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## **Climate-Derived Tensions in Arctic Security**

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# Climate-Derived Tensions in Arctic Security

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## *ABSTRACT*

Globally, there is no lack of security threats. Many of them demand priority engagement and there can never be adequate resources to address all threats. In this context, climate is just another aspect of global security and the Arctic just another region. In light of physical and budgetary constraints, new security needs must be integrated and prioritized with existing ones. This discussion approaches the security impacts of climate from that perspective, starting with the broad security picture and establishing how climate may affect it. This method provides a different view from one that starts with climate and projects it, in isolation, as the source of a hypothetical security burden.<sup>1</sup> That said, the Arctic does appear to present high-priority security challenges.

Uncertainty in the timing of an ice-free Arctic affects how quickly it will become a security priority. Uncertainty in the emergent extreme and variable weather conditions will determine the difficulty (cost) of maintaining adequate security (order) in the area. The resolution of sovereignty boundaries affects the ability to enforce security measures, and the U.S. will most probably need a military presence to back-up negotiated sovereignty agreements. Without additional global warming, technology already allows the Arctic to become a strategic link in the global supply chain, possibly with northern Russia as its main hub. Additionally, the multinational corporations reaping the economic bounty may affect security tensions more than nation-states themselves. Countries will depend ever more heavily on the global supply chains. China has particular needs to protect its trade flows. In matters of security, nation-state and multinational-corporate interests will become heavily intertwined.

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<sup>1</sup> *Because of the rapid outpouring of climate change information, this report not only uses scientifically vetted resources (often several months behind current events), it also uses crosschecked news releases. The information contained herein is only as current as that available 18 September 2008.*

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## 1.0 Overview

Many organizations and institutions recognize the need to consider the potential security implications of climate change.<sup>2,3,4,5</sup> While climate may exacerbate the security situation in already sensitive areas, the Arctic presents a (potentially rapid) emergent theater of security concerns. Arctic security affairs will evolve over the years and the initial response will most probably be unsuitable and inadequate for future needs. Conversely, developing a long-range response may prove to be unsuitable and inadequate for nascent needs.

With its mission of national security, research at Sandia National Laboratories is evaluating the impact of climate change within the Arctic. A sister study addresses the physical impacts of uncertainty on the timing and extent of climate change on Arctic security priorities.<sup>6</sup> This report presents the implications for the underlying drivers of security within the changing Arctic.

The opening of the Arctic presents many security challenges because of the high potential it has for changing global economic (and thereby, geo-political) power balances. Once the Arctic becomes economically exploitable, it may provide a large fraction of new global oil, gas, and mineral reserves. The adequate open-water conditions of the future will also 1) allow a dramatic increase in shipping, 2) could spur spectacular infrastructure and processing development along the route and 3) elevate inevitable economic and strategic competition. The convergent trade routes (and local resources) will present a major economic boon for parts-assembly product-finishing and for the refining of raw/bulk materials into high-value products. This added economic expansion could radically complicate law enforcement, environmental protection, and peacekeeping activities in the Arctic.

With recognition of the fact that good science requires the existence of dissenting views, there is a strong consensus agreement among scientists about anthropogenic climate-change.<sup>7</sup> Further, there is growing confidence in the models used to understand future

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<sup>2</sup> *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change*, **Center for Strategic & International Studies** and **Center for New American Security**, November 2007, <http://www.cnas.org/en/cms/?1278> and [www.csis.org/media/csis/pubs/071105\\_ageofconsequences.pdf](http://www.csis.org/media/csis/pubs/071105_ageofconsequences.pdf)

<sup>3</sup> *National Security and the Threat of Climate Change*, **CNA Corporation**, Alexandria, Virginia, 2007 <http://securityandclimate.cna.org/report/>

<sup>4</sup> *Climate Change Will Have Destabilizing Consequences, Intelligence Agencies Warn*, **US News and World Report**, June 25, 2008 <http://www.usnews.com/articles/news/2008/06/25/climate-change-will-have-destabilizing-consequences-intelligence-agencies-warn.html>

<sup>5</sup> *Climate Change and Security*, **Bulletin of the Atomic Scientists**, Issue Volume 64, Number 2, pp. 19-60, May/June 2008 <http://thebulletin.metapress.com/content/92610jg36j374838/>

<sup>6</sup> Ivey, Mark, Mark Boslough, Mark Taylor, Bernard Zak, and George Backus, **Arctic Climate Change Impacts on National Security**, Sandia National Laboratories, SAND Report, Albuquerque, NM, 2008

<sup>7</sup> *The Scientific Consensus on Climate Change*, **Science** 3, Vol. 306, no. 5702, p. 1686, December 2004, <http://www.sciencemag.org/cgi/content/full/306/5702/1686>

climate conditions.<sup>8</sup> The work of the Intergovernmental Panel on Climate Change (IPCC) represents the mainstream scientific assessment.<sup>9</sup> However, IPCC results only portray those aspects of climate-change science fully supported by historical data and vetted computer simulations. These measured results reveal significant changes in the latter part of the 21<sup>st</sup> century, but the projections focus mainly on best estimates whose graphical representations show relatively gradual change over the next decade. Nonetheless, other assessments for the Arctic, which support and give detail to the IPCC work, create a disturbing picture even when viewed in the longer timeframe.<sup>10</sup> Recent studies indicate more rapidly changing impacts, especially in the Arctic, where dramatic changes (e.g., an ice-free Arctic) may occur in as little as five years.<sup>11</sup> This is a difference of 60 years compared to the IPCC assessment. Other scientists believe that the Arctic crossed the “tipping point” last year, where reinforcing phenomena will now accelerate changes further.<sup>12</sup> One recent study presents evidence that life-extinguishing levels of abrupt climate change can occur in year-level timeframes.<sup>13</sup> This year continued a rapid reduction in Arctic ice-cover.<sup>14</sup> The assessment in this report assumes the intermediate, non-catastrophic situation where the Arctic Ocean becomes assessable for rapid economic exploitation during the next decade, with ever-increasing levels of access thereafter.

Rapid climate change has the potential to cause ruinous shifts in economic and political fortunes. As discussed in the next section, the historical record then shows a close link between economic/political disruptions and volatile security conditions. Thus, changes in economic and political status guide the assessment of future security dynamics. Economic assessments to-date overlay the future climate change on the existing economic and demographic conditions. There is an assumption of increased mineral exploration and shipping activity, but often only a limited perspective on the implied (larger) knock-on effects. This analysis attempts to avoid a linear, one-cause-one-effect outlook. It also includes the implications of climate change as not being a single event but rather as being a process of continual transformation. In that framework, territorial claims and permafrost degradation play a supporting role to the broader security circumstances, as constrained by these underlying realities. Hence, as presented below,

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<sup>8</sup> *Climate Models Look Good When Predicting Climate Change*, **Science Daily**, Apr. 6, 2008,

<http://www.sciencedaily.com/releases/2008/04/080402100001.htm> with the full study at:

[http://www.insc.utah.edu/~reichler/publications/papers/Reichler\\_07\\_BAMS\\_CMIP.pdf](http://www.insc.utah.edu/~reichler/publications/papers/Reichler_07_BAMS_CMIP.pdf)

<sup>9</sup> *IPCC Fourth Assessment*, **Intergovernmental Panel on Climate Change**, Geneva, 2007,

<http://www.ipcc.ch/>

<sup>10</sup> *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, **Arctic Climate**

**Impact Assessment (ACIA)**, Cambridge, UK: Cambridge University Press, 2004, <http://amap.no/acia/>

<sup>11</sup> *Meltdown in the Arctic is speeding up*, **The Observer**, August 10 2008,

<http://www.guardian.co.uk/environment/2008/aug/10/climatechange.arctic>

<sup>12</sup> Arctic ice 'is at tipping point', **BBC News**, UK, 28 August 2008,

<http://news.bbc.co.uk/2/hi/science/nature/7585645.stm>

<sup>13</sup> Jørgen, Peder Steffensen, et al., *Abrupt Climate Change Happens in Few Years*

*High-Resolution Greenland Ice Core Data Show*, **Science** 321, pp. 680-684, 2008,

<http://www.sciencemag.org/cgi/reprint/sci;321/5889/680.pdf> and

<http://www.sciencemag.org/cgi/reprint/sci;321/5889/650.pdf>

<sup>14</sup> *No 2008 record for Arctic sea ice*, **BBC News**, 16 September 2008,

<http://news.bbc.co.uk/2/hi/science/nature/7619770.stm>



the evolution of and response to security risks are hampered by a continually changing physical setting, and thereby, a changing political and economic environment.

This report neglects several security aspects of climate change other than to note them here: Migration could cause cascading demands on not only receiving and donor nations but would generate pressures also on the supporters and adversaries of those nations, and on international peacekeepers and aid suppliers. These demands can compete with or can spill over into Arctic tensions. Climate-induced disease vectors and natural disasters can amputate nation-state leadership and create power voids where factional entities (and their allies) compete to the same effect. Rapidly evolving land-use changes can amplify climate change impacts and bring on the agricultural collapse, migration, and disease that cause the destabilization.<sup>15</sup> Further, financial market stability may be an early victim of climate-change due to variations in national and corporate fortunes from transient or sustained extreme weather and environmental conditions (e.g. melting of permafrost and change in hydrological cycles). Financial destabilization is often a source of civil destabilization. Later observations will note the high-stake investment flows the Arctic can precipitate for companies and nations – with their sensitivity to financial stability. In fact, the large financial flows espoused for mitigation efforts may themselves be financially destabilizing. Lastly, some would also argue that efforts to provide Arctic security promote a balance-of-power “arms-race” that on-its-own increases conflict opportunities.<sup>16</sup>

This report does attempt to address Arctic-region security dynamics caused by geo-political and accelerated economic activity. Oil, gas, and mineral exploration along with expanded shipping operations will jump-start the Arctic “gold rush,” but the re-location of secondary and tertiary infrastructure in the supply chain to the Arctic region may be the primary drivers of Arctic economic expansion. Protecting those supply chains, the enforcing of rights and renegotiation of poorly defined rights within a jurisdiction, and safeguarding multinational/nation-state interests could require significant resources. Shifting climate conditions will further alter the effectiveness/requirements of U.S. security forces over time.

For assessing security needs in the Arctic, the question is not “What security risk happens when the Arctic opens?” but rather “How will security risks evolve as the geo-political and economic-expansion plays out?” The physical speed with which the Arctic changes will determine the gap between reality and expectations, and will shape the perceived threat from the unexpected setbacks. This perceived status-gap and the ability to cope with changing circumstances appear to define the trigger of conflict.<sup>17</sup> Early, slow

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<sup>15</sup> *Landcover Changes May Rival Greenhouse Gases As Cause Of Climate Change*  
**Goddard Space Flight Center**, October 01, 2002,  
<http://www.gsfc.nasa.gov/topstory/2002/20020926landcover.html>

<sup>16</sup> Haldén, Peter, *The Geopolitics of Climate Change: Challenges to the International System*, **FOI - Swedish Defence Research Agency**, Stockholm, December 2007  
<http://www.foi.se/upload/projekt/Climatools/Rapporter/FOI-R--2377--SE.pdf>

<sup>17</sup> Backus, G. A. and Glass, R. J., **An Agent-Based Model Component to a Framework for the Analysis of Terrorist-Group Dynamics**, Sandia National Laboratories, SAND2006-0860, Albuquerque, New Mexico, 2006 [https://cfwebprod.sandia.gov/cfdocs/CCIM/docs/06\\_0860P\\_ConceptualModel1.pdf](https://cfwebprod.sandia.gov/cfdocs/CCIM/docs/06_0860P_ConceptualModel1.pdf)

dynamics in the Arctic can allow all parties to co-evolve toward balanced positions. Rapid dynamics can abruptly change political, military, and economic standing, with raised tensions as a consequence. Because climate-change will produce an ever-shifting playing field, relative status is more important than absolute status, and relative change is more important than absolute change.

The next sections of this chapter explore: 1) categorizing the risk prioritization of climate change, 2) economic transitions in the Arctic and its national security implications, 3) the United Nations Convention on the Laws of the Sea and its relation to security risk, 4) multinational-corporation and nation-state intersections creating the security landscape, 5) contributions of Russia and China to arctic security dynamics, 6) security constraints from the severity of the Arctic environment, 7) security constraints from the fragility of the Arctic environment, 8) security (cost) constraints from the expansiveness within the Arctic, and 9) impacts of Arctic changes on southern-hemisphere security.

## 2.0 Risk Prioritization of Climate Change

Is there really a security risk from climate change in the Arctic or only paranoia based on speculation? If there is a risk, how does it compare to other priorities, what are the pragmatic implications, and what are the timing constraints for an effective response? The answers to these questions require recognition of the uncertainty in future climate conditions and recognition that it is not just climate change, but also the consequences of climate change on human behaviors that form the chain of security strains.

### 2.1 Scientific Versus Engineering (Security) Risk

Security assessments use engineering risk, not scientific risk. The difference is that engineers use conservative design criteria for realizable worst-case scenarios, whereas scientists focus on the most probable outcome. There is high confidence that climate change is real. There is also large uncertainty on how fast and how dramatically it will evolve.<sup>18</sup> Science generally lags data. It takes time to accumulate the data to support (or falsify) scientific assertions with any sense of confidence. Recent data, primarily events in the Arctic, however, do indicate that the aspects of climate change, where science has a limited understanding, are causing changes that are much faster and far more dramatic than the best estimates for most probable predictions.<sup>19</sup> Many scientists now believe that we have crossed the tipping-point where climate change will accelerate due to reinforcing interactions within the environment itself. The best knowledge and models available to address the current conditions indicate the events will simply occur 40 to 60 years earlier, and much more abruptly, than anticipated.<sup>20</sup> Still, this means an ice-free Arctic can occur within the next 5 years.<sup>21</sup> Further, the yet-to-be understood processes that cause the timing underestimation could provide additional near term surprises, as well as the regional and global feedbacks associated with an ice-free Arctic.

To imbue popular political acceptance, mainstream climate assessment efforts must minimize scientific risk. Scientific risk minimization entails the maximal use of data to support analyses and conclusions. In science, it is better to “conservatively” underestimate change rather than to endanger credibility. Conversely, security concerns relate to engineering risks. Engineering risk minimization entails the maximal use of contingency planning and uncertainty analyses to ensure acceptable outcomes under all

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<sup>18</sup> Working Group I Report “The Physical Science Basis”, IPCC Fourth Assessment Report Intergovernmental Panel On Climate Change, Geneva, 2007, <http://www.ipcc.ch/ipccreports/ar4-wg1.htm>

<sup>19</sup> See note 12 above.

