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He Who Would Rule: Climate Change in the Arctic and its Implications for U.S. National Security

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Anthropogenic climate change will have its greatest effect on the Arctic, which will experience impacts ranging from increasing ambient air temperature to glacier and sea ice melting to permafrost thaw. This altered environment will result in new national security concerns for circumpolar nations such as the United States, including increased Arctic access by Russia and other nations; competition over newly accessible fossil fuel resources; and loss of Arctic military facilities resulting from permafrost thaw and land subsidence. Although these effects will be felt cumulatively over the coming decades, the United States must make the necessary strategic changes now in order to prevail in this new security environment. The United States should retrain and re-equip military forces for greater Arctic operability, work toward a clear legal understanding of open sea access in newly ice-free waters, and consider implementing a joint circumpolar security apparatus to facilitate adaptation to this new globally-warmed Arctic.

Introduction

The superior man, when resting in safety, does not forget that danger may come.– Confucius

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Hidden on the roof of the earth, far away from the din and tendentiousness of the trafficked world, lies an area with a unique ecosystem and a unique mythology. From legends of Valhalla to the Canadian poet Robert Service to the television hit *Northern Exposure*, the Arctic has been a cold and quiet place of mystery. It is the home of fur-clad indigenous peoples, charismatic megafauna like polar bears and caribou, and a wealth of natural resources. It has been referred to as the Mediterranean of the Future (Theutenberg 1988, 303) to reflect the many nations learning to cooperate around one body of water.

Ever since the development of the long-range bomber and intercontinental ballistic missile (ICBM), the Arctic has also been regarded as a place of Cold War strategic importance (Jalonen 1988, 157ff; see also Palosaari and Möller 2004, and Young 1985). At that time, Distant Early Warning Line radar stations were placed along the sixty-sixth parallel to warn the United States and Canada of an incoming Soviet nuclear attack. In addition to its nuclear dimension, political strategists in the 1980s advised that the Arctic take a place of greater prominence in security affairs due to its fossil fuel energy resources (Young 1985, 165-166). In 1983, during the height of the Cold War, the Reagan administration issued *National Security Decision Directive 90*: *United States Arctic Policy.* It states that, "The United States has unique and critical interests in the Arctic region, related directly to national defense, resource and energy development, scientific inquiry, and environmental protection" (Federation of American Scientists 2003).

However, with the end of the Cold War, nuclear tensions between the United States and Russia ebbed, and some of the strategic focus of American national security that had previously been on the Arctic shifted southward to the Middle East, from which the United States secures approximately one-quarter of its imported oil (Energy Information Administration 2006b). Furthermore, climate change has not played a significant role in national security policy making. Occasionally, an unofficial strategic scenario may take into account the effects of climate change (Chalecki 2006, Schwartz and Randall 2003), but none of them focus specifically on the Arctic (Carman 2002, 182-183). Nevertheless, oil and gas removal, increased ocean access, and resurgent legal concerns make this area worthy of consideration for long-range U.S. policy formation, and merit bringing a globally-warmed Arctic back into prominence in American strategic thinking.

