

THE CONSEQUENTIAL CHALLENGES OF CLIMATE CHANGE

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USAWC STRATEGY RESEARCH PROJECT

THE CONSEQUENTIAL CHALLENGES OF CLIMATE CHANGE

by

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ABSTRACT

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President Obama stated in his 2010 National Security Strategy that the danger from climate change is real, urgent, and severe. Climate change serves as a “threat multiplier”, exacerbating existing problems such as poverty and racial or religious tensions and overwhelming governments of already fragile states. The resultant effect on U.S. national security is threefold. First, regional instability and failed or failing states lend themselves to an environment that radical extremists can then influence to advance their causes, as has been seen in Afghanistan. Second, U.S. national security relies upon unfettered access to strategic resources such as oil, and conflict in nations holding these resources may be perilous to the U.S. economy. Finally, the United States will likely continue to be the preeminent first responder to humanitarian disasters worldwide. As the global temperature continues to rise and the effects of climate change multiply, the U.S. military, in particular, may find itself overextended providing humanitarian relief in multiple settings.

This paper recommends improvements to a whole of U.S. government approach and enhanced partner nation engagement to successfully tackle the world-wide consequences of climate change.

THE CONSEQUENTIAL CHALLENGES OF CLIMATE CHANGE

“The danger from climate change is real, urgent, and severe”, states President Barack Obama in his 2010 National Security Strategy (NSS).¹ Drought, sea level rise, flooding and increased extreme weather events associated with climate change may lead to competition over scarce resources of fresh water, food and habitable land. The effects of climate change are already being seen in the Arctic where the Polar Cap is melting as temperatures increase at twice the rate seen elsewhere. Climate change acts as a “threat multiplier”, exacerbating existing problems such as poverty and racial or religious tensions and overwhelms the governments of already fragile, developing countries.² Situations may become so dire that mass migrations away from an affected area occur, thereby worsening social, ethnic and religious tensions to the point of conflict. A government incapable of providing services to its people rapidly loses legitimacy, creating a power vacuum that may, unfortunately, be filled by radical extremists looking to take advantage of the situation.

Climate change has a threefold effect on the national security of the United States. First, regional instability and failed or failing states lend themselves to an environment that radical extremists can then influence to advance their causes as has been seen in Afghanistan. Climate change has already been shown to affect regional stability as evidenced by the situations in Darfur and Chad. In Darfur, scarcities in water and fertile land have been shown to contribute to internal violence and conflict.³ Furthermore, conflict in Darfur has forced over 285,000 refugees into neighboring Chad, where water and other natural resources are already limited.⁴ Second, U.S. national security relies upon unfettered access to strategic resources such as oil. As an

example, Nigeria is consistently one of the top five oil exporters to the United States, yet is subject to the same regional perils of climate change as Darfur and Chad. Any type of destabilizing event there, to include repercussions from the effects of climate change, could limit access to strategic resources and prove perilous to the U.S. economy. Finally, the United States has been and will likely continue to be the preeminent first responder to humanitarian disasters worldwide. As the average global temperature continues to rise, multiplying the effects of climate change, and as the number of extreme weather events increases, the U.S. military, in particular, may find itself overextended in providing humanitarian relief in multiple settings.

The consensus within the scientific community is that the Earth's climate is changing and that the cause for the changes is anthropogenic.⁵ This paper acknowledges that skepticism exists outside the scientific community, yet it is beyond this paper's scope to debate causation or to provide recommendations for mitigation of anthropogenic causes of climate change. Rather, the focus will be on exploring the observed effects of climate change, citing examples of past and present challenges, and then providing a projection of future challenges likely to affect U.S. national security. Broad ranging recommendations for a whole of government and international approach to combating climate change will be provided at the conclusion of the paper.

