



Issue Brief

THE NATIONAL SECURITY IMPACTS OF CLIMATE CHANGE

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In its 2010 Quadrennial Defense Review, the U.S. Department of Defense (DOD) officially recognized climate change as a factor worthy of consideration in future national security planning. The report stated, "Climate change and energy are two key issues that will play a significant role in shaping the future security environment," noting that "climate change, energy security, and economic stability are inextricably linked."¹ The report goes on to describe the vast geopolitical impacts of climate change anticipated by the intelligence community, including sea level rise, increasing temperatures, food and water scarcity, the proliferation of disease vectors, and the risk of mass migration by vulnerable populations to escape these impacts. These risks led DOD to declare that "while climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world."² The department's leaders recognized that the United States' existing role in responding to extreme weather events, delivering humanitarian assistance, and preserving national security would be made all the more difficult by climate change.

Since DOD's public call to action, the department has worked to better integrate climate risk across its operations and long-term planning. DOD has also pursued climate mitigation and adaptation measures in accordance with a broad set of Executive Branch initiatives designed to move the entire U.S. government towards a lower carbon footprint, more efficient resource consumption, and improved resilience against extreme weather events. The institutionalization of climate adaptation and mitigation measures has transformed how the department does business and has resulted in a more sustainable and agile military. Responsibilities for these measures have been distributed across the Pentagon for development and implementation and have been outlined in numerous memos, reports, and other official guidance. In addition, each of the five service branches has established its own clean energy goals to be achieved through physical infrastructure upgrades, as well as training to adjust behaviors and risk perception among its personnel.

This issue brief will cover the ways the U.S. military defines climate change risks and the subsequent challenges DOD will likely face going forward. Specific examples of global and domestic impacts and consequences are also explored. In addition, a high-level accounting of DOD and Congressional actions on climate and security is provided.

RISKS AND CHALLENGES

Department of Defense Considerations

The 2014 Quadrennial Defense Review labeled climate change as a "threat multiplier," meaning the stressors already present around the world ("poverty, environmental degradation, political instability, and social tensions") will likely be amplified and worsened by the introduction of climate impacts. DOD's six Geographic Combatant Commands (GCC) each tailor their approaches to climate-driven issues according to the challenges present in their part of the globe. For example, U.S. Africa Command (USAFRICOM) has cited future humanitarian crises tied to

drought and disease as potential destabilizing events in that region.³ A region faced with severe water and food shortages may become more susceptible to having contributing elements of extremism and violence take root.⁴ The degradation or outright loss of land due to drought, erosion, and/or sea level rise can contribute to the threat multiplier equation through the displacement of people and the subsequent loss of a population's livelihood, housing, and agricultural capabilities. Warmer temperatures can also exacerbate the introduction and proliferation of heat-related illnesses and disease vectors, such as mosquitoes, into vulnerable regions.⁵ Humanitarian aid has the power to bring additional stability to impoverished nations, buffering them against natural disasters and political forces that may instigate conflict. Foreign investment in resilient infrastructure can allow vulnerable nations to better stand on their own and recover more quickly when disaster strikes.

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.

– Secretary of Defense
James Mattis⁶

Extreme weather events are projected to increase in severity and frequency over the next several decades and will place a greater burden on DOD units, personnel, and assets tasked with responding to such events and delivering humanitarian and disaster relief, both in the United States and abroad.⁷ For instance, DOD was a major player in responding to Typhoon Haiyan in 2015, providing substantial airlift support to deliver 750,000 pounds of supplies and 1,200 first responders, while extracting 5,640 storm victims to safety.⁸ Typical operations can also include the delivery of medical care, supplemental communications capabilities, electric grid repairs, water purification, and re-opening of shipping ports. At home, DOD mobilized 14,000 DOD personnel in direct response to Super Storm Sandy in 2012, with another 10,000 personnel providing additional assistance on infrastructure repair, debris removal, power restoration, and other services. Humanitarian assistance and disaster relief already poses a high fiscal cost for DOD and is primarily funded through the Overseas Humanitarian, Disaster, and Civic Aid (OHDACA) appropriation, which allows the GCCs to provide a rapid response to countries in need.⁹

