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A Deeper Look at Climate Change and National Security

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A Deeper Look at Climate Change and National Security

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Abstract

Climate change is a long-term process that will trigger a range of multi-dimensional demographic, economic, geopolitical, and national security issues with many unknowns and significant uncertainties. At first glance, climate-change-related national security dimensions seem far removed from today's major national security threats. Yet climate change has already set in motion forces that will require U.S. attention and preparedness. The extent and uncertainty associated with these situations necessitate a move away from conventional security practices, toward a small but flexible portfolio of assets to maintain U.S. interests. Thoughtful action is required now if we are to acquire the capabilities, tools, systems, and institutions needed to meet U.S. national security requirements as they evolve with the emerging stresses and shifts of climate change.

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Introduction

Climate changes, whether or not moderated by human effort, will affect regional and local patterns of rainfall, sea level, and storm intensity, and in turn will affect population, economic growth and development, as well as national and geopolitical structures and systems. Though many of these changes are expected to occur over the longer term, it is certain that they will in some way affect regional and global security in addition to the security of individual nations.

There is a risk that if climate change is not addressed, some of these nascent national security threats will lie unappreciated and ignored until, like the proverbial "frog in boiling water," they emerge as pressing issues that require an urgent, immediate response. The main reasons for this apparent shortsightedness are that these threats are difficult to see through the lens of today, and because they are assumed, for the most part, to be longer-term issues, and therefore easy to defer.

To avoid keeping these future dangers "on the back burner," both the nation and the world need a thoughtful system of diagnostic and early-warning tools, including models, databases, sensor systems, and expert judgment that will better focus today's lens on the national security trends and issues that are evolving in response to climate change.

Such tools would help insure that appropriate national security threat mitigation technologies and systems, including appropriate geopolitical forums, will be available when needed. At a minimum, climate change-induced threats should be considered, within appropriate time frames, as a part of official national security reviews.

With climate change near the top of many national agendas and the budgets of the U.S. government and many of its allies under stress, this is an opportune time to consider ways of dealing with the national security dimensions of this epochal phenomenon. It will take time and resources to develop and implement new tools and systems to meet these challenges; however, they can and should be integrated within a forward-thinking plan to deal with the consequences of climate change. Here we place these concerns in the broad global context of how climate change may affect the future missions of our security forces.

National Security and Climate Change Linkages

Climate change is already upon us; in fact, many scientists are concerned that its rapidity and severity may be grossly understated. As populations continue to increase, as land becomes less productive, and as natural resources become more depleted, the human urgency for resources will extend to exploitation of areas that once were marginal choices. For example, the known mineral and aquacultural value of the Arctic will result in greater exploitation in the near future, independently of climate. Inevitably, climate-motivated agreements and treaties will require government agencies to independently monitor and verify compliance, particularly with regard to sovereignty claims, climate/environmental restrictions on economic activities, and the downstream impacts of unilateral geo-engineering attempts. Some analysts have forecast that the Arctic will become ice-free by the summer of 2013. Most analysts expect the Arctic to be ice free by the end of the century, but climatic volatility will ensure periods of accelerated ice-loss will generate early expectations and activities within the region. A scenario such as this invokes the classical national security challenges inherent in defining regional sovereignty, rights of usage/transit, and protective and environmental responsibility.

The question of whether the dynamics of climate change will cause conflict depends upon how severely and how fast their impacts, for example the loss of livelihood and property, emerge. In any case, the U.S. must assess the potential dynamics and design preparedness measures for high-consequence, credible situations. As a measure of the gravity of climate change, consider that the U.S. actively pursues programs to mitigate the risk from a catastrophic asteroid encounter. The probability distribution representing the uncertainty in expected climate change implies that the risk of catastrophic outcome is more than forty thousand times more probable than that from an asteroid collision with the earth. By this logic, it follows that climate change deserves in-depth forethought of its potential security risks. For the first time, the U.S. Department of Defense's Quadrennial Defense Review (2010) considered climate change and noted it as a geopolitically destabilizing force.

