultural heritage of the region together make up a unique heritage that must be protected for future generations. This is why the environment and natural resources in the north must be protected against pollution and over-harvesting. It is also important to prevent developments from causing damage to the environment, and to prevent wear and tear and disturbance from increased traffic.⁸⁸

International Frameworks

There is growing international interest in the framework of future Arctic governance. Arctic Nations have increasingly articulated their respective economic stakes in the region's untapped resources in order to delineate the boundaries of territorial claims well before new discoveries are realized. At the same time, the international community has expressed the need to cooperate in responsible environmental management of the fragile resources in the Arctic. Despite calls for new international frameworks in the Arctic, existing frameworks are well-established. The new paradigm of Arctic governance may simply be to implement these frameworks with environmental cooperation in mind.

Harkening back to the days of colonial imperialism and the glory days of Sputnik, Russia's symbolic flag planting sparked a wave of sensationalist literature ripe with Wild West imagery of a 'lawless Arctic Gold Rush' with nations making an 'armed mad dash' to 'carve up' resources. Similar to Sputnik, the act may have served as a wake-up call for the US. "In spite of the exaggerated coverage, many were pleased the Russian 'media stunt' had reminded the US it was an Arctic nation with an important stake in the region."⁸⁹

Contrary to these portrayals of chaos, the process of submitting territorial claims to the UN has thus far been deliberate and orderly. Norway submitted its claim in 2006 and Canada and Denmark are gathering the data to submit their claims prior to their respective submission deadlines of 2013 and 2014 respectively. "In fact, the international community has maintained a

relatively collegial atmosphere of negotiation in the region based on an effective framework of bilateral and multilateral agreements.”⁹⁰ This is not to say that there are not any territorial disputes however. In fact six such disputes are known to exist, and three involve the US. US/Canadian disputes involve how to legally define the Northwest Passage and the demarcation of a 100 square mile portion of the maritime border in the Beaufort Sea. The US has also not resolved a disagreement with Russia over the status of an 18,000 square mile area of the Chukchi Sea.⁹¹ Canada has a dispute with Denmark over the status of Hans Island, located in the Nares Strait, between Canada’s Ellesmere Island and Greenland. Russia and Norway have yet to resolve their maritime boundary in the Barents Sea, and Norway and Denmark have a similar disagreement in the East Greenland Rift Basin.⁹²

A perfect historical analogy for resolving sovereignty disputes in the Arctic does not exist. Nonetheless, despite the unique characteristics of the Arctic Ocean, UNCLOS provides an important piece of a suitable international framework to resolve territorial issues and regulate commerce, as described below:

The convention provides mechanisms for states to settle boundary disputes and submit claims for additional resources beyond their exclusive economic zones. Furthermore, UNCLOS sets aside the resources in the high seas as the common heritage of humankind, it allows states bordering ice-covered waters to enforce more stringent environmental regulations, and it defines which seaways are the sovereign possessions of states and which international passages are open to unfettered navigation.⁹³

Written in large part by the US with its own national interests in mind, the US Senate has yet to ratify this comprehensive international law due to concerns over yielding US sovereignty. A small group of Senators has been able to stall the ratification process for roughly 15 years by keeping it tied-up in committee and preventing a full vote on the Senate floor. US Secretary of State, Hillary Clinton, when asked if ratifying UNCLOS will be a priority for her State

Department responded emphatically, "Yes it will, because it's way overdue."⁹⁴ Coalter G.

Lathrop, president of Sovereign Geographics counters predictions of chaos, observing:

There exists a comprehensive legal regime that defines the rights and obligations of states in, over, and under the world's oceans. It comes complete with customary rules, framework and subsidiary conventions, and dispute-settlement mechanisms and institutions. It applies to the Arctic Ocean. Whether such a regime stinks of world government or rings of international cooperation, it is far from a "legal vacuum"...if the Arctic descends into anarchy, it will be despite the rules that are already in place.⁹⁵

Presently, Arctic governance is formed by UNCLOS, along with the International Maritime Organization (IMO) and the Arctic Council. In this regime, the five coastal states have the primary responsibility for managing activities in the region, including both development and environmental protection. On May 28th 2008, representatives meeting in Ilulissat, Greenland adopted the *Ilulissat Declaration of the five Arctic States*. See [Appendix E](#). The declaration reaffirmed the responsibilities and challenges faced by the coastal states under the established legal regime. It also recognized the right of other states to participate in development and protection under the provisions of international law and through the IMO, the Arctic Council and other relevant international forums. Furthermore, it specifically states that there is "no need to develop a new comprehensive international legal regime to govern the Arctic Ocean."⁹⁶ As such, it recognizes the effectiveness of, and pledges a commitment to, the frameworks already in place. Likewise, it rejects the notion of an alternative regime for the Arctic Ocean as contrary to the existing, effective, frameworks and therefore unnecessary.

Maritime governance can be dated back to the first international treaty adopted in 1914, following the Titanic disaster of 1912. This treaty, the *International Convention for the Safety of Life at Seas* (SOLAS), is still the most important treaty for maritime safety today.⁹⁷ The IMO was established in 1948, following the foundation of the UN. The IMO's main task has been to,

“develop and maintain a comprehensive regulatory framework for shipping and its remit today includes safety, environmental concerns, legal matters, technical co-operation, maritime security and the efficiency of shipping.”⁹⁸ The mission statement of the IMO emphasizes cooperation and preparedness for maritime accidents, including distress and safety communications, search and rescue, and oil pollution response.

Arctic governance also has deep roots in the *Arctic Environmental Protection Strategy* (AEPS) of 1991, an initiative of Finland signed by all eight Arctic Nations. The broad recognition of the strategy is that, “Only through careful stewardship by Arctic countries and Arctic peoples can environmental damage and degradation be prevented. These are the challenges which must be taken up in order to secure our common future.”⁹⁹ The AEPS identified many areas of emphasis still direly needed in a sustainable strategy today, including scientific cooperation, assessment of environmental impacts, pollution control measures, and a commitment to international implementation.¹⁰⁰ It also established programs to foster this future cooperation: Arctic Monitoring and Assessment Programme; Protection of the Marine Environment in the Arctic; Emergency Prevention, Preparedness, and Response in the Arctic; and Conservation of Arctic Flora and Fauna.

Building on this strategy, the Arctic Council has been a strongly influential intergovernmental forum since its establishment in 1996 by the Ottawa Declaration. It serves as a “means for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic Indigenous communities and other Arctic inhabitants on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic.”¹⁰¹ It includes all members of the eight Arctic Nations and currently has six indigenous organizations as permanent participants. In addition, the council offers observer status to non-

Arctic states, as well as other intergovernmental and non-governmental organizations that have a stake in its purpose. Denmark will take over the two-year rotating Arctic Council chairmanship role from Norway in April 2009. This rotation, though, does not indicate a change in major focus areas of the council over the long term. The Norwegian, Danish, and Swedish chairmanships, spanning from 2006 to 2012, have cohesively identified common objectives in the Arctic, including: following up on the ACIA report for climate change findings; improving the integration of resource management for sustainability and environmental protection; enhancing relations with the international Arctic science community, to include the massive *International Polar Year* project; improving the living conditions of local indigenous peoples; and continual assessment of its progress and international processes.¹⁰²

One example of the effective use of established international processes is the case of the close cooperation in the Straits of Malacca and Singapore. The agreement resulting from the *Jakarta Initiative* provides a recent model for a multilateral approach relevant to the Arctic sea routes. Over a two-day meeting in Jakarta ending on 8 September 2005, Malaysia, Indonesia, and Singapore launched a joint effort with the IMO, which respects the integrity of UNCLOS and directly promotes sustainable development and environmental protection. During his opening remarks to the session, Mr. Efthimios Mitropoulos, Secretary-General of the IMO, spoke of a global imperative of the safety and security in the straits, and affirmed that genuine progress could be made without delay using existing international frameworks:

Today and tomorrow we will take stock of existing agreements and endeavour to reach convergence on the perception of likely threats to the safety of navigation in the Straits of Malacca and Singapore and, subsequently, identify the actions necessary to contribute to the building of confidence among the various stakeholders to address the demands of safety, security and environmental protection throughout while, at the same time, respecting the sovereignty and territorial integrity of the three littoral States and the relevant provisions of

international law, in particular the United Nations Convention on the Law of the Sea.¹⁰³

A key piece of the initiative in Jakarta is the ‘Eye in the Sky’ program that established combined maritime patrol to ensure continuous coverage over the 805-kilometer Straits of Malacca. At the meeting in Jakarta, Colonel Suryo Wiranto, Assistant Chief of Operations for Western Fleet Command of the Indonesian Navy, stated that, “This multilateral initiative will help optimize air surveillance of the participating countries by providing intelligence and information aimed at enhancing the immediate action of the naval patrolling units along the Malacca Straits.”¹⁰⁴ According to Mr. Mitropoulos, this combined force is critical to building capacity for monitoring the straits, as a shared responsibility, for threats like piracy, armed robbery, and terrorism. It also enhances training to prevent or suppress unlawful acts and enacts cooperation in the areas of search and rescue and response to marine pollution incidents.

Overall, the Jakarta model stands as an international precedent for employing existing frameworks for better control of the seas and management of environmental risks. Again, Mr. Mitropoulos emphasized that, “Nowadays, safety, security, and environmental protection are, within the maritime domain and the work of the IMO, intertwined and inseparable.”¹⁰⁵ As he further explains, the pathway to success is paved by a spirit that recognizes the need to work cooperatively: “For I am convinced that it is only through working together that we will be able to better address the multi-faceted and interconnected challenges and threats confronting our world nowadays and achieve progress in all areas of concern such as those that brought us here in Jakarta.”¹⁰⁶ James Kraska, Oceans Policy Adviser for International Negotiations on the Joint Staff in Washington, agrees that UNCLOS and the IMO are crucial pieces to a comprehensive package of international agreements necessary to regulate the Northwest Passage in the Canadian Arctic. He views the model in the Malacca Straits as the ideal working model for the

environmentally sensitive strait that is gradually becoming more accessible. In his words, “In the era of globalization, the multilateral successes in the Straits of Malacca and Singapore provide a framework for promoting Canada’s goals of preserving the fragile Arctic environment, maintaining maritime domain awareness in Arctic waters and exercising appropriate jurisdiction and oversight over the Northwest Passage.”¹⁰⁷

Shifting Emphasis

Despite an apparently clear path to success in the Arctic, much progress is needed to ensure cohesive politics. Perhaps the most significant impact of climate change awareness stemming from the Arctic is a welcomed shift in viewing the world as an interconnected global community. Politically, in the words of Dr. John Ackerman, “the consequences of global warming could initiate replacement of the dominant international relations paradigm.”¹⁰⁸ At the current crossroads of the international community, though, it seems that the tendency has been for a traditional response. Case in point: *Discover* magazine released the top 100 scientific discoveries from 2008, listing the melting Arctic as its #5 story. Ironically, the focus of the story was not that sea-ice coverage last year was one-third smaller than the 1979-2000 average, but that new sovereignty maps have been proposed.¹⁰⁹ Specifically, the story highlights the fact that the International Boundaries Research Unit at Durham University in England “produced an online map of the Arctic maritime jurisdictions and boundaries that in a mere three days had been downloaded more than 42,000 times.”¹¹⁰ See [Appendix F](#).