<sup>20</sup> For the first time in human history, the North Pole can be circumnavigated, **The Independent**, London, UK, 31 August 2008  
<http://www.independent.co.uk/environment/climate-change/for-the-first-time-in-human-history-the-north-pole-can-be-circumnavigated-913924.html>

<sup>21</sup> Arctic Ice on Track for Another All Time Low, **Wired**, August 28, 2008  
<http://blog.wired.com/wiredscience/2008/08/arctic-ice-on-t.html> based on Whelan, J., Maslowski, W., Clement Kinney, J.L., Jakacki, J. *Understanding Recent Variability in the Arctic Sea Ice Thickness and Volume - Synthesis of Model Results and Observations*, **Eos Transactions of the American Geophysical Union** (52): Fall Meeting Suppl., Abstract C22A-06, 2007

realizable conditions. Thus for security assessments, it is better to “conservatively” place bounds on the envelope of possibilities and not have conditions outside the expected norm blind-side decision-makers. Climate change characterizes the future weather variability (and its impacts) from the norm. Consequently, security assessments anchored in projections based on minimizing scientific risk overlook the primary drivers for the security dynamics. For this reason, we must make the careful distinction between “scientific conservatism” and “engineering conservatism” -- which are essentially antonyms in this context.

Certainty is seldom a part of decision-making and uncertainty (risk) is definitely part of the security equation. Because the weighting of uncertainty toward larger climate impacts, and large impacts mean larger consequence, dealing with the risk is essentially unavoidable. Because of the high costs in managing risk and the necessary priority trade-off with other existing risks, the decision to add climate change risk as a priority requires a quantified understanding of the uncertainty, assessment of potential consequences, and a process for validated, risk-informed decision making.<sup>22</sup>

What are the security risks from climate change? A recent British study notes:

*“Climate change is just one component of the larger problem of direct manmade environmental change. That said, climate change alone is likely to cause international legal disputes, disrupt access to vital resources, and damage critical infrastructure.”<sup>23</sup>*

The actual risk, however, is not from climate change itself, but rather the consequence of the climate change. Droughts, less food, and mass migrations present possibly global humanitarian threats, but in themselves, they are not security threats. Thus, the security risk stems from the geo-political response to the socio-economic consequence of the physical climate change. Note that the climate change uncertainty itself does not dilute claims of uncertainty in physical, socio-economic, or geopolitical consequences. When climate change occurs, changes in physical and socio-economic conditions are a certainty. In these circumstances, the adjustment involves changes in relative status quo. That is, there will be winners and losers. Even among the losers, there will be degrees of loss, which will change relative economic status in a way that those at the bottom will probably perceive as unfair. In such an atmosphere, risk of a geo-political response is then also certain. The purpose of security measures is to respond to probable-risks because predicting actual hostile events, timing, and import is not the basis for military and safeguard preparedness.

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<sup>22</sup> Boslough, M. and T. Trucano, **Verification and Uncertainty Quantification of Radiative Forcing and Climate Sensitivity Estimates**, Sandia National Laboratories, Sand Report 2008-XXXX, Albuquerque, NM, 2008

<sup>23</sup> Paskal, Cleo, *How climate change is pushing the boundaries of security and foreign policy*, The Royal Institute of International Affairs, **Chatham House**, London, June 2007  
[http://www.chathamhouse.org.uk/files/9250\\_bp0607climatecp.pdf](http://www.chathamhouse.org.uk/files/9250_bp0607climatecp.pdf)

## 2.2 International Security Perspectives

The IPCC lays out the broad physical consequences of climate change, albeit, possibly in too scientifically conservative of a sense relative to timing.<sup>24</sup> The Navy has considered the types of missions the U.S. would encounter 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.”<sup>25</sup> While these are all important missions, the prioritization may depend on the potential for conflict – and potential for the conflict to expand. There are differing views on whether the stress that climate imposes on resource competition actually correlates with international tensions. Some researchers argue that the evidence is insufficient to draw conclusions.<sup>26</sup> Others argue that historical evidence confirms the impact of climate change on conflict incidence.<sup>27,28</sup> The changes in the Arctic may make these arguments moot, because the issue is neither directly about climate-change nor about climate-induced loss of resource access. The opening Arctic simply creates a “new world” with dynamics not unlike those experienced in 16<sup>th</sup> and 17<sup>th</sup>-century North and South America. The issues pin on the sovereignty boundaries and limitations. As will be discussed in the next two sections, the motivating interests of all parties are already well defined.

European researchers warn of new social and security risks arising from potential conflicts over newly accessible minerals<sup>29</sup>, and the European Union notes its concerns for the Arctic focus on the sovereignty debate:

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<sup>24</sup> *International Scientific Panel Approves Report on Climate Change Impacts, Adaptation and Vulnerability, U.S. Climate Change Science Program*, Press release, 6 April 2007 <http://www.climatechange.gov/Library/pressreleases/pressrelease6apr2007.htm> and *Synthesis report. Summary for Policymakers, Intergovernmental Panel On Climate Change*, Geneva, Switzerland 2007 [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf)

<sup>25</sup> *Naval Operations in an Ice-Free Arctic, Symposium Final Report, Office of Naval Research (ONR)*, pp 36-37, April 17-18 2001. <http://www.natice.noaa.gov/icefree/FinalArcticReport.pdf>

<sup>26</sup> Buhaug, Halvard; Nils Petter Gleditsch & Ole Magnus Theisen, *Implications of Climate Change for Armed Conflict, World Bank*, Washington, DC, 2008 [http://siteresources.worldbank.org/INTRANETSOCIALDEVELOPMENT/Resources/SDCCWorkingPaper\\_Conflict.pdf](http://siteresources.worldbank.org/INTRANETSOCIALDEVELOPMENT/Resources/SDCCWorkingPaper_Conflict.pdf)

<sup>27</sup> *Arctic Climate Impact Science, WWF International Arctic*, Oslo, Norway, April 2008 [www.wwf.org.uk/filelibrary/pdf/arctic\\_climate\\_report.pdf](http://www.wwf.org.uk/filelibrary/pdf/arctic_climate_report.pdf)

<sup>28</sup> Homer-Dixon, Thomas. 1994 *Environmental Scarcities and Violent Conflict: Evidence from Cases, International Security*, Vol. 19, No. 1, pp. 5-40, Summer 1994, <http://www.library.utoronto.ca/pes/evidence/evid2.htm>

<sup>29</sup> Herrmann, G. *Gereiztes Klima nach dem Tauwetter. Die Erderwärmung lässt das Arktis-Eis schmelzen – nun streiten Anrainerstaaten um freiwerdende Bodenschätze wie Öl und Gas. Süddeutsche Zeitung*, Munich, 2006 <http://jetzt.sueddeutsche.de/texte/anzeigen/340764> and *World in Transition – Climate Change as a Security Risk, German Advisory Council on Global Change*, Earthscan, London 2007 [http://www.wbgu.de/wbgu\\_jg2007\\_engl.html](http://www.wbgu.de/wbgu_jg2007_engl.html)

IPCC

*“The speed of polar ice cap melting will have a large geostrategic impact, with conflicts likely over the vast new mineral resources that will become accessible, as well as the opening of new sea routes for international trade. Rival claims to the mineral wealth and shipping routes will challenge Europe's ability to secure its interests in the region.”*<sup>30</sup>

*“There is an increasing need to address the growing debate over territorial claims and access to new trade routes by different countries which challenge Europe's ability to effectively secure its trade and resource interests in the region and may put pressure on its relations with key partners.”*<sup>31</sup>

Russia's eminent dominance in the Arctic denotes a particular concern. Mineral rights may motivate aggressive stances, but relatively less contentious items such as fishing rights may create an environment where tensions accumulate.<sup>32</sup> To ensure sovereignty, analysts believe Russia will militarize the Arctic to back-up boundary disputes<sup>33</sup> and that the military risk is both real and significant.<sup>34</sup> Russia has long wanted to be a maritime nation. The Russian side of the Arctic will open sooner than the North American side. This will give them an upper hand in securing their domain of influence through experience and the early placement of assets.<sup>35</sup> The early use of the sea-lanes could also be a source of conflict with Russia due to issues of jurisdiction.<sup>36</sup>

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<sup>30</sup> *EU told to prepare for flood of climate change migrants*, **The Guardian**, Monday March 10 2008, <http://www.guardian.co.uk/environment/2008/mar/10/climatechange.eu>

<sup>31</sup> *Climate change and international security*, **Council Of The European Union**, 7249/08, Brussels, 3 March 2008 [http://www.consilium.europa.eu/ueDocs/cms\\_Data/docs/pressData/en/reports/99387.pdf](http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/reports/99387.pdf) and *Climate Change And International Security*, Paper from the High Representative and the European Commission to the European Council, **European Union**, S113/08, 14 March 2008 [http://www.euractiv.com/29/images/SolanaCCsecurity%20reportpdf\\_tcm29-170886.pdf](http://www.euractiv.com/29/images/SolanaCCsecurity%20reportpdf_tcm29-170886.pdf)

<sup>32</sup> Traynor, Ian, *Climate change may spark conflict with Russia, EU told Alert over scramble for control of energy resources in the Arctic*, **The Guardian**, Monday March 10 2008, <http://www.guardian.co.uk/world/2008/mar/10/eu.climatechange>

<sup>33</sup> Rusling, Matthew, *Coast Guard Unprepared for Climate Change in Arctic*, **National Defense**, August 2008 <http://www.nationaldefensemagazine.org/archive/2008/August/Pages/CoastGuardUnpreparedforClimateChangeinArctic.aspx>

<sup>34</sup> Borgerson, Scott G., *Arctic Meltdown: The Economic and Security Implications of Global Warming*, **Foreign Affairs**, March/April 2008, <http://www.foreignaffairs.org/20080301faessay87206/scott-g-borgerson/arctic-meltdown.html>

<sup>35</sup> Corell, Robert W., *The Science of Climate Change*, in *Global Climate Change National Security Implications*, Carolyn Pumphrey (ed.) **Strategic Studies Institute**, Triangle Institute for Security Studies, Army War College (U.S.). Carlisle Barracks, PA., 2008, <http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB862.pdf>

<sup>36</sup> Chalecki, Elizabeth, *He Who Would Rule: Climate Change in the Arctic and Its Implications for U.S. National Security*, paper presented at the **International Studies Association**, Chicago, 2007. <http://fletcher.tufts.edu/maritime/documents/ArcticSecurity.pdf> and <http://www.princeton.edu/~jpia/pdf2007/Chalecki%20Chapter%2010%20.pdf>

Russian nationalism appears to already motivate actions that are cast in terms of geopolitics and military-intent:

*“The Arctic is perceived as a geopolitical “frontier” where Russia should use its competitive advantages and assert its claims since the readiness to advance its own interests, even if not of immediate character, is presumed to constitute an additional source of strength.”<sup>37</sup>*

*“The main line of Russia’s Arctic intrigue goes however towards the US, and the Kremlin expects that it would constitute a separate dimension in the complex relationship where the elements of confrontation and cooperation coexist but tensions tend to escalate as the hyper-power in decline seeks to check the rise of an independent power center. The main source of risk in this rather simplistic picture is not that the US leadership would decide that Moscow had allowed itself one liberty too many, but that the four Arctic states—plus possibly the UK—who all happen to be NATO member-states, could join forces against Russia. The experiments with combat patrolling by Strategic Aviation could actually increase the probability of such coalition-building, so Moscow has to take into account the possibility that the concerned neighbors might find some forceful collective replies to its challenges.”<sup>38</sup>*

U.S. planning to balance potential Russian ambitions becomes very problematical if the Arctic opens much faster than expected. The strategy to manage Arctic security may vary significantly depending on the time horizon for implementation.

European concerns link the Canadian-side access with the Russian-side access to the Arctic as a strategic military complication:

*The Northwest Passage, a long-sought sea route linking the Atlantic and Pacific, opened up the last three years, [Walt] Meier [U.S.] said. Last year, the Parry Channel -- deep enough for large ships to pass -- opened for the first time, he said. ... “It’s advantageous for shipping and in a military-conflict situation,” [Cleo] Paskal [UK] said. “It needs to be managed very carefully for it not to be another destabilizing factor in geopolitical affairs.” ... Of the northern nations, Russia has a “big advantage in strategic control over the Arctic” because it has ports on the permafrost and a fleet of icebreaker ships, Paskal said.<sup>39</sup>*

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<sup>37</sup> Baev, Pavel, **Russia’s Race for the Arctic and the New Geopolitics of the North Pole**, The Jamestown Foundation, Washington, D.C. 2007. <http://www.jamestown.org/docs/Jamestown-BaevRussiaArctic.pdf>

<sup>38</sup> See note 37 above.

<sup>39</sup> *Arctic Ice Retreat May Be Harbinger of Climate Change*, **Bloomberg**, September 17, 2008, <http://www.bloomberg.com/apps/news?pid=20601082&sid=aFLKxIyTHX8Q&refer=canada>

China has a large stake in the Arctic as well. As a trading nation, the Arctic routes reduce costs and diversify strategic supply chains. As consumers, they will also be eager to utilize the energy resources:

*“Chinese demand for ... resources may fundamentally alter [global] shipping patterns if the Arctic sea ice recedes and the Arctic routes become routinely navigable.”<sup>40</sup>*

A later section will more fully discuss the influence of the Russian and Chinese interests on U.S. security decisions, but uncertainty in how fast the Arctic will become economically accessible merely governs how immediate the pre-existing sovereignty tensions demand military backing for diplomatic resolution.

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<sup>40</sup> *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs*, Committee on the Assessment of U.S. Coast Guard Polar Icebreaker Roles and Future Needs, **National Research Council**, Washington, DC, pg. 33, 2007 [http://www.nap.edu/catalog.php?record\\_id=11753](http://www.nap.edu/catalog.php?record_id=11753)



### **3.0 Economic Transitions in the Arctic and Its National Security Implications**

The reduction in Arctic ice coverage may quickly open the Arctic for routine, seasonal marine transport. The length of the season may “naturally” grow rapidly, but the intensive use of icebreakers may also greatly extend the shipping season beforehand. With its nuclear-power icebreakers, the Russians claim they already have year-round service.

