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REPORT IN BRIEF

National Security Implications of Climate Change for U.S. Naval Forces

Naval Studies Board
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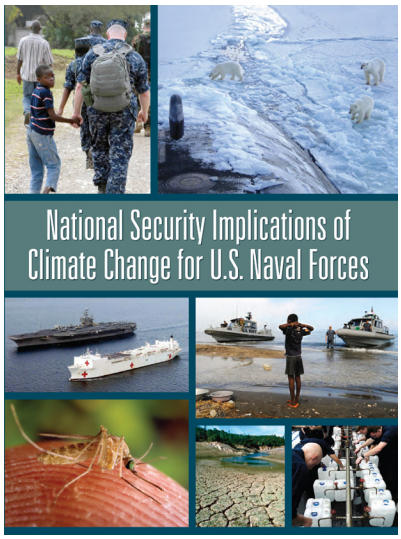
Recent shifts in the Earth's climate have led to observed and measured increases in surface and ocean temperatures, precipitation and drought extremes, and a rising sea level -- the result of melting mountain glaciers and arctic sea ice. Though the long-term impacts of these trends remain uncertain, it is increasingly obvious that their continuation, even at a moderate level, will present new security challenges for nations around the globe, and the United States in particular. Indeed, many changes are already underway which call for action by the U.S. Navy, Marine Corps, and Coast Guard. Rising concern about the preparedness of the United States' seafaring forces for the predicted environmental changes and their effects formed the impetus for this report, which recommends actions in six identified areas of need. The findings and recommendations contained within the report are based on Intergovernmental Panel on Climate Change (IPCC) scenarios and other peer-reviewed assessments.

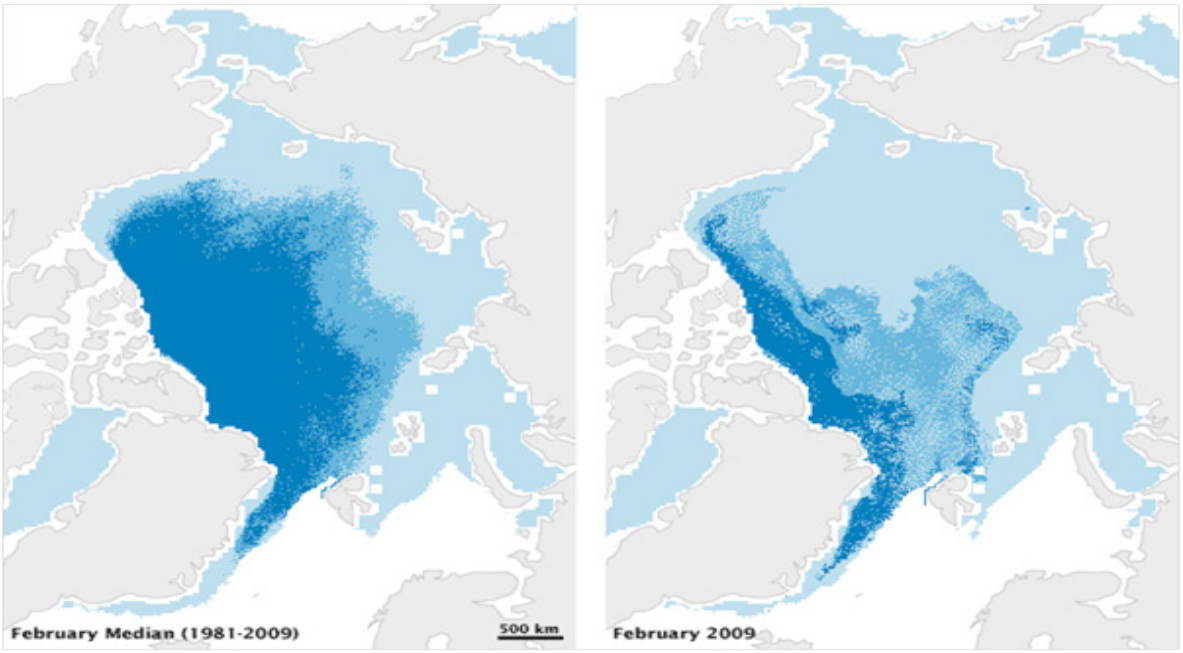


A Changing Arctic

The biggest near-term impacts of climate change affect the Arctic, which is experiencing significant reductions in sea ice cover that have already allowed for an increase in activities such as resource exploration and tourism, and will likely result in the ability to engage in ice-free cross-Arctic transit by late summer by 2030. However, the Navy's currently limited surface capability and operational infrastructure in the Arctic will prevent it from addressing growing regional security demands. To cope with a projected increase in conflicts relevant to U.S. national security in the Arctic, naval leadership should establish a strong and consistently funded effort to increase Arctic operations and share lessons, and initiate a cold-weather training program. A review should also be performed of the United States' responsibilities for the Arctic, and of current and projected ice-breaker ship capabilities.