Managing Security Risk Dynamics

Climate change and its impacts are a cumulative process. Climate change interacts with geopolitical and socioeconomic systems to increase the underlying complexity of the problem. The large variance in weather intrinsic to climate change adds new causes of stress and changes the trajectories of risk. Subsequent variations can then trigger security events. Because climate change acts across multiple regions and feeds back on itself over time, strategic planning requires a dynamic, systematic, and integrated approach to anticipating the expanding longer-term impacts on U.S. national security. Because of these inevitable uncertainties, the national security implications of climate change require adaptive approaches to ensure successful responses and new processes to deal with new problems. The combination of sensor information and computer models, although not a panacea, can promote the effective use of limited security resources while providing the foundation for a long-term warning system.

From a national security perspective, planners must focus attention on the risks associated with known knowledge gaps. This can be accomplished by evaluating the possibilities and quantifying the uncertainties by using integrated engineering verification and validation techniques. Verification ensures that a simulation correctly portrays the concepts its designer intends, whereas validation ensures that the simulations accurately match actual outcomes. Thus, development of interventions that will assure robust outcomes under a wide range of uncertainty provides a link between risk assessment and security preparedness. Modeling potentially can allow the exploration of the full range of known possibilities and can identify the critical forces that may lead to conflict.

Security decisions need to distinguish root causes from proximate causes. Simulation models can make such differentiations. These differentiations are important to policy makers because proactive policy interventions can readily address the root causes and prevent their growth into subsidiary points of conflict. Reactive interventions, on the other hand, typically perpetuate the root causes while attempting to restore pre-event conditions. In the instance of climate-induced conditions, models can assess future conditions, options, policies and responses using physical, behavioral, societal, economic, and security analyses across many countries and policy domains. In so doing, they can generate leading indicators through root-cause analysis while avoiding false alarms from proximate-cause assessments. New methods and high performance computing will allow high fidelity climate risk analyses, which formerly took months to complete, to be performed in a day.

Just as, in the final analysis, all politics are local, all climate change is local; however, the consequences of local impacts can lead to global security concerns. Therefore, coupling climate models that capture regional detail with socioeconomic models that capture security dynamics offers a fruitful approach for assessments. Even when large uncertainties exist, models can help discover four types of phenomena that limit blind-sided decision-making.

Emergent phenomena are trends or effects that cannot be anticipated intuitively or predicted from simple reasoning. Exploration-mode, high performance computing, a subdiscipline devoted to emergent phenomena, is a laboratory tool that can lead to discovery of the unpredictable.

Robust phenomena emerge from physics, dynamics, and geometry over a very broad range of assumptions. Regional-scale simulations can discover robust emergent phenomena before they are ready for validated scientific research.

Signpost phenomena foretell future change and provide forecast validation.

Consequential phenomena have large effects on economies, the environment, security, or other systems on which humans depend. Forecasts should emphasize consequential phenomena, even those of very low probability.

New analysis methods already have the capability to assess these consideration for informing climate change policy and for making decisions under uncertainty.

Increasing international political and economic interdependencies may tend to make international security less amenable to military force and perhaps more dependent on managing behavioral interactions. Planners must focus on coordinated social, political, and physical interventions in attaining the end goal, recognizing that unique and unforeseeable possibilities exist at each step. Successfully informing decision-making and anticipating the unintended consequences of security dynamics requires a globally applicable system to simulate evolving conflict dynamics and intervention options while incorporating uncertainty.

Current socioeconomic models accommodate neither conflict evolution nor the type of validation rigor needed for security missions. Yet it is essential to extend existing socioeconomic behavioral models with conflict progression dynamics. These assessments would make use of directly coupled geopolitical models and climate models.

Climate Interactions and Implications

In many parts of the world, as countries attempt to compensate for climate-induced stresses, new activities may increase the demand for energy, water, and other scarce resources, at least in the near to intermediate term. Additionally, migration from marginal rural areas to urban areas could increase where climate change degrades traditional agricultural land, and where resources are not readily available for capital- and energy-intensive farming methods. At the same time, other parts of the world may benefit from reduced energy requirements and/or improved agricultural land where, for example, previously unproductive land in colder climates is brought into cultivation.