Figure 1: The World as Seen from the Northern View

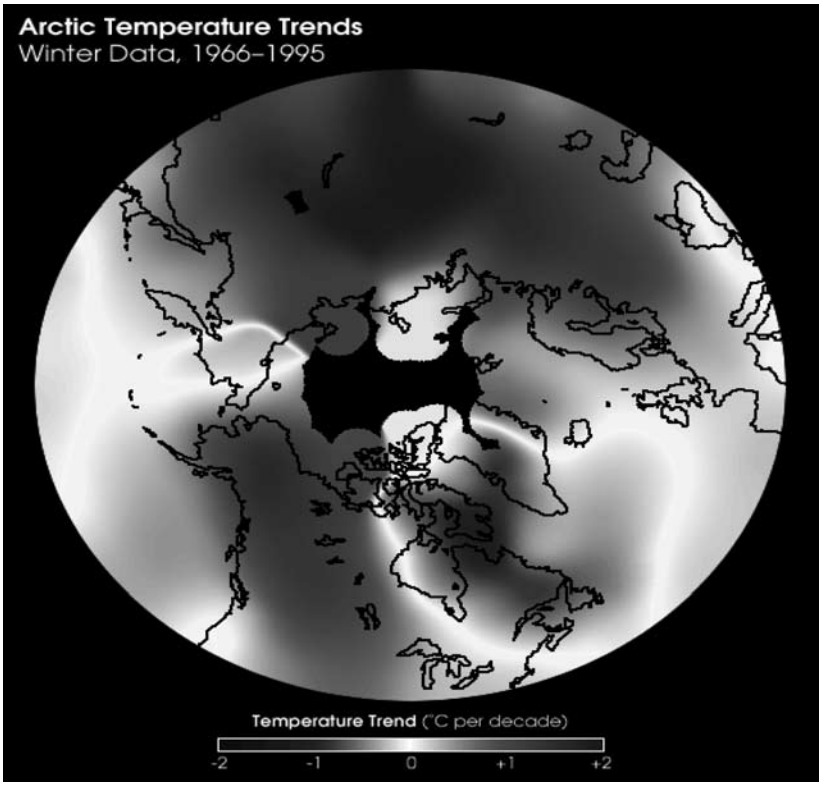
Anthropogenic Climate Change and Its Effects on the Arctic

In 2005, the United States alone burned approximately 86 quadrillion Btu of fossil fuels (EIA 2006b) and put over 7,147.3 million metric tons carbon dioxide equivalent of greenhouse gases into the atmosphere, an increase of 16.9% from the Kyoto Protocol benchmark year of 1990 (EIA 2006a, ix). This accumulation of greenhouse gases (GHGs) is causing the earth's temperature to rise, a phenomenon known as global warming. By itself, global warming is not a destructive phenomenon—without the warming effect of the atmosphere, there would be no life on earth at all, since the surface would be the same temperature as outer space. However, human emissions of greenhouse gases are pushing this effect further than at any time in recorded history.

Greenhouse warming in the Arctic, as shown in Figure 2, will have three significant positive feedback loops not felt elsewhere on the globe. First, the warming potential of the Arctic is more significant than the rest of the globe because snow and ice melt will change local albedo, or reflectivity, levels from high to low. As highly reflective snow and ice cover melt into highly absorptive water, surface area that used to reflect sunlight will now absorb it, radiating the resulting energy back from the

earth as heat. Second, since the planetary atmosphere is shallower toward the poles, the volume of air that must be warmed in order for the surface to begin warming is less. Third, as sea ice retreats, heat that is absorbed by the oceans in summer is readily transferred to the atmosphere in winter (Arctic Climate Impact Assessment 2005, 20). Since much of the Arctic's environment is close to 32 degrees Fahrenheit, a relatively small increase in the ambient air temperature can result in large environmental changes and feedbacks (Weller et. al. 1999, 23).

Figure 2: Arctic Temperature Trends



(Graphic: NASA Earth Observatory; the black area at the North Pole represents gaps in data coverage.)

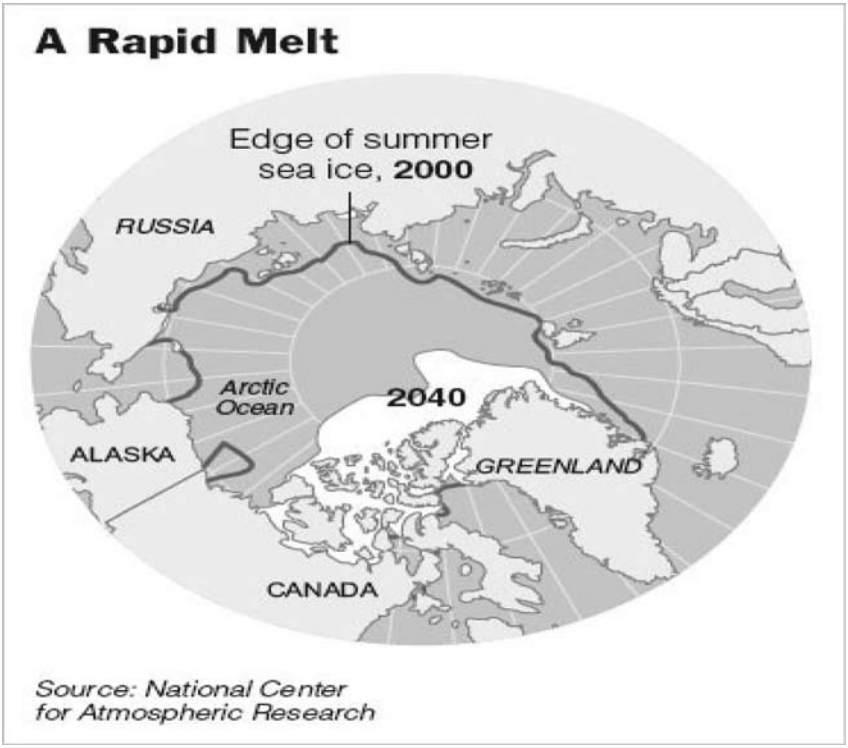
The Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2001 reported instrumental measurements of a 5 degrees Celsius warming over extensive Arctic land areas, with a small cooling occurring off Canada's eastern coast, and that from 1987-1997, air