Add to this that the NDU report, while discussing the “US Strategic Climate,” lists American priorities in this order: security, economics, and environment.¹¹¹ The common mindset consistently places environmental concerns second or third in line, rather than in the same first-tier category of security interests, on a par with sovereign territorial claims and

balance of power politics. This was the prevalent American strategic position under the Bush administration. Simply recognizing that climate change exists does not mitigate its consequences. Until the strategic communication at the national level places environmental security in line with national security, each individual nation will continue contributing to, and suffering from, the impacts of climate change in the Arctic.

President Bush released National Security Presidential Directive (NSPD) 66, *Arctic Region Policy*, on 12 January 2009. This effectively ‘updated’ the existing US policy on the Arctic dating back to Presidential Decision Directive (PDD) 26 from 1994. The six principal objectives in the Arctic region remain unchanged with the new policy, with the exception of referring to “homeland security needs” instead of “post-Cold War national security.”¹¹² The clear undertone in the new policy, however, is one of national sovereignty, and control of potential resources and future Arctic exploitation. This appears to be a conscious shift away from the 1994 policy which spoke of an “atmosphere of openness and cooperation with Russia” and “unprecedented opportunities for collaboration among all eight Arctic Nations on environmental protection, environmentally sustainable development, concerns of indigenous peoples and scientific research.”¹¹³

The push for international cooperation on the Arctic has been driven not just by those nations with sovereignty claims, but by others who see the issue from an environmental aspect. Their stakes are clear: the entire global community in the broadest sense consists of ‘Arctic nations’ when coupling the fragility of the natural environment with the global impacts of climate change. In December 2008, the United Nations held a Conference on Climate Change in Poland, where there was an aura of great expectations for the 15th conference of the *UN Framework Convention on Climate Change* (UNFCCC) to be held in Copenhagen in December

2009. On the website for Conference of the Parties (COP15), Michael von Bülow says it is a matter of urgency for the members to come to clear direction and appropriate burden sharing to put plans into action from the conference. He writes, “From a historical point of view, the UN Climate Conference in Copenhagen is one of the most significant gatherings ever. The world has precious little time to reach an agreement which will secure the future habitability of the planet.”¹¹⁴ He places the event higher in magnitude than peace accords after the world’s greatest wars as they were of only temporary impact. In contrast, “Copenhagen will be dealing with something fundamental to life on Earth: the stability of the biosphere.”¹¹⁵

UN Secretary-General Ban Ki-moon highlighted the importance of cooperation during his opening statement in Poland stating, “Today we need a global solidarity on climate change, the defining challenge of our era.”¹¹⁶ His speech came across as a call to arms by the United Nations to face the challenge of climate change. A fundamental aspect of his speech was that much success could be created by facing this challenge in conjunction with the failing global economy. In his words, “these crises present us with a great opportunity – an opportunity to address both challenges simultaneously... An investment that fights climate change creates millions of green jobs and spurs green growth. We need a Green New Deal.”¹¹⁷ He went on to praise the efforts of countries already embracing the spirit of the new green economy: green development conferences like those held in Qatar and Warsaw, investments in green energies like Denmark and even China, and active green economies like Brazil. “We must keep climate change at the top of our national agendas,” he stated.¹¹⁸ Furthermore, he said the world looks for leadership from the European Union (EU) and the US, speaking with great optimism on the “incoming administration’s plan to put alternative energy, environmentalism and climate change

at the very center of America's definition of national security, economic recovery, and prosperity."¹¹⁹

The response of the EU and the US to calls for cooperation like those expressed by Ban Ki-moon has been one of reciprocity. The EU wants to do its part, and the US has started setting the stage for bold action and clear statements as the world leader on the issue. János Herman, Principal Advisor for Regional Cooperation of the European Commission, states the EU is a "natural and legitimate player" in the Arctic based on its members with Arctic claims, its proximity to the Arctic Circle, and its strategic relationship with the US, Canada, and Russia.¹²⁰ The Commission's core objectives in the Arctic, he says are: 1) the protection and preservation of its environment; 2) the sustainable husbandry of its resources; and 3) developing its governance.¹²¹ The general outlook in these three objectives, from the EU point of view, is to mitigate the effects of climate change, exploit resources with caution, and build on existing governance provided by UNCLOS.¹²² Among the steps for improved governance is a push for EU observer status on the Arctic Council, with hopes to gain a seat at the table for discussion on Arctic development and to ensure "exploration or exploitation activities would be carried out in accordance with the highest environmental standards."¹²³ The sustainable use of the region's resources is of highest concern for the EU according to Oda Helen Sletnes, Ambassador and Head of the mission to Norway for the EU. She uses the analogy of the "canary in the coal mine" to describe the Arctic because it warns the rest of the world of the looming dangers of climate change.¹²⁴

The US, in kind, has begun speaking with increased commitment to working as a world leader on the current global problems of climate change and the suffering economy. The newly sworn in Obama administration has echoed the spirit of Ban Ki-moon in the words of official

speeches, in the selection of its highly influential positions, and in its first policy actions. During his Inaugural Address, the President spoke of the need to navigate the icy waters ahead, referring to the tough times and hard choices ahead for the US. He specifically talked to building a new green economy with climate change mitigation in mind.¹²⁵

Secretary of State Hillary Clinton, likewise, highlighted American lead on this issue as a high priority when she addressed a crowd welcoming the appointment of Todd Stern as a new Special Envoy for Climate Change:

As should be evident by now, the President and I believe that American leadership is essential to meeting the challenges of the 21st century. And chief among those is the complex, urgent, and global threat of climate change. From rapidly rising temperatures to melting arctic icecaps, from lower crop yields to dying forests, from unforgiving hurricanes to unrelenting droughts, we have no shortage of evidence that our world is facing a climate crisis. And let's be clear. A world in crisis goes well beyond the air we breathe, the food we eat, the water we drink. It is at once an environmental, economic, energy and national security issue with grave implications for America's and the world's future.¹²⁶

Indicative of the new political commitment to this problem, Mr. Stern then addressed the same crowd, and spoke of the opportunity of "transforming the global economy."¹²⁷ He stated, "We need partnerships and joint ventures among countries, collaborations between governments and the private sector, new technology and new financing. And we will need, above all, political will."¹²⁸

The President also sent a strong message by appointing Dr. Steven Chu, Nobel Prize winning physicist, as US Secretary of Energy. Clearly, the new administration plans to hold true to its promise to base response to climate change and efforts to build a green economy on sound science. At the same time, the political will to act was demonstrated by raising the federal Corporate Average Fuel Economy (CAFE) standards in order to encourage incentives for improving fuel efficiency in American vehicles. This legislation replaces standards that have

been effectively frozen at 1986 levels. This is part of the administration's strategy to "Deploy the Cheapest, Cleanest, Fastest Energy Source – Energy Efficiency."¹²⁹

Dr. Ackerman's suggestion that a political paradigm shift could be spurred by climate change may be unattainable in a timely manner without strong political will, like that promised by the new administration. This shift also requires a change to an ecologically based economy that is not only necessary for America's security, but also for global security. Furthermore, this shift requires a broader awareness of human impacts on the world around us. Professor Simon Dalby of Carleton University suggests that we now exist in an 'Anthropocene' geological period where human interactions with the environment are at such a scale as to produce ecological disruptions and vulnerabilities that outweigh nature's ability to absorb them and heal itself.¹³⁰ "Thus," he states, "security planning needs to emphasize the importance of reducing the total throughput of materials and energy in the biosphere to limit disruptions while simultaneously building resilience and habits of international cooperation into human societies to better cope when disaster strikes."¹³¹ He depicts rather grimly the harsh reality that faces human security of all nations based on scientific evidence suggesting the prospect of 'peak oil,' the interconnectedness of the Earth's biosphere, and the corollary impacts on global economics and politics. In addition, he suggests a fresh look on mitigation efforts and the preservation ethos traditionally flagged as 'environmentalism.' He suggests that "adapting to new ecological circumstances...is not about parks and protection; it is about changing the modes of production and consumption to reduce total ecological throughput in the biosphere for sustainable human existence."¹³²

This suggested paradigm shift has monumental implications for policy makers charged with developing an appropriate national strategy in the Arctic. As Dalby continues his

discussion into what he calls “Anthropocene social science,” he emphasizes that while “state-based politics and spaces are appropriate paradigms for the human side of environmental matters...Political leaders must move from mitigation and regulation after the fact to thinking seriously about design and construction of artifacts, technologies, and societies that minimize ecological throughput.”¹³³ Dalby, therefore, lays out a new framework for a global environmental security that must: 1) decrease ecological disruptions; 2) refocus military capabilities on providing short-notice aid and assistance; and 3) “extend the habits and institutions of international cooperation so that aid and trade – rather than confrontation and conflict – are the responses to ecological disruptions.”¹³⁴ A better understanding of the biosphere system through natural science drives sound policy, as the two are inextricably linked.

Science

*Collaboration harvests its benefits from differences in perspectives, knowledge and approaches, solving problems while at the same time offering benefits to all those involved in the process.*¹³⁵

—Zinaida Fadeeva, United Nations University

The theory of climate change builds from the successful observations of numerous international programs of scientific study. The importance of science driving policy for climate change appears rather obvious. The need for continued research programs is clear, but what may be less easy to coalesce are the extent of scientific efforts and information sharing across national and international organizations. A strong national strategy for the Arctic should incorporate the collaborative spirit seen in the international scientific community. Furthermore, the national effort should merge military and civilian assets for synergistic response to climate change. This section shows some examples of successful implementation of these concepts at the international and interagency levels.