Background

So what, scientifically, is climate change doing to the world? In 2007, the Intergovernmental Panel on Climate Change (IPCC) released a 3,000 page report that indicated climate change is an "unequivocal reality", and gave several examples of evidence to support that thesis.⁶ Among other challenges, the report cited rising average global temperatures, rising sea levels and an increasing number of abnormal

precipitation events. As measured by multiple methods, the global annual average temperature rose 0.13°C per decade between 1955 and 2005, effectively doubling the rate experienced the five decades prior whereas the eleven years between 1995 and 2006 rank among the top twelve warmest years since thermometer readings were first recorded in 1850.⁷ Scientists have over ninety percent confidence that average Northern Hemisphere temperatures during the second half of the 20th century were higher than during any other 50-year period in the last 500 years, and almost seventy percent certainty the temperatures were the highest in at least the past 1300 years.⁸

According to the IPCC, the cause of these temperature increases is a dramatic rise in carbon dioxide (CO₂) levels in the atmosphere since the Industrial Revolution to a level not seen in over 650,000 years.⁹ Furthermore, CO₂ levels continue to at an exponential rate as depicted in the chart below. CO₂ lingers in the atmosphere, absorbs infrared radiation from the Earth and reradiates this thermal radiation back to the Earth having a net warming effect. A certain amount of atmospheric heating is necessary to sustain human life, but an overabundance of carbon dioxide will cause excessive warming – an effect scientists are seeing now.

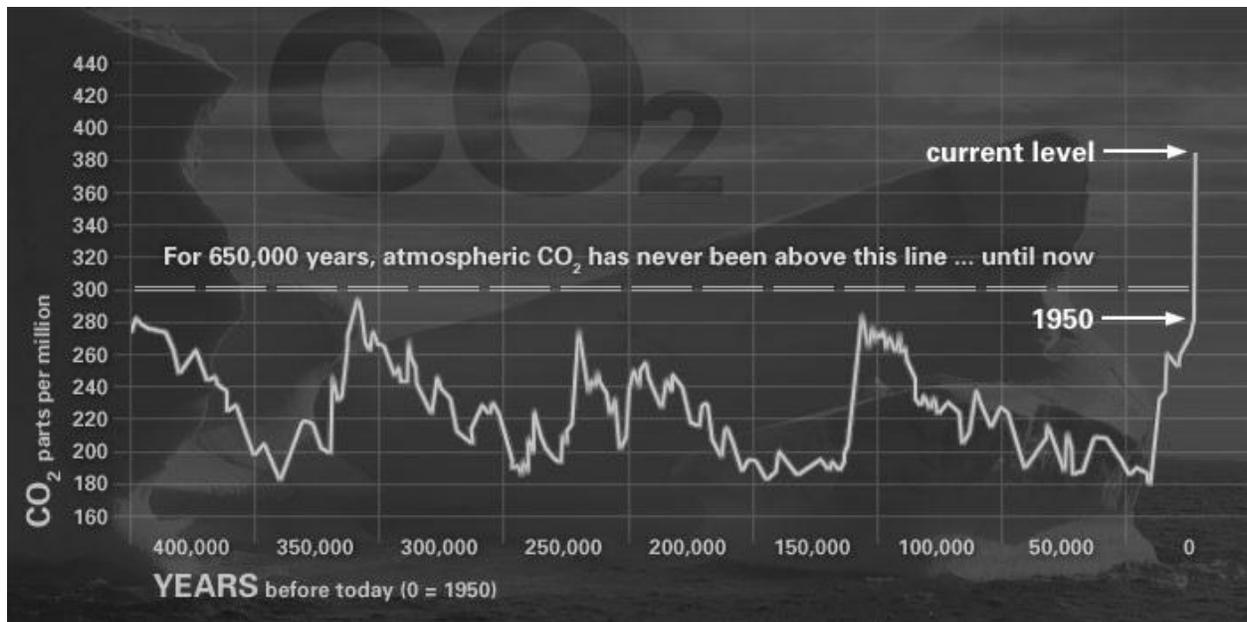


Figure 1: CO₂ Level Increase over Time¹⁰

One such effect of this warming is a rise in the global sea level. Since 1993, the global sea level rose 3mm per year - nearly doubling the previous rate of 1.7mm per year experienced during most of the 20th century. The rise in sea level has varied drastically around the globe, however, as sea levels along the U.S. Mid-Atlantic and Gulf Coasts rose 5-6 inches more than the global average due to subsiding of coastal lands.¹¹