temperature in the Arctic rose by 0.9 degrees Celsius (IPCC 2001, 810). If these trends continue, such changes mean that the Arctic will experience wide-ranging impacts, from increasing ambient air temperature to glacier and sea ice melting to permafrost thaw. More recently, the IPCC Working Group I Summary for Policymakers, released in advance of the forthcoming Fourth Assessment Report, found that average Arctic temperatures have increased at almost twice the global rate during the past 100 years, and that the last time polar regions were significantly warmer than present, reductions in polar ice volume led to sea level rise of between 4-6 meters (IPCC 2007, 8-10). These physical changes will lead to subsequent changes in species composition and disruptions for polar peoples who live traditional lifestyles. Moreover, permafrost thaw and land subsidence will have detrimental impacts on buildings, transportation, and defense infrastructure.

The IPCC is not alone in reaching this conclusion. In November of 2004, the Arctic Council[1] published a summary of their two-year assessment of the impact of climate change in the Arctic. The results were alarming beyond even the IPCC's predictions. While regional variations exist, the evidence shows a clear and significant warming trend across most of the Arctic. Up from an observed temperature increase of 5 to 7 degrees Fahrenheit over the past fifty years, the Arctic Climate Impact Assessment (ACIA) predicts an increase in ambient air temperatures of 5 to 9 degrees Fahrenheit over land and up to 13 degrees Fahrenheit over ocean within the next one hundred years.[2] Wintertime averages over land and sea for the same time period will increase 7 to 13 degrees Fahrenheit and 13 to 18 degrees Fahrenheit, respectively (ACIA 2005, 2). A significant finding common to all these models is that climate change always causes Arctic warming. The exact amount and year may vary from model to model, but *in no case does any model predict Arctic cooling* as a result of GHG accumulation.

Significant climate change in the Arctic will result in both increasing loss of sea ice cover and thinning ice (Holland et. al. 2006, Weller et. al. 1999). Over the past thirty years, annual average sea ice cover has declined by 8 percent. Additional declines in average annual sea ice cover have been predicted at 10 to 50 percent. However, the most recent computer models from the American Geographic Union speculate that gradual ice thinning will give way to sudden ice loss, rendering the Arctic virtually ice-free in the summer by 2040 (Figure 3). This is decades earlier that previously predicted (Holland et. al. 2006).

