THE CLIMATE AND SECURITY ADVISORY GROUP

BRIEFER

November 16, 2018

The U.S. Department of Defense's Forthcoming Climate Change Vulnerability Report: What to Expect and How Congress Should Use It.

> "Not later than one year after the date of the enactment of this Act, the Secretary of Defense shall submit to the Committees on Armed Services of the Senate and the House of Representatives a report on vulnerabilities to military installations and combatant commander requirements resulting from climate change over the next 20 years."
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> *Fiscal Year 2018 National Defense Authorization Act*
> *Enacted December 12, 2017*

INTRODUCTION

The Climate Security Advisory Group (CSAG), a voluntary, non-partisan group of U.S.-based military, national security, homeland security, intelligence and foreign policy experts from a broad range of institutions, is chaired by the Center for Climate and Security (CCS) in partnership with the George Washington University's Elliott School of International Affairs. For a list of CSAG participants, see: climateandsecurity.org/csagrecommendations2018

In February 2018, the CSAG issued a report entitled "A Responsibility to Prepare," which included a series of recommendations designed to strengthen national and homeland security in the face of a changing climate. Among its recommendations, it supported Congressional direction to assess vulnerabilities to military installations and combatant commander requirements resulting from climate change. In that assessment, Congress directs DoD to identify the ten installations per military service that are most vulnerable to climate change. That report is due on December 12, 2018.

This CSAG Briefer offers context, advice and recommendations to the U.S. Congress and the U.S. Department of Defense regarding this report, and next steps on assessing and preparing for climate change risks to the nation's military.

CONGRESSIONAL CONTEXT

At the beginning of 2017, there was widespread expectation that the new Administration would roll back climate initiatives across the U.S. government. There are certainly several examples of this, with the repeal of executive orders on climate change and the announcement that the United States would withdraw from the Paris Climate Agreement. However, one notable exception was the new Secretary of Defense, who responded to the Senate Armed Services Committee in very strong terms about the threat that climate change posed to national security.

> *"Climate change is impacting stability in areas of the world where our troops are operating today. It is appropriate for the Combatant Commands to incorporate drivers of instability that impact the security environment in their areas into their planning."*
> *"I agree that the effects of a changing climate — such as increased maritime access to the Arctic, rising sea levels, desertification, among others — impact our security situation. I will ensure that the department continues to be prepared to conduct operations today and in the future, and that we are prepared to address the effects of a changing climate on our threat assessments, resources, and readiness."*
>
> Secretary James Mattis
> Response to Senate Armed Services Committee
> March 14, 2017

Secretary Mattis' views were echoed repeatedly by senior defense officials – both civilian and military. They carved out room in the Administration's broadly skeptical climate posture for adaptation to climate change impacts, particularly where they affected our national security.

In Congress, the discussion on climate and security gained traction in both the House and Senate Armed Services Committees, and climate security provisions were debated during development of the Fiscal Year 2018 National Defense Authorization Act.

In the House Armed Services Committee, Congressman James Langevin offered an amendment (Appendix 1) that directly quoted Secretary Mattis and other senior military officials. It cited specific impacts in its findings, such as the fact that a three-foot rise in sea levels would threaten operations at more than 128 military installations, and specifically noting the risk imposed by sea-level rise to a billion-dollar radar facility on Kwajalein Atoll, the increased frequency of wildfires and the damage they have done to military installations, and damage occurring on Arctic installations due to warming.

The Langevin Amendment declared the Sense of Congress that climate change is a direct threat to national security. Specifically, with regard to installations, the language created a legal requirement for the Department of Defense to deliver:

- A list of the ten most vulnerable military installations within each service based on the effects of rising sea tides, increased flooding, drought, desertification, wildfires, thawing permafrost, and any other categories the Secretary determines necessary.

- An overview of mitigations that may be necessary to ensure the continued operational viability and to increase the resiliency of the identified vulnerable military installations and the cost of such mitigations.

While the Amendment passed in Committee, the debate spilled onto the House Floor, with Congressman Scott Perry offering an amendment to strip the language. In a bipartisan 185-234 vote, dozens of Republicans crossed the aisle to reject the Perry Amendment and preserve the climate change requirement. Ultimately, it was retained in the House-Senate conference on the bill and was signed into law by the President on December 22, 2017.

