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U.S. MILITARY BASING CONSIDERATIONS DURING A REBALANCE TO ASIA: MAINTAINING CAPABILITIES UNDER CLIMATE CHANGE IMPACTS

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Abstract

The Department of Defense (DoD) bases in the Pacific serve many different roles as they enable major systems, including force projection, training, equipping, Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), supply and other critical missions. Therefore, these bases underpin the United States security commitments to its allies, and are critical for deterrence, reassurance, and ensuring regional stability. Because Pacific basing options include locations on relatively small islands, the uncertainty involving the timing and magnitude of climate change impacts presents challenges for military planners during a rebalance of forces to Asia. Depending on the base location and the impacts realized, capabilities at individual bases, as well as across the region-wide system counted on during the rebalance planning, may erode over time. Current infrastructure may require adaptation investments, and new infrastructure will require resiliency planning decisions under uncertainty. This article describes the nature and extent of the challenge of climate change impacts and military basing in the Pacific, and discusses the need for robust strategies for maintaining long-term capabilities under climate change impacts during the rebalance to Asia.

Introduction

Picture all of the office space in Midtown Manhattan, the largest business district in the country. Nearly the same amount of floor space is used by the Department of Defense (DoD) in buildings outside of the continental United States across locations in the Pacific region^{2,3}. More than 40,000 DoD buildings sit on Pacific installations and sites comprising more than 1,400 square miles, or 21 times the size of Washington, D.C. The DoD's rebalance to Asia sets up a range of long-term choices about how the Department plans for the future^{4,5}, yet it is infrastructure that provides the footing for the objectives of the rebalance. U.S. bases in the Pacific serve many different roles as they enable major systems, including force projection, training, equipping, Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), supply, humanitarian, and other critical missions. These bases are a visible component of the U.S. security commitments to its allies, and are critical for deterrence, reassurance, and ensuring regional stability. Climate change impacts such as increased heat, changes in precipitation, and sea level rise will affect the performance and life cycle costs of DoD's existing and planned infrastructure, which will affect the military capabilities of the Pacific installations. Hence as part of the rebalance, DoD needs to ensure the military capabilities enabled by installations in the Pacific are maintained under a changing climate.

The DoD Infrastructure Footprint

Globally, the DoD real estate portfolio contains nearly 562,000 facilities on 4,600 sites and 513 active installations, with a planned replacement value of nearly \$880 billion⁶. In Fiscal Year 2014, the DoD spent about nearly \$9.7 billion for new facilities under the military construction program⁷ and about \$11.5 billion for sustainment, modernization and restoration of existing facilities around the world⁸. In addition to the costs of constructing and maintaining facilities, the DoD spends about \$4 billion annually on installation energy costs for electricity, natural gas, fuel oil, steam and other services⁹.



Figure 1. Locations of OCONUS DoD Buildings in the Pacific¹⁴

Rebalancing to Asia brings new focus on the posture and assets of the U.S. Pacific Command (USPACOM), one of six geographic United Combatant Commands of the U.S. military. The USPACOM Area of Responsibility (AOR) encompasses half of the earth's area and includes 49 major bases across multiple Pacific nations (excluding those in the United States)¹⁰. Assets at some U.S. locations outside the continental U.S. (OCONUS) are also included in USPACOM, most notably in Alaska, Hawaii and Guam, and nearly 360,000 U.S. military and civilian personnel are assigned to the USPACOM AOR¹¹. The buildings¹² included in DoD's Pacific real estate portfolio are located in Japan, the Republic of Korea, Diego Garcia, Singapore, Australia, Cambodia, Hong Kong, U.S. territories, and U.S. state locations¹³, as illustrated in Figure 1.

The U.S. presence in the Pacific is heavily coastal, with many smaller islands playing critical roles. For example, the low-lying Indian Ocean atoll of Diego Garcia provides a location for one-third of the U.S. Afloat Prepositioning Force. U.S. ships and subs use its wharf, an Air Expeditionary Wing supports tactical and long-range aircraft, and critical communications are routed through the atoll¹⁵. The U.S. island territory of Guam is also an increasingly important military support and logistics hub, and as much as one-fifth of the U.S. submarine force could conceivably be stationed there¹⁶. As part of the rebalance, the DoD will expand its presence in the Southwestern Pacific, and place a broader emphasis on many of the coastal states of the Indian Ocean²¹.