What is rational for the individual is not necessarily rational for the society, a dilemma that can lead to public policies that make matters worse than those they are intended to correct. In a recent study, Robert Repetto of Yale University noted that:

1) Humans are myopic decision-makers, placing little value in uncertain future events or in past events, and sidestepping an aggressive response to climate threats because the problem is not immediate;

2) People tend to underestimate cumulative probabilities when the immediate probability of direct consequence is low, despite the fact that the probability of a catastrophe ultimately will occur is exceedingly high;

3) Humans anchor themselves to the *status quo* and resist deviations in habit; and

4) Individuals actively reject information that challenges entrenched values and beliefs.

In his book *Collapse*, Jared Diamond theorizes why societies often find themselves in a position where they appear to have no choice but to react to immediate, escalating needs at the risk of long-term survivability. The societal disruptions of climate-induced extreme weather, combined with the human need for security and certainty, present opportunities for autocrats to take power in poor nations that have exploitable resources. Furthermore, at a time when residents of individual consuming nations may fear the loss of resource supplies, slow political processes could limit the prompt adoption of measures to provide needed supplies. As a result, the international community could fracture into competing fragments.

China, India, and Russia may be particularly vulnerable to climate change-induced societal change. Portions of China and India heavily depend on rapidly receding glaciers for water. As these problems worsen, mass migrations to coastal areas will challenge governmental efforts to deliver services or to maintain order. In addition, coastal areas will be susceptible to the salinization of water supplies, land subsidence, and destructive storm surges that accompany hurricanes and other intense storms.

Governmental authority largely depends on the convergence of economic performance and civil order with popular expectations. In the instances of China and India, for example, increasing fractions of the citizenry expect growth and improved economic conditions. However, if climate change causes reality to diverge from such expectations, the mode of governance may need to change as well.

Defense forces will no doubt be required to protect shipping routes as they change in response to climate change. China's recent large investment in naval modernization, for example, reflects its dependence on global maritime supply chains for strategic materials and for the international trade upon which its economy depends. Should climate change lengthen its supply chains, for example, to import oil from Central Africa and food from South America, its risks from external geopolitical tensions will increase. Thus, China and other countries with growing demand must be prepared to protect changing supply chains, wherever they reach, to satisfy their growing needs.

Russia expects to strengthen its international stature, using its oil and mineral wealth as foundations for success. Climate change may benefit Russia by providing warmer temperatures and an increase in agriculturally productive land; ice-free access to the mineral wealth and shipping routes in the far north may confer even greater geopolitical and economic rewards. If and when the Arctic sustains reliable sea routes in the future, North American and European products could be moved more economically through western Russia. In addition, if increased oil supplies were recovered from the Russian Arctic they could provide China and Japan with an alternative to the use of tankers plying through the dangers of the Straits of Malacca and the Horn of Africa.

In May 2009, Russia released the national security strategy produced in September 2008 by the Russian Security Council. It considers Arctic policy through 2020 and notes that, "with the ongoing competition for resources, it cannot be ruled out that military force could be used to resolve emerging problems that would destroy the balance of forces near the borders of Russia and her allies." It identifies Russia's Arctic zone as "a national strategic resource base capable of fulfilling the socio-economic tasks associated with national growth," and promotes the deployment of armed forces "capable of guaranteeing military security in different military-political situations" within the Arctic area. It goes on to say, "The presence and potential escalation of armed conflicts near Russia's national borders, pending border agreements between Russia and several neighboring nations, are the major threats to Russia's interests and border security." In March of 2010, President Dmitry Medvedev reaffirmed the need for Russia to defend its claims to the mineral resources of the Arctic in increasing competition with other nations, while Prime Minister Vladimir Putin justified Russia's Arctic territorial rights.