In the Senate, the debate was less contentious. Senator Bill Nelson offered an amendment (Appendix 2) in committee calling for a broad assessment of the threat posed by climate change. The amendment was accepted without objection and was incorporated as part of the Senate Report to accompany the bill. In his amendment, Senator Nelson cited several specific examples of climate change impacts on the defense enterprise – including damage caused by extreme weather, coastal erosion that damaged radar infrastructure, training range closures due to wildfires, flood damage to installations, and damage driven by permafrost thaw to Arctic installations.

The Nelson Amendment directed the Secretary of Defense to submit a comprehensive threat assessment and implementation master plan covering a broad range of climate security topics, with impacts to installations representing only a portion. Key requirements for the assessment include study of:

- Effects and mission impacts of a changing climate, if any, on DOD operations, testing and training ranges, readiness, basing, acquisition, contingency basing, command and control, supply chain, logistics, stockpiles, and the associated costs;
- Plans and procedures to continue missions in the event of loss or damage to critical energy and water infrastructure;
- Adaptation plans and procedures to ensure military investments with taxpayer dollars are constructed to better withstand flooding and extreme weather events;
- Updates to built and natural infrastructure design, changes to military construction standards, Unified Facilities Code, and encroachment procedures;
- Improved modeling techniques and data sources to better predict future erosion, flooding, and other extreme weather events; and
- Opportunities to pursue public-private partnerships under existing authorities with any non-DOD entity in order to mitigate climate-related impacts.

HOW SHOULD DOD RANK VULNERABLE INSTALLATIONS?

Measuring installation vulnerability is neither a simple exercise nor does it leverage a single metric. It will be a complex function of infrastructure vulnerabilities, constraints imposed on operations and readiness impacts, and vulnerabilities of surrounding communities upon which the installation depends. As the Department develops its priorities, these factors will all be tempered by the criticality of the mission that is being threatened.

One analog that captures the complexity is that of the Base Realignment and Closure (BRAC) military value analysis, which involves enormous data calls and hundreds of weighted metrics to arrive at a single score for the military value of a base – one that can be used to compare bases against each other. However, this analog is prohibitively difficult and involves resources well beyond that which will be devoted to this report. If the goal, therefore, is to determine the *relative vulnerability* rather than a comprehensive or absolute measure, then perhaps DoD should consider a combination of qualitative and quantitative measures and develop a tiering system.

Even in such a subjective analysis, the Department will need to consider several categories of metrics. It will need to assess the vulnerability of infrastructure to a wide range of climate effects, with the specifics depending on the installation. This could include the percentage of the base impacted by future sea-level rise, frequency of flooding, the number of weather-driven electricity outages, or the general vulnerability of a region to extreme weather.

In fact, the most significant impacts on bases to date, measured by the costs of recovery, have been as a result of extreme weather, which might result in a focus on location and vulnerability to the most likely extreme weather events in that region.

Any assessment of installation vulnerability should also incorporate the impact that climate change has on readiness. Climate Change factors such as higher temperatures, drought and water shortages, sea-level rise, increased wild fire risk, increased frequency and duration of severe weather, and loss of permafrost, are currently and will continue to impact training and training assets. Climate change effects have the ability to inflict damage on range infrastructure and instrumentation, degrade training land, restrict the use of ammunition and weapons, and compromise the safety of both personnel and equipment. Over the course of time, the cumulative impacts of climate change have the potential to degrade training readiness as damage to ranges and training area increases and loss in the carrying capacity of land and coastal assets to support future training mission requirements diminishes. Metrics can be used to assess the impacts of the climate change factors on training readiness, thus aiding in strategic planning needed to assess vulnerabilities, design mitigation and resiliency plans, provide input to stationing decisions, and defend new requirements.

Ideally, the Department would generate a vulnerability analysis that would capture the climate change event (e.g. flooding, drought, prolonged high temperatures, permafrost melt, wildfire risk) that contributed to specific training impacts (e.g. lost training days, lost flying hours, restrictions to training, Mission Essential Tasks not trained to standard), impacts to training assets/resourcing impacts (e.g. range and instrumentation damage; training land damage, cost to replace, cost to repair), frequency and duration of the impact and cost of workarounds. However, we are faced with the need to collect significant amounts of data (though hopefully much of this is currently captured) and to correlate impacts to specific climate events (which is likely not currently the case).