International

The *International Polar Year* (IPY) is a prime example of this collaborative spirit to understand regional changes and global linkages. This fourth IPY spanned from March 2007 to March 2009 and involved over 200 projects with thousands of scientists from over 60 nations using state-of-the-art technologies to explore physical, biological, and social research topics in both the Arctic and Antarctic.¹³⁶ Among the urgencies of the IPY are the changing snow and ice, rising sea levels, permafrost degradation, and health challenges of Northern people. These studies represent an enormous effort; according to the International Council for Science and the World Meteorological Organization, the IPY is “one of the most ambitious coordinated international science programmes ever attempted.”¹³⁷ These studies are not blind natural science

efforts because the IPY recognizes the innate relationship between the physical and social sciences. The opportunity to draw the proper conclusions from the studies is assisted by these mutual efforts. The IPY describes the spirit of discovery and the scope of science as follows:

Many scientific frontiers in the polar regions are at the intersection of disciplines, and progress will be achieved not only through the use of new observational techniques, but also by the interdisciplinary cross-analysis of existing databases, taking advantage of outstanding strides made recently in computing capability and communication on the Internet. New polar scientific advances will occur on a tremendous range of spatial scales, from the previously inaccessible realms of the genome to vast areas of the Earth's crust beneath the ice and polar oceans.¹³⁸

Interagency

Scientific collaboration at the national level is also not without precedent. US programs dedicated to the Arctic continue to make headway in understanding the Arctic problem. The US Arctic Research Commission (USARC), for example, was established in 1984 by the *Arctic Research and Policy Act*. Its seven Commissioners are appointed by the President and report to the President and the Congress on goals and priorities for the US Arctic Research Program, which is coordinated by the Interagency Arctic Research Policy Committee (IARPC), chaired by the National Science Foundation (NSF) Director.¹³⁹ In conjunction with the IPY, USARC helped develop an Arctic Observation Network (AON), a system of atmospheric, land- and ocean-based monitoring capabilities designed to advance Arctic environmental observations. AON data, in addition to furthering the efforts of the IPY, enables the US government interagency initiative to “get a handle on the wide-ranging series and rapid changes occurring in the Arctic.”¹⁴⁰ This initiative is aptly called the Study of Environmental Arctic Change (SEARCH).

US interagency efforts have had varying degrees of success in information sharing, but it seems that interagency use of assets and methods is inevitable. One such effort was the

cooperation of Central Intelligence Agency (CIA) with Medea, a program initiated in 1991 by then-Senator Al Gore. Medea scientists worked to study trends in environmental science, like global warming and the condition of polar ice caps, while benefiting from some of the data collected from CIA satellites, aircraft, ships and sonar arrays. The intent of this information-sharing program was to declassify certain information gathered for military intelligence purposes to be used for science. According to Jeffrey Richelson of *Scientific American*: “Never before has the intelligence community worked with a group of scientists outside the government with the kind of scale, trust and intimacy that will be required if the scientists are to make the fullest use of the government data and assets.”¹⁴¹

Information sharing helps tackle two main pillars of the scientific method: the ability to replicate findings and to verify their validity through experimentation and observation. Skeptics of sharing classified information are concerned about the sensitivity of national security capabilities and data sets and question the usefulness of information declassified too late in the game for scientists to benefit. The overall experience of the Medea program, though, was mutually beneficial since Medea scientists helped intelligence community analysts to process and fuse data from multispectral inputs. For example, their methods were crucial to understanding the effects of a series of oil spills in the Komi region of Russia and of Russia’s chemical weapons disposal in the Arctic.¹⁴² Other critics who feared that environmental observations would overwhelm shared intelligence assets have been disproven by the Medea experience, where “environmental collection effort occupies less than 1% of the time of reconnaissance satellites.”¹⁴³

Options Analysis

This section takes into consideration the previous discussion of the natural environment, economics, politics, and science while comparing strategy options for the Arctic. First, it examines the options presented at the NDU conference, using the criteria for success introduced at the beginning of this paper. Next, it compares the current and former Arctic region policies with the same criteria. Finally, it highlights the strengths and weaknesses of each strategy for consideration in the conclusion and recommendations section.

Options Comparison

The NDU report, *The Arctic Circle: Development and Risk*, laid out three potential options for a national Arctic strategy without recommending a best course of action. While the report suggests a lower risk for each successive option, the implications of individual components are assessed here. Option 1 of the report is ‘status quo’: retain current levels of an international framework. This is considered a high risk option because of the expanding Arctic mission area, insufficient Arctic infrastructure, and unsatisfied diplomatic agreements.¹⁴⁴ Option 2 is labeled as ‘limited enhancement’ and is assessed as a medium risk option with the following steps:

- Ratify UNCLOS
- Articulate an Arctic Strategy which positively defines US interests and priorities
- Arm the USCGC *Healy* (sole US ice-breaker) for defensive purposes
- Create an Arctic Combatant Command able to manage and lobby for DoD assets in the region
- Initiate a DoD working group to assess the feasibility of improving US Navy Arctic operations
- Act to resolve border disputes with the Russian Federation and Canada on a bilateral basis
- Develop a plan to safeguard the Bering Strait (the future Trans-Arctic gateway for shipping)

- Review plans for establishing a base on Little Diomed Island (in the Bering Strait off the Alaskan coast) or improving Kivalina Lagoon (slightly further north in the Kotzebue Sound)¹⁴⁵ See [Appendix G](#) for map.

Finally, option 3 lays out a presumably low risk option with the following priorities:

Short Term

- Ratify UNCLOS
- Submit US claims for extended territorial boundary
- Conduct a comprehensive DoD review of Arctic exigency plans
- Establish an interagency working group on Arctic scenarios

Long Term

- Improve, upgrade, and expand American icebreaker fleet (but begin process now)
- Review feasibility of a new Arctic Combatant Commander
- Act to resolve border disputes with Russia and Canada
- Begin fundraising campaign for US infrastructure improvements which will also serve Arctic clients; i.e. improved “ports of refuge,” navigation and communication satellites, search and rescue operations, cartographical measurements, etc...
- Arctic armaments treaty which restricts weapons in the region¹⁴⁶

The following analysis illustratively compares these options and their components with the research criteria, namely that the optimal strategy must:

- 1) Peacefully resolve territorial sovereignty issues and promote free trade economics.
- 2) Mitigate risks to human and environmental security in the region and around the globe.
- 3) Provide a long-term solution to the sustainable development of the Arctic.
- 4) Include a mechanism for enforcement and monitoring compliance.

The matrix below summarizes the viability of these options with respect to these criteria. A traffic light analogy is used to express the quality of each option. Note that only Options 2 and 3 receive a ‘green light’ assessment, but not in all areas. Overall, none of the three options constitute an acceptable comprehensive strategy.

Criterion	Option 1	Option 2	Option 3
1	Red	Yellow	Green
2	Yellow	Yellow	Yellow
3	Red	Red	Yellow
4	Yellow	Green	Yellow
Overall	Red	Yellow	Yellow

The first criterion is to peacefully resolve sovereignty issues and promote free trade; it is clear that while progressing from Option 1 to Option 3, the strategy becomes more viable. Current policy is insufficient due to the unacceptable ambiguity over US claims and existing disputes with Russia and Canada. With ratification of UNCLOS in Option 2, however, the US legitimizes its claims under international law, and would gain leverage in negotiation with other nations that have ratified the convention. With Option 3, there is more substantial support to meet this first criterion because it recommends submitting US claims for its extended boundary. Scientific evidence and ocean mapping efforts already underway could provide empirical data required to substantiate these claims and make sovereignty resolution more objective.

Criterion	Option 1	Option 2	Option 3
2	Yellow	Yellow	Yellow

None of the options successfully meet criterion 2 for environmental security. This is because the NDU report acknowledges the climate change problem but falls short of suggesting strategy options that incorporate steps to mitigate it. Because no option discusses how to protect

the Arctic's fragile environment or to consider the social and human welfare impacts of capitalizing on new resource and transit opportunities, a new option should address this core issue. Effectively, the status quo is just as good for this criterion since no new approaches are offered. A newly articulated strategy should emphasize environmental security as a high priority. The suggestion of a non-militarized Arctic, though respectable, is actually somewhat irrelevant and possibly even counter-productive to safeguarding the Arctic and controlling harmful interactions from an enforcement point of view.

Criterion	Option 1	Option 2	Option 3
3	Red	Red	Yellow

Again, the options fall short with criterion 3, which is to provide long-term sustainability. Option 1 represents the worst option in some respects since it does not allow the US to lawfully claim its offshore resources. Ratification of UNCLOS, on the other hand, only begins the process of exercising economic options from a traditional point of view. This step would need to be incorporated into an adaptive economy that benefits from activities like eco-tourism and port services rather than oil drilling and mineral extraction alone. Long-term sustainability could be more at risk if these endeavors are not approached with measured caution. Option 3 suggests improvements to the icebreaker fleet and infrastructure projects, which could be positive steps toward sustainability.

Criterion	Option 1	Option 2	Option 3
4	Yellow	Green	Yellow

Finally, the enforcing and monitoring criterion, a capstone to the other three criteria, is perhaps the greatest challenge of all due to the substantial size of the region and the potentially competing interests of state and non-state actors. Military assets would probably play a significant role in this regard, giving teeth to international agreements and providing the best observation and response capabilities. Better monitoring could be achieved through satellite assets as proposed in Option 3, but the suggestion to restrict weapons in the Arctic takes enforcement agencies out of the picture if those not in compliance with international law choose to arm themselves. Assets like the USCGC *Healy* and proposed basing in the islands and lagoons of northern Alaska could provide the required leverage for proper enforcement. Because Option 2 suggests arming the *Healy* for defensive purposes, it receives the highest mark for this criterion.