The Game-Changing Arctic

Current data present a dramatic picture of the increase in the rate of Arctic melting. The curve is rapidly approaching a vertical slope, indicating that many previously unimportant, newly self-reinforcing phenomena are redefining the nature of the Arctic. The need for oil and mineral resources is promoting technological advances that would permit economic exploitation, even in the absence of continued climate change. Shipping and economic activity in the Arctic are experiencing double-digit growth, albeit from a small base.

As Laurence Smith points out in his recent book *The World in 2050: Four Forces Shaping Civilization's Northern Future*, the potential economic and physical changes here could be enormous. For example, after trans-Arctic shipping routes become viable, economics may justify perhaps 80% or more of northern hemisphere trade traveling through the Arctic Ocean. While trans-Arctic shipping conceivably could become a viable proposition around 2013, primary estimates tend to favor a later date, perhaps around 2030. Because northern hemisphere countries dominate economic activity and global trade, rerouting trade away from equatorial and southern routes could have a destabilizing effect on those southern hemisphere countries that are dependent on existing shipping patterns, unless alternative trade flows develop for them.

When mineral extraction becomes economically mature in the Arctic, many developed and developing nations will likely suffer the consequences. Russia’s potential agricultural expansion could cause significant disruptions in current north-south agricultural trading patterns. China’s sensitive supply chains could move north and south instead of primarily east and west. Europe and the U.S. East Coast could become closer to Asia through the Arctic. New support industries and infrastructure investments could quickly materialize with the expansion of Arctic shipping, since the new infrastructures will themselves represent a powerful new economic growth engine. Rather than having products travel to multiple countries in the course of assembly, parts could converge at a central Arctic location for a single trip to the end-use market. Local energy and mineral sources within the Arctic could serve this industrial center. The cost advantages of reduced time, economies of scale, reduced production steps, and minimized shipping trips, may compensate for the added complications of Arctic travel and assembly. The Arctic Council produced a 2005 report that shows the considerable risk to structural, electric power, and infrastructure assets due to permafrost dynamics. As experience on the North Slope of Alaska has shown, advanced engineering competence is needed to compensate for the extreme cold as well as melted permafrost. Initially, robotics might have to dominate any industrial process, but unemployment caused by climate change elsewhere could furnish a supply of human labor, with the Arctic providing a population relief valve.

Russia would seem to be the likely hub of global economic expansion as the Arctic becomes economically accessible. With a border that spans over 160 degrees of the Arctic region, its side of the Arctic is opening to exploration faster than the North American/European side.

Disputes over sovereignty and usage rights in the Arctic seem certain for several reasons. The U.S. currently is not yet a signatory of the U.N. Convention on the Laws of the Sea, which specifies the process for claiming jurisdictional rights; Russia has developed separate rules for transport in water it claims; and the five countries surrounding the Arctic contend that their combined authority includes the entire Arctic region. These issues must be seriously considered, for controversy is sure to accompany the exploitation of newly accessible polar energy and mineral resources. Treaty negotiations likely will include monitoring and enforcement requirements, as well as requirements for border protection from environmental damage and unauthorized use. Routine security activity will likely include safeguarding strategic supply chains, resources, shipping, international environmental standards, and port activities.

From a historical perspective, the opening of the Arctic could prove to be as momentous as the opening of the New World in the 16th century. In that epoch, European interests in the New World led to global conflict. In the Arctic, intense competition and rapid regional economic development can eventually create new cities, infrastructure and industry in an environment that is physically, and possibly politically, fragile. As in the New World, economic expansion and the imposition of national claims will conflict with the hitherto practiced lifestyle of indigenous peoples. Industrialized activity could severely affect the Arctic environment, leading to political backlash and possible violence. Eco-terrorism and destructive counter-responses to economic expansion are possibilities that cannot be ignored.

Adapting National Security Operations to the Changing Climate

The U.S. national security community must begin to position itself to better understand, plan, and operate in a changing physical climate. The current mix of equipment and resources may be inadequate for the altered physical conditions of the engagement theater, and could force changes in field tactics and contingencies while increasing the cost of intervention. Further, it is to be expected that some existing bases may no longer be useful if extreme weather conditions become routine.