*“The nuclear icebreaker fleet, operated by the Murmansk Shipping Company (MSC) for the Ministry of Transportation, services the western section of the route extending from Murmansk to River Lena as well as river ports on major Siberian rivers. The Arctica-class icebreakers can open passages through 1.5–2 m thick ice, which is sufficient to make possible year-round navigation in the region.”<sup>41</sup>*

Between 1982 and 2005, the summer sea-ice declined by an area equivalent of 22 Western U.S. states, mostly on the Russian side.<sup>42</sup> Last year a vessel reached the North Pole without the use of icebreakers.<sup>43</sup> Figure 1 shows the September 2007 Arctic-ice conditions. In 2006, the ice peninsula at the Vilkitskiy strait of Russia that limits the use of the Northeast Passage opened, which appears to be the case again this year.<sup>44</sup> Figure 1 illustrates the Northeast Passage (more commonly called the Northern Sea Route) as the blue line and the Northwest Passage as the yellow line. The top linkage of the two also provides a now routinely open route between Canada and Russia. Canadian oil companies are already expanding their use of Arctic-Canadian rivers, rail, and ports to access tar-sands oil. Churchill, in Northeast Manitoba (in Hudson Bay), is experiencing rapidly growing demand. Going from Churchill to Russia for European market entry via the Arctic waterway is four days faster than attempting to ship via the Great Lakes. In the Northwest Territories, Arctic maritime freight shipments increased almost 60% from the previous year.<sup>45</sup> For the first time in history, ships could circumnavigate the polar region.<sup>46</sup>

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<sup>41</sup> Bukharin, Oleg *Russia's Nuclear Icebreaker Fleet*, **Science and Global Security** 14, Taylor & Francis Group, LLC pp.25–31, 2006 [http://www.princeton.edu/~globsec/publications/pdf/14\\_1\\_25-31\\_Bukharin.pdf](http://www.princeton.edu/~globsec/publications/pdf/14_1_25-31_Bukharin.pdf)

<sup>42</sup> *Russia builds worlds biggest nuclear icebreaker*, **Pravda**, 01 March 2006 <http://english.pravda.ru/science/tech/01-03-2006/76685-icebreaker-0>

<sup>43</sup> *Profiteering from the Arctic Thaw*, **Der Spiegel**, March 10, 2006, <http://www.spiegel.de/international/0,1518,405320,00.html>

<sup>44</sup> See note 20 above.

<sup>45</sup> *Arctic melt opening sea lanes for shippers, new cargo vessel*, **Bloomberg News**, March 2, 2008 <http://www.bloomberg.com/apps/news?pid=20601082&refer=Canada&sid=aQ4ROJIItxvU> with a more complete article at <http://www.nwanews.com/adg/Business/218544/>

<sup>46</sup> See note 20 above.

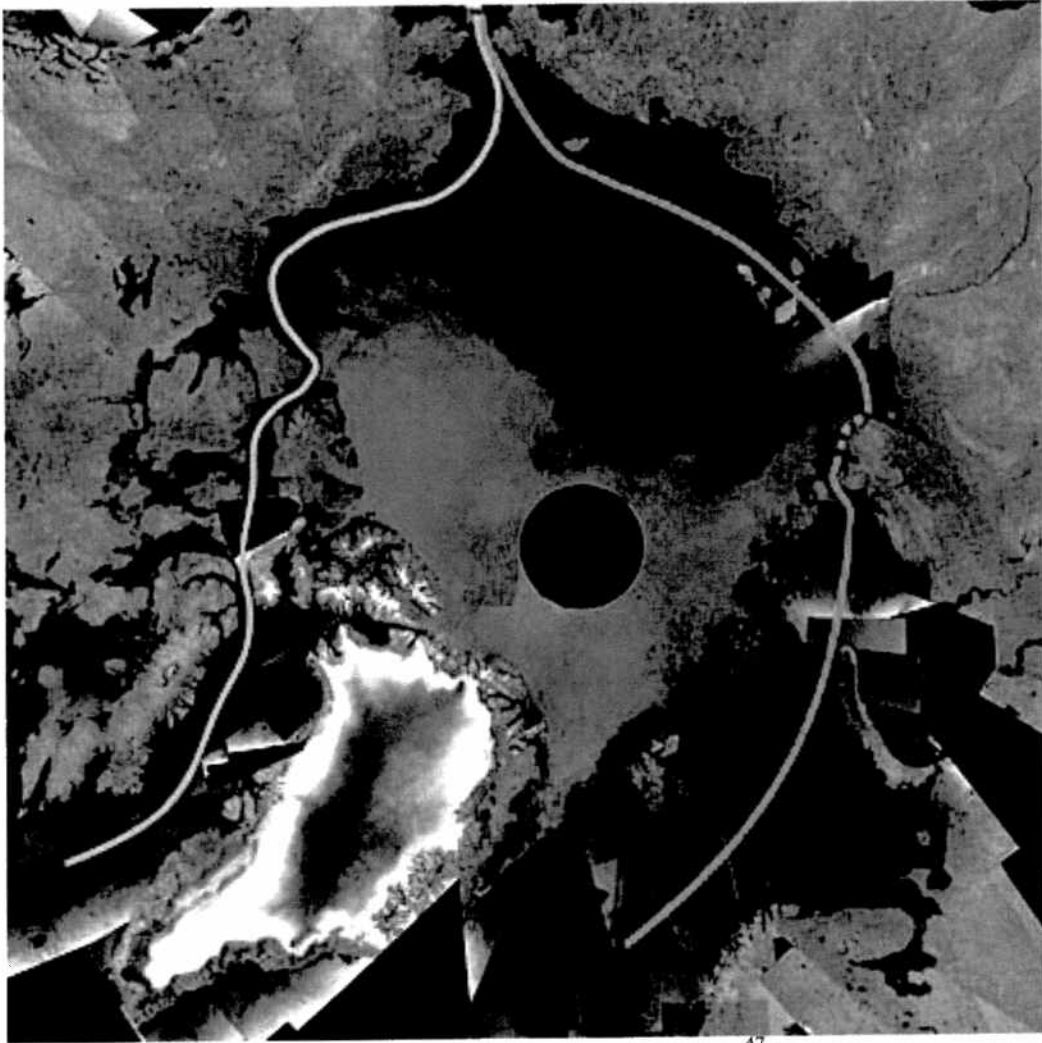


Figure 1: 2007 Arctic Ice Cover<sup>47</sup>

Other countries and industries are well aware of the trade advantage. Russia already has many icebreaker oil tankers,<sup>48</sup> with other countries actively building both icebreaking oil and LNG tankers,<sup>49,50</sup> and with numerous other countries gearing up to build icebreaker freighters.<sup>51</sup>

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<sup>47</sup> *Satellites witness lowest Arctic ice coverage in history*, **European Space Agency**, 14 September 2007, [http://www.esa.int/esaCP/SEMYTC13J6F\\_index\\_0.html](http://www.esa.int/esaCP/SEMYTC13J6F_index_0.html)

<sup>48</sup> *Icebreaker LNG carriers for Arctic Alaska gas an interesting but challenging concept*, **Petroleum News**, Vol. 13, No. 24, Week of June 15, 2008, <http://www.petroleumnews.com/pntruncate/114342229.shtml>

<sup>49</sup> Noble, Peter G., *Oil & Gas Exploration, Production and Transportation in the Arctic Symposium on the Impact of an Ice-Diminishing Arctic on Naval & Maritime Operations*, U.S. Arctic Research Commission, Washington, DC, 10-12 July 2007  
<http://www.star.nesdis.noaa.gov/star/documents/2007IceSymp/Noble.pdf>  
<http://www.star.nesdis.noaa.gov/star/IceSymposium.php>

The Department of Homeland Security and the U.S. Coast Guard see the recent Arctic changes as now transcending sterile scientific explanations. They recognize the global economic impacts of an opening and the security implications it may pose.

*“The new geo-strategic and maritime security reality such a directive will have to deal with includes several facets. First is the fact that the nature of US interests in the Arctic are likely to ratchet up considerably over the next few years. As ice melts in the Arctic region the area, believed to contain vast oil and gas reserves and other mineral riches, is likely to become far more accessible to exploration and development and thus the locus of hundreds of billions of dollars worth of critical energy and other industrial infrastructure. The rapid melting of the Arctic’s summer sea ice will also open up the fabled Northwest Passage and other shipping lanes to unprecedented volumes of foreign commercial and perhaps military fleets, taking advantage of new routes that drastically cut the distance and expense of Europe to Asian voyages that now are routed through the Panama canal.”<sup>52</sup>*

Although the arctic remains a severe environment,<sup>53</sup> it appears that the enduring reduction in ice-cover, minimized transportation costs, and new technology now makes the use of the Arctic economically advantageous. By the end of 2008, as much as 10% of the commercial tanker fleet can ply frozen waters and the 152 ice-capable-vessel order-backlog is 50% of the current worldwide fleet.<sup>54</sup> In the interim, Russia has a growing fleet of between 7-18 full-capability icebreakers that can escort vessels and maintain trade routes.<sup>55,56,57,58</sup>

With open Arctic water and rivers, Russia can ship Siberian goods north to foreign ports making them accessible to global markets. It can tap its vast mineral resources and deliver high-value processed goods made from them. The Arctic not only opens up an immense wealth of mineral resources, it now acts as a common confluence for all traded

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<sup>50</sup> Carman, Jessie C., *Economic and Strategic Implications of Ice-free Arctic Seas*. Chapter 9 of **Globalization and Maritime Power**, ed. Sam J. Tangredi, Institute for National Strategic Studies, National Defense University, Washington, DC, 2002.  
[http://www.ndu.edu/inss/Books/Books\\_2002/Globalization\\_and\\_Maritime\\_Power\\_Dec\\_02/10\\_ch09.htm](http://www.ndu.edu/inss/Books/Books_2002/Globalization_and_Maritime_Power_Dec_02/10_ch09.htm)

<sup>51</sup> See note 45 above.

<sup>52</sup> *The Arctic Heats Up As Security Focus*, **Homeland Security Today**, 11 August 2008,  
<http://www.hstoday.us/content/view/4655/149/>

<sup>53</sup> *Arctic Ice Hints at Warming, Specialists Say*, **New York Times**, September 6, 2008  
<http://www.nytimes.com/2008/09/07/science/earth/07arctic.html?partner=rssyahoo&emc=rss>

<sup>54</sup> See note 45 above.

<sup>55</sup> *A Push to Increase Icebreakers in the Arctic*, **New York Times**, August 17, 2008  
<http://www.nytimes.com/2008/08/17/world/europe/17arctic.html?ref=environment>

<sup>56</sup> Eight of which Russia claims are nuclear powered. See note 42 above.

<sup>57</sup> *Arctic shipping set to explode in legal vacuum, experts warn*, **Agence France Presse**, September 8, 2008

[http://news.yahoo.com/s/afp/20080908/sc\\_afp/arcticjusticeenvironmentshippingtourism\\_080908174031](http://news.yahoo.com/s/afp/20080908/sc_afp/arcticjusticeenvironmentshippingtourism_080908174031)

<sup>58</sup> *Conflict fear over Arctic borders*, **BBC News**, 10 September 2008,  
<http://news.bbc.co.uk/2/hi/science/nature/7606132.stm>

commodities – which mostly represent partial products awaiting final assembly. The result is an economic explosion. Russia's icebreakers and head-start with Arctic-water experience alone indicate it can lock-in the greatest amount of early economic activity.<sup>59</sup> As will be detailed below, Russian geographical advantages will probably make it the hub of Arctic economic expansion and therefore the apparent source of tensions when economic activities clash with sovereignty issues.

Estimates indicate that the Arctic routes could reduce transportation costs by an average of 40% on key Asian-European routes and cuts some key route distances by two-thirds.<sup>60</sup> A simple use of economic data<sup>61</sup> indicates that such reductions imply that Arctic open-water could attract up to 80% of the global transportation market. As intimated above, with global supply chains all converging within the area, natural economic pressures argue to take the FedEx model of a "spoke & hub" to its logical extreme.<sup>62</sup> Beyond making the Arctic the mother of all distribution centers, also make it the final-product manufacturing center. Rather than have a shirt or a machine visit 10 different countries before it reaches the final consumer, and since all the parts converge at the Arctic, assemble the product there and send it on its single (short!) path to the final market. In such a scenario, the use of advanced automated manufacturing practices would need to compensate for the *current* lack of a large labor force in the Arctic. Japanese and Korean firms have the required expertise. The need for energy to run these facilities implies it may make sense to process newly exploitable, energy resources locally. If the energy infrastructure is available, other raw materials extracted from Arctic regions can also be refined and used locally. Finished products have typically much more economic value (profit margins) than raw materials. There are added multiplier affects for secondary industries to support the primary ones.<sup>63</sup> A dollar's worth of primary output can beget two to three or more added dollars of economic activity. If the Arctic becomes economically accessible, it could easily become the next global economic growth engine.<sup>64</sup> Such global impacts can produce significant ripple affects for the Southern hemisphere, as will be discussed later.

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<sup>59</sup> See note 55 above.

<sup>60</sup> *Research key to unlocking Arctic riches*, **Petroleum News**, Vol. 12, No. 10 Week of March 11, 2007, <http://www.petroleumnews.com/pntruncate/900471425.shtml>

<sup>61</sup> Litman, Todd, *How Prices and Other Factors Affect Travel Behavior*, **Victoria Transport Policy Institute**, Victoria, BC, Canada, 26 July 2008 <http://www.vtpi.org/elasticities.pdf>

<sup>62</sup> Hudson, Scott, *Success with Hub and Spoke Distribution*, Supply Chain Resource Cooperative, **North Carolina State University**, accessed September 12, 2008, <http://scm.ncsu.edu/public/lessons/less031014.html>

<sup>63</sup> For an over view of multipliers see *A User Handbook for the Regional Input-Output Modeling System (RIMS II)*. Bureau Of Economic Analysis, **U.S. Department Of Commerce**, Washington, DC 20402, March 1997 <http://www.bea.gov/scb/pdf/regional/perinc/meth/rims2.pdf> and see <http://www.bea.gov/regional/rims/index.cfm> for recent values in the U.S. Multipliers dynamically vary by country and industry and their grouping.