Temperature and precipitation changes vary across the planet, with some changes in ecosystems occurring at a vastly larger rate and magnitude than scientists previously anticipated. For example, the temperatures in the Arctic are rising at almost double the overall global rate, whereas in general, temperatures are rising faster over land masses than over open oceans.¹² Over the last hundred years, land masses north of 30 degrees latitude have experienced more precipitation while the tropics have experienced less since the 1970s.¹³ Other evidence of climate change is demonstrated

in the thawing of the northern latitude permafrost and an increased frequency and intensity of heat waves and droughts.¹⁴

The IPCC projects global temperatures will rise by approximately 0.5° C in the next twenty years and 1.8° C to 4.0° C by the end of the century.¹⁵ These projections are based on a range of greenhouse gas emission scenarios, but noteworthy is the assertion by the IPCC that even if emissions were capped at 2000 levels, a further warming of 0.1°C would still occur.¹⁶ To put these temperature changes in perspective, consider the statement by the Director of the White House Office of Science and Technology Policy, Dr. John Holdren, that the “difference between an ice age and an interglacial period is only about 5° C”.¹⁷

Regarding global average sea level rise, conservative IPCC projections indicate an increase of up to 3 inches over the next two decades and 7 inches to 2 feet by the end of the century.¹⁸ RADM David Titley, the current Oceanographer and Navigator of the Navy, has called these projections “gross underestimate(s)” and asserts that sea level rise by the end of the century will more likely be in the range of 3-6 feet.¹⁹ Even the IPCC report itself acknowledges the conservative nature of the estimates as they are based on observed ice flow rates from the Greenland and Antarctic ice sheets between 1993 and 2003.²⁰ More recent observations suggest warming could amplify the vulnerability of these ice sheets thereby drastically increasing projected sea rise levels.²¹

While a vast majority of the IPCC report was considered valid and well documented, two items in particular were refuted, and the integrity of the report was initially tarnished. Specifically, the IPCC “findings” on the melting of the Himalayan

glaciers, indicated a very high likelihood that the glaciers would disappear by 2035 or perhaps sooner if the Earth continued to warm at the current rate.²² This claim was heavily scrutinized and was found to be based on a speculative 1999 news article, not actual research. Additionally, leaked e-mails between scholars at the University of East Anglia (UEA) in eastern England were interpreted as showing evidence of data manipulation.²³

Subsequent independent inquiries and peer reviews of the IPCC report by organizations such as the InterAcademy Council (IAC), a multinational organization of science academies, showed no evidence of scientific malpractice.²⁴ The science was shown to be sound, with problems based primarily on procedural failures in publishing or editing. Ironically, the scrutiny imposed upon the IPCC 2007 report had the net effect of strengthening, not weakening, the scientific community's confidence in its conclusions.²⁵

The report perhaps most relevant to a discussion of climate change, national security and the military is the 2007 Center for Naval Analyses (CNA) Corporation report entitled "National Security and the Threat of Climate Change".²⁶ The report was generated by CNA's Military Advisory Board (MAB), composed of twelve retired admirals and generals who studied how climate change may affect U.S. national security over the next 30-40 years. A majority of these officers started the study as skeptics, yet were ultimately convinced of the reality of climate change when presented with the overwhelming scientific evidence. In particular, the MAB was tasked with addressing the following: conditions climate changes are likely to produce around the world that may be security risks to the United States, ways in which those conditions

may affect America's national security interests and finally, and actions the nation should take to address the national security consequences of climate change.²⁷ The MAB found predicted effects of climate change to be in-line with those of the IPCC report, and asserted that conditions such as extreme weather events, drought, flooding and sea level rise would present a "serious" threat to national security.²⁸ Additionally, the report highlighted a key consequence of these conditions, namely that climate change acts as a "threat multiplier" for instability, worsening already poor living standards, increasing societal demands on a weak governments with insufficient capacities, thereby creating widespread political instability and increasing the chances of failed states.²⁹