Finally, in considering the vulnerability of an installation, one must consider the vulnerability of infrastructure and services *outside the base*, in the surrounding community. Over time, defense communities have become indispensable to the installations they surround, providing electricity, water, communications, transportation infrastructure, housing for the majority of military personnel, the civilian workforce, education services for military children, specialized medical services, and emergency response services. In addition, key logistics requirements would eventually be a problem, as it may be difficult to provide essential supplies like food or fuel to the installation. Finally, outside dependencies to the broader defense enterprise need to be considered, such as private shipyards and other defense industrial base elements that might be vulnerable. The bottom line is that most bases would not be able to function for long without the services provided by their neighboring community.

The vulnerability of a civilian community may affect the mission on a base, even if the base is completely resilient. In the case where a major disaster affects a broad part of the nation, defense bases may need to reorient themselves to provide support to civilian authorities or humanitarian assistance. In these cases, even if there is no impact on the base itself, the mission is certainly impacted.

However, because the dependencies are so difficult to measure and the data is external to DoD, this may be a facet of vulnerability that is examined once vulnerable installations are identified. In other words, for the DoD report, this wouldn't necessarily be a factor that is incorporated – at least not quantitatively – but once the most vulnerable installations are identified and DoD starts doing deeper dives on how to mitigate impacts at those locations, the community dependencies would absolutely have to be part of what is examined.

HOW SHOULD CONGRESS USE THIS ASSESSMENT?

In the end, regardless of the metrics it ultimately uses, what is most important is that DoD provide its best military judgment on which installations are the most vulnerable to climate change impacts. Even a subjective assessment that identifies a top tier of vulnerable installations is an important tool for Congress as it determines how to prioritize resources for improving the resilience of military installations.

However, a prioritization of bases will not necessarily identify the actions on a given base that are required to improve its resilience. Vulnerabilities may be based on a wide variety of impacts such as likelihood of extreme weather, sunny-day flooding that blocks access to the installation, sea-water intrusion into a fresh water source that undermines the ability to support the population on the base, or threats due to frequent wildfires in proximity to the installation.

Congress will need to require comprehensive plans for each of the installations identified by DoD and the Services - Military Installation Resilience Plans (MIRPs) – that include customized responses and resilience prescriptions for each identified location.

These MIRPs would need to be tailored documents designed with the installation's specific missions in mind and focused on improving their resilience to the specific threats to which the installation is vulnerable.

Ideally, a MIRP would include, at a minimum, a discussion of:

1) Vulnerable missions at the installation;
2) Vulnerable assets or infrastructure at the installation;
3) Specific climate threats and impacts to which the installation or its missions are vulnerable, in both the immediate future and within a longer timeframe (30-50 years to align with new construction life cycle);
4) Specific dependencies to off-base resources and infrastructure which may also be vulnerable, and without which installation operations will be threatened;
5) Resilience posture of those off-base dependencies and an assessment of the efforts of local authorities to address vulnerabilities;
6) Operational and infrastructure resilience solutions, which could range from establishment of redundant mission capability to construction of sea-walls or hardening hangars; and
7) Cost assessments of the resilience solutions.

Like similar plans within DoD, these plans should also be reviewed and updated every five years, so new information on missions, resilience status and climate threats can be incorporated into the document.

A RESPONSIBILITY TO PREPARE

This assessment required by Congress is an important step. It demonstrates that Congress wants to understand the vulnerabilities of military missions, assets and infrastructure to climate impacts, and knowing which locations are the most at risk. Now Congress has the opportunity – and the responsibility – to act.

Ultimately, armed with the ability to foresee climate impacts that have and will threaten military installations, Congress and DoD have a responsibility to prepare for those impacts. They have a responsibility to support our Soldiers, Sailors, Airmen and Marines and their families in the face of these changes; they have a responsibility to ensure critical assets and infrastructure are built to withstand foreseeable hazards; and they have a responsibility to ensure that our servicemembers are given the tools they need to perform their missions, in spite of the impacts of climate change.

The development of this CSAG Briefer was chaired by:

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Appendix 1: The "Langevin Amendment"

From Public Law 115-91 (Fiscal Year 2018 National Defense Authorization Act)

SEC. 335. REPORT ON EFFECTS OF CLIMATE CHANGE ON DEPARTMENT OF DEFENSE

(a) Findings.--Congress makes the following findings:

(1) Secretary of Defense James Mattis has stated: ``It is appropriate for the Combatant Commands to incorporate drivers of instability that impact the security environment in their areas into their planning.".