<sup>64</sup> See notes 43, 45, and 56 above.

Historians often argue, “Geography is destiny.”<sup>65</sup> The physical realities of the Arctic region will determine where the economic entrenchment occurs first. The maps of Figures 2 through 4 show the results of a 2003 assessment of the risks to significant infrastructure in the United States, Canada, and Russia from changes in permafrost temperatures for structures, transportation, electrical transmission and oil and gas pipelines.<sup>66</sup> With the recent Arctic-change data noted previously, the 2003 assessment is mostly like an underestimation of impacts. The darker colored the area the greater the increased ground instability (risk) and the need for either sophisticated engineering solutions or limitations in using that area. Note that central northern Russia appears to be in the best situation for stable land-based access to the Arctic. Further, Russia is in the best position to provide the processing, manufacturing and assembly facilities that makes the polar shipping into a game-changing economic powerhouse. Russia experience with Arctic shipping, mineral processing, infrastructure development, and security organization continues to accelerate.

As a simplistic metaphor for the potential confluence of trade within the Arctic, “all the world’s longitude lines meet at the North Pole.” In an ice-free Arctic, many of China’s sensitive supply chains would go north and south, instead of primarily east and west. In a positive sense, the Straits of Malacca become less critical with an Arctic trade highway and an Arctic oil supermarket. This situation could relieve a host of potential global threats. On the other hand, extreme weather (which may become more extreme) in the Arctic and elsewhere, magnifies politico-economic challenges and the security environment. As a negative effect, fewer east-west shipments would reduce the use of the Panama Canal with potentially damaging effects on Central and South American economies. Reductions in Suez Canal use could similarly affect Africa.

To allow competitive economic expansion vis-à-vis Russia, the infrastructure challenges implied by the 2003 assessment and future environmental containment requirements implied by a 2006 study<sup>67</sup> indicate that the U.S. and Canada would need to develop new Arctic-tolerant technologies.

In summary, the move toward Arctic shipping could instigate a much greater economic expansion of the Arctic. Mineral/energy extraction may play a supporting, rather than primary role in this global economic transition. Nonetheless, the energy industry may be the first to overcome technical hurdles to infrastructure development in the Arctic. Russia has a significant leg-up on establishing economic supremacy in the region.

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<sup>65</sup> For example see Landes, David S., **The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor**, New York: W. W. Norton, 1998 and Diamond, Jared, **Guns, Germs, and Steel: The Fates of Human Societies**, Norton, W. W. & Company, Inc., New York, July 2005

<sup>66</sup> *Climate Change, Permafrost, and Impacts on Civil Infrastructure*, U.S. Arctic Research Commission Permafrost Task Force), Special Report 01-03, **U.S. Arctic Research Commission**, Arlington, Virginia, ECV-T7-permafrost-ref-03, 2003 <http://www.arctic.gov/files/PermafrostForWeb.pdf>

<sup>67</sup> *Arctic Pollution 2006, Arctic Monitoring and Assessment Programme AMAP*, Oslo, 2006 [http://www.amap.no/documents/index.cfm?action=getfile&dirsub=&FileName=AAHA\\_overview\\_FINAL\\_071106\\_LOW.pdf](http://www.amap.no/documents/index.cfm?action=getfile&dirsub=&FileName=AAHA_overview_FINAL_071106_LOW.pdf)

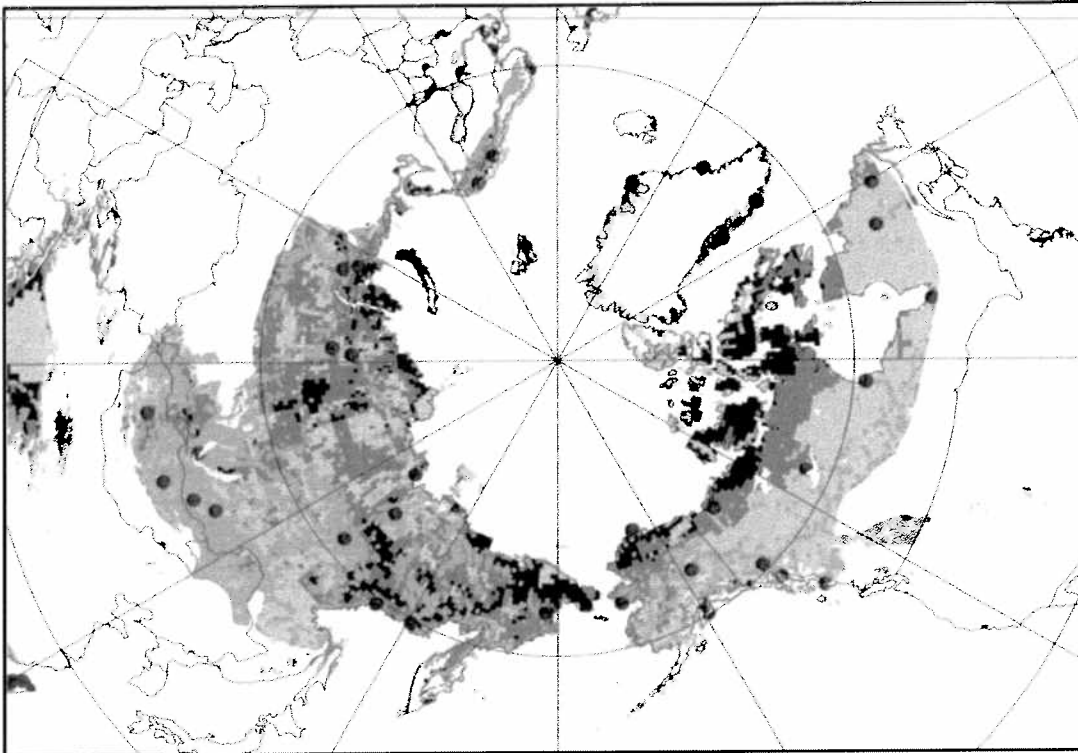


Figure 2: Risk to infrastructure. The red dots indicate population centers; the pink shading indicates areas of human settlement.<sup>68</sup>

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<sup>68</sup> See note 66 above.

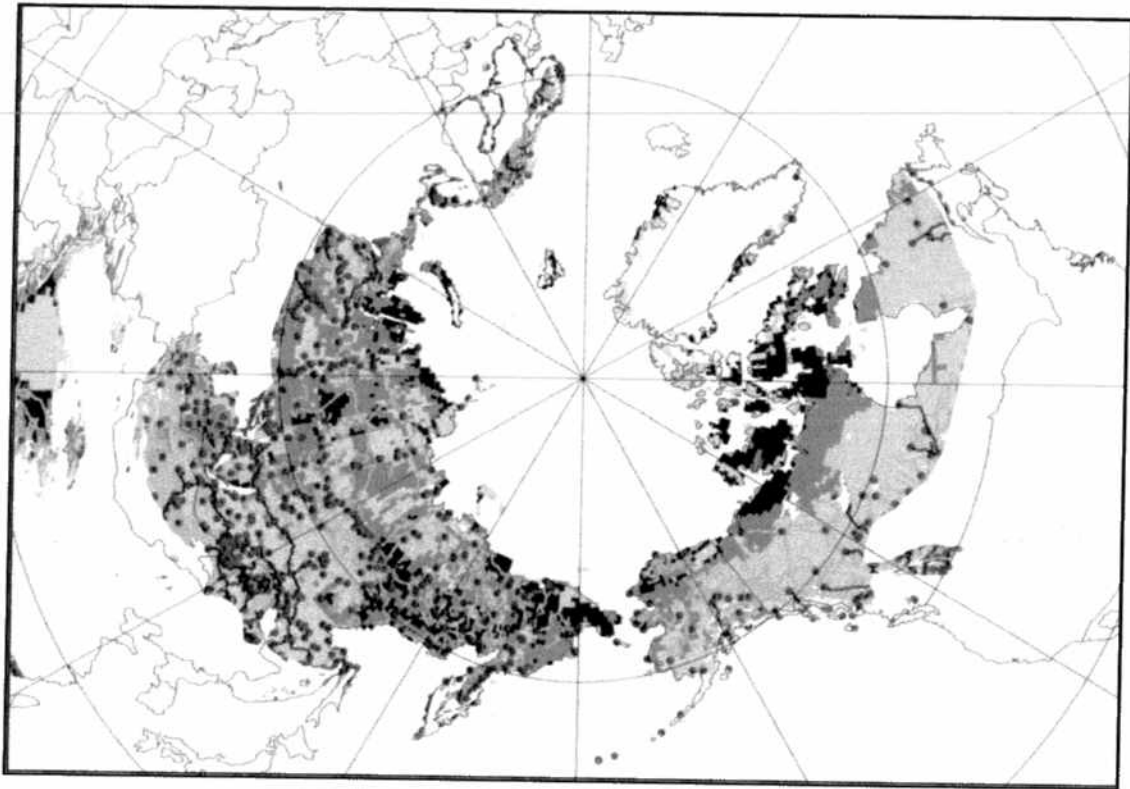


Figure 3: Risk to transportation facilities. The yellow lines indicate winter trails, the blue lines indicate railroads, and the red dots indicate airfields.<sup>69</sup>

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<sup>69</sup> See note 66 above.

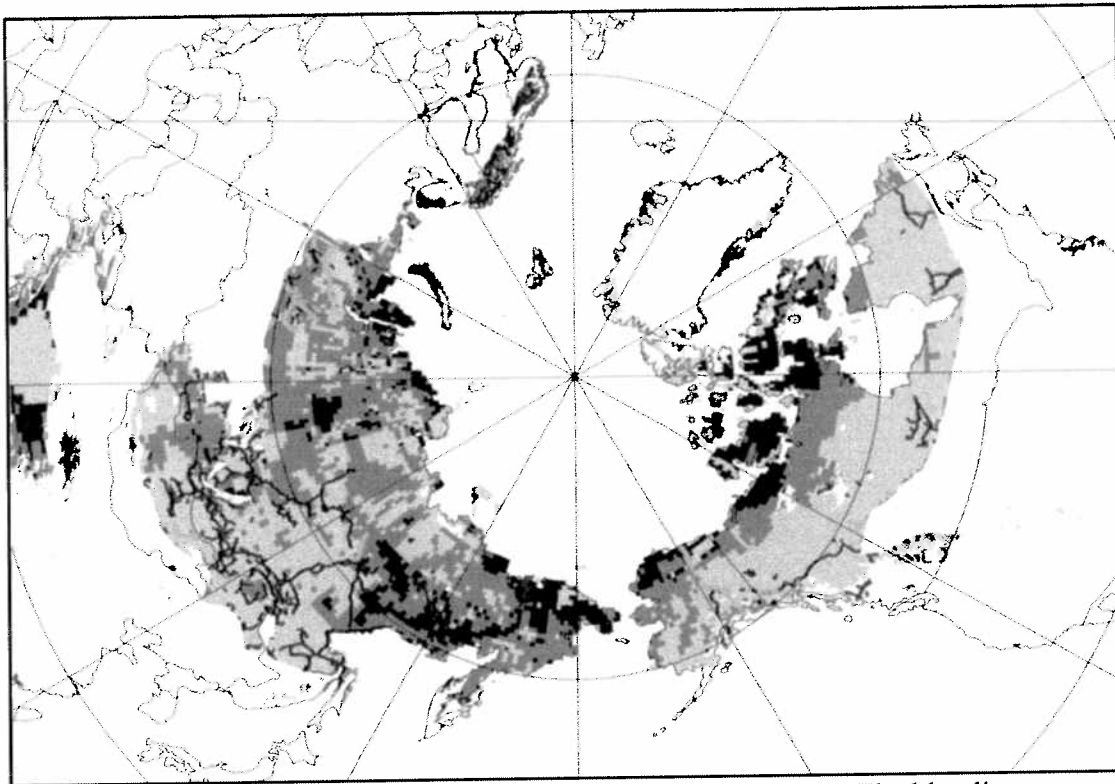


Figure 4: Risks to major electrical transmission lines and pipelines. The blue lines indicate electrical transmission lines, the yellow lines indicate pipelines (yellow), and the black dot with red lightning is the location of the Bilibino nuclear power plant in Russia.<sup>70</sup>

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<sup>70</sup> See note 66 above.



#### ***4.0 United Nations Convention on the Laws of the Sea and its Relation to Security Risk***

Many believe that the United Nations Convention on the Laws of the Sea (UNCLOS)<sup>71</sup> will 1) set the agenda for claimants of Arctic resources and surface access, and 2) act as the legal framework for the governance of the Arctic. The U.S. has not ratified the UNCLOS, which means the U.S. has limited engagement (no legal standing) with those negotiating under the UNCLOS rules.<sup>72</sup> By being outside the UNCLOS regimen, some would argue that the U.S. could choose those provisions most advantageous to its interests.<sup>73</sup> Such an approach would confront other participants with de-facto security tensions. Conversely, if the U.S. did ratify UNCLOS, it would face restrictions on unilateral activities formerly considered normal procedure, such as the use of previously “international” waters, which could be now deemed internal (restricted) waters.

The UNCLOS’ exclusive-economic-zone (EEZ), and its possible extension by claims of the prolongation of the continental shelf, define the exclusive use of an area for mineral extraction. Within the EEZ, the owning nation has exclusive rights over all resources, but foreign nations can have rights of navigation and over-flight. Waters deemed internal or territorial allow potential interpretations that can restrict any foreign utilization of the area. Resolving sovereignty disputes (which can exchange firm boundaries for economic-access rights in the previously disputed areas) would clearly set expectations and jurisdiction within the area. Without well-defined boundaries, the possibility of conflicts over the right to utilize resources increases dramatically.<sup>74</sup>

For Russia, the Arctic is a key source of wealth. The importance of the Arctic to Russia is akin to the importance of the Gulf of Mexico for the United States (except it is about nine times more extensive), and similar to the comparable roles played by the Panama Canal for the United States.<sup>75</sup> Russia is presently attempting to make formal claims on a large share of the Arctic.<sup>76</sup> It is additionally attempting to define the Northeast Passage (Northern Sea Route) as Internal-Water and thereby denying the right-of-transit.<sup>77</sup>

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<sup>71</sup> Law of the Sea, United Nations, <http://www.un.org/Depts/los/index.htm>

<sup>72</sup> Borgerson, Scott G., *Arctic Meltdown: The Economic and Security Implications of Global Warming*, **Foreign Affairs**, March/April 2008, <http://www.foreignaffairs.org/20080301faessay87206/scott-g-borgerson/arctic-meltdown.html>

<sup>73</sup> *U.S. Strategy in the Arctic: Energy, Security, and the Geopolitics of the High North*, **Center for Strategic and International Studies (CSIS)**, July 23, 2008  
[http://www.csis.org/media/csis/events/080723\\_arctic\\_event\\_summary.pdf](http://www.csis.org/media/csis/events/080723_arctic_event_summary.pdf)

<sup>74</sup> *New laws needed in changing polar regions: experts*, **Agence France Presse**, September 7, 2008, [http://news.yahoo.com/story//afp/20080907/sc\\_afp/arcticantarcticjusticeenvironmentshippingtourism\\_080907172615](http://news.yahoo.com/story//afp/20080907/sc_afp/arcticantarcticjusticeenvironmentshippingtourism_080907172615)

<sup>75</sup> See comments by Caitlyn Antrim in the reference of note 73 above.