The CNA panel's first recommendation was for national security and national defense strategies to fully integrate national security consequences of climate change.³⁰ An amendment to U.S. Code, Title 10, addressed this recommendation and implemented a requirement for national strategies to address the problem of climate change.³¹ Accordingly, President Obama's 2010 National Security Strategy (NSS) addresses climate change as a real danger and highlights U.S. confrontation of climate change as "based upon clear guidance from the science" and "in cooperation with all nations."³² Additionally, the NSS gives some detail on carbon emission cuts for the near and long term, while ensuring an international effort has the necessary financing so that developing countries can successfully adapt to climate change while mitigating its impacts.³³ The current National Defense Strategy, not updated since 2008, briefly mentions climate change as one of several physical pressures to be confronted over the next twenty years, and speaks to the need to "tackle climate change" yet does not

provide much detail as to how that might be accomplished.³⁴ The 2010 Quadrennial Defense Review contains perhaps the most detailed acknowledgment of climate change, stating that “climate change and energy will play significant roles in the future security environment” and acknowledging climate change as a trend which may “spark or exacerbate future conflicts.”³⁵ The recently released 2010 National Military Strategy (NMS) is, unfortunately, severely lacking in language regarding climate change.³⁶ While not specifically required by the Title 10 amendment, a more robust NMS would allow military planners to more proactively and accurately plan for future contingencies related to climate change based on higher guidance.

In June 2008, Dr. Thomas Fingar, as Chairman of the National Intelligence Council, testified to the House Permanent Select Committee on Intelligence and the House Select Committee on Energy Independence and Global Warming.³⁷ In his testimony, Dr. Fingar gave a National Intelligence Assessment (NIA) on the National Security Implications of Global Climate Change to 2030. The NIA study leveraged outside climate research, working with modelers and experts from the U.S. Climate Change Science Program, the Department of Energy national laboratories, the National Oceanic and Atmospheric Agency (NOAA), the Joint Global Change Research Institute and the Naval Post Graduate School, among others.³⁸ Using the United Nations IPCC Fourth Assessment Report as their primary source for climate science, the study group focused on the implications of climate change on U.S. national security and gleaned several key observations. Specifically noted were “wide-ranging implications for U.S. national security interests” over the next 20 years. Predictions indicate the U.S. will be less affected directly by climate change, but rather the most significant impact on U.S.

national security will result from climate induced effects on other countries. Assessing that climate change alone is unlikely to trigger state failures, the NIA study did ascertain that the impacts of climate change will exacerbate existing problems such as poverty and ineffectual leadership, likely leading to conflicts over scarce water resources and environmental migration.³⁹

The U.S. Navy has led the way for the military in addressing climate change. On May 15, 2009 the Chief of Naval Operations directed the establishment of Task Force Climate Change (TFCC) and the development of an Arctic roadmap for the Navy. Since that time, the TFCC has published the Arctic Roadmap (dated November 10, 2009) and the Navy Climate Change Roadmap (dated April 2010).⁴⁰ Additionally, in 2010 the U.S. Navy conducted its first gaming exercise with a focus on climate-induced challenges. “Irregular Challenges 2010” brought together a diverse group of interagency experts to include military officers, climate scientists, health practitioners and water experts, all with the goal of exploring challenges and consequences of climate change, among other issues.⁴¹ Climate-induced disasters were fed into each of the gaming scenarios and ultimately participants found climate change did in fact contribute to regional and even global instability.⁴²

With the measurable effects of climate change and projected future climate changes as a background for analysis, this paper will now transition to an examination of climate change in the context of U.S. national security. This will be accomplished by focusing on four particular challenges of climate change. The challenges to be studied are increased drought, desertification and water scarcity; extreme weather events; rising sea levels; and the melting Arctic polar cap.

Challenge – Drought, Desertification and Water Scarcity

Darfur is recognized by most as being the “First Modern Climate-Change Conflict”.⁴³ Sporadic conflicts began there in the 1980s over access to water and grazing lands, with violent fighting beginning in earnest in February 2003.⁴⁴ By 2007, over two million residents had been displaced to Chad, with the number of killed or wounded estimated to be between 200,000 and half a million.⁴⁵ Assertions that this conflict began as a result of climate change have been made by Vice President Al Gore, UK Special Representative for Climate Change to the UN, Mr. John Ashton and UN Secretary-General Ban Ki-moon who stated publicly that the “Darfur conflict began as an ecological crisis, arising at least in part from climate change.”⁴⁶ Drought in the northern part of Sudan drove Arab nomads southwards into a predominately agricultural area, igniting not only tribal, but also ethnic and religious tensions.