Climate Change Brings New Vulnerabilities for Infrastructure

Planning for climate change resiliency at defense installations has been mentioned in the 2010 and 2014 Quadrennial Defense Reviews^{18 19}. In reality, reducing climate change vulnerabilities across the Department's vast infrastructure assets translates into a multi-decadal effort. The Defense Science Board recommended that the Pentagon assess the climate vulnerability and adaptation capacity of DoD critical facilities and infrastructure; and that guidance be developed to ensure climate resilience in facility design and construction standards²⁰. In response to an Executive Order²¹, the DoD developed a climate change adaptation roadmap²² that identified five climate change impacts that could affect DoD missions: 1) rising temperatures, 2) changes in precipitation patterns, 3) increases in storm frequency and intensity, 4) rising sea levels and associated storm surge, and 5) changes in ocean temperature, circulation, salinity and acidity. The roadmap recommended integrating climate change considerations into existing processes and using a Robust Decision Making approach^{23 24}, which considers options that are successful across a broad range of uncertain futures. Recently, the Pentagon further outlined²⁵ how changes in temperature, droughts, severe weather, sea level rise, and other conditions would affect the Combatant Commands. What has largely been missing is more tactical in nature – defining how infrastructure designs need to change. The DoD's environmental research unit completed a report assessing climate change impacts on coastal military installations²⁶, and found that these installations were designed assuming the impacts of the natural environment are stationary. With a recognition that long-lived infrastructure will experience climatic conditions that look a lot different from those in the past,

this “history-as-future” approach to infrastructure has finally begun to be reexamined within the DoD and the larger engineering community²⁷.

During a rebalance to Asia, there is a wide range of potential climate change impacts that will affect infrastructure across the Pacific AOR over the near- and long-term. A continuing challenge for decision-makers is that there is uncertainty in the location, timing and magnitude of many of these climate impacts. Since most DoD infrastructure is designed to last 30 to 50 years²⁸, it is imperative to evaluate how climate change impacts affect the performance of new and existing infrastructure in the region.

First, we need to understand how the relationship of coastal installations in the Pacific to the sea, and extreme weather, will evolve. Globally, sea level has risen by about 8 inches since the late 1880s²⁹. By 2100, a realistic low-end projection is an additional 1 foot of sea level rise globally, with an upper end projection of 4 feet or higher³⁰. Sea level rise not only threatens infrastructure over the long-term but a rising sea exacerbates the flooding effects of storm surges and high tides³¹. During severe storm events, water that surges onto installations from the sea can damage installation infrastructure or training areas. Risk from sea level rise and storm surge are not limited to low-lying islands and atolls. While portions of Guam are well above sea level, most of the infrastructure is on or near the coasts and remains exposed to sea level rise and storm surge³². Potentially heavier and more frequent precipitation will also affect installation maintenance costs and require additional flood or erosion control measures³³. Military capabilities and readiness are degraded when airstrips, piers, roadways, communication, energy and other infrastructure are unavailable due to flooding or erosion. Losing access to these facilities is potentially equivalent to temporary anti-access to an area. DoD should consider the capability thresholds required in the AOR and design resiliency and redundancy into infrastructure plans to maintain these thresholds. Pacific installations also need to be especially resilient to natural disasters such as tropical cyclones, as they not only need to maintain capabilities after an event, but often serve as a base of operations

Members of the Papua New Guinea Defense Force prepare to embark aboard the Royal Australian Navy landing ship, as a part of the Pacific Partnership 2010, an annual U.S. Pacific Fleet humanitarian and civic assistance endeavors to strengthen regional partnerships. August 2010. **US NAVY/EDDIE HARRISON**



when DoD is supporting humanitarian assistance and disaster relief. The rebalance enables a portfolio-wide look across U.S. assets in the Pacific to evaluate the likelihood of two or more locations being disrupted from the same disaster, as well as the individual installation resilience to loss of capabilities during severe storm events such as tropical cyclones.