(2) Secretary of Defense James Mattis has stated: ``I agree that the effects of a changing climate -- such as increased maritime access to the Arctic, rising sea levels, desertification, among others -- impact our security situation.".

(3) Chairman of the Joint Chiefs of Staff Joseph Dunford has stated: ``It's a question, once again, of being forward deployed, forward engaged, and be in a position to respond to the kinds of natural disasters that I think we see as a second or third order effect of climate change.".

(4) Former Secretary of Defense Robert Gates has stated: ``Over the next 20 years and more, certain pressures-population, energy, climate, economic, environmental-could combine with rapid cultural, social, and technological change to produce new sources of deprivation, rage, and instability.".

(5) Former Chief of Staff of the U.S. Army Gordon Sullivan has stated: ``Climate change is a national security issue. We found that climate instability will lead to instability in geopolitics and impact American military operations around the world.".

(6) The Office of the Director of National Intelligence (ODNI) has stated: ``Many countries will encounter climate-induced disruptions--such as weather-related disasters, drought, famine, or damage to infrastructure--that stress their capacity to respond, cope with, or adapt. Climate-related impacts will also contribute to increased migration, which can be particularly disruptive if, for example, demand for food and shelter outstrips the resources available to assist those in need.".

(7) The Government Accountability Office (GAO) has stated: ``DOD links changes in precipitation patterns with potential climate change impacts such as changes in the number of consecutive days of high or low precipitation as well as increases in the extent and duration of droughts, with an associated increase in the risk of wildfire. . . this may result in mission vulnerabilities such as reduced live-fire training due to drought and increased wildfire risk.".

(8) A three-foot rise in sea levels will threaten the operations of more than 128 United States military sites, and it is possible that many of these at-risk bases could be submerged in the coming years.

(9) As global temperatures rise, droughts and famines can lead to more failed states, which are breeding grounds of extremist and terrorist organizations.

(10) In the Marshall Islands, an Air Force radar installation built on an atoll at a cost of $1,000,000,000 is projected to be underwater within two decades.

(11) In the western United States, drought has amplified the

threat of wildfires, and floods have damaged roads, runways, and buildings on military bases.

(12) In the Arctic, the combination of melting sea ice, thawing permafrost, and sea-level rise is eroding shorelines, which is damaging radar and communication installations, runways, seawalls, and training areas.

(13) In the Yukon Training Area, units conducting artillery training accidentally started a wildfire despite observing the necessary practices during red flag warning conditions.

(b) Sense of Congress.--It is the sense of Congress that--

(1) climate change is a direct threat to the national security of the United States and is impacting stability in areas of the world both where the United States Armed Forces are operating today, and where strategic implications for future conflict exist;

(2) there are complexities in quantifying the cost of climate change on mission resiliency, but the Department of Defense must ensure that it is prepared to conduct operations both today and in the future and that it is prepared to address the effects of a changing climate on threat assessments, resources, and readiness; and

(3) military installations must be able to effectively prepare to mitigate climate damage in their master planning and infrastructure planning and design, so that they might best consider the weather and natural resources most pertinent to them.

(c) Report.--

(1) Report required.--Not later than one year after the date of the enactment of this Act, the Secretary of Defense shall submit to the Committees on Armed Services of the Senate and the House of Representatives a report on vulnerabilities to military installations and combatant commander requirements resulting from climate change over the next 20 years.

(2) Elements.--The report on vulnerabilities to military installations and combatant commander requirements required by paragraph (1) shall include the following:

(A) A list of the ten most vulnerable military installations within each service based on the effects of rising sea tides, increased flooding, drought, desertification, wildfires, thawing permafrost, and any other categories the Secretary determines necessary.

(B) An overview of mitigations that may be necessary to ensure the continued operational viability and to increase the resiliency of the identified vulnerable military installations and the cost of such mitigations.

(C) A discussion of the climate-change related effects on the Department, including the increase in the frequency of humanitarian assistance and disaster relief missions and the theater campaign plans, contingency plans, and global posture of the combatant commanders.

(D) An overview of mitigations that may be necessary to ensure mission resiliency and the cost of such mitigations.

(3) Form.--The report required under paragraph (1) shall be submitted in unclassified form, but may contain a classified annex.