Drought has also been blamed as the root cause for the conflict in Somalia. Former Army Chief of Staff, General (Ret) Gordon R. Sullivan is on record as stating the drought in Somalia caused famine, which caused Non-Governmental Organizations (NGOs) to arrive in an effort to provide food assistance. Local warlords started controlling the food on the black market, while letting the other side starve, which caused migration to nearby countries, ultimately destabilizing the region.⁴⁷

An August 2009 National Intelligence Council Special Report on the Impact of Climate Change on North Africa through 2030 indicates that surface temperatures in North Africa will increase by up to two degrees Celsius by 2050, with precipitation decreasing by 10-30% across much of the desert areas of the region and larger precipitation decreases of up to 200% along the northern Africa coast.⁴⁸ Couple this with the projected population increase in Africa from 906 million to 1.9 billion by 2050,

and the situation could very well be dire.⁴⁹ Migrations into Europe from Africa are ongoing and predicted to increase, creating significant challenges for our close European allies.

In Nigeria, the fourth largest exporter of oil to the United States, conflict between Nigerian gangs shut down nearly a quarter of the OPEC member's oil output in 2006.⁵⁰ The combination of increasing temperatures, decreasing available land for agriculture, increasing unemployment with a growing youth bulge compounded by existing social tensions and it is easy to see the "threat multiplier" effect climate change may have on this region. Particularly alarming is the likelihood of interference to U.S. access to strategic resources – in this case, Nigerian oil.⁵¹

Stability in the Middle East, of vital importance to U.S. national security, is being threatened by consequences of climate change and water-related issues. Already, water systems in the Middle East are incredibly stressed. Four consecutive years of drought in the Fertile Crescent area, which includes portions of Syria and Iraq, have created security concerns for national governments who have grown more dependent upon other countries for food and water.⁵² In Syria, this drought has pushed two to three million people into extreme poverty, with an estimated 50,000 families migrating from rural to urban areas in 2010.⁵³ In Iraq, more than 70% of the underground aqueducts have dried up and been abandoned.⁵⁴ Challenges such as these can destabilize the moderate Muslim population in the Middle East, upon whom the United States depends for regional stability and access to strategic resources.

Another challenge to regional stability exists in the tenuous situation between India and Pakistan, two nuclear powers and eternal rivals, who have, until recently,

peacefully shared the waters of the Indus River since signing a treaty in 1960.⁵⁵ A feud over water rights will likely upset prospective peace talks and produce yet another level of volatility. As evidence, Lashkar-e-Taiba, the belligerent group behind the 2008 bombings in Mumbai, has already begun to use the water dispute as an excuse for more anti-India rhetoric.⁵⁶ Here exists a direct intersection of U.S. national security with a challenge of climate change. It is extremely likely that future extremists will directly blame the United States and other western countries, as mass producers of greenhouse gases, for the climate change effects being felt in developing countries - just as Usama bin Laden did in a January 2010 tape.⁵⁷ Misaligned blame such as this will fan the fires of radical extremism and may make the United States and its allies an even larger target for terrorism.

Challenge – Extreme Weather Events

2010 was a devastating year due in part to extreme weather events world-wide. Floods in Pakistan killed more than 1,600 people and left two million homeless, a heat wave in Russia killed as many as 15,000 or more while the grain harvest was reduced by at least a third due to drought, and nearly 1,500 people died in landslides due to months of torrential rain in China.⁵⁸ While scientists are reticent to directly link global warming with these weather phenomena, one study by the U.N. World Meteorological Organization concluded that global warming had “doubled the chances” of heat waves such as experienced in Russia.⁵⁹ Furthermore, scientists from the University of Reading and the Royal Netherlands Meteorological Institute believe the extreme weather events are caused by the same disruption to atmospheric circulation.⁶⁰ While no single event could be directly attributed to climate change, the exhibited pattern of increased extreme weather fits the scientific expectation of effects due to climate change.⁶¹