To operate effectively in the evolving environment of the Arctic, the United States should also ratify the United Nations Law of the Sea, which would facilitate negotiations with maritime partners in the region and improve mission effectiveness.

Climate measurements indicate that Arctic sea ice is shrinking and thinning. These Arctic maps show the median age of February sea ice from 1981-2009 (left) and February 2009 (right). As of February 2009, ice older than 2 years accounted for less than 10 percent of the ice cover (dark blue represents multiyear ice). Source: National Snow and Ice Data Center, University of Colorado, Boulder.



Humanitarian Aid and Disaster Relief

Numerous peer-reviewed reports and scientific models anticipate an increase in global disasters due to the effects of climate change, including more frequent draughts, storms, and other events with negative consequences for food and water supplies which have the potential to be particularly devastating to an increased global population. These events are likely to amplify stressors in already vulnerable regions; leading to an increased demand for Naval forces for antipiracy and counterterrorism missions in addition to and increasing requests for U.S. Navy hospital ships to provide humanitarian aid and disaster relief missions. The U.S. Naval forces should analyze strategies for retaining the medical capability of current hospital ships into the future, including the construction of new platforms or modifications to current surface platforms or amphibious ships or construction of next generation Navy fleet hospitals, or leasing commercial ships and crews.

Threats to Coastal Installations

Satellite measurements reveal a rise in sea levels of about 3 mm per year globally, with significant regional variations. The interaction of these changes with tidal amplitudes and weather patterns has increased the occurrence of storm surges, which have the potential to cause billions of dollars in damage to naval installations. In response, Naval leadership should work in conjunction with the other armed services and the Office of the Secretary of Defense to ensure that a coordinated analysis is undertaken to address naval installation vulnerability to rising sea levels, higher storm surges, and other consequences of climate change. It should look beyond average sea level rise and take into consideration local conditions of its facilities when planning adaptive actions.

Maritime Partnerships

Climate change effects are global, and thus will impact the security of all regions of the world, resulting in an overall greater need for assistance in dealing with humanitarian aid, disaster relief, and mass migration. Given the limited resources of the United States, more robust partnerships between allies, private organizations, and non-traditional partners (such as Russia and China) will be required to deal with these climate change-related issues. These partnerships should extend into the arctic.

Climate Change and Technology

Though changes in climate are unlikely to directly affect the technologies that the U.S. naval forces rely on, there is a high likelihood that a warming climate will increase the level of operations in some regions, including the Arctic, leading to increased burdens on navigation systems, communication systems, and nautical charting systems. Naval leadership should therefore increase research and development efforts to address the shortfalls of these systems, and should make extending coverage of these systems to include the Arctic region a priority.

It is also projected that regional changes due to climate change may drive the U.S. to conduct antisubmarine warfare operations in the Arctic. In light of this prediction, the Navy should increase its submarine presence in the Arctic for training purposes, develop relevant data infrastructure, and conduct multiplatform training exercises.

Measured Climate Change Effects with Impact for U.S. Naval Forces

Climate Change Effect	Observed Impact
Higher Temperature Extremes	Higher maximum-temperatures, increased heat index and heat waves over land areas, harsher operating conditions, negative impacts for fresh water supply negative impact agricultural production, changing disease vectors, (tropical diseases migrating north)
More Vigorous Hydrological Cycle	More energy in hydrological cycle, extreme rainfall events, more frequent high-intensity storms in some areas, prolonged regional droughts, flooding potential humanitarian assistance and disaster relief impacts
Melting of Ice	Reduced glacier mass, reduced ice sheets, reduced multiyear sea ice in the Arctic, thawing permafrost, changing ocean salinity
Sea-Level Rise	Higher storm surges, salinization of fresh water, risks to coastal infrastructure, risks to high population coastal deltas

Investing in Climate Change Preparedness

Effective naval operations and planning rely in substantial part on detailed information about the environment. Currently, this information is collected by public government systems and classified Department of Defense observation systems. Past coordination between these open and closed systems has enabled advances in climate change research. To improve its own forecasting efforts and better prepare for future environmental changes, the Navy should develop and support a philosophy for providing access to previously classified information that can be used by the climate change community. In addition, the Navy should consider extending its own research and development capabilities with regard to climate change modeling, especially on regional aspects of sea level rise and sea ice concentration, due to the potential impact on coastal infrastructure and operational needs. In addition, the Navy should become actively engaged in the development of an Arctic Observing System specifically with respect to development and deployment of in situ and remote sensing systems (such as gliders, buoys, and satellites), as well as icebreakers, in support of research.

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