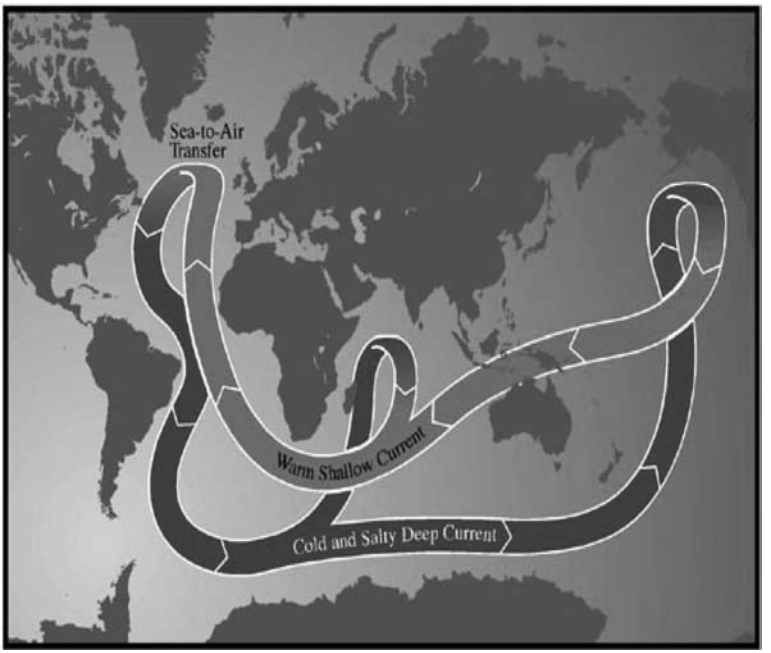
Figure 3: Projected Extent of Sea Ice Melting



(Graphic: New York Times 2006)

Concomitantly, the trend in sea-level rise is also accelerating. Global average sea level has risen approximately three inches in the past thirty years due to thermal expansion and melting of land-based ice. In this century, global average sea level is predicted to rise between four inches and three feet, with the rate of rise increasing toward the end of the century (ACIA 2005, 42). Finally, changes in thermohaline circulation may flow from increasing Arctic ice melt. The ocean is a delicate balance of salt and fresh water, sometimes referred to as the Great Ocean Conveyor (Figure 4) in which specific currents carry warm and cold water around the globe. Added freshwater runoff from melting glaciers may alter or shut down this circulation, resulting in widespread regional climatic changes such as colder European winters and changing fish migration patterns (U.S. Global Change Research Program 1999).

Figure 4: Thermohaline Circulation



(Graphic: USGCRP 1999)

Oil and Gas Infrastructure

With a globally-warmed Arctic resulting in loss of sea ice and permafrost thaw sometime this century, a new raft of security concerns comes forward. Unlike the Antarctic, its nearest climatic compatriot, the Arctic is primarily an oceanic realm, and oceanic effects and capabilities will determine how securely the United States can operate within it. One energy security challenge the United States and all circumpolar nations will face is the viability of oil and gas infrastructure in the Far North. The Arctic contains as much as 40 percent of world oil and gas reserves (Theutenberg 1988, 303). The United States has already expended billions of dollars in energy infrastructure to bring Arctic crude oil and natural gas from Prudhoe Bay eight hundred miles down the Trans-Alaska Pipeline to the nearest ice-free port of Valdez, and from there to the rest of the country. Both Canada and Russia have funded similar hydrocarbon extraction projects.

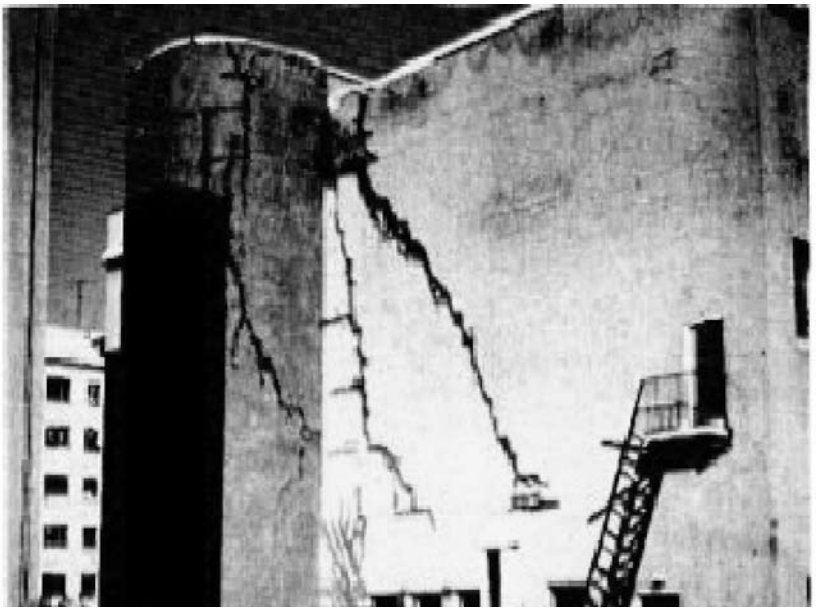
With an ice-free Arctic, increased fossil-fuel exploration and production from this area is likely. Siberia alone is estimated to hold petroleum reserves equal to the Middle East. The only barrier to its exploitation by oil and