Appendix 2: The "Nelson Amendment"

Report Language from S. 1519 (S. Rpt. 115-125), FY18 National Defense Authorization Act ("The Nelson Amendment")

Defense threat assessment and master plan for climate

The committee notes that the Department of Defense (DOD) must be able to execute its missions effectively and efficiently by adapting to the full spectrum of current and future threats. Secretary Mattis stated to the committee, ``where climate change contributes to regional instability, the Department of Defense must be aware of any potential adverse impacts", ``climate change is impacting stability in areas of the world where our troops are operating today" and ``the Department should be prepared to mitigate any consequences of a changing climate, including ensuring that our shipyards and installations will continue to function as required."

The committee notes that a series of climate-related events have cost DOD significant resources, measured in funding and negative impacts on readiness. Specifically, the committee notes that in January, a tornado caused over $320.0 million in damages at Marine Corps Depot at Albany, Georgia. At Lackland Air Force Base in Texas, there were 81 black flag training days in 2012, and 226 in 2016. In Alaska, three locations of early warning radar infrastructure have been damaged and moved due to coastal erosion that was not expected to occur until 2030. Wildfires postponed the launch of a satellite in California and led to training range closures for multiple months in North Carolina, South Carolina, Idaho, Florida, and New Mexico. Researchers at the University of Nebraska at Lincoln found that wildfires have tripled between 1985 and 2014, growing from 33 to 117 per year. At Laughlin Air Force Base, a hail storm damaged 39 pilot training aircraft, costing roughly $80.0 million in repairs which won't be completed until June of 2018. Warehouses containing hazardous materials flood 24 inches on a regular basis in Norfolk and Portsmouth, Virginia. In South Carolina, private citizens near Fort Jackson have filed seven lawsuits seeking $20.0 million in damages, alleging the Army failed to maintain a dam that ruptured during historic rainfall and flooding. In Louisiana, the railroad system at Fort Polk's Joint Regional Training Center requires major repairs due to ``epic rains." In Virginia, high water flooding creates ``significant damage" to pier infrastructure at Norfolk Naval Shipyard creating reliability and safety issues. Warming Arctic temperatures at Thule Air Force Base in Greenland have caused extensive airfield pavement repairs at over $30.0 million, which is roughly the cost of one Army Combat Training Center rotation. In Arizona, a heat wave caused over 40 flights to be canceled, with clear implications that DOD aircraft, ships, and vehicles must be able to continue to operate in extreme hot and cold temperatures. The Congressional Budget Office has concluded ``costs associated with hurricane damage will increase more rapidly than the economy will grow" resulting in $39.0 billion annually by 2075. Lastly, the Government Accountability Office found that ``weather effects associated with climate change pose operational and budgetary risks" to DOD.

Accordingly, the Secretary of Defense shall submit to the

congressional defense committees a comprehensive threat assessment and implementation master plan no later than March 1, 2018 on the risks and vulnerabilities to DOD missions and infrastructure associated with climate-related events. The assessment and master adaptation plan shall include: (1) Effects and mission impacts of a changing climate, if any, on DOD operations, testing and training ranges, readiness, basing, acquisition, contingency basing, command and control, supply chain, logistics, stockpiles, and the associated costs; (2) Plans and procedures to continue missions in the event of loss or damage to critical energy and water infrastructure; (3) Guidance for combatant commanders to address regional-specific theater campaign plan impacts in order to mitigate climate-related events that contribute to instability; (4) Anticipated impacts from increased global operations tempo as a result of greater numbers of humanitarian assistance and disaster response events; (5) Guidance for the military services and Joint Staff to integrate climate impact scenarios and long-term projections into planning; (6) Adaptation plans and procedures to ensure military investments with taxpayer dollars are constructed to better withstand flooding and extreme weather events; (7) Updates to built and natural infrastructure design, changes to military construction standards, Unified Facilities Code, and encroachment procedures; (8) Improved modeling techniques and data sources to better predict future erosion, flooding, and other extreme weather events; (9) Opportunities to pursue public-private partnerships under existing authorities with any non-DOD entity in order to mitigate climate-related impacts; (10) Adaptation progress metrics and recommendations for further research and development; (11) Strategies and recommendations to alleviate climate vulnerabilities, including timelines and resource requirements; and (12) Any other aspects deemed appropriate.

The threat assessment and implementation master plan may include a classified annex, if necessary.