The IPCC 4th assessment asserts extreme weather events will be more common in the coming years due to climate change. Accompanying that assertion is an assumption that the U.S. military will be called upon for more humanitarian relief missions.⁶² Dr. Joshua Busby asserted at the 2007 Strategic Studies Institute colloquium on Global Climate Change that extreme weather events are a more immediate, serious and direct threat to the U.S. homeland than rising sea levels or drought.⁶³

The recent earthquake in Haiti, while not obviously caused by climate change, is illustrative of the types of challenges associated with a developing country's response to natural disaster. The United States deployed nearly 15,000 troops to the area and spent nearly \$380 million between Department of Defense and USAID expenditures. Additionally, over 1,300 people died from an outbreak of cholera, with over 57,000 sickened by the epidemic, the situation compounded by Haiti's weak health and sanitation systems.⁶⁴

Contrastingly, Chile's stronger 8.8 magnitude earthquake just a few weeks later was absorbed by the Chilean population without a requirement for a U.S. military response. The delta between the U.S. responses for disaster relief required in Chile vs. Haiti is instructive in highlighting the importance of proactive preparation, sound policy and solid governance. Hurricane Katrina proved that even a superpower such as the United States may not be able to adequately handle a natural disaster of significant scope. More likely problematic is an inadequate response to a natural disaster by a developing country's government that may be less prepared, less resourced and less credible than the U.S. government.

Certainly world opinion can have an effect on U.S. national security by fueling anti-Americanism and mobilizing would-be terrorists. A second or third order effect of U.S. participation in humanitarian assistance and disaster relief missions is the positive influence it has on the public opinions of those helped. Polls conducted by the Pew Research Center after the U.S. military's response to the 2005 tsunami in Indonesia found that the percentage of Indonesians with a favorable opinion of the United States increased from 15% in 2003 to 38% in 2005.⁶⁵ A Terror-Free Tomorrow poll showed an increased in favorable opinion to 44% just a year later.⁶⁶ Similarly, favorability among local Pakistani people following the U.S. response to the 2005 earthquake doubled from 23% pre-disaster to 46% post-disaster. Winning hearts and minds is never easy, but the successful response of the U.S. military in situations such as these has been shown to be noteworthy towards decreasing the leverage of those who would wish the United States harm, while at the same time opening the doors for greater cooperation.

Challenge – Rising Sea Levels

The costly combination of increased extreme weather events and rising sea levels will be particularly detrimental to coastal nations. In addition to reduced inhabitable land, decreased availability of freshwater for drinking and irrigation will cause obvious problems for the affected population and in crop production for food. Mass migrations to more prosperous areas are likely, and regardless of causation, will tend to swamp the social infrastructure of the receiving government and exceed the local capacity for sustainment.

As sea levels rise, island and coastal nations such as the Muslim nation of the Maldives, have been forced to make some difficult choices. As the Maldives is only 2.4 meters above sea level, the nation has begun saving a portion of its national income to

purchase land for its nation in Australia.⁶⁷ Maldives has the benefit of being one of the richer island nations and can afford to be proactive and purchase a new homeland. Other nations will not be so lucky and environmental migrations for their populations will likely be more difficult and possibly deadly.

Bangladesh and India were recently listed by Maplecroft, a British global risk analysis company, as the nations most vulnerable to climate change.⁶⁸ Bangladesh, for example, is projected to be affected by the melting of the Himalayan glaciers, rising sea levels in the Bay of Bengal, and increased cyclonic activity.⁶⁹ The resulting migration of millions from rural to urban environments, including cross-border migrations into India, is very likely to cause social turmoil and ethnic tension. Furthermore, efforts to address climate change in this particular region are complicated by strained political relations between the governments of India, Pakistan, Nepal and Bangladesh.