gas companies has been economic: it is difficult and expensive to move oil and gas out over land via Russia's insufficient and aging infrastructure. Climate change will make their task easier and more economical by allowing regular sea transport over newly ice-free sea lanes. Consequently, oil and gas industries such as Lukoil, Gazprom, Statoil, and Norsk Hydro have already ordered ice-capable tankers in anticipation of easier Arctic transit (Carman 2002, 175). In addition, Denmark, Russia, Norway, Canada, and the United States have all used various interpretations of the Law of the Sea to stake territorial claims to parts of the Arctic seabed in order to exploit their considerable oil and natural gas reserves (Revkin 2004, D4).

Once on land, however, the burning of these same fossil fuels will make it that much more difficult to get at the hydrocarbons in the Arctic. Existing pumps, pipelines, infrastructure buildings, and workers' housing are built on permafrost. Since the bearing capacity of permafrost decreases with warming (IPCC 2001, 821), the land will subside considerably when it thaws, resulting in shifting ground, erosion, and landslides. (USGCRP 2000). Structural damage, such as that depicted in Figure 5, will reduce oil companies' ability to extract oil economically by forcing them to sink additional costs into infrastructure preservation and operation.

The Trans-Alaska pipeline, for example, carries 20 percent of U.S. domestic oil from the Alaskan North Slope, and significant thawing of permafrost could require shutdown and expensive re-engineering of sections of the pipeline (Weller et. al. 1999, 20-21). A stoppage of North Slope oil will imperil U.S. energy security by foreshortening the supply and forcing the United States to either conserve oil, perceived to be a politically infeasible choice, or import the shortfall from other nations. If the United States chooses to do so from the Middle East, the American military may extend its presence in Iraq, Saudi Arabia, and other oil-producing countries in the region.

Figure 5: Structural Damage in Siberia



(Photo: S. Yu. Parmuzin, in Weller et al. 1999, 34)

Also, permafrost thaw will affect buildings, transportation, and defense infrastructure such as airport runways, roads, and radar installations at the four active U.S. military facilities located in Alaska, and at other military facilities in each of the circumpolar nations (North Atlantic Treaty Organization 1998, 12-13).

Increased Arctic Ocean Access

Another security challenge the United States faces is increased ocean access to, and through, the Far North. An open-water Arctic is a more accessible Arctic for the international community which means that more ships will inevitably cross both the Northwest Passage and the Northeast Passage (above Canada and Russia, respectively). Naval vessels, merchant ships, recreational boats, cruise liners, and especially submarines will find an accessible Arctic to their advantage. The Northwest Passage alone can decrease commercial voyages from Europe to Asia by more than four thousand nautical miles by bypassing the expensive and narrow ninety-year old Panama Canal and the treacherous Cape of Good Hope (CNN 2002).

This will make it irresistible to transoceanic shippers around the world. However, while an ice-free Northwest Passage may translate into more trade and material wealth, increased ship traffic will also result in a rising number of vessels from hostile nations or non-state actors, who have no incentive to obey internationally-accepted laws regarding national waters or even notify a country of their presence. This will require the United States, and any other circumpolar nation concerned about its northern front, to enlarge its military presence in the Arctic in order to monitor shipping and military traffic through adjacent waters.

Complicating the access issue further are Canada's claims of territoriality. In 1977, Canada declared the Northwest Passage to be Canadian internal waters. While they have not yet used armed force to turn back any ship wishing to transit the passage, they request to be notified when a ship proposes to do so. This may not sound like a compelling method for Canada to defend its sovereignty, but the number of ships transiting has been extremely low because of the extent of the ice. The issue has not yet been tested either in court or by show of Canadian force.