<sup>76</sup> See note 73 above.

<sup>77</sup> *The Arctic Ocean And Climate Change: A Scenario For The US Navy*, **United States Arctic Research Commission**, Special Publication No. 02-1, Arlington, Virginia 2002  
<http://www.natice.noaa.gov/icefree/NavyArcticPanel.pdf>

Canada also wants to define the Northwest Passage as Internal-Water.<sup>78</sup> These specific issues will become less problematic if further ice reductions allow shipping to take a more direct route through the Arctic Ocean.

Without an accepted and formal framework for the legal rights within the Arctic, adversarial situations will be commonplace.<sup>79</sup> The rapid opening of the Arctic is already causing demands to define a host of environmental and commercial laws.<sup>80,81</sup>

As shown in Figure 5, the claims in the Arctic overlap already and many countries have not yet established their official position on claimed area.<sup>82</sup> As noted earlier, unlike resource claims, sovereignty issues do show a strong history for producing conflict. If there were open waters, these would be under the jurisdiction of UNCLOS's International Seabed Authority (ISA).<sup>83</sup> China and Russia are already experienced in procuring rights under the ISA for exploiting ocean-bed poly-metallic resource and have active agreements/contracts.<sup>84</sup> Consistent with its position on UNCLOS, the U.S. is not a signatory of ISA and remains outside of Authority activities other than as an observer. To obtain legal standing, many argue for the U.S ratification of the UNCLOS.<sup>85,86</sup> Per the economic discussions of the last section, financial institutions would see territorial title as a prerequisite for U.S. businesses to invest in the Arctic.<sup>87</sup>

As per the discussion of the previous section, increased trade between Canada and Russia implies large traffic flows from Canadian waters, through U.S. waters, to Russian waters. Accident, pollution, and commercial logistics could become a nightmare when an incident occurs within a contested area or enforcement activities transition across sovereign boundaries.

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<sup>78</sup> Carnaghan, Matthew and Allison Goody, *Canadian Arctic Sovereignty* PRB 05-61E, Political and Social Affairs Division, **Library of Parliament**, Ottawa, Canada, 26 January, 2006  
<http://www.parl.gc.ca/information/library/PRBpubs/prb0561-e.htm>

<sup>79</sup> For example see Currie, Duncan E.J. *Sovereignty and Conflict in the Arctic Due to Climate Change: Climate Change and the Legal Status of the Arctic Ocean*, August 5, 2007  
[www.globelaw.com/LawSea/arctic%20claims%20and%20climate%20change.pdf](http://www.globelaw.com/LawSea/arctic%20claims%20and%20climate%20change.pdf)

<sup>80</sup> *New laws needed in changing polar regions: experts*, **Agence France Presse**, September 7, 2008,  
<http://afp.google.com/article/ALeqM5jnTq2a4zaRtQl2hW-lMEc8nCtiig>

<sup>81</sup> *Arctic shipping set to explode in legal vacuum, experts warn*, **Agence France Presse**, September 8, 2008, <http://www.physorg.com/news140103041.html>

<sup>82</sup> *Maritime jurisdiction and boundaries in the Arctic region*, **Science Daily**, August 6, 2008  
<http://www.sciencedaily.com/releases/2008/08/080805192723.htm>

<sup>83</sup> International Seabed Authority, <http://www.isa.org.jm/en/home>

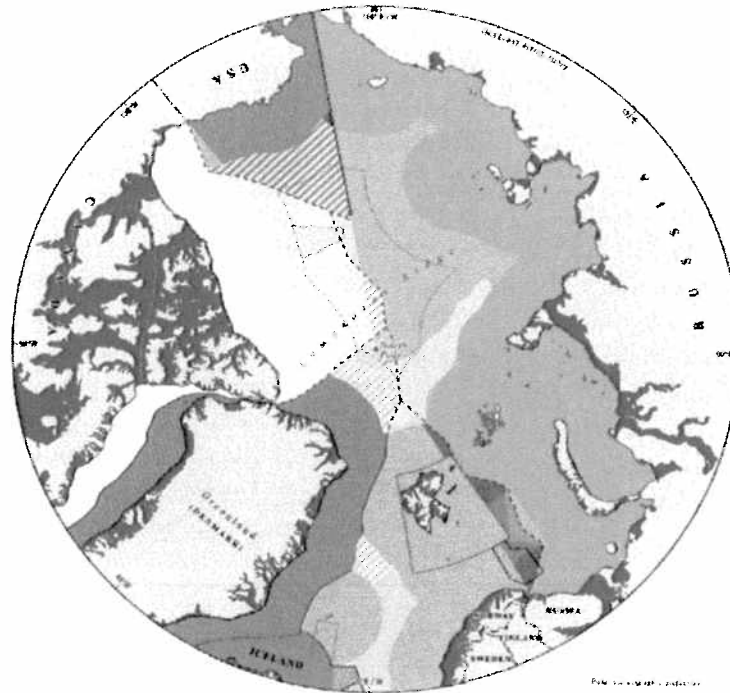
<sup>84</sup> <http://www.isa.org.jm/en/documents/mcode> and  
[http://en.wikipedia.org/wiki/International\\_Seabed\\_Authority](http://en.wikipedia.org/wiki/International_Seabed_Authority)

<sup>85</sup> *US Senate panel backs Law of the Sea treaty*, **Reuters**, October 31, 2007,  
<http://www.reuters.com/article/latestCrisis/idUSN31335584>

<sup>86</sup> Newton, George, *America's Ocean Future Demands Accession to The Law of the Sea Treaty*, **US Arctic Research Commission**, <http://www.arctic.gov/files/ed-LawoftheSeaTreaty.pdf>

<sup>87</sup> See note 73 above

Maritime jurisdiction and boundaries in the Arctic region



- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li> Territorial waters</li> <li> Canadian continental shelf and exclusive economic zone (EEZ)</li> <li> Potential Canadian continental shelf beyond 200 nautical miles</li> <li> Denmark territorial sea and EEZ</li> <li> Denmark claimed continental shelf beyond 200 nautical miles</li> <li> Potential Danish continental shelf beyond 200 nautical miles</li> <li> Iceland EEZ</li> <li> Danish claimed continental shelf beyond 200 nautical miles</li> <li> Norway territorial sea and EEZ. Factory zone (see Norway's Farøya installation near Kvaløya)</li> <li> Norway claimed continental shelf beyond 200 nautical miles</li> </ul> | <ul style="list-style-type: none"> <li> Russia territorial sea and EEZ</li> <li> Russia claimed continental shelf beyond 200 nautical miles</li> <li> Overlapping Norway - Russia EEZ (note 4)</li> <li> Overlapping Norway EEZ - Russia claimed continental shelf beyond 200 nautical miles</li> <li> Overlapping Norway - Russia claimed continental shelf beyond 200 nautical miles</li> <li> USA territorial sea and EEZ</li> <li> Potential USA continental shelf beyond 200 nautical miles</li> <li> Overlapping Canada - USA EEZ (note 5)</li> <li> Eastern Arctic Area (note 6)</li> <li> Unclaimed or un-demarcated continental shelf (note 7)</li> </ul> | <p>Straight boundaries</p> <p>Dashed lines: Agreed boundaries</p> <p>---: Not agreed</p> <p>---: USA EEZ from 1983 to 1996 (note 1)</p> <p>---: 200 nautical miles EEZ (note 2)</p> <p>---: 200 nautical miles EEZ (note 3)</p> <p>---: Norway - Russia EEZ (note 4)</p> <p>---: Swedish continental shelf (note 5)</p> <p>---: 200 nautical miles EEZ (note 6)</p> <p>---: Minicoya Passage (note 7)</p> |
|---|--|---|

Figure 5: Claims of Ownership Map<sup>88</sup>

While the primary sovereignty issues relate to the five nations (U.S., Russia, Canada, Denmark-Greenland, and Norway) that surround the Arctic, China also has significant

<sup>88</sup> Durham University United Kingdom, 2008, <http://www.dur.ac.uk/ibru/resources/arctic/>

interest in the “economic and social” implications of the Arctic on China.<sup>89</sup> It is fully utilizing its modern icebreaker for research that could be useful to shipping and the protection of such shipping in the future.<sup>90</sup> China will need to develop and protect the strategic trade flows through the Arctic.

Adding Islamic Terrorism into the mix of economic pressures causes security analysts to view the U.S. security situation as relatively complex:

*“However as the Arctic heats up so might a panoply of pressures on the sovereignty of and security of the Alaskan border. Barry Zellen,<sup>91</sup> a specialist on Arctic politics and security issues at the Center for Contemporary Conflict in the Naval Postgraduate School in Monterey, California, has written of a few scenarios. “There might be efforts by a future Chinese navy or Islamic trading entity to test claims to the Arctic, perhaps to divert American and trans-polar military resources from other theaters of conflict,” he wrote in his recently published book. ‘Such potential for an indirect collision by a non-Arctic power and the United States or a future trans-polar bloc of nations increases in time - and this may lead to more forward Arctic deployments of military assets, greater efforts to protect northern industrial assets from potential sabotage or terror attacks, and enhanced surveillance and perimeter defense efforts in the Arctic region - perhaps even eclipsing those of the Cold War. But this all depends on what military threats emerge from Asia that could be projected over the top to the Arctic states.’”<sup>92</sup>*

The sovereignty issues combined with economic exploitation of the Arctic produce the time-tested ingredients for conflict risk.<sup>93</sup> Climate change only acts to lower the physical hurdles that allow the economic dynamics to progress. Thus, the security risk in the Arctic will exist independent of additional climate change. However, progressive climate change can dramatically affect the speed and intensity (and uncertainty) with which the events unfold. Further, the physical situation dramatically affects the ability and cost to maintain security in the area.

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<sup>89</sup> Chief scientist: China's North Pole trip focuses only on climate studies, **Peoples Daily (Online)**, July 13, 2008 <http://english.people.com.cn/90001/90781/90879/6449077.html>

<sup>90</sup> Icebreaker Xuelong sails into Arctic, **Peoples Daily (Online)**, August 03, 2008, <http://english.peopledaily.com.cn/90001/90781/6465324.html> and China's Arctic expedition team starts research in 87 degree north latitude, **Peoples Daily (Online)**, August 31, 2008 <http://english.peopledaily.com.cn/90001/90776/90882/6490060.html>

<sup>91</sup> Zellen, Barry Scott, **Breaking the Ice: From Land Claims to Tribal Sovereignty in the Arctic**, Lexington Books, Lanham, MD, 2008

<sup>92</sup> *The Arctic Heats Up As Security Focus*, **Homeland Security Today**, 11 August 2008, <http://www.hstoday.us/content/view/4655/149/>

<sup>93</sup> *Conflict fear over Arctic borders*, **BBC News**, 10 September 2008 <http://news.bbc.co.uk/2/hi/science/nature/7606132.stm>

## **5.0 Multinational Corporate and Nation-State Intersections Create the Security Landscape**

A nation is its economy. When discussions focus on protecting the security of the nation, they are generally understood to mean the protection of its economy. Other than in terms of weapons-of-mass-destruction, protecting society is synonymous with protecting the economy. Nation-states depend on multinational-corporations for what are now primarily global supply chains. Any Internet search produces thousands of reliable documents on the military of nation-states protecting multinational-company operations.<sup>94</sup> Multinational security firms protect both nations and multinational corporations.<sup>95</sup> Over recent history, these firms can have as much capability as the national military themselves.<sup>96</sup> Conversely, multinational corporations support nations through needed direct investments, a tax-base, and country financial solvency through exports.<sup>97</sup> Multinational corporations have interests in maintaining profitable operations; countries have interest in maintaining their government's viability. Many large corporations such as Pemex, Saudi Aramco, and Petróleos de Venezuela S.A. are clearly state owned. In many countries, such as Russia and China, partial state ownership or political relationships blur the distinction between country and company.<sup>98</sup>

### **5.1 Nation and Corporation Comparability**

Multinational corporations may be more dominant than nation-states from a security perspective. This is not so much out of the need for corporations to protect their assets, but out of the realization that tensions among multinational corporations, or between countries and multinational corporations, could jeopardize security. In a globalized world, especially that part of it in the Arctic, multinational corporations may leverage more geo-political power than most of the nations involved.

To illustrate the perspective that multinational corporations may be more important than countries to security assessments, Table 1 shows the results of converting multinational financial records into analogous GDPs of nations. In the type "T" column, a "C" denotes a county and an "M" denotes a multinational corporation. Note that the M's vastly out

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<sup>94</sup> For example see *Minerals in Conflict Global Policy Forum*, New York, September 11, 2008 <http://www.globalpolicy.org/security/natres/mineindex.htm>

<sup>95</sup> Foaleng, Mpako H, *Private Military and Security Companies and the Nexus Between Natural Resources and Civil Wars in Africa*, Chapter 1 of *Private Security In Africa Manifestation, Challenges And Regulation*. **Institute for Security Studies**, Monograph No 139, Pretoria, November 2007

[http://www.iss.co.za/index.php?link\\_id=30&slink\\_id=5920&link\\_type=12&slink\\_type=12&tmpl\\_id=3](http://www.iss.co.za/index.php?link_id=30&slink_id=5920&link_type=12&slink_type=12&tmpl_id=3)

<sup>96</sup> Howe, Herbert, *Global Order and Security Privatization* National Defense University, Institute For National Strategic Studies, Strategic Forum Number 140, Washington DC, May 1998

<http://www.ndu.edu/inss/strforum/SF140/forum140.html>

<sup>97</sup> For example, see the UN working group papers concerning China. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007SC1444:EN:HTML>

<sup>98</sup> *How the KGB (and friends) took over Russia's economy*, CNN, SEPTEMBER 10, 2008 [http://money.cnn.com/2008/09/04/news/international/powell\\_KGB.fortune/index.htm](http://money.cnn.com/2008/09/04/news/international/powell_KGB.fortune/index.htm)

number the C's and that the M's are denser as the rank number ("No." column) increases. There are anomalies in this approach, but the implications are unambiguous.