While conflict in South Asia may pose an indirect threat to the national security of the United States, rising sea levels do also provide direct threats to the infrastructure of the United States. The Strategic Environmental Research and Development Program (SERDP) is pursuing a number of areas of investigation to help support the Department of Defense in addressing vulnerabilities and impacts of rising sea levels on multiple locations. SERDP determined that over thirty military installations in the United States will be affected in the coming years by rising sea levels.⁷⁰ Additionally, coastal and island installations outside the continental United States will likely be affected as well. Specifically, flooding and the possible loss of Diego Garcia or Guam, strategic logistical bases, would be detrimental to operations in the Middle East and the Pacific Command Area of Responsibility.

Challenge – Melting Arctic

Perhaps the most visual example of climate change and the wide ranging implications is the melting of the Arctic Polar Ice Cap. According to the IPCC 4th Assessment, satellite data shows the annual average Arctic sea ice coverage has shrunk by 2.7% per decade and up to 7.4% per decade during the summer months since measurement by satellites began in 1979.⁷¹ In 2007 Arctic sea ice reached its lowest levels of coverage in nearly thirty years, allowing for the complete opening of the Northwest Passage for the first time in recorded history.⁷² Scientists agree that an ice-free Arctic Ocean during the summer months could happen as early as 2030.⁷³ Surface temperatures in the Arctic have warmed almost two times as quickly as the global rate resulting in a rapid reduction in sea ice.⁷⁴ Dark arctic waters absorb more of the sun's energy than reflective white sea ice, and therefore, the water surface temperature is increased. The melting has decreased the surface area of reflective white ice, resulting in more dark arctic waters and creating a feedback loop that is self-perpetuating.⁷⁵

Implications of an open Northwest Passage and increased access to the Arctic region offer opportunity and present interesting challenges. An obvious opportunity is the opening of a shorter, accessible trade and transit route between Asia and Europe. However, with this opportunity abide concerns.

The U.S. Geological Society claims that nearly a quarter of all undiscovered oil resources lay below the Arctic.⁷⁶ Arctic nations such as Russia, Canada and the United States are already making claims to these resources, as is the non-Arctic nation China.⁷⁷ Accession to the United Nations Law of the Seas Convention (UNCLOS) would allow the United States, and other signatories, the legal right to claims on an extended economic exclusion zone based upon certification of an extended continental

shelf. For the United States, this economic region would be similar in size to California, and would provide an enormous economic opportunity and access to significant strategic resources for the United States.

The Arctic is a largely ungoverned space and dispute exists on the international stage regarding ownership and responsibility for the region. That is to say, Canada regards much of the area as within its territorial waters while other nations, the United States included, regard the area as international waters. Additional challenges in the Arctic include the risks of terrorist activity in the vast ungoverned space, as well as the environmental disaster associated with an oil spill or the complications of a major search and rescue operation in the Arctic.

Conclusions and Recommendations

Climate change presents a variety of high probability/high consequence scenarios that are already affecting and will increasingly affect US national security. General Paul Kern, former Commanding General of the U.S. Army Materiel Command, is on record as stating that the threat of climate change "...demands a military problem solving-like approach."⁷⁸ The U.S. military and its senior leadership would be negligent to ignore, yet prudent to plan for these scenarios now. While much uncertainty still exists as to the specifics of climate change – how rapidly it will happen, where it will strike, how devastating the effects will be - military leaders "cannot wait for certainty," and must plan based on current predictions.⁷⁹

Six broad categories of recommendations, modeled closely around the Navy's Climate Change Roadmap framework, but modified to reflect a whole of government and international approach, are highlighted below to include: assessment and prediction; strategy, policy, plans; operations, training and partner engagement;

investments; communications and outreach; and adaptive capability and capacity.⁸⁰ All recommendations are intended to have the desired effect of improving U.S. and partner capabilities and capacities in order to decrease the likelihood of regional instability, allow unfettered access to strategic resources and proactively prepare for response to climate-induced disasters.

Assessment and Prediction

Recommendation 1: U.S. government entities must have current environmental assessments in order to develop a clear understanding of the effects of climate change on the environment and to plan effectively and efficiently. Toward that end, the Navy's Arctic Roadmap recommends the establishment of a permanent interagency partnership to synchronize environmental assessment and prediction efforts in the Arctic environment.⁸¹ This paper recommends formalization of that partnership and expansion of its tasking to provide worldwide impact assessments.