Interestingly, legal scholars have not supported this position explicitly, though most would concede that an assumption shared and acted upon by many nations becomes a form of customary international law. The legal concepts of *mare liberum* (open sea) and *mare clausum* (closed or territorial sea) have been in customary use since the publication of *De Jure Praedae* (The Law of Prize and Booty) by Hugo Grotius in 1604, though the exact point at which a particular area of mare goes from liberum to clausum is not specified. In the past, the Arctic has been frozen over and the Northwest Passage has been impassable for most of the year, so the issue has been functionally moot. However, as climate change melts the Arctic ice, more surface ship traffic will force the Canadians to either defend their claim or abandon it. This situation may strain the relationship with the United States if Americans continue to send ships to cross the passage without Canadian permission as they did in 1985. Alternatively, if the United States, concerned about increasing traffic to the north, thinks that Canada cannot adequately patrol its Arctic waters, it might assume responsibility itself, treading on Canadian sovereignty (Figure 6).

Figure 6: U.S. Coast Guard Ice Breakers Escorting a Merchant Ship

(photo: U.S. Coast Guard)

The Northeast Passage, also called the Northern Sea Route, will also become ice-free for a greater part of the year, and the United States will certainly try to take advantage of that new mobility. Russia, therefore, will find itself in the same position as Canada with regard to its territorial waters, although the Northeast Passage has not faced the same tribulations as its sister waterway. While Russia has also declared the Northeast Passage to be internal waters, they have a much more ice-capable navy and have indicated an interest in allowing transit through the Passage for commercial ships. Since World War II, they have maintained a regular highway for Soviet shipping along the Passage through the development of new ports and the exploitation of resources in the interior. A fleet of Russian icebreakers, aided by aerial reconnaissance and by radio weather stations, keeps the route navigable from June to October (European Space Agency 2004). A great boon to shippers, the Northeast Passage cuts the distance between northern Atlantic and northern Pacific ports in half. However, the Russian Arctic faces the same climate change-induced problems the U.S.-

Canadian Arctic does, including permafrost thaw, disruption of traditional peoples' lifestyles, and incursions on national sovereignty.

In addition, increased oceanic activity across the Arctic will bring forward the legal problem of "creeping jurisdiction": as nations begin to operate with greater frequency in ice-free waters, areas of limited national sovereignty will become areas of exclusive national jurisdiction through repeated use (Theutenberg 1988, 305). In 1926, the former Soviet Union established the sector principle under which all Arctic areas between the eastern and western boundaries of the Soviet Union up to the North Pole, including the seabed, were said to be under Soviet control. Again, due to the mostly frozen state of the Arctic, the sector principle was never formally challenged. However, since the dissolution of the USSR, Russia has lost all the territory and ports on its southern and western borders. However, it still controls the north and the east, and since those are the resource-rich areas with ocean access, future projection of Russian sea power, critically important to its plans to regain superpower status, depends on a Russian-controlled Arctic. The Russian government has been very clear about maintaining Arctic accessibility and they may go to great military lengths to ensure this. With increased access to resources and the potential for conflict, creeping jurisdiction thus becomes every nation's security concern, as the line between mare liberum and mare clausum becomes increasingly unclear.

New Missions and Operational Capabilities

Naval Arctic missions for the United States in a globally-warmed world would result as a response to security challenges from hostile nations or from opportunities to exploit operational efficiencies offered by peacetime Arctic transit. The U.S. Office of Naval Research (ONR) has identified the nine most likely missions that the United States would face in an ice-free Arctic: "1. law enforcement operations; 2. ensure freedom of navigation; 3. protection of natural resources; 4. transit of forces; 5. homeland defense; 6. forward presence, intelligence, surveillance and reconnaissance (ISR); 7. scientific exploration; 8. maintain/improve capability to operate in the Arctic; 9. uphold allied commitments" (ONR 2001, 36-37). More specifically, the United States might face Russian naval incursions into its northern waters. Although these two countries are currently allies, U.S. (and Canadian) strategic considerations would not permit Russia to have unfettered access to the Western Hemisphere Arctic. Alternatively, large-scale disruption of the traditional Arctic way of life might lead to armed unrest on the part of native peoples. Although seemingly unlikely, this sort

of internal security situation has occurred before in other places where the environment was destroyed and the traditional way of life was rendered less economically viable.[3]