No.	T	Name	Value (\$B/YR)	No.	T	Name	Value (\$B/YR)
1	C	United States	\$13,840.0	70	M	Morgan Stanley	\$189.9
2	C	Japan	\$4,384.0	71	M	ConocoPhillips	\$189.3
3	C	Germany	\$3,322.0	72	C	Malaysia	\$186.5
4	C	China (PRC)	\$3,251.0	73	C	Czech Republic	\$175.3
5	C	United Kingdom	\$2,773.0	74	C	Colombia	\$171.6
6	C	France	\$2,560.0	75	M	UniCredit Group	\$171.4
7	C	Italy	\$2,105.0	76	M	Volkswagen Group	\$170.1
8	C	Spain	\$1,439.0	77	C	Nigeria	\$166.8
9	C	Canada	\$1,432.0	78	C	Romania	\$166.0
10	C	Brazil	\$1,314.0	79	M	Daimler	\$165.1
11	C	Russia	\$1,286.0	80	M	Merrill Lynch	\$164.7
12	C	India	\$1,099.0	81	C	Chile	\$163.8
13	C	South Korea	\$957.1	82	C	Israel	\$161.9
14	C	Australia	\$908.8	83	C	Singapore	\$161.3
15	C	Mexico	\$893.4	84	M	Generali Group	\$150.8
16	C	Netherlands	\$768.7	85	M	AT&T	\$146.5
17	C	Turkey	\$663.4	86	M	Berkshire Hathaway	\$145.6
18	M	Royal Bank of Scotland	\$489.2	87	M	Aviva	\$145.2
19	C	Sweden	\$455.3	88	C	Philippines	\$144.1
20	C	Belgium	\$453.6	89	C	Pakistan	\$143.8
21	C	Indonesia	\$432.9	90	M	Sinopec-China Petroleum	\$141.5
22	C	Switzerland	\$423.9	91	C	Ukraine	\$140.5
23	C	Poland	\$420.3	92	C	Hungary	\$138.4
24	M	Wal-Mart Stores	\$395.1	93	M	ENI	\$132.1
25	C	Norway	\$391.5	94	C	Algeria	\$131.6
26	M	ING Group	\$391.1	95	C	New Zealand	\$128.1
27	C	Taiwan	\$383.3	96	C	Egypt	\$127.9
28	M	ExxonMobil	\$382.8	97	M	Deutsche Post	\$121.2
29	M	Royal Dutch Shell	\$382.4	98	M	Carrefour Group	\$120.0
30	M	HSBC Holdings	\$381.4	99	M	ArcelorMittal	\$118.6
31	M	Citigroup	\$378.0	100	M	Hewlett-Packard	\$116.5
32	C	Saudi Arabia	\$376.0	101	M	Siemens	\$115.9
33	C	Austria	\$373.9	102	M	E.ON	\$114.1
34	M	BNP Paribas	\$365.6	103	M	Prudential	\$112.3
35	M	Barclays	\$322.9	104	M	Verizon Communications	\$112.2
36	M	UBS	\$318.9	105	C	Kuwait	\$111.3
37	C	Greece	\$314.6	106	M	IBM	\$110.8
38	C	Denmark	\$311.9	107	C	Peru	\$109.1
39	M	BP	\$304.6	108	M	EDF Group	\$108.8
40	C	Iran	\$294.1	109	M	Deutsche Telekom	\$107.9
41	M	Allianz	\$293.9	110	M	Nippon Telegraph & Tel	\$106.5
42	M	Bank of America	\$290.8	111	M	Nestlé	\$104.7
43	C	South Africa	\$282.6	112	M	Honda Motor	\$104.5
44	M	JPMorgan Chase	\$272.6	113	C	Kazakhstan	\$103.8
45	M	Crédit Agricole	\$267.9	114	M	McKesson	\$102.2
46	M	Société Générale Group	\$260.8	115	M	Gazprom	\$101.9
47	C	Argentina	\$260.0	116	M	Samsung Electronics	\$101.0
48	C	Ireland	\$258.6	117	M	Petrobras-Petróleo Brasil	\$100.5
49	M	AXA Group	\$258.2	118	M	Nissan Motor	\$99.5
50	M	General Electric	\$252.3	119	M	PetroChina	\$99.4
51	C	Thailand	\$245.7	120	M	Valero Energy	\$98.7
52	C	Finland	\$245.0	121	M	Munich Re	\$98.2
53	M	Deutsche Bank	\$244.1	122	M	StatoilHydro	\$97.9
54	C	Venezuela	\$236.4	123	M	Telefónica	\$96.7
55	M	HBOS	\$233.9	124	M	Hitachi	\$96.0
56	M	Toyota Motor	\$231.4	125	M	Procter & Gamble	\$94.2
57	M	Dexia	\$229.8	126	M	Cardinal Health	\$91.7
58	C	Portugal	\$223.3	127	M	BASF	\$91.3
59	M	Fortis	\$223.3	128	M	France Telecom	\$91.0
60	M	Chevron	\$218.8	129	M	Fiat Group	\$89.0
61	M	Total	\$216.3	130	M	Tesco	\$88.5
62	M	American Intl Group	\$216.1	131	M	Matsushita Electric Indl	\$84.1
63	C	Hong Kong	\$206.7	132	M	Peugeot Groupe	\$83.7
64	M	Banco Santander	\$205.5	133	M	Metro AG	\$83.1
65	M	Credit Suisse Group	\$203.2	134	M	Vodafone	\$82.7
66	M	Ford Motor	\$200.4	135	M	CVS Caremark	\$81.8
67	M	Goldman Sachs Group	\$200.0	136	M	Home Depot	\$81.8
68	M	General Motors	\$196.0	137	M	UnitedHealth Group	\$80.5
69	C	United Arab Emirates	\$192.6	138	M	Sony	\$80.4

Table 1: Economic-Power Ranking of Countries and Corporations

The county data for the table came originally from the CIA World Factbook<sup>99</sup> and the corporate data from Forbes and Fortune magazines.<sup>100</sup> The table uses the data as compiled in Wikipedia.<sup>101</sup> The relevant implications to be drawn do not depend on the precise figures. The GDP includes private consumption plus government consumption plus investment plus exports less imports. Corporate reported revenue leaves out investments. For the purposes here, GDP consumption and corporate consumption (costs to the corporation and profits) are considered equivalent. The analysis omits imports and exports. The corporate part of each country's GDP is NOT subtracted out.<sup>102</sup> (Note this would move the multinational ranking higher.) Despite their importance, the analysis neglects state-owned corporations and sovereign-wealth funds. This analysis also treats corporations partially owned by governments as if they were entirely private. By using annual financial reports from representative companies to estimate an average value, the analysis sets corporate investment to 10% of managed-asset book-value. All quantities are in billions of dollars per year and a mix of 2006 and 2007 U.S. dollars.

The first and most important point is obvious. If protecting national security means protecting the economy, corporations dominate the security concerns. Corporations understand the fact that they are the entity being protected; they understand how important they are to the stability of many nations and to their multi-national investors, and they know how to lobby and influence outcomes as well as nations.

A key generic "anomaly," first noticed at rank 18 (for 2007), is the Bank of Scotland.<sup>103</sup> Data used for the Bank of Scotland show that they have nearly \$3 trillion dollars of managed assets. If it is like the other banks and investment firms noted in the list, its annual investments could far exceed 10% of assets. They could in theory buy and sell many countries. They could certainly influence the governments of many countries. (Note the World Bank and the International Monetary Fund are omitted from the analysis by being fully "owned" by way of a consortium of countries, albeit "partially owned" by individual countries.) If only 10% of the Bank of Scotland's funds represented high-power investments, it would still have potentially tremendous international influence on

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<sup>99</sup> *World FactBook*, CIA, Washington DC, 2007, <https://www.cia.gov/library/publications/the-world-factbook/>

<sup>100</sup> *The World's Biggest Companies*, **Forbes**, March 2, 2008, [http://www.forbes.com/2008/04/02/worlds-largest-companies-biz-2000global08-cx\\_sd\\_0402global\\_land.html](http://www.forbes.com/2008/04/02/worlds-largest-companies-biz-2000global08-cx_sd_0402global_land.html) and *The Fortune 500*, **Fortune Magazine**, as reported by CNN, September 11, 2008, [http://money.cnn.com/magazines/fortune/fortune500/2007/full\\_list/index.html](http://money.cnn.com/magazines/fortune/fortune500/2007/full_list/index.html)

<sup>101</sup> *List of companies by Revenue*, **Wikipedia**, September 11, 2008, [http://en.wikipedia.org/wiki/List\\_of\\_companies\\_by\\_revenue](http://en.wikipedia.org/wiki/List_of_companies_by_revenue) and *List of Countries by GDP*, **Wikipedia**, September 11, 2008, [http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_GDP\\_\(nominal\)](http://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal))

<sup>102</sup> Note that a previous creation of this table a few years ago had the first multinational corporations appearing in rank thirteen (ExxonMobil). The U.S. exchange rate dramatically affects the ranking. A strong dollar makes the value of other countries decline in relative sense compared to the U.S. economy and U.S. based companies.

<sup>103</sup> As of September 18, 2008, due to the global financial crisis brought about by the U.S. sub-prime mortgage market collapse, the Bank of Scotland (HBOS Plc) merged with Lloyds TSB Group Plc. This entity is not to be confused with the (Royal) Bank of Scotland discussed above.

counties.<sup>104</sup> The Bank of Scotland may not actually belong at the rank it has, but financial institutions do represent as powerful an economic force and security concern as, for example, natural-resource corporations. The international ramifications from the meltdown of large financial institutions during September 2008 reinforce this view.

## 5.2 Corporate Security

As noted at the beginning of this section, nations, military forces, and corporations have overlapping interests and relationships. Nations could feel the need to intervene for corporations with armed forces for protecting what they see as national or sovereignty interests. Conversely, corporations could (and have) asked nations for protection. In the Arctic, natural resource companies and shipping companies from many nations, which are serving the strategic supply chain of other nations, will routinely “cross paths” and cross sovereignty boundaries (actual and legal). Simple accidents, routine asset/personnel protection, or the enforcement of shipping controls may lead to confrontations among corporations and nations. It is very easy to imagine a normally benign situation that becomes a worsening and convoluted security concern.

Corporations themselves are often associated with private security forces that protect their assets and affect broader military conflict. There is little evidence any corporation has ever considered military force outside of its self-directed protection, but the consequence of their activities do often spill over to security tensions previously considered the sole domain of nations and their adversaries.<sup>105</sup> For example, Amnesty International urges boardrooms to consider the hazards with...

*“...the use of security forces to protect foreign installations and the dilemmas of operating under corrupt regimes or in war zones. All those factors, it argues, have become more relevant as multinational corporations play an increasingly dominant role in economic development.”<sup>106</sup>*

*“Multinational corporations, especially involved in the extraction of raw materials, frequently collaborate closely with local security forces. ... Internal armed conflicts may be prolonged where warring factions discover how remunerative control of territory containing valuable minerals can be...”<sup>107</sup>*

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<sup>104</sup>As a converse example to make the point, most Central Banks fear China moving its vast investments out of U.S. Treasury Bonds. The recent past crises of the Ruble, Baht, and the Argentinean Peso are all financial (bank) crises with severe physical and political impacts. Some might even argue military impacts.

<sup>105</sup>Bennett, Juliette, *Multinational Corporations, Social Responsibility and Conflict*, **Journal of International Affairs**, vol. 55, no. 2. New York. Spring 2002, [http://info.worldbank.org/etools/docs/library/57510/bennett\\_article.pdf](http://info.worldbank.org/etools/docs/library/57510/bennett_article.pdf)

<sup>106</sup>*A Call to Put Social Issues on Corporate Agendas*, **New York Times**, April 6, 2000 <http://query.nytimes.com/gst/fullpage.html?res=9C02E4D6153FF935A35757C0A9669C8B63>

<sup>107</sup>*Human rights, big business intersect on WTO stage*, **SeattlePI**, November 28, 1999, <http://seattlepi.nwsource.com/opinion/rtejmp.shtml>



The combination of private security forces and corporate protection needs can lead to conditions that engage broader conflict susceptibilities.<sup>108,109,110</sup> Within the Arctic, the physical protection of off-shore assets and shipping resources, in combination with the host government or unilaterally by the corporations, can only complicate the dynamics of any security tensions that do occur.