Extreme weather and increased weather variability could also change the mission space and strategic implications of intervention, since climatic conditions affect the requirements on, and the effectiveness of, security activities. Such changes would necessitate a reassessment of the technological requirements for geographically shifting threats, amidst potentially diminished efficacy of conventional resources. This, in turn, could create a need to revise the mission-space definition for military and political intervention. In this regard, both the Navy and the Coast Guard are actively evaluating the future mission needs of the Arctic region.

As previously suggested, climate change can foster the breakdown of societal, political, and financial institutions that have typified the historical nation state. Because it is difficult to reverse the momentum once the disintegration starts, the defense community must anticipate the emergence of these conditions and determine robust countermeasures to minimize the likelihood of catastrophic consequence. Assessing such changes would require coupled regional climate and geopolitical modeling, as well as monitoring with real-time simulation analyses, to provide early signals to fend off what potentially could be a cascade of destabilizing conditions.

Environmental accidents in the Arctic could have long-lived impacts that carry severe economic and related political implications. In the absence of careful planning, environmental fragility may also constrain U.S. responsiveness in the Arctic and elsewhere, necessitating the design and use of equipment/facilities to limit adverse environmental effects. With operational challenges evolving in physically demanding environments, modular mobile facilities and bases may become the norm, and new ground rules for installation, planning, and design will need to be formulated. Specifying the criteria for such entities will require the assessment of future conditions, options, policies, and responses. Given the uncertainty in the extent of climate change and the security issues it will cause, verified and validated computer simulations can offer decision-makers an avenue to secure more successful, cost-effective and flexible acquisition programs.

U.S. security response to the challenges of climate change must start with available technologies and resources and follow up with an evolving strategy that keeps pace with a morphing mission space. The capability for anticipatory assessment must underpin the actual response. This approach is not new, but in the case of climate change, the assessment would make use of optimized ocean, ice, atmospheric, hydrologic, and space-based sensor networks. This would be done in cooperation with the Department of Defense (DoD), Department of Homeland Security (DHS), the Department of Energy's National Nuclear Security Administration (DOE/NNSA), the intelligence community, and other concerned U.S. government agencies, with computer simulation assessments that include large-scale climate, geopolitical, and socioeconomic modeling. In the Arctic, accessibility limitations demand the use of lower-cost sensor systems in lieu of high-cost manned surveillance. Additionally, Arctic accessibility, and extreme weather in the lower climes suggests a greater dependence on unmanned, often remote, responses to potential security situations, as with unmanned aerial systems.

While the primary role of sensors would be for detection and identification of situations within a timeframe for an effective response, sensor systems could have many uses, including the monitoring of economic and military flows for assessing strategic-resource politics and updating models of early warning with demographic and land-use trends that indicate emerging disruptions. For the Arctic region, this may entail analyzing economic shifts and potential sea-lane disputes from Arctic-route trade expansion. Tying real-time sensor data into models to anticipate and recommend the least-action proactive response to unfolding problems could render the larger effort of responding reactively to fully developed problems unnecessary. DHS techniques for simulating the failure modes and recovery of critical infrastructures can be extended to evaluate the potential consequences of questionable activities.

Summary

Climate change is a long-term process that will trigger a range of multi-dimensional issues with many unknowns and significant uncertainties. At first glance, climate-change-related national security dimensions seem far removed from today's major national security threats. Yet climate change has already set in motion forces that will require U.S. attention and preparedness. The extent and uncertainty associated with these situations necessitate a move away from conventional security practices, and doing so in a way that is mindful of national budgetary pressures. Long-range and real-time anticipatory assessments of unfolding security conditions, making extensive use of relatively inexpensive sensors and modeling and simulation tools, can allow a small but flexible portfolio of assets to maintain U.S. interests. Thoughtful action is required now if we are to acquire the capabilities, tools, systems, and institutions needed to meet U.S. national security requirements as they evolve with the emerging stresses and shifts of climate change.

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