Recommendation 2: Leverage use of the State Department's Interagency Conflict Assessment Framework (ICAF) process to provide an on the ground assessment of where climate change stressors may already be affecting societies. This process involves face to face interviews with members of a given society and from that conflict drivers and opportunities for engagement can be derived. This assessment would be useful to assist in properly resourcing adaptation efforts and improving local and regional governance where needed.

Strategy, Policy, Plans

A holistic understanding of climate change based on current and future environmental assessments above would allow for more robust and accurate policy

development and planning. Initial policy recommendations and planning cannot wait for certainty and must be started now.

Recommendation 3: Recommend the U.S. Army, U.S. Air Force and U.S. Coast Guard follow Navy's lead in developing Climate Change Roadmaps for their respective services.

Recommendation 4: Recommend military plans for combating climate change be synchronized at a centralized organization – namely, the Joint Staff J5 directorate. The J5 staff is already respected amongst Combatant Commander and Service staffs, and carries the functional responsibility for policy and plans.

Recommendation 5: Recommend organization and stand-up of a Joint Interagency Coordination Group for Climate Change (JIACG-CC) at each Combatant Command. Conceivably each JIACG-CC would include interagency partners, military members and regional climate change specialists working towards the common goal of developing sound policies, strategies and plans for a specific region.

Recommendation 6: Recommend the Chairman of the Joint Chiefs of Staff include climate change language and direction for strategic and operational planners in future versions of the National Military Strategy.

Operations, Training and Partner Nation Engagement

Recommendation 7: Include climate change science and strategic considerations in core curriculum of all Service Academies, Reserve Officer Training Corps (ROTC) units and Senior Service Schools.

Recommendation 8: Recommend all U.S. military services incorporate climate-induced disasters and projected climate change impacts into wargames and table-top exercises.

Recommendation 9: Recommend enhanced military to military engagements in order to help professionalize partner nation military forces while at the same time creating legitimacy, capacity and good governance for military and government. The benefits of prior U.S. - Egyptian military engagements were evident during the Egyptian crisis in February 2011.

Recommendation 10: Recommend broadening of the Navy's Africa Partnership Station model to provide education on climate change and adaptation techniques. Partnerships must be fostered and information shared in order to increase the capacity of response and resilience to climate change in nations around the globe. Combating climate change will require a multi-lateral, inter-agency, "all hands on deck" effort.

Furthermore, recommend the Partnership Station model and methodology be incorporated into Southern Command, European Command and Pacific Command Theater Security Cooperation Plans. While these commands differ slightly in capacity, capability and focus from the Africa Command, the concepts of education and training of partner nations from this platform, particularly in the climate change realm, would be extremely beneficial.

Investments

Recommendation 11: Recommend U.S. Army and U.S. Air Force initiate Capability Based Assessments focused on projected force structure and capabilities required to effectively accomplish future missions under a changing climate, and impacts to installations and infrastructure due to sea level rise and extreme weather events.

Recommendation 12: Recommend Navy and Coast Guard formally initiate resource planning for ice-strengthened vessels and icebreaker vessel capability.

Communications and Outreach

Recommendation 13: The scientific reality of climate change, its causes and its effects, must be strategically communicated to as wide an audience as possible.

Recommendation 14: Recommend outreach to environmental businesses, corporations and Non-Governmental Organizations to leverage work on adaptation techniques and enhance cooperation.

Adaptive Capability and Capacity

Recommendation 15: The U.S. military will be unable to act unilaterally in the future when faced with an overwhelming number of humanitarian situations as a result of climate change, while possibly dealing with the effects of climate change on the American home front. The United States is likely to, and should, continue to respond as able to humanitarian disasters around the world where the United States has national interests, not only because it is the humane thing to do, but because of the marked difference it makes in international opinion.

In conclusion, climate change is real, it is happening right now and has already affected or exacerbated situations around the world. Scientists agree that the conditions of climate change are only going to worsen in the coming years. Therefore, it is a vital national interest for the U.S. government, and its military, to expend resources now to better model the projected effects of climate change. Furthermore, the United States must accept its role as a world leader and properly plan for worldwide operations based on these projections, while increasing the capacity and legitimacy of international partners.

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