### 5.3 Russian and Chinese Corporate and National Interests

Both Russia and China have particularly strong interests in the Arctic. Russia has always wanted to be a maritime power.<sup>111</sup> As stated above, the Arctic is opening first on the Russian side and in so doing allowing Russia to establish its economic and security capabilities in the area. The Arctic is strategically important to Russia, and Russia is already the dominant player in the area.<sup>112</sup> To maintain the Northeast Passage, Russia needs to keep the Vilkitskiy Strait open, but can take advantage of an already long shipping season along its Arctic coast.<sup>113</sup> As noted earlier, Russia claims it can maintain full transport capability all year long with their advanced icebreaker fleet.<sup>114</sup> Recent activities in Russia have brought control of the largest firms within Russia under the direct influence of Prime Minister Putin, which effectively ties corporate and national interest together.<sup>115</sup> Russia clearly understands the wealth the Arctic offers.<sup>116</sup> Russia, Canada, and the U.S. have already initiated heated rhetoric, based on marginal incidents, to escalate Arctic ownership issues.<sup>117,118</sup> To maintain its rights at the exclusion of

<sup>108</sup> Brooks, Stephen G., et al., **Producing Security: Multinational Corporations, Globalization, and the Changing Calculus of Conflict**, Princeton University Press, Princeton, January 2007

<sup>109</sup> Nossal, Kim, Richard, *Global Governance And National Interests: Regulating Transnational Security Corporations In The Post-Cold War Era*, **Melbourne Journal of International Law**, Vol 2, 2001  
[http://www.mjil.law.unimelb.edu.au/issues/archive/2001\(2\)/06Nossal.pdf](http://www.mjil.law.unimelb.edu.au/issues/archive/2001(2)/06Nossal.pdf)

<sup>110</sup> Collingsworth, Terry, *The Key Human Rights Challenge: Developing Enforcement Mechanisms*, **Harvard Human Rights Journal**, Boston, MA, Vol. 15, Spring 2002

<sup>111</sup> Corell, Robert W., *The Science of Climate Change*, in *Global Climate Change National Security Implications*, Carolyn Pumphrey (ed.) **Strategic Studies Institute**, Triangle Institute for Security Studies, Army War College (U.S.), pg. 50, Carlisle Barracks, PA., 2008,  
<http://www.strategicstudiesinstitute.army.mil/pdf/files/PUB862.pdf>

<sup>112</sup> *Global Researcher*, **CQ Press**, Vol 2, Number 8, August 2008, [http://www.itssd.org/CQ\\_Arctic.pdf](http://www.itssd.org/CQ_Arctic.pdf)

<sup>113</sup> Brigham, Lawson W., "Arctic Marine Shipping Assessment (AMSA): Responding to Changing Arctic Marine Access" *Symposium on the Impact of an Ice-Diminishing Arctic on Naval & Maritime Operations*, U.S. Arctic Research Commission, Washington, DC, 10-12 July 2007

<http://www.star.nesdis.noaa.gov/star/documents/2007IceSymp/Brigham2.pdf>

<http://www.star.nesdis.noaa.gov/star/documents/2007IceSymp/Brigham1.pdf>

<http://www.star.nesdis.noaa.gov/star/IceSymposium.php>

<sup>114</sup> *Russia builds worlds biggest nuclear icebreaker*, **Pravda**, 01 March 2006  
<http://english.pravda.ru/science/tech/01-03-2006/76685-icebreaker-0>

<sup>115</sup> *How the KGB (and friends) took over Russia's economy*, **CNN**, SEPTEMBER 10, 2008  
[http://money.cnn.com/2008/09/04/news/international/powell\\_KGB.fortune/index.htm](http://money.cnn.com/2008/09/04/news/international/powell_KGB.fortune/index.htm)

<sup>116</sup> *Profiteering from the Arctic Thaw*, **Der Spiegel**, March 10, 2006,  
<http://www.spiegel.de/international/0,1518,405320,00.html>

<sup>117</sup> *Russia accused of annexing the Arctic for oil reserves by Canada*, **Telegraph**, 18 May 2008  
<http://www.telegraph.co.uk/news/worldnews/europe/russia/1976314/Russia-accused-of-annexing-the-Arctic-for-oil-reserves-by-Canada.html>

others, Russia is declaring *currently* accessible water routes as internal-water and thereby threatening the right-of-transit for other nations.<sup>119</sup> This and Canada's similar stance could limit U.S security operations until the Arctic-melt proceeds further north. Analysts believe that Russia will militarize the area to protect its economic (corporate) interests and claimed sovereign borders.<sup>120</sup>

Russian advisors see the Arctic as central to economic expansion.

*"According to Professor Alexander Granberg, advisor to ... Vladimir Putin, 'Because of the Northern Sea Route, the Arctic is the leading economic region of Russia. The Arctic will develop much more quickly than all of the rest of Russia.'"*<sup>121</sup>

And President Medvedev clearly places a high degree on the significance of the Arctic for Russia, including unilateral declarations of sovereignty.

*Russia should pass a law marking its territory in the disputed Arctic where it claims a large share of the mineral resources, Russian President Dmitry Medvedev said on Wednesday. ... "We must finalize and adopt a federal law on the southern border of Russia's Arctic zone," Medvedev told Russia's security council according to Interfax news agency. "It is our duty to our direct descendents; we have to ensure the long-term national interests of Russia in the Arctic."*<sup>122</sup>

*"This region has strategic significant for us. Its development is directly tied to solving the long-term tasks of the state and its competitiveness on global markets," Medvedev said.*<sup>123</sup>

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<sup>118</sup> *USA to steal oil rich Arctic region away from Russia, Pravda, August 12, 2005*  
[http://english.pravda.ru/main/18/88/354/16595\\_arctic.html](http://english.pravda.ru/main/18/88/354/16595_arctic.html),

<sup>119</sup> *The Arctic Ocean And Climate Change: A Scenario For The Us Navy, United States Arctic Research Commission, Special Publication No. 02-1, Arlington, Virginia 2002*  
<http://www.natice.noaa.gov/icefree/NavyArcticPanel.pdf>

<sup>120</sup> Borgerson, Scott G., *Arctic Meltdown: The Economic and Security Implications of Global Warming, Foreign Affairs*, March/April 2008, <http://www.foreignaffairs.org/20080301faessay87206/scott-g-borgerson/arctic-meltdown.html>

<sup>121</sup> Hanna, USN Lieutenant Magda, *In the Dark and Out In the Cold, Proceedings Magazine*, U.S. Naval Institute Vol. 132/6/1,240, June 2006,  
[http://www.usni.org/magazines/proceedings/archive/story.asp?STORY\\_ID=56](http://www.usni.org/magazines/proceedings/archive/story.asp?STORY_ID=56)

<sup>122</sup> *Russia needs to mark its Arctic territory: Medvedev, Reuters*, September 17, 2008,  
<http://www.reuters.com/article/scienceNews/idUSLH46436320080917?feedType=RSS&feedName=scienceNews>

<sup>123</sup> *Russia threatens to seize swathe of Arctic, Telegraph UK*, 18 September 2008,  
<http://www.telegraph.co.uk/news/worldnews/europe/russia/2976009/Russia-threatens-to-seize-swathe-of-Arctic.html>

China is a global economy with growing domestic needs dependent on global supply chains:

*“China is building strategic relationships along the sea lanes from the Middle East to the South China Sea in ways that suggest defensive and offensive positioning to protect China’s energy interests, but also to serve broad security objectives.<sup>124</sup> The report also cited China’s known build up of sea-lane control weapon systems such as submarines, warships with long range ballistic missiles, undersea mines, aircraft, optical satellites, and unmanned aerial vehicles for use in the maritime environment.<sup>125</sup> With this knowledge, it can be reasonably assumed that China will pursue enhanced Arctic capability at some point in the future, not simply for time and cost saving reasons, but for more suitable theater-strategic reasons. Specifically, China may attempt to exploit the opportunity of increased Arctic access so it can keep the United States at bay by taking advantage of known U.S. limitations in Arctic monitoring capability and lack of formidable presence in the region.”<sup>126</sup>*

China has icebreaker capabilities<sup>127</sup> and is active in researching the Arctic, including an understanding of the oceanography and mapping of the seabed that would be useful for routing.<sup>128</sup>

*“China’s investment in the development and deployment of ice breaking technology is an indicator of its vision for the future. In 1999, a Chinese icebreaking vessel made an unannounced visit to Tuktoyaktuk in Northern Canada.”<sup>129</sup>*

China apparently designed its new nuclear submarine fleet to protect its strategic supply-chain.<sup>130</sup> The Arctic routes would take pressure off the supply-chain security threats from the Strait of Malacca and Lombok Strait. With an open Arctic, China’s supply-chains could be dominantly north-south as opposed to the current east-west dependence. As noted previously, a change to the Arctic could alter global shipping patterns and alter the politico-economic positions of many countries.<sup>131</sup>

<sup>124</sup> Ridly, Bill, *China and the Final War for Resources*, **Energy Bulletin**, 08 February 2005 <http://www.energybulletin.net/4301.html>

<sup>125</sup> See note 124 above.

<sup>126</sup> Burd, Michael L. *Global Warming and the Combatant Commander: Engaging the Arctic*, Naval War College, pg. 13, Newport, RI, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA463334&Location=U2&doc=GetTRDoc.pdf>

<sup>127</sup> *Conflict fear over Arctic borders*, **BBC News**, 10 September 2008, <http://news.bbc.co.uk/2/hi/science/nature/7606132.stm>

<sup>128</sup> *Chief scientist: China’s North Pole trip focuses only on climate studies*, **Peoples Daily (Online)**, July 13, 2008 <http://english.people.com.cn/90001/90781/90879/6449077.html>

<sup>129</sup> See note 124 above, pg 14.

<sup>130</sup> *Global scrutiny follows reports of Chinese nuclear base*, **Christian Science Monitor**, May 13, 2008, <http://www.csmonitor.com/2008/0513/p99s01-duts.html>

<sup>131</sup> *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs*, Committee on the Assessment of U.S. Coast Guard Polar Icebreaker Roles and Future Needs, **National Research Council**, Washington, DC, pg. 33, 2007 [http://www.nap.edu/catalog.php?record\\_id=11753](http://www.nap.edu/catalog.php?record_id=11753)

There are also concerns over the mutual interdependencies of Russia and China that could actually lead to security tensions, and which could possibly spill out in the Arctic.<sup>132</sup> These possibilities depend on whether China and Russia can cooperate on trade and resource issues. Extrapolating China's resource needs into the future indicates that they could desperately try to maintain their supply chain for Russian resources and those accessible via the Arctic, if faced with stiff competition from other nations. Any rapid unfolding of events could derail current U.S. security planning and create problematic security gaps around Arctic shipping and sovereignty concerns.<sup>133</sup> All these issues add to the complexity of dealing with intertwined multinational-corporation and nation-state operations in the Arctic.

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<sup>132</sup> *Fear and Loathing in Siberia*, **Newsweek** Mar 27, 2006,

<http://www.newsweek.com/id/46951?tid=relatedcl>

<sup>133</sup> Chalecki, Elizabeth, *He Who Would Rule: Climate Change in the Arctic and Its Implications for U.S.*

*National Security*, paper presented at the **International Studies Association**, Chicago, 2007.

<http://fletcher.tufts.edu/maritime/documents/ArcticSecurity.pdf> and

<http://www.princeton.edu/~jpia/pdf2007/Chalecki%20Chapter%2010%20.pdf>

## 6.0 Security Constraints from the Environment

Climate will radically alter the physical and ecological properties of the Arctic, but many of its inhospitable characteristics will remain unchanged or perhaps increase. It will be a brutal environment spending much of its time in stormy, complete darkness.<sup>134</sup> The magnitude and frequency of severe storms may increase. Efforts to maintain security will be difficult and ever changing. Because of the cold, the Arctic environment will remain sensitive to accidents and even routine economic activities – in a milieu where the expected fishing industry will have the same political import as does farming in many temperate countries.<sup>135,136</sup> Environmental regulation may constrain security activities. These severity and fragility realities combine with changing global security threats--for which climate is also a contributor--to challenge the U.S. ability to provide adequate resources for all global security needs. As such, serving the security needs in the Arctic may require a fundamentally different approach to the planning, technology, and deployment of security assets.

### 6.1 Severity Constraints

In the most likely projections of a future Arctic, there will be less ice-cover but more snow<sup>137</sup> with more extreme weather and variability.<sup>138</sup> In the darkness of the winter, open water, storms, and drifting-snow changes the morphology of sea-ice, creating additional hazards to already dangerous ice floes. The size distribution of ice has a long tail<sup>139</sup> that will ensure a base population of unpredictable, rapidly moving, navigational hazards.<sup>140</sup> The momentum of a 130-foot thick patch of ice the size of Manhattan will be

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<sup>134</sup> Noble, Peter G., *Oil & Gas Exploration, Production and Transportation in the Arctic Symposium on the Impact of an Ice-Diminishing Arctic on Naval & Maritime Operations*, U.S. Arctic Research Commission, Washington, DC, 10-12 July 2007  
<http://www.star.nesdis.noaa.gov/star/documents/2007IceSymp/Noble.pdf>

<sup>135</sup> *The Polar Regions*, in Chapter 2: *State of the Environment*, UNEP, September 11, 2008,  
<http://www.unep.org/GEO2000/english/0116.htm>

<sup>136</sup> *Arctic Shipping Activities Into The Next Decade*, Norwegian Maritime Directorate, Akureyri, Iceland, 1999, <http://old.pame.is/sidur/uploads/shippingactivitess.pdf>; also see  
<http://old.pame.is/sidur/sidur.asp?id=13&menu=docs>

<sup>137</sup> *World in Transition – Climate Change as a Security Risk*, German Advisory Council on Global Change, **Earthscan**, pg. 132, London 2007 [http://www.wbgu.de/wbgu\\_jg2007\\_engl.html](http://www.wbgu.de/wbgu_jg2007_engl.html)

<sup>138</sup> See note 113 above

<sup>139</sup> Bitz, C.M., J. K. Ridley, M. M. Holland, and H. Cattle, 2008: *20th and 21st century Arctic Climate in Global Climate Models*, submitted to **Arctic Climate Change - The ACSYS Decade and Beyond**, edited by P. Lemke, 2008, [http://www.atmos.washington.edu/~bitz/Bitz\\_et al2008.pdf](http://www.atmos.washington.edu/~bitz/Bitz_et al2008.pdf)

<sup>140</sup> See note 113 above.

no match for oil and gas facilities<sup>141</sup> -- and it will present complications to shipping and any response efforts for accident, enforcement and security needs.

The Bering Strait will be a choke point for Asia-to-Europe shipping<sup>142</sup> and a rapidly warming Arctic climate could increase the flushing rate of ice into Atlantic shipping corridors.<sup>143</sup> Elsewhere, “open water in the passages over Russia, particularly, remains clotted with thick, dangerous floes and can also close up in a matter of hours.”<sup>144</sup> As noted earlier, permafrost and hydrologic changes will require special technology for land-based support and may require transportable security-bases to accommodate the changing physical and security circumstances. Only additional analysis (or painful experience) can determine what other emergent phenomena will confront security activities.