Policy Recommendations

Recommendation 1: Train And Equip The U.S. Military For Greater Arctic Operability

In order to be able to execute these new missions and see to its Northern defense, the United States will need to start planning for greater Arctic operability now by improving its capabilities in the North. Currently, the U.S. Coast Guard has only two aging icebreakers, while the U.S. Navy has none. There are four active military facilities in Alaska, though one is currently slated for closure and the rest for downsizing under the Base Realignment and Closure Act (DOD 2007, C-2). Should the United States decide to take strategic advantage of upcoming climatic changes in the Arctic, U.S. naval ships would have to be ice-strengthened, soldiers and sailors would have to be increasingly Arctic-trained, and weaponry and machinery would need to be built to withstand Arctic conditions if the United States is to maintain a consistent and capable presence in the far North.

In addition, the United States will need to invest time, money, and goodwill in bilateral and multilateral alliances in the region in order to maximize its efficiency in the area. Military experts have suggested fruitful grounds for cooperation, such as a joint U.S-Canadian Arctic search and rescue operation (Carman 2002, 180). Whether alone or in concert with its allies, the United States will certainly have to adapt to an increasingly ice-free Arctic, and this globally-warmed world will provide the backdrop for all future military operations, Arctic or otherwise. Forging a familiarity with and respect for the Arctic will help prevent it from becoming another environmental and security disaster like the Aral Sea.

Finally, all of these security concerns are based upon the assumption that the effects of climate change will be linear. What if they are not? Already scientific predictions of summer ice melt have been foreshortened by decades. Non-linear effects or threshold events such as sudden temperature changes, shifts in global ocean currents, or extreme weather events in unusual places are one of the great uncertainties of climate modeling.

Recommendation 2: Increase Funding for Earth Monitoring Satellites and Data Collection

On March 1 of this year, the world scientific community kicked off the

fourth International Polar Year (IPY). Covering two full annual cycles, from March 2007 to March 2009, this international scientific endeavor will measure and document physical and biological changes at both poles. Nevertheless, a recent report[4] by the National Research Council states that the number of earth-observing instruments will drop to sixty percent of current capacity by 2010, a victim of both under-funding and the Bush Administration's call to focus on manned space missions (Revkin 2007, F4). In the wake of the IPY, this policy decision is severely misguided. Earth-based data collection is the backbone not only of the United States' climate prediction capability, but also of its ability to understand and respond to environmentally-generated threats. Scientists and policy makers can only make an educated guess at the likelihood and severity of such threats.

If they are significant enough, these threats can overwhelm society's adaptive capacity and undercut all U.S. plans for strategic superiority. However, an uncertain timeline of effects is not necessarily fatal to consideration of adaptive measures. It would be strategically short-sighted to insist upon waiting for climate models to specify exact effects and locations. Rather, the identified trends provide enough information for forward-thinking nations to begin building operational flexibility into their defenses that would allow for adaptability to future conditions.

Possible Future Institutions and Trends

Some scholars posit that ongoing environmental change in the Arctic is one of the clearest indicators of the need for new geopolitical thinking. Multinational organizations such as the Arctic Council have gone a long way towards bringing the scientific realities of the Arctic to the attention of policymakers around the northern hemisphere. Franklyn Griffiths, a well-known Canadian Arctic scholar, argues that international scientific collaboration can help reinforce military cooperation in the area (Griffiths 1988, 6). This collaboration is even more pressing given new discoveries of the effects of climate change on the polar environment.

Recommendation 3: Increase Diplomatic, Military, and Scientific Cooperation with Other Circumpolar Nations

Already Norway, Russia, and the United States have launched the Arctic Military Environmental Cooperation (AMEC) for contact and cooperation on military environmental issues. The overall goal of AMEC is to support sustainable military use of the Arctic (Palosaari and Möller 2004, 269). Taken one step further, the creation of a new defense institution might help to further international security in the Arctic in the face of

ecological and economic changes brought about by global warming. The United States and Canada have long cooperated over Arctic issues such as the DEW Line, but a permanent standing bilateral body (not unlike the International Joint Commission that oversees the Great Lakes and other U.S.-Canadian boundary waters) could institutionalize the Far North as an area of legitimate joint concern. Staffed with Arctic experts and possessing its own budget, this bilateral body could ensure that Arctic matters were high in the pantheon of defense concerns the United States faces. In a bold move, a trilateral institution could include Russia, thus ensuring that the major Arctic powers had a forum to resolve access disputes and to discuss and act upon security concerns in concert.