Arctic Policy Comparison

Beyond the options proposed by the NDU report, a look at the current *Arctic Region Policy*, released 12 January 2009 by President Bush, reveals shortcomings as well, when matched against the proposed criteria. In fact, this revision of the 1994 *United States Policy on the Arctic and Antarctic Regions* seems to regress in the fundamental area of environmental security. It appears the new policy was a final effort of the Bush administration to boldly state that the US is an Arctic Nation with rightful claims to offshore resources and the Northwest Passage. However, the new policy strikes out the idea of “openness and cooperation with Russia” and “environmentally sustainable development.”¹⁴⁷ On a positive note, the 2009 policy endorses continued international scientific cooperation and states that “Arctic environmental research, monitoring, and vulnerability assessments are top priorities.”¹⁴⁸ The policy recognizes that the “Arctic environment is unique and changing” and that additional stressors to its

environment have “potentially serious consequences for Arctic communities and ecosystems.”¹⁴⁹ It directs the Senate to promptly ratify UNCLOS, which would help to resolve territorial disputes and “give the United States a seat at the table when the rights that our vital to our interests are debated and interpreted.”¹⁵⁰

Criterion	1994	2009
1	Red	Green
2	Green	Yellow
3	Green	Red
4	Yellow	Yellow
Overall	Yellow	Yellow

The downside of the 2009 policy lies mainly in the sustainable development criterion as it ignores the new Arctic paradigm by intentionally placing higher emphasis on potential energy resources and traditional national security interests over global security. When referring to economic issues, it seeks to use cooperative mechanisms with other nations mainly because, “most known oil and gas resources are located outside of United States jurisdiction.”¹⁵¹ Furthermore, it denies the possibility of an expanded role of the Arctic Council, suggesting that it, “not be transformed into a formal international organization, particularly one with assessed contributions.”¹⁵² This misses a key step in achieving a three-prong Arctic strategy, as proposed by Scott Borgerson, International Affairs Fellow at the Council on Foreign Relations. His first two steps are effectively accomplished with the new policy: he suggested that President Bush make a final attempt to pass UNCLOS through the Senate and to unilaterally update its Arctic policy.¹⁵³ However, the updated policy makes no mention of ramping up US Coast Guard

icebreaker capabilities as Borgerson recommends. Finally, the third prong of investing real diplomacy in the Arctic is unfulfilled. His suggestion to empower the Arctic Council by creating a security institution of Arctic Nations has merit. The 2009 *Arctic Region Policy* acknowledges long-standing boundary issues with Canada and Russia without offering diplomatic efforts for better cooperation.

Conclusion

*Collaborative approaches require that countries and citizens choose their strategic decisions considering those of others, in such a way that the system's solution reaches the optimum.*¹⁵⁴

—Rodrigo Lozano, Cardiff University

Achieving an adaptive national strategy for the Arctic poses a fundamental challenge to the United States. Such a strategy demands awareness of the dire environmental signals from climate change observations in the Arctic region and around the planet. A business-as-usual approach fails to ensure future US security because impacts observed in the Arctic are intrinsically linked with the rest of the global biosphere as one interconnected system. The conclusions of this research support the idea that there are holes in both the current US Arctic policy and recent proposals from the NDU conference on Arctic climate change. The recommendations below bridge the gap for a sustainable, responsible Arctic strategy.

Conclusions

The findings of this research indicate the need for a new national security paradigm due to the global consequences of climate change if the US continues on the traditional course of competition for resources and fossil fuel energy. The melting Arctic has brought increased interest in the region's resources, especially oil and natural gas reserves, despite the practical complications of their extraction and the questionable long-term benefit of their use. Prospective commercial use of the Northwest Passage and Northern Sea Route to dramatically reduce shipping distances is also desirable from the traditional point of view. However, the negative impacts on Arctic people and ecosystems may outweigh the benefits of new-found short-cuts and port economies. Furthermore, the nature of climate change impacts on the global environment

may make the movement of certain goods irrelevant as major shifts occur in local resources, agriculture, and human health.

On a positive note, the research also revealed that significant international frameworks are firmly established in both the political and scientific arenas. Scientific understanding of climate change through studies by organizations like the Arctic Council and the UNFCCC provide awareness to facilitate the current discussion for political change. Most nations have officially accepted the idea of global warming and are working under the agreement of the *Kyoto Protocol* to decrease greenhouse gas emissions. Collaboration has been most significant in the international scientific community, to include major projects like the recent *International Polar Year* for improving Arctic observations. For resolving territorial disputes and standardizing maritime law, UNCLOS provides a proven universal framework which is relevant in the Arctic.

The options analysis compared three possible strategic approaches proposed by the NDU report against four criteria. Of these, only Criteria 1 and 4 are met, meriting a ‘green light’ assessment. Criterion 1, peaceful resolution of sovereignty disputes and promotion of free trade is satisfied through the recommendation to ratify UNCLOS and submit territorial claims to the CLCS. The fact that all other Arctic Nations have already taken this step enhances the potential for resolving US disputes in the Arctic. Criterion 4, providing a monitoring and enforcement mechanism, is satisfied through the recommendation to provide capable military assets and basing options in the Arctic, to include more US icebreakers.

A look at the current and most recently revised US Arctic region policies shows that Criterion 2 and 3 were actually best addressed under the old 1994 version. This is mainly because the environmental concerns and spirit of cooperation, especially in the case of Russia, were paramount in that policy. The biggest concerns of the 2009 policy are the clear message of

heightened national security in the region and the desire to claim and exploit hydrocarbon energy reserves.

Recommendations

The most appropriate national strategy for the Arctic is to pursue a combination of status quo with enhanced capabilities and frameworks. The context of the new presidential administration provides a tremendous opportunity to make the right choices for climate change, at a time when the world sees itself at a critical decision point for sustainability. This national Arctic strategy could be summarized by three overriding themes for the United States:

- 1) Homeland Security
- 2) A Good Neighbor
- 3) World Leadership.¹⁵⁵

Together, these themes produce a layered effect that is palatable for national security advocates, while leveraging the globalization and environmental security concepts that have become virtually indivisible from national security in the modern world.

Unilaterally, the United States should foster a true homeland security mindset that incorporates environmental security concerns with national security assets. The US should continue with collaborative scientific programs through the NSF and USARC while promoting interagency information and asset sharing through programs Medea. The US should ratify UNCLOS, continue the process of Arctic geological surveying and ocean-floor mapping, and promptly submit the scientific evidence of its territorial claims to the CLCS. Through responsible time sharing of intelligence satellites, more specific collection requirements should be addressed for key Arctic climate change indicators and environmental disaster monitoring. The US Coast Guard should immediately acquire a respectable polar-capable icebreaker fleet and

should be expanded to include armed, Arctic-capable ships that can provide enforcement and port protection services.

Bilaterally, the US should continue its strong relationship with Canada and work more openly with Russia to find common ground on Arctic sovereignty disputes in the spirit of cooperation and environmental protection. The US should work with Canada to strengthen a common continental defense and begin combined Coast Guard training exercises that focus on controlling transit of the Northwest Passage, responding to oil spills, and conducting search and rescue operations in the Arctic environment. The US should also engage with Canada to expand NORAD mission sets to include routine Arctic monitoring from the sea, air, and space. An equivalent arrangement should be established with Russia emphasizing improved cooperation in Arctic scientific research. A more level-headed diplomacy with Russia should emphasize shared responsibilities to track toxic pollutants in the ocean, reduce greenhouse gas emissions, and respond to environmental disasters.

As a world leader, the US should first set the example of a climate change conscience by reshaping its energy infrastructure into a greener, more responsible one. It should continue international efforts that study and respond to climate change and encourage multilateral talks that address environmental security. The US should influence the Arctic Council to accept members of the EU in observatory status so they can voice environmental concerns and provide useful data and research methodologies. The US should reverse its current *Arctic Region Policy* in two main areas: propose expanding the role of the Arctic Council to an enforcing organization, and express the importance of increased cautiousness with Arctic drilling.

An expanded Arctic Council is the proper venue for improved Arctic governance. The Arctic Council was founded on sound principles from the AEPS that are relevant to a sustainable

Arctic strategy, and it already has membership of the eight Arctic Nations and indigenous peoples. A strong cooperative working relationship for issues in the region is well-established through the council, and the ability to reach consensus on future governance in the Arctic is most promising with this framework. Models like the Jakarta Initiative and the recent Ilulissat Declaration confirm that continued governance in accordance with the IMO and UNCLOS is sufficient to regulate sovereignty and basic behavior in the Arctic. The Arctic Council, then, should provide the specific oversight for responsibilities in protecting the Arctic environment and ensure safe and secure transit of vessels through the northern sea lines.

The concept of creating a new political alliance or adopting a new military Geographic Combatant Commander (GCC) specific for the region, as suggested in the NDU report, seems unnecessary, and possibly even counter-productive. It is true that the US will need to determine jurisdiction for the GCC overlap in the Arctic, with US European Command, Pacific Command, and Northern Command currently sharing responsibilities in the Arctic. Nonetheless, the US should pursue more military cooperation with other Arctic Nations to ensure common security in the region. A standing multinational force comprised of equitably shared resources should be established and mutually trained to ensure compliance of Arctic agreements and protect the region from ill intentions. A combined force, acting as an arm of the Arctic Council, would promote sharing of military assets and information to better monitor, assess, and respond to human and environmental emergencies. It would also ensure gap coverage by time sharing with mutually responsible nations, like the successful efforts in the Straits of Malacca.

The US should be the first to suggest a temporary moratorium on drilling in the Arctic. This would set the tone for the international community with clear guidelines on scientific support for suspected impacts over the long term. This moratorium period should heavily focus on

international collaborative research to include inputs from indigenous peoples on economic, social, and environmental impacts of energy exploitation in the Arctic.

Finally, the Obama administration should rewrite the current NSS. The 2006 NSS is founded on two pillars: 1) promoting freedom, justice and human dignity; and 2) confronting the challenges of our time by leading a growing community of democracies.¹⁵⁶ A new pillar should reflect the urgency of responding to climate change and should increase general awareness of the impacts in the Arctic. It should incorporate the same spirit of leadership, collaboration, and stewardship expressed throughout this paper. This pillar of the NSS would express these values as follows:

The third pillar is leading the world in a spirit of collaboration for a common environmental security and stewardship of a sustainable planet. We will lead by actively pursuing cleaner energy sources and protecting fragile ecosystems like those in the Arctic. America will work with other nations to improve the scientific understanding of our interconnected biosphere and ensure safe, secure, and responsible transit on our oceans.

Glossary

Adaptation – “Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”¹⁵⁷

Albedo – Reflectivity of energy radiated from the sun; water absorbs more sun energy and reflects less than snow and ice, which causes temperature increases to be more predominant in the Polar regions as more melting occurs.