Existing security assets were not designed for the environmental conditions associated with climate change. There will be difficulties maintaining military capability due to extreme (and evolving) weather/climate.<sup>145</sup> As climate change progresses, assets will lose viability over time.<sup>146</sup> The same is true for the applicability of equipment.<sup>147</sup> The U.S. currently has no forward bases and no aircraft that can sustain operations in the Arctic theater.<sup>148</sup> The U.S. is poorly prepared for ground war at higher latitudes.<sup>149</sup> The highly variable weather in the Arctic, the total darkness in winter, and mobile ice will present complex situations.<sup>150</sup>

Altered physical conditions of the engagement theater will force changes in tactics/contingences. Bases may no longer be useable for expected activities due to routine extreme-weather conditions. Climate assessments<sup>151</sup> indicate that alliance partners (and their budgets) could be preoccupied with climate-related disasters within their own territories or in non-Arctic theaters, and thus not available to aid U.S. efforts in the Arctic. Climate-induced stresses and events can dictate the location, type, rapidity, and incidence of conflict.

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<sup>141</sup> Spotts, Peter N., *Shrinking Arctic Ocean sea ice signals climate change*, **The Christian Science Monitor**, September 4, 2008 <http://features.csmonitor.com/environment/2008/09/04/shrinking-arctic-ocean-sea-ice-signals-climate-change/>

<sup>142</sup> See note 113 above.

<sup>143</sup> See note 141 above.

<sup>144</sup> *Arctic Ice Hints at Warming, Specialists Say*, **New York Times**, September 6, 2008 <http://www.nytimes.com/2008/09/07/science/earth/07arctic.html?partner=rssyahoo&emc=rss>

<sup>145</sup> *An Uncertain Future: Law Enforcement, National Security and Climate Change*, **Oxford Research Group**, January 2008, [http://www.oxfordresearchgroup.org.uk/publications/briefing\\_papers/pdf/uncertainfuture.pdf](http://www.oxfordresearchgroup.org.uk/publications/briefing_papers/pdf/uncertainfuture.pdf)

<sup>146</sup> See note 145 above.

<sup>147</sup> See note 145 above.

<sup>148</sup> Rusling, Matthew, “Coast Guard Unprepared for Climate Change in Arctic”, *National Defense*, August 2008 <http://www.nationaldefensemagazine.org/issues/2008/August/CoastGuard.htm>

<sup>149</sup> See the comments of William Schlesinger, pg. 275 in the reference of note 111 above.

<sup>150</sup> See note 113 above.

<sup>151</sup> *Impacts, Adaptation and Vulnerability*, IPCC Fourth Assessment Report, **Intergovernmental Panel on Climate Change** <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>

To maintain a sense of control in an increasing complex physical, political, and commercial environments, there will be an “early-warning” need to assess emerging threats and the countermeasures to manage them. Given the logistical (time and material) constraints to operations, it will be necessary to anticipate conditions that allow realizable countermeasures for redirecting the outcome away from catastrophic consequence. For example, it may be a routine situation where accident, enforcement, or actual security activities need to operate in an unstable physical situation while in a disputed territory.

Combined behavioral and physical-climate simulations can analyze economic shifts and conflict potential from Arctic-route trade expansion. Given the economic and political conditions, modern behavioral models can aid in recognizing the potential evolution of conflict across regional boundaries. The results of these analyses combined with climate, logistic models could then help design sensor, platform, and resource allocations that minimize costs and maintain the flexibility/capability to address the more pressing security concerns.

## **6.2 Environmental Constraints**

Within the Arctic, environmental accidents (e.g. oil or hazardous material spills) can have long-lived impacts that could produce severe economic, ecological, and political implications. If security operations, both in preparedness and execution, cause environmental calamity, then international authorities (possibly encouraged by adversarial parties) would probably demand restrictions on operations and future capability. Therefore, there is an upfront need to recognize that the design and use of facilities may constrain strategic and tactical function.

Continued environmental change may make land or coastal areas become overly sensitive to environmental stresses or make them unstable, and thereby increase the potential for accidents that cause environmental damage. Requirements for mobile “bases” change the ground rules for installation planning and design.

Water and air pollution have long lifetimes in the Arctic, and can exacerbate or accelerate the effects of climate change and ecological degradation. Environmental laws may prevent the routine use of conventional (diesel) vessels in the Arctic, such as for patrols, training, and surveillance. The Russians have a clear advantage with their nuclear ships. The U.S. itself may have to quickly consider such options.

In the Arctic, minimizing the footprint of security may be good for relieving both the environmental and cost constraints of security needs.

## **6.3 Expansiveness Constraints**

Section 2 of this report noted the large mission space that the Arctic presented. The interaction of offshore resource extraction activities, international shipping through

multiple sovereignty-boundaries, and the highly extreme/variable weather/ice environment engenders a picture of incredibly complex security-related scenarios. Conventional approaches to resource placement for security would not only be enormously expensive, they would still probably be inadequate for the evolving and obstacle-laden missions in the Arctic. If the U.S. is to provide a security presence in the Arctic, it needs to have a highly flexible capability that minimizes the asset (cost) footprint. The need is for scalable and flexible technology, and the evolving rapid development of new technology, that minimize cost and environmental impacts. While there will be times when a physical response is needed, the response will have to be infrequent and near the current location of responsive assets. Most probably there will not be time for equipment and personal to reach an area before it evolves to a more complicated set of problems. Certainly, icebreaking vessels will be an important part of the mix.<sup>152</sup> Nonetheless, technological solutions may be able to limit the need for the mobilization of resources from one area to a distant area.

Security forces need to use technology for monitoring, tracking and assessment, communication, cooperation. This list of functions actually represents a flow. If all five functions occur in near real time, multiple international resources can share tasks to produce the realized response. The communication is to friend and foe; the coordination is also with friend and foe. A foe is a partner in maintaining controlled conditions when it relates to some other party. A friend can be a conventional vessel now aware of (and proximate witness to) any accident, enforcement or security situation. The reward structure of sovereignty and economics in the Arctic can actually make such an approach viable. The physical conditions are the common, ever present, enemy.

Optimized ocean-floor, ice, and ocean-surface Sensor-Networks can provide monitoring, tracking and assessment. Multi-spectral satellites can increase that information content and context. UAVs and long-endurance, lighter-than-air, instrument platforms can collect information and control communications. UAVs with wingspans that are less than four feet have clocked 23-hour missions with micro-SAR and other instrumentation, while covering 1500km of airspace. UAVs with five-year mission times are now considered possible.<sup>153</sup> Lighter-than-air systems can be quite large, instrument packed, placed at altitudes above the weather, and mobile enough to allow continuous SAR imaging for months. These systems also have a minimal environmental footprint.

With a continuous picture of conditions, computer models can forecast potential future conditions and the situations they might imply. This approach generates early warning/leading indicators for potential accident, enforcement, and security events -- and false alarms that need no response beyond communication. If a situation requiring a response is realized, there is then a time-window large enough to improve the chances of mobilizing resources. More importantly, with communications based on complete

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<sup>152</sup> *A Push to Increase Icebreakers in the Arctic*, **New York Times**, August 16, 2008, <http://www.nytimes.com/2008/08/17/world/europe/17arctic.html>

<sup>153</sup> *Quest for 5-Year UAVs Drives Record-Shattering Flights*, **Defense News**, 8 September 2008, <http://www.defensenews.com/story.php?i=3711816&c=FEA&s=TEC>



knowledge of all activities in the area, minimally perturbing requests toward parties near the situation can intervene in many situations – often by just avoidance rather than engagement.

This approach would require the assessment of future conditions, options, policies, and responses. It could assess technological requirements for the geographically shifting threats, amid diminished efficacy of existing resources. Most importantly, it can define the criteria specification and engineering solutions for evolving operational challenges in new Arctic conditions along an implementation sequence that minimizes cost and relieves planning/logistic constraints.

Such assessments need to be keenly aware of uncertainty and failure modes. The assessment purpose is to allow risk informed decisions. Modern verification and validation methods with uncertainly quantification can ensure confidence in operational decision-making under uncertainty for resource deployment.

In the Arctic, it would seem that time and cost constraints occur at all points of implementation: Planning, Design, Strategic and Tactical, and Operations. In a security setting where anticipation is more important than actual physical response, understanding evolving geo-political and commercial tensions is just as important to operational assessment as the ocean and ice forecasts. Consequence-Evaluation and Unintended-Consequence avoidance become key features in maintaining sustainable conditions. System-of-systems simulation must and can integrate across the required domains with a focus on unfolding dynamics rather than static assessments. These domains include intelligence, asset functionality, weather, climate, sensor-networks, communications, engineering, logistics, behavioral/political responses, commercial economics, verification & validation, and uncertainty quantification.

In summary, the Arctic offers conditions for which conventional assets are ill-suited due to 1) cost, 2) the timing to implement, and 3) the continuously shifting physical and mission needs in the theater of operation. These constraints are overcome by being much smarter in anticipating essentially all options and determining the minimal physical response required to mitigate any concern. Advanced technology (sensors/-communication) and information systems offer an approach to these security demands.



## **7.0 Impacts of Arctic Change on Southern Hemisphere Security**

Many of the tropical and southern hemisphere countries are already the most vulnerable to climate change due to droughts and the loss of agricultural productivity.<sup>154</sup> They will additionally suffer economic dislocations due to changes in the Arctic. Industrialized and industrializing countries will continue to demand food, oil, and mineral resources from these regions and may impose political alliances to ensure access. With reduced water and extreme weather, these areas will require enhanced infrastructure.<sup>155</sup> Thus, there will be competing demands for infrastructure investments between the Arctic and Southern Hemisphere. In some areas, water will be so limiting that local support of existing populations will become impossible. In areas where pursuing more resource-intensive practices would enable the regional agriculture to still serve global needs, the demand for destitute labor could act as a relief valve for the inevitable mass-emigration. In some areas, the regional environment or bad governance could limit migratory options and lead to either local conflicts or humanitarian crises.<sup>156</sup> In areas where commercial agriculture survives, governments will have adequate funds to maintain stability. In areas with massive losses of the economically productive population, and therefore losses of government revenues, many governments could fail. The problems swell to international scope if these same areas hold strategic mineral resources or they develop into magnets for disenfranchised (radicalized) populations.

Due to Arctic trade and economic activities, the northern immigration of low-cost labor may also alleviate destabilizing pressure in the Southern Hemisphere. If Arctic economic activities do proceed as imagined in this document, then Arctic trade and processing will change supply chains and the balance of political and economic power within the tropics and Southern Hemisphere. Because such a significant amount of trade is among northern hemisphere countries who will now depend more on Arctic routes, the near equatorial (Panama) and southern routes (Africa, Indonesia, and S. America) will experience severe dislocations, except in possibly the matter of oil and agricultural products. Economies-of-scale provide a strong incentive to avoid the size restrictions of Panamax ships, encouraging shippers to take economic advantage of the larger vessels that can ply the Arctic.

With the change in economic relationships and dependency, alliances between developing countries and the U.S., China, and others could become quite fluid. If no economic alternative options exist in a country (e.g., enhanced agriculture, mineral

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<sup>154</sup> *Impacts, Adaptation and Vulnerability*, IPCC Fourth Assessment Report, **Intergovernmental Panel on Climate Change** <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>

<sup>155</sup> *Climate Change Hits Hard on Latin America and the Caribbean*, United Nations Environment Programme, Brussels, 6 April 2007. <http://www.unep.org/Documents/Multilingual/Default.asp?DocumentID=504&ArticleID=5558&l=en>

<sup>156</sup> Kato, Takatoshi, *Implications of Climate Change for Africa*, **Fourth Tokyo International Conference on African Development (TICAD IV)**, International Monetary Fund, Yokohama, Japan, May 29, 2008 <http://www.imf.org/external/np/speeches/2008/052908a.htm>

extraction, or the development of new competition-preserving infrastructure), but there is adequate labor mobility to reduce internal strife, then the government retrenchments in disadvantaged nation-states may avoid regional conflicts. Nonetheless, if multiple neighboring countries simultaneously experience enduring downturns, warlords can readily take advantage of the situation. Economically developed areas may be able to compete with the Arctic for locally-produced and locally-consumed goods.

Climate security risks are not the direct result of separate discrete events such as migration or the loss of resources. Migration may bring constructive economic change to a host country and the loss of population may relieve pressures in the donor country. As noted previously, risk is not due to a static chain of events, but from the dynamics and shifting interactions among the climate, physical, socio-economic, and geo-political components. A one-cause, one-effect assessment misses the primary drivers of the risk. The magnitude of the cascade of changes determines the need for security measures and the prioritization they deserve.

Many of these impacts will require computer modeling of realizable dynamics in economic supply chains, societal responses, geopolitical stability, and conflict evolution, in addition to the physical climate system. As triggers for conflict in areas already stressed by the economic and environmental fallout of Arctic transformations, the impact of natural disasters on water, energy, and infrastructure disruption become important. Stresses that intensify destructive land use, deforestation, and non-sustainable agriculture practices can generate circumstances that push local societies into a failed-nation status. Understanding these dynamics is important to allocating global security efforts and ensuring adequate coverage in critical hot spots. Luckily, post-9/11 events have promoted the development of such simulation/assessment capabilities.

## **8.0 Summary**

Uncertainty in the timing of an ice-free Arctic affects how quickly it will become a security priority. Uncertainty in the emergent extreme and variable weather conditions will determine the difficulty (cost) of maintaining adequate security (order) in the area. The resolution of sovereignty boundaries (presumably based on UN Convention on the Laws of the Sea negotiations) affects the ability to enforce security measures. The U.S. will most probably need a military presence to back-up negotiated sovereignty agreements.

Mineral extraction may initiate the “gold rush” to the Arctic, but shipping could jump-start the economic engine that propels the Arctic into being the next global growth engine. The processing of resources and the finishing of product may become the dominate economic activity, dwarfing the mineral and shipping efforts that now primarily act to support the global economic supply chain in the Arctic --- centered primarily on Russian shores and in Russian waters.

Nonetheless, the multinational corporations creating the economic bounty may affect security tensions more than nation-states themselves. Countries will depend ever more heavily on the global supply chains. China has particular needs to protect its trade flows. Nation-state and multinational-corporate interests will become heavily intertwined in a security sense.

The Arctic environment is both fragile and severe. Environmental protection constraints (laws) may negatively affect security operations, and evolving weather (climate) conditions will require an evolving set of assets for security responses.

Once the Arctic does become economically accessible, its importance to security appears to be a certainty. The importance of the Arctic to the global economy should make its security issues a top priority. Understanding the timing and extent of security needs, along with the strategy to counter the need, consistent with cost and planning constraints, will require assessments of uncertainty-weighted risks and optimized planning based on advanced technology.



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