Perhaps joint Arctic military defense is not enough. What else could the United States do to ensure its Far North security? Most of the land and ocean of the larger circumpolar nations (the United States, Canada, and Russia) lies outside the Arctic. These states have historically considered the Arctic to be their northern backyard, a place devoid of any meaning unless they assign it meaning (Dalby 2003). However, steps such as the 2001 creation of the virtual University of the Arctic[5] can help to build commonality in the region and facilitate a common Arctic identity. This is not foolproof: the states surrounding the Mediterranean Sea share a common identity, as well as common customs, cuisine, and history. However, significant ethnic and economic divisions remain between them. Nor would a common Arctic identity address the sovereignty concerns faced by circumpolar states. However, a regional identity would allow the Arctic to be more self-identified and stable.

Conclusion

Security planners and policy makers tend to believe that the future will resemble the past, a common human failing. U.S. policy planning reflects the assumption that the important problems of the day will remain important into the future. However, the predicted Arctic melt will thrust policy makers and planners physically into a world that has never existed before. In 2004, the Bush Administration released its *U.S. Ocean Action Plan* for coordinating and directing U.S. ocean policy for the next decade. The plan says nothing about the Arctic.

Yet, if the United States could face an ice-free Arctic as early as 2040, it must embrace the concept of environmental security—especially as it applies in the Arctic, the first laboratory of global climate change—if it is to remain secure. The empirical evidence of global warming is one of the clearest indications that circumpolar nations need to change their strategic

and geopolitical thinking from the solely military viewpoint to one that includes military, environmental, economic, and human aspects. Already Inuit peoples have discovered commonalities with Pacific Islanders as they see themselves as victims of diminished adaptive capacity with their homes and traditional ways of life eroded by climate change (Doyle 2004). The United States, a wealthy country with a robust adaptive capacity, may yet see its way of life erode if it does not respect the links between the climate and national security.

You who this faint day the High North is luring
Unto her vastness, taintlessly sweet;
You who are steel-braced, straight-lipped, enduring,
Dreadless in danger and dire in defeat:
Honor the High North ever and ever,
Whether she crown you, or whether she slay;
Suffer her fury, cherish and love her--
He who would rule must learn to obey.

– Robert Service, "Men of the High North"

Notes

[1]The Arctic Council is a high-level intergovernmental forum consisting of six indigenous peoples' organizations and the eight circumpolar nations: the United States, Canada, Russia, Greenland/Denmark, Norway, Sweden, Finland, and Iceland.

[2]The ACIA used the IPCC's B2 emissions scenario (regional emphasis and slower population growth) for its main findings. The American Geophysical Union based their findings on the A1B emissions scenario, while also discussing findings relying on A2 and B1 scenarios. Detailed discussion of the emissions scenarios and the assumptions underlying them can be found in the IPCC's *Special Report on Emissions Scenarios* (2000).

[3]University of Toronto scholar Thomas Homer-Dixon has conducted studies linking environmental degradation and conflict, most notably in Rwanda, Pakistan, and the Philippines (Homer-Dixon 1994). While none of these countries is an Arctic nation, the underlying conditions are the same: rent-seeking actions by a political elite causes environmental collapse and loss of livelihood. In Homer-Dixon's cases, such disruption of the civil order resulted in armed insurrection by the displaced segment of the population. It is very possible that the same might occur in the Arctic and provide a growing security concern for the United States, Canada, or Russia.

[4]While the final edited version of the report, entitled *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, has not yet been released, the draft version is available at http://www.nap.edu/catalog/11820.html. Information on the International Polar Year can be found at http://www.ipy.org.

[5]The University of the Arctic is a virtual university with faculty based in Canada, the United States, Sweden, Denmark, and Russia. It offers a Bachelor's Degree in Circumpolar Studies. Their website is www.uarctic.org.

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