Anthropocene – Current geological period, according to Dr. Simon Dalby, where human interactions with the environment are at such a scale as to produce ecological disruptions and vulnerabilities that outweigh nature’s ability to absorb them and heal itself.¹⁵⁸

Biosphere – Interconnected system of the Earth’s ecological processes; generally, the earth’s oceans and species populations are co-dependent and inherently linked.

Ecosystem – Grouping of plants, animals, and micro-organisms functioning within the physical environment of a shared habitat; dynamic, interdependent relationships are its key identifying features.

Global warming – General trend of temperatures to rise over the years; this is also generally understood to be linked with human causes from burning of hydrocarbons, deforestation, etc.

Isotherm – Line showing an average constant temperature; regarding the Arctic, this line represents the physical delineation where the average July temperature is 10° C and roughly corresponds to the ecological boundary formed by the Arctic tree line.

Soft power – Influence of a political state that is created by its intangible appeal; this is a result of various factors that motivate other states to look for positive leadership from those with this influence. According to Dr. Joseph Nye, who coined the term, “Soft power rests on the ability to set the political agenda in a way that shapes the preferences of others...It is the ability to entice and attract. And attraction often leads to acquiescence or imitation.”¹⁵⁹ Dr. Nye is Dean of the Kennedy School of Government at Harvard University and served as Chairman of the National Intelligence Council and Assistant Secretary of Defense during the Clinton administration.

Thermohaline circulation – Ocean temperature and salinity variations that help drive the conveyor of ocean currents; these currents are known to play a critical role in determining regional and even global weather patterns.

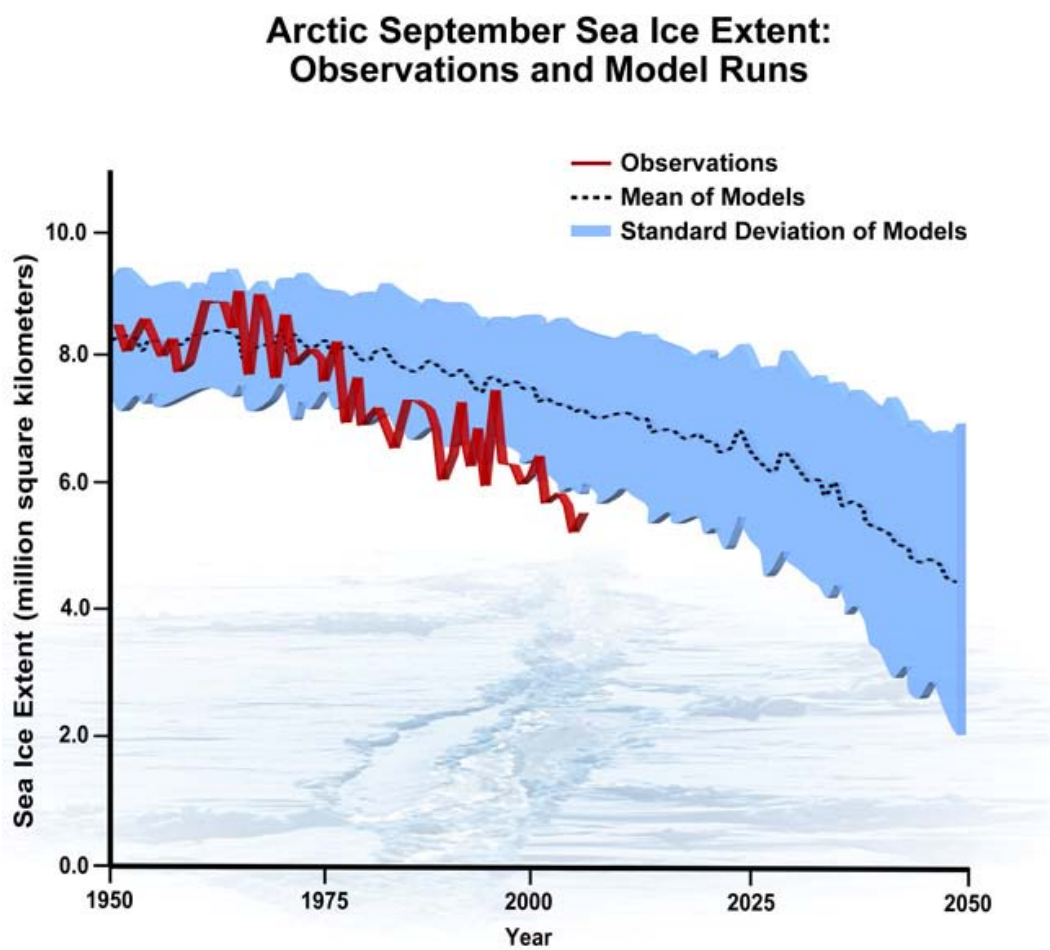
Appendices

Appendix A: Isotherm Arctic Map



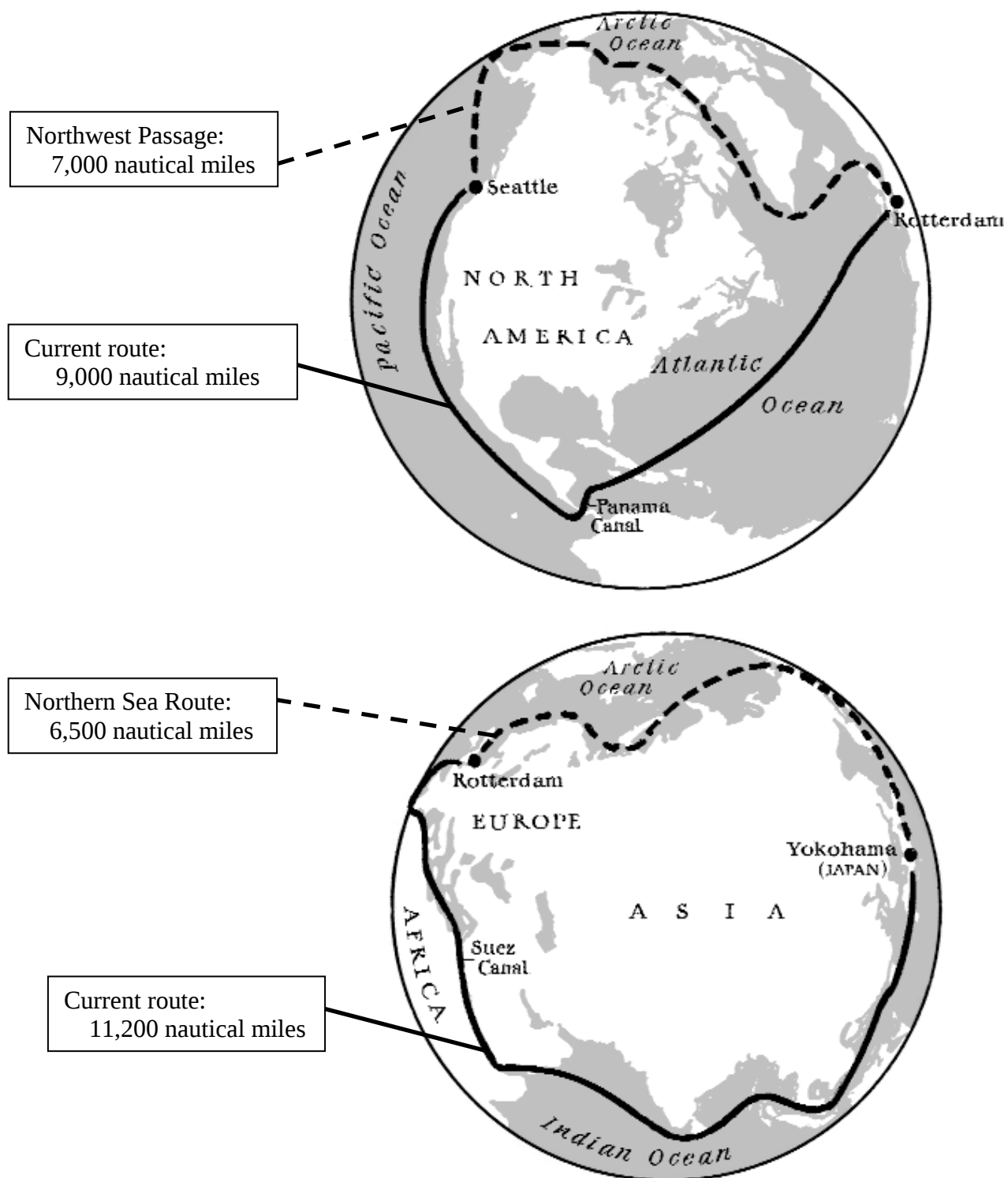
Source: National Snow and Ice Data Center Perry-Castañeda Library Map Collection

Appendix B: Sea Ice Melting



Source: University Corporation for Atmospheric Research Digital Image Library

Appendix C: Trans-Arctic Shipping Routes



Source: *Foreign Affairs*, March/April 2008

Appendix D: Indigenous Arctic Populations



Arctic peoples subdivided according to language families

Indo-European family

Germanic branch

Uralic family

Finno-Ugric branch

Samoyedic branch

Altaic family

Turkic branch

Tungusic branch

Chukotko-Kamchatkan fam.

Isolated languages
(Ketic and Yukagir)

Eskimo-Aleut family

Inuit group (of Eskimo br.)

Yupik group (of Eskimo br.)