Next, DoD needs to design infrastructure for a hotter world. The most notable change is in the Arctic, where higher temperatures are reducing sea ice and also thawing the permafrost that underlies much of the region's buildings, airstrips and roadways³⁴.

Elsewhere in the warmer areas of the Pacific, high-heat days can reduce the availability of roads and runways, reduce airlift capacity, and limit training opportunities³⁵. Higher temperatures will also affect the way installations provide and use both electricity and water. Installations that use water for power or steam generation, either directly or from host-nations, could see reduced capacity of power plants during hot periods, just as power demand from air conditioning spikes. Increasing the number of active-duty and civilian personnel located in the Pacific will also require more freshwater resources for drinking, lavatories, laundry, and other uses. On many Pacific islands, the cascading combination of increased temperatures, droughts, and saltwater intrusion into groundwater due to sea level rise will reduce the amount of freshwater available³⁶. So when a Pacific installation expands, DoD is making a long-term commitment to energy, water and resource use in the area. Scenarios for energy and water availability and potential solutions need to be included among other criteria in making these important decisions.

Thinking About Infrastructure as a Weapons System

The bulk of the DoD's climate adaptation efforts have been on identifying vulnerabilities, which is important and needs to continue. However, without explicit guidelines about the range of impacts to design for, as well as the resources committed for climate-resilient construction, DoD infrastructure will continue to be built for last century's climate. The GAO found that despite DoD's strategic goal of considering how climate change affects infrastructure, installations officials did not propose climate adaptation projects due to the perception that these would not get funded³⁷. Thus short-term infrastructure interests were apparently traded for higher risks and potential increases in life cycle costs.

The DoD has large acquisition programs in place to plan for the procurement and sustainment of major weapons systems such as aircraft, ships and submarines. Similar to these systems, installations also have long service lives, large capital and operating expenses, and provide a range of military capabilities. Therefore it is possible to think of installations as major weapons systems themselves and employ capabilities-based planning to analyze installation infrastructure investments under a changing climate. Introduced in the DoD's *Quadrennial Defense Review* in

2001³⁸, capabilities-based planning develops the assets and abilities needed for success against surprise, deception and asymmetries. Capabilities-based planning has been applied to examples in Global Strike and Ballistic Missile Defense³⁹, installation energy security⁴⁰, and other cases. The core concept, similar to Robust Decision Making, translates well for climate change impacts and infrastructure: planning under uncertainty to maintain DoD capabilities under a wide range of future challenges while working within cost constraints. Approaching the rebalance to Asia from a capabilities-based perspective would ask: What does DoD need from U.S. Pacific installations in the near- and long-term? What infrastructure investments enable those capabilities? How does climate change degrade those capabilities over time? What are DoD thresholds for the tradeoffs between risks and costs? And finally, what adaptation investments can be made that will maintain capabilities in a wide range of future conditions? This process can result in the specific guidance DoD infrastructure planners need to design and budget for resiliency at installations.

The DoD estimates the replacement value of the structures they use in the Pacific to be nearly \$180 billion⁴¹, which is greater than the combined 2014 annual budgets⁴² of the Departments of Commerce, Energy, Homeland Security, State, and Transportation. Given that level of government investment, DoD has recognized that climate resiliency at existing facilities should be integrated at the installation, Service and Departmental levels⁴³. Yet it is important that climate change impacts not be treated as just an environmental challenge, but be recognized as an issue that will define the landscape in which the future unfolds. In the rebalance to Asia, the choice of installation locations and the types of investments at each location enable a set of military capabilities in both the near- and long-term. The implementation of the rebalance provides an opportunity to assess the impacts of climate change on Pacific installations, estimate the corresponding effects on capabilities, and most importantly, take action to keep these capabilities going forward.

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Notes

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