Aleut branch

Na-Dene family

Athabaskan branch

Eyak branch

Tlingit branch

Arctic circle

Arctic boundary according to AMAP

Notes:

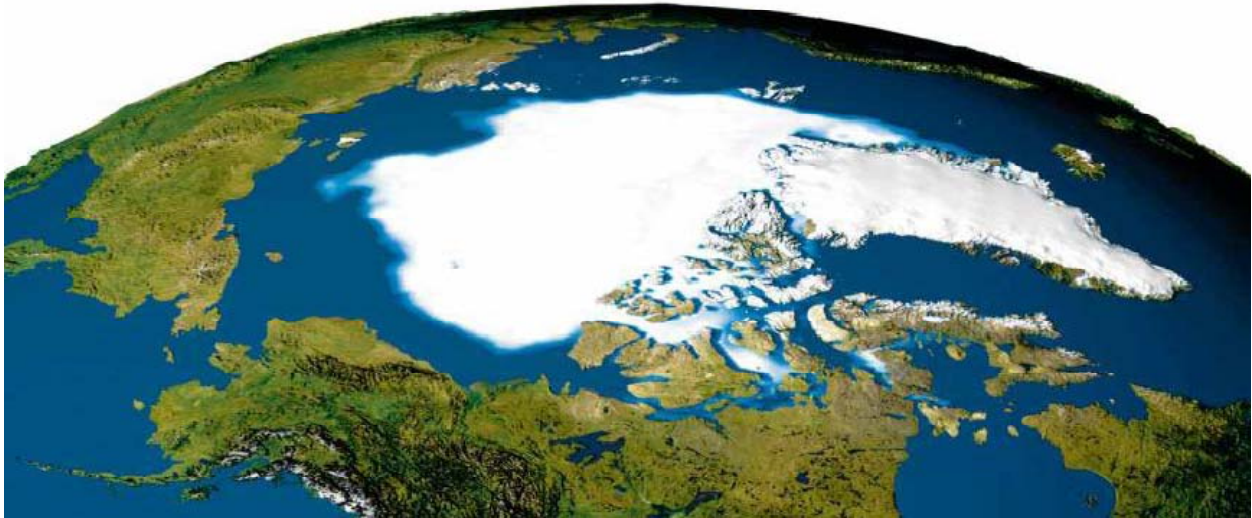
Areas show colours according to the original languages of the respective indigenous peoples, even if they do not speak their languages today.

Overlapping populations are not shown. The map does not claim to show exact boundaries between the individual language groups.

Typical colonial populations, which are not traditional Arctic populations, are not shown (Danes in Greenland, Russians in the Russian Federation, non-native Americans in North America).

Source: http://arctic-council.org/section/maps_and_photos

Appendix E: Ilulissat Declaration



THE ILULISSAT DECLARATION ARCTIC OCEAN CONFERENCE ILULISSAT, GREENLAND, 27 – 29 MAY 2008

At the invitation of the Danish Minister for Foreign Affairs and the Premier of Greenland, representatives of the five coastal States bordering on the Arctic Ocean – Canada, Denmark, Norway, the Russian Federation and the United States of America – met at the political level on 28 May 2008 in Ilulissat, Greenland, to hold discussions. They adopted the following declaration:

The Arctic Ocean stands at the threshold of significant changes. Climate change and the melting of ice have a potential impact on vulnerable ecosystems, the livelihoods of local inhabitants and indigenous communities, and the potential exploitation of natural resources.

By virtue of their sovereignty, sovereign rights and jurisdiction in large areas of the Arctic Ocean the five coastal states are in a unique position to address these possibilities and challenges. In this regard, we recall that an extensive international legal framework applies to the Arctic Ocean as discussed between our representatives at the meeting in Oslo on 15 and 16 October 2007 at the level of senior officials. Notably, the law of the sea provides for important rights and obligations concerning the delineation of the outer limits of the continental shelf, the protection of the marine environment, including ice-covered areas, freedom of navigation, marine scientific research, and other uses of the sea. We remain committed to this legal framework and to the orderly settlement of any possible overlapping claims.

This framework provides a solid foundation for responsible management by the five coastal States and other users of this Ocean through national implementation and application of relevant provisions. We therefore see no need to develop a new comprehensive international

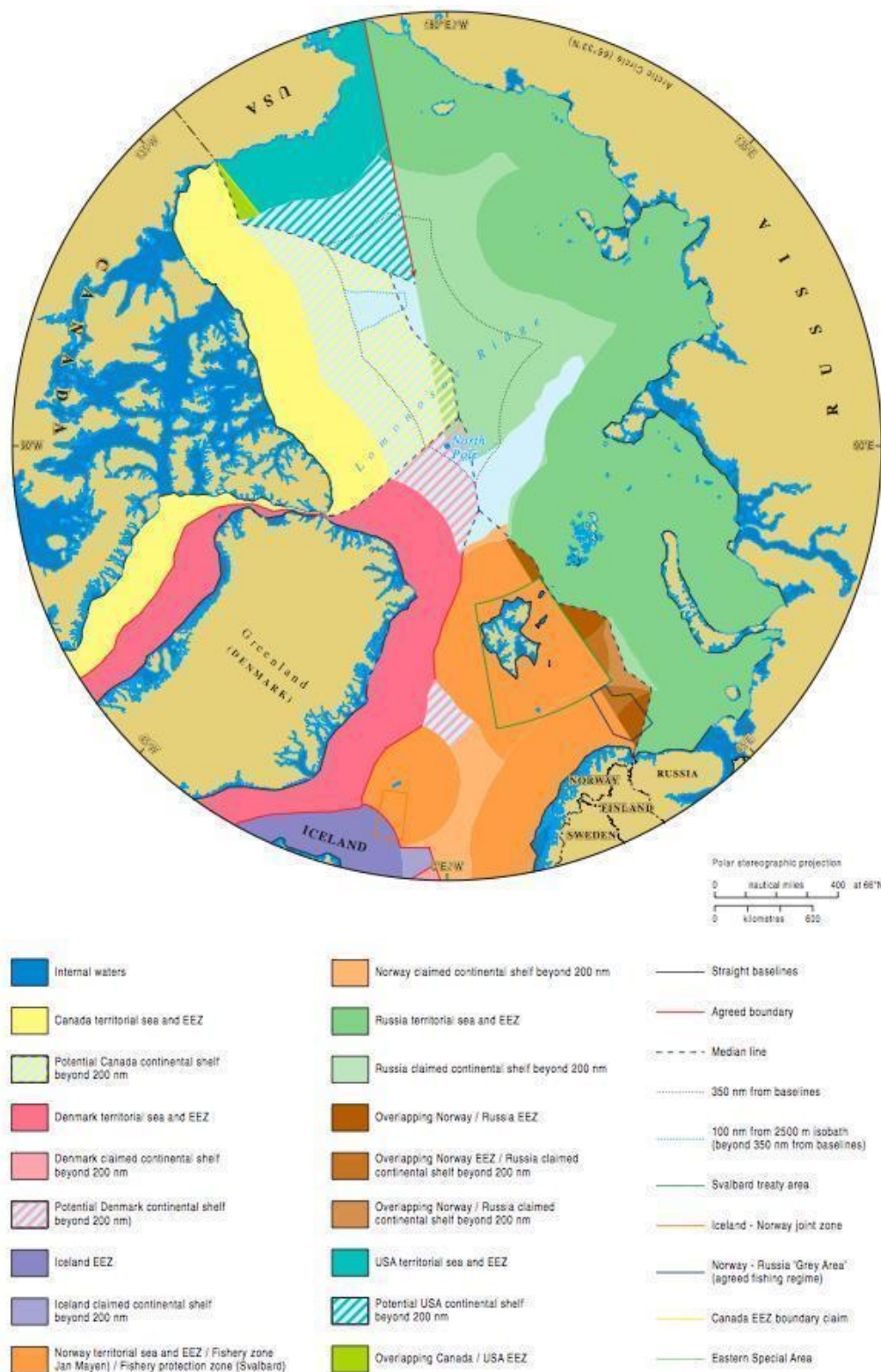
legal regime to govern the Arctic Ocean. We will keep abreast of the developments in the Arctic Ocean and continue to implement appropriate measures.

The Arctic Ocean is a unique ecosystem, which the five coastal states have a stewardship role in protecting. Experience has shown how shipping disasters and subsequent pollution of the marine environment may cause irreversible disturbance of the ecological balance and major harm to the livelihoods of local inhabitants and indigenous communities. We will take steps in accordance with international law both nationally and in cooperation among the five states and other interested parties to ensure the protection and preservation of the fragile marine environment of the Arctic Ocean. In this regard we intend to work together including through the International Maritime Organization to strengthen existing measures and develop new measures to improve the safety of maritime navigation and prevent or reduce the risk of ship-based pollution in the Arctic Ocean.

The increased use of Arctic waters for tourism, shipping, research and resource development also increases the risk of accidents and therefore the need to further strengthen search and rescue capabilities and capacity around the Arctic Ocean to ensure an appropriate response from states to any accident. Cooperation, including on the sharing of information, is a prerequisite for addressing these challenges. We will work to promote safety of life at sea in the Arctic Ocean, including through bilateral and multilateral arrangements between or among relevant states.

The five coastal states currently cooperate closely in the Arctic Ocean with each other and with other interested parties. This cooperation includes the collection of scientific data concerning the continental shelf, the protection of the marine environment and other scientific research. We will work to strengthen this cooperation, which is based on mutual trust and transparency, inter alia, through timely exchange of data and analyses.

Appendix F: Durham University Map



Source: Durham University International Boundaries Research Unit

Appendix G: Bering Strait & Chukchi Sea



Source: http://en.wikipedia.org/wiki/Chukchi_Sea

Notes

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- ¹ NDU, *The Arctic Circle: Development and Risk*, 3.
² Bush, NSS, 3.
³ Ibid., 47.
⁴ Ibid., 3.
⁵ Ibid.
⁶ Nye, *The Paradox of American Power*, 8-12.
⁷ NDU, 3.
⁸ Ibid, 11.
⁹ Ibid., 11-12.
¹⁰ Hansen, "The Threat to the Planet," under Section 1.
¹¹ Wilkinson, "Voyage into the Arctic as summer ice vanishes," 1.
¹² Tomczak, *Regional Oceanography*, 83.
¹³ Collins, "The Physical Science Behind Climate Change," 69.
¹⁴ Ibid, 66.
¹⁵ NOAA, *Arctic Report Card 2008*, 7.
¹⁶ Ibid.
¹⁷ Wilkinson, 2.
¹⁸ IPCC WGI, *Technical Summary*, 37.
¹⁹ NSDIC, "Education Center: All About Sea Ice: Processes: Albedo."
²⁰ Wilkinson, 2.
²¹ Schwartz, *An Abrupt Climate Change Scenario and Its Implications for United States National Security*, 9.
²² Ibid., 12.
²³ Ibid., 6.
²⁴ Ibid.
²⁵ Wilkinson, 2.
²⁶ Farrar, *Global Warming*, 7.
²⁷ NCAR, "Arctic Ice Retreating More Quickly than Computer Models Project."
²⁸ Ibid.
²⁹ UNEP, *Global Environment Outlook (GEO4)*, 279.
³⁰ ACIA, *Impacts of a Warming Arctic*, 5.
³¹ Ibid., 10.
³² Ibid., 11.
³³ UNEP, 199.
³⁴ ScienceDaily, "Arctic Sea Ice At Lowest Recorded Level Ever."
³⁵ Westly, "Arctic Land Grabs Could Cause Eco-Disaster."
³⁶ Hansen, under Section 2.
³⁷ ACIA, 3.
³⁸ Hansen, under Section 4.
³⁹ IPCC AR4, *Summary for Policymakers*, 15.
⁴⁰ Ibid.
⁴¹ USGS, *Circum-Arctic Resource Appraisal*, 1.
⁴² Borgerson, "Arctic Meltdown," 67.
⁴³ Ibid., 67.
⁴⁴ USGS, *Circum-Arctic Resource Appraisal*, 1.
⁴⁵ Roberts, *End of Oil*, 64.
⁴⁶ Ibid., 313-314.
⁴⁷ IICWG, "National Ice Services Advise of Continuing Navigation Hazards."
⁴⁸ Borgerson, "Arctic Meltdown," 70.
⁴⁹ Ibid., 76.
⁵⁰ AEPS, 14.
⁵¹ Ibid., 71.

-
- ⁵² USARC, “Congress Hears Needs for New Icebreaker Vessels as White House Formulates Arctic Policy.”
- ⁵³ Dhanapala, “Arctic Security Problems – A Multilateral Perspective,” 12.
- ⁵⁴ Ibid.
- ⁵⁵ NDU, 7.
- ⁵⁶ NDU, 3.
- ⁵⁷ Gislason, “A Brief History of Alaska Statehood”, under “Beginnings.”
- ⁵⁸ Ibid.
- ⁵⁹ Schanz, “Strategic Alaska,” 49.
- ⁶⁰ Gislason, under “The War Years.”
- ⁶¹ Schanz, 49.
- ⁶² Ibid., 49.
- ⁶³ RDC. “Alaska’s Oil and Gas Industry,” under “Facts and Economic Impact.”
- ⁶⁴ USGS, *Arctic National Wildlife Refuge*, 4.
- ⁶⁵ Roberts, 155.
- ⁶⁶ Borgerson, “An Ice-Cold War.”
- ⁶⁷ Ibid.
- ⁶⁸ CBC News, “North Pole may belong to Denmark, early mapping data suggests.”
- ⁶⁹ Ibid.
- ⁷⁰ DND, *Canada First Defence Strategy*, 8.
- ⁷¹ Ibid., 3.
- ⁷² Ibid., 7.
- ⁷³ DoD, *National Defense Strategy of the United States*, 4.
- ⁷⁴ DND, 8.
- ⁷⁵ Borgerson, “No Time for Chest Thumping.”
- ⁷⁶ US Department of State, “Barbary Wars, 1801-1805 and 1815-1816.”
- ⁷⁷ NDU, 6.
- ⁷⁸ Borgerson, “No Time for Chest Thumping.”
- ⁷⁹ NDU, 9.
- ⁸⁰ Renuart, Memorandum for Chairman, Joint Chiefs of Staff.
- ⁸¹ Ibid.
- ⁸² The Official Website of Denmark, “The Crown Prince’s Background: Expedition Sirius 2000.”
- ⁸³ Loukacheva, “Security challenges and legal capacity of Greenland and Nunavut jurisdictions,” 3.
- ⁸⁴ Østreng, *National Security and International Cooperation in the Arctic – the Case of the Northern Sea Route*, 233.
- ⁸⁵ Ibid.
- ⁸⁶ Ibid., 136.
- ⁸⁷ Ibid.
- ⁸⁸ Norwegian Government, *The Norwegian Government’s High North Strategy*, 45.
- ⁸⁹ NDU, 6.
- ⁹⁰ Ibid, 6.
- ⁹¹ Russell, “Carpe DIEM,” 97.
- ⁹² Borgerson, “Arctic Meltdown,” 74.
- ⁹³ Ibid., 72.
- ⁹⁴ US Senate, *Secretary of State Confirmation Hearing: Hillary Clinton*.
- ⁹⁵ Lathrop, Letter to the Editor of *Foreign Affairs*.
- ⁹⁶ *Ilulissat Declaration*, 1.
- ⁹⁷ IMO, “About IMO,” under “Introduction to IMO.”
- ⁹⁸ Ibid.
- ⁹⁹ AEPS, 7.
- ¹⁰⁰ Ibid., 2.
- ¹⁰¹ Arctic Council, “About Arctic Council.”
- ¹⁰² Arctic Council, “Norwegian, Danish, Swedish common objectives for their Council chairmanships 2006-2012.”
- ¹⁰³ Mitropoulos, Opening remarks for Jakarta Meeting on Straits of Malacca and Singapore.
- ¹⁰⁴ Yusoff, “Eye-in-the-Sky Over the Malacca Straits.”
- ¹⁰⁵ Mitropoulos.

-
- ¹⁰⁶ Ibid.
- ¹⁰⁷ Kraska, "The Law of the Sea Convention and the Northwest Passage," 281.
- ¹⁰⁸ Ackerman, *Global Climate Change: Catalyst for International Relations Disequilibria*, xvi.
- ¹⁰⁹ Gosnell, "Top 100 Stories of 2008 #5: Nations Stake their Claims to a Melting Arctic," 26.
- ¹¹⁰ Ibid.
- ¹¹¹ NDU, 7.
- ¹¹² Bush, *Arctic Region Policy*, 2 and Clinton, 2.
- ¹¹³ Clinton, 2.
- ¹¹⁴ Bülow, "The countdown to Copenhagen."
- ¹¹⁵ Ibid.
- ¹¹⁶ Ki-Moon, Opening Statement to the High Level Segment of the United Nations Climate Change Conference, 4.
- ¹¹⁷ Ibid., 1-2.
- ¹¹⁸ Ibid., 3.
- ¹¹⁹ Ibid., 2.
- ¹²⁰ European Policy Centre Website, "The EU and the Arctic: exploring uncharted territory?"
- ¹²¹ Ibid.
- ¹²² Ibid.
- ¹²³ EurActiv Network, "Environment pushes EU to become Arctic player."
- ¹²⁴ European Policy Centre Website.
- ¹²⁵ Obama, Inaugural Address.
- ¹²⁶ US Department of State. Announcement of Appointment of Special Envoy for Climate Change Todd Stern.
- ¹²⁷ Ibid.
- ¹²⁸ Ibid.
- ¹²⁹ The White House Website, "The Agenda: Energy & Environment."
- ¹³⁰ Dalby, "Ecology, Security, and Change in the Anthropocene," 155.
- ¹³¹ Ibid.
- ¹³² Ibid., 159.
- ¹³³ Ibid., 161.
- ¹³⁴ Ibid., 162.
- ¹³⁵ Lozano, "Collaboration as a Pathway for Sustainability," 372.
- ¹³⁶ IPY Website. "About IPY."
- ¹³⁷ ICSU/WMO Joint Committee for IPY 2007-2008, *The Scope of Science for IPY 2007-2008*, 1.
- ¹³⁸ Ibid., 11-12.
- ¹³⁹ Treadwell, *Is America Prepared for an Accessible Arctic?*, 1.
- ¹⁴⁰ National Science Foundation, "Fact Sheet: The Arctic Observation Network (AON)."
- ¹⁴¹ Richelson, "Scientists in Black."
- ¹⁴² Ibid.
- ¹⁴³ Ibid.
- ¹⁴⁴ NDU, 11.
- ¹⁴⁵ NDU, 11-12.
- ¹⁴⁶ Ibid., 12.
- ¹⁴⁷ Clinton, 2.
- ¹⁴⁸ Bush, *Arctic Region Policy*, 9.
- ¹⁴⁹ Ibid., 8.
- ¹⁵⁰ Ibid., 4.
- ¹⁵¹ Ibid., 8.
- ¹⁵² Ibid., 4.
- ¹⁵³ Borgerson, "Russia's Other Front."
- ¹⁵⁴ Lozano, 379.
- ¹⁵⁵ Ferdinand, Kevin B., Major, Canadian Forces, ACSC instructor, interviewed on 28 Jan 09.
- ¹⁵⁶ Bush, NSS, ii.
- ¹⁵⁷ IPCC WG II, *Technical Summary*, 27.
- ¹⁵⁸ Dalby, "Ecology, Security, and Change in the Anthropocene," 155.
- ¹⁵⁹ Nye, *The Paradox of American Power*, 9.

Bibliography

- Ackerman, John T. *Global Climate Change: Catalyst for International Relations Disequilibrium?* University of Alabama, Department of Political Science, 2004.
- Arctic Climate Impact Assessment (ACIA). *Impacts of a Warming Arctic*. Cambridge, UK: Cambridge University Press, 2004.
- Arctic Council. "About Arctic Council." <http://arctic-council.org/article/about>.
- Arctic Council. "Norwegian, Danish, Swedish common objectives for their Arctic Council chairmanships 2006-2012." *arctic-council.org*, 27 November 2007. http://arctic-council.org/article/2007/11/common_priorities (accessed 1 April 2009).
- Arctic Environment Protection Strategy* (AEPS). Roveniemi, Finland, 14 June 1991.
- Borgerson, Scott G. "An Ice Cold War." *New York Times*, 8 August 2008. http://www.nytimes.com/2007/08/08/opinion/08borgerson.html?_r=2&oref=slogin (accessed 25 November 2008).
- Borgerson, Scott G. "Arctic Meltdown: The Economic and Security Implications of Global Warming." *Foreign Affairs*, March/April 2008, 63-77.
- Borgerson, Scott G. "No Time for Chest Thumping." *International Herald Tribune*, 9 September 2007. http://www.cfr.org/publication/14169/no_time_for_chest_thumping.html (accessed 26 January 2009).
- Borgerson, Scott G. "Russia's Other Front." *Huffington Post*, 19 August 2008. http://www.huffingtonpost.com/scott-g-borgerson/russias-other-front_b_119946.html (accessed 1 April 2009).
- Bülow, Michael von. "The countdown to Copenhagen." *en.cop15.dk*, 23 January 2009. <http://en.cop15.dk/news/view+news?newsid=578> (accessed 29 January 2009).
- Bush, George W. *National Security Presidential Directive/NSPD-66, Homeland Security Presidential Directive/HSPD-25: Arctic Region Policy*. Washington, DC: The White House, 12 January 2009.
- Bush, George W. *The National Security Strategy of the United States of America* (NSS). Washington, DC: The White House, 16 March 2006.
- Canadian Broadcast Company (CBC) News. "North Pole may belong to Denmark, early mapping data suggests." *cbc.ca*, 12 March 2009. <http://www.cbc.ca/canada/north/story/2009/03/12/north-pole.html> (accessed 13 March 2009).

- Clinton, William J. *Presidential Decision Directive/NSC-26: United States Policy on the Arctic and Antarctic Regions*. Washington, DC: The White House, 10 June 1994.
- Collins, William, Robert Coleman, James Haywood, Martin R. Manning and Philip Mote. "The Physical Science behind Climate Change." *Scientific American*, August 2007, 64-73.
- Dalby, Simon. "Ecology, Security, and Change in the Anthropocene." *Brown Journal of World Affairs*, no. 13 (Spring-Summer 2007): 155-164.
- Department of National Defence (DND). *Canada First Defence Strategy*. Ottawa, ON: Office of the Prime Minister of Canada, May 2008.
- Dhanapala, Jayantha. "Arctic Security Problems – a Multilateral Perspective." Lecture. Burnaby BC, Simon Fraser University, 12 March 2008.
- EurActiv Network. "Environment pushes EU to become Arctic player." *Euractiv.com*, 4 December 2008. <http://www.euractiv.com/en/energy/environment-pushes-eu-arctic-player/article-177438> (accessed 24 January 2009).
- European Policy Center Website. "The EU and the Arctic: exploring uncharted territory?" <http://www.epc.eu/en/er.asp?TYP=ER&LV=293&see=y&t=2&PG=ER/EN/detail&l=&AI=859> (accessed 24 January 2009).
- Farrar, Amy. *Global Warming*. Edina, MN: ABDO Publishing Co., 2008.
- Gosnell, Mariana. "Top 100 Stories of 2008 #5: Nations Stake their Claims to a Melting Arctic." *Discover*, January 2009, 26.
- Hansen, Jim. "The Threat to the Planet." *New York Review of Books* 53, no. 12 (July 13, 2006): 12-16, <http://www.nybooks.com/articles/19131> (accessed 25 March 2009).
- Ilulissat Declaration*. Arctic Ocean Conference. Ilulissat, Greenland, 27-29 May 2008.
- Intergovernmental Panel on Climate Change Working Group II (IPCC WG II). Fourth Assessment Report (AR4). *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Cambridge, UK: Cambridge University Press, 2007.
- Intergovernmental Panel on Climate Change Working Group I (IPCC WG I). Technical Summary. *Climate Change 2007: The Physical Science Basis – Summary for Policymakers*. Cambridge, UK: Cambridge University Press, 2007.
- Intergovernmental Panel on Climate Change Working Group II (IPCC WG II). Technical Summary. *Climate Change 2007: Climate Change Impacts, Adaptation, and Vulnerability*. Cambridge, UK: Cambridge University Press, 2007.
- International Council for Science (ICSU) and World Meteorological Organization (WMO) Joint Committee for IPY 2007-2008. *The Scope of Science for the International Polar Year*

- 2007–2008. Geneva, Switzerland: WMO, February 2007.
- International Ice Charting Working Group (IICWG). “National Ice Services Advise of Continuing Navigation Hazards.” *nsidc.org*. 24 October 2008. http://nsidc.org/noaa/iicwg/IICWG_2008/presentations/IICWG_IX_NEWS_RELEASE.pdf (accessed 1 April 2009.)
- International Polar Year (IPY) Website. “About IPY.” <http://www.ipy.org/index.php?ipy/about/>.
- Ki-Moon, Ban, Secretary-General, United Nations. Opening Statement to the High Level Segment of the United Nations Climate Change Conference. Poznan, Poland, 11 December 2008.
- Kraska, James. “The Law of the Sea Convention and the Northwest Passage.” *The International Journal of Marine and Coastal Law* 22, no. 2 (2007): 257-281.
- Lathrop, Coalter G, President, Sovereign Geographics, Inc. Letter to the Editor of *Foreign Affairs* in response to “Arctic Meltdown,” March/April 2008.
- Loukacheva, Natalia. “Security challenges and legal capacity of Greenland and Nunavut jurisdictions.” Toronto, ON: Munk Centre for International Studies, University of Toronto, 2004.
- Lozano, Rodrigo. “Collaboration as a Pathway for Sustainability.” *Sustainable Development* 15 (2007): 370-381.
- Mitropoulos, Efthimios, Secretary-General, International Maritime Organization. Opening remarks for Jakarta Meeting on Straits of Malacca and Singapore. Jakarta, Indonesia, 7 September 2005.
- National Center for Atmospheric Research (NCAR). “Arctic Ice Retreating More Quickly than Computer Models Project.” *UCAR.edu*. 30 April 2007. <http://www.ucar.edu/news/releases/2007/seaice.shtml#mediaterms> (accessed 31 March 2009).
- National Defense University (NDU). “The Arctic Circle: Development and Risk.” Arctic Conference Report, 13-14 May 2008. http://www.ndu.edu/ctnsp/NCW_course/Arctic%20Summary,%20Approved.pdf (accessed 25 November 2008).
- National Oceanic and Atmospheric Administration (NOAA). *Arctic Report Card 2008*. Washington, DC: Department of Commerce, October 2008.
- National Science Foundation (NSF). “Factsheet: The Arctic Observation Network (AON).” http://www.nsf.gov/news/news_summ.jsp?cntn_id=109687.
- National Snow and Ice Data Center (NSIDC). “Education Center: All About Sea Ice: Processes: Albedo.” <http://nsidc.org/seaice/processes/albedo.html>.

- Norwegian Government. *The Norwegian Government's High North Strategy*. Oslo/Trosnø, Norway: Norwegian Ministry of Foreign Affairs, 1 Dec, 2006.
- Nye, Joseph S. *The Paradox of American Power: Why the World's Only Superpower Can't Go It Alone*. New York: Oxford University Press, 2002.
- Obama, Barack. Inaugural Address. Washington, DC, 20 January 2009.
- The Official Website of Denmark. "The Crown Prince's Background: Expedition Sirius 2000." <http://www.denmark.dk/en/menu/About-Denmark/Society/Royal-Denmark/The-Crown-Prince-Couple/The-Crown-Princes-Background/Expedition-Sirius-2000/> (accessed 1 April 2009).
- Østreng, Willy, ed. *National Security and International Environmental Cooperation in the Arctic – the Case of the Northern Sea Route*. Dordrecht: Kluwer Academic Publishers, 1999.
- Renuart, General Victor E, Commander US Northern Command, General Norton A. Schwartz, Commander US Transportation Command, and Admiral Timothy J. Keating, Commander US Pacific Command. Memorandum for Chairman, Joint Chiefs of Staff, not dated.
- Resource Data Center (RDC). "Alaska's Oil and Gas Industry." <http://www.akrdc.org/issues/oilgas/overview.html>.
- Richelson, Jeffrey T. "Scientists in Black." *Scientific American*, 3 February 1998, 48-55. <http://jya.com/sib.htm> (accessed 28 January 2009).
- Roberts, Paul, *The End of Oil: On the Edge of a Perilous New World*. New York, NY: Houghton Mifflin Company, 2004.
- Russell, Anthony L. "Carpe DIEM: Seizing Strategic Opportunity in the Arctic." *Joint Forces Quarterly* 51 (4th quarter 2008), 94-101.
- Schanz, Marc V. "Strategic Alaska." *Air Force Magazine*, November 2008, 46-49.
- Schwartz, Peter and Doug Randall. *An Abrupt Climate Change Scenario and Its Implications for United States National Security*. Emeryville, CA: Global Business Network, 2003.
- ScienceDaily. "Arctic Sea Ice At Lowest Recorded Level Ever." <http://www.sciencedaily.com/releases/2008/09/080915162428.htm> (accessed 24 January 2009).
- Tomczak, Matthias and J. Stewart Godfrey. *Regional Oceanography: An Introduction*. Tarrytown, NY: Elsevier Science Inc, 1994. http://gyre.umeoce.maine.edu/physical_ocean/Tomczak/regoc/pdffiles/colour/single/07P-Arctic.pdf (accessed 31 March 2009).

- Treadwell, Mead, Chair, US Arctic Research Commission. *Is America Prepared for an Accessible Arctic?: Hearings before US Senate Commerce Committee*. Washington, DC, 24 June 2008.
- United Nations Environment Programme (UNEP). *Global Environment Outlook (GEO₄)*. UNEP, 2007.
- United States Geological Survey (USGS). *Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle*. Washington, DC: Department of the Interior, May 2008.
- US Arctic Research Commission (USARC). “Congress Hears Needs for New Icebreaker Vessels as White House Formulates Arctic Policy.” *arctic.gov*, 19 August 2008. www.arctic.gov/files/congress_hears_needs-20080819.doc (accessed 1 April 2009).
- US Department of Defense (DoD). *National Defense Strategy of the United States*. Washington, DC: Office of the Secretary of Defense, June 2008.
- US Department of State. Announcement of Appointment of Special Envoy for Climate Change Todd Stern. Washington, DC, 26 January 2009.
- US Department of State. “Barbary Wars, 1801-1805 and 1815-1816.” <http://www.state.gov/r/pa/ho/time/jd/92068.htm> (accessed 31 March 2009).
- US Senate. *Secretary of State Confirmation of Hillary Clinton: Hearings before the Foreign Relations Committee*. 111th Congress, 1st session, January 2009.
- Westly, Erica. “Arctic Land Grabs Could Cause Eco-Disaster.” *Discover*, August 2007.
- The White House Website. “The Agenda: Energy & Environment.” http://www.whitehouse.gov/agenda/energy_and_environment/ (accessed 26 January 2009).
- Wilkinson, Marian. “Voyage into the Arctic as summer ice vanishes.” *Sydney Morning Herald*, 4 August 2008. <http://www.smh.com.au/news/environment/a-voyage-into-the-great-arctic-meltdown/2008/08/03/1217701855502.html> (accessed 26 January 2009).
- Yusoff, Mohd Nasir. “Eye-in-the-Sky Over Malacca Straits From Sept 13.” *Bernama.com*, 8 September 2005. http://www.bernama.com.my/bernama/v3/news_lite.php?id=154485 (accessed 27 January 2009).