The consequences of climate change will likely heighten the risk DOD infrastructure already faces from severe weather events. DOD has expressed concern about how future conditions will affect the department's "ability to maintain both its built and natural infrastructure and to ensure military readiness in the future."¹⁰ Beyond infrastructure damages, sea level rise and extreme weather could be particularly disruptive to training operations that rely on reliable access to land, air, and sea-based training facilities. To better understand these vulnerabilities, DOD has taken on a comprehensive internal assessment of climate impacts on its installations.¹¹ DOD retains one of the largest real estate portfolios in the U.S. government, encompassing 562,000 buildings and structures distributed across 4,800 sites worldwide. This includes 293 active installations across the Army, Navy, and Air Force, in addition to numerous Coast Guard installations under the Department of Homeland Security.¹² Extreme weather events could also hinder acquisition and supply chain operations that maintain these facilities, potentially influencing the types of equipment DOD acquires and the ways goods are transported, distributed, and stored.¹³

The U.S. military will have to face the fallout of these impacts, given its operations in vulnerable and potentially volatile parts of the world. As these challenges manifest and worsen, DOD's ability to meet its mission objectives will be strained, both at home and abroad. To succeed in the long-term, DOD must continue to adapt its operations, strategies, and physical infrastructure to a global environment shaped by climate change.

Risk Perception by Other Government Entities

DOD is not the only national security-oriented agency to be vocal about the multitude of risks climate change poses to its operations and assets. Leading voices within the Department of Homeland Security (DHS) and Central Intelligence Agency (CIA) have repeatedly stressed the importance of responding and adapting to climate change, both in testimony before Congress and public speeches. In addition, numerous reports have been funded, commissioned, and published by these agencies that detail the security implications of climate change. These

include CIA-backed reports from the National Research Council and Harvard University's Center for the Environment, and the 2014 Quadrennial Homeland Security Review, which covered climate-related threats in several sections.^{14,15,16}

In 2013, outgoing Secretary of Homeland Security Janet Napolitano warned that her successor would need to be prepared for more severe weather-related events as a result of climate change.¹⁷ This view was reaffirmed in a 2015 hearing for the House Committee on Homeland Security in which three senior DHS representatives, including the acting assistant secretary, described climate change as a threat multiplier and warned against disregarding its potential impact.¹⁸ Several former CIA directors have also highlighted the threat of climate change. Several former CIA directors have focused on the threat of climate change while in office, including John Brennan and Leon Panetta.^{19,20} Director Panetta in particular was a strong advocate of furthering climate research and oversaw the formation of the Center for Climate Security and the restart of Medea, a program where intelligence operatives and civilian scientists collaborated to better understand the impacts of environmental change, in 2010.²¹ The program gave scientists access to numerous classified intelligence assets, including observation satellites, sensors, and ocean and tidal readings from Navy submarines.²² Medea enabled scientists to better track and document climate change around the world and allowed for closer collaboration with national security agencies, but the program ended in 2015 when lawmakers, arguing that CIA assets should focus on more immediate security concerns, criticized it.

Both the Office of Management and Budget (OMB) and Government Accountability Office (GAO) have issued reports that detail the wide range of impacts climate change will likely have in the next several decades. A 2016 OMB report titled, "Climate Change: The Fiscal Risks Facing the Federal Government," outlined five major fiscal risks for the United States that are directly related to climate change. These risks are crop insurance, health care, wildfire suppression, hurricane-related disaster relief, and federal facility flood risk, all of which are anticipated to cost billions of dollars more by the end of the century due to the impacts of climate change.²³ The GAO has issued numerous reports that identify potential climate-related threats to government assets, with just a sampling of potentially affected areas being public health, energy, defense, water infrastructure, federal and private insurers, federal supply chains, and federal fisheries.^{24,25,26,27,28,29,30} Furthermore, the 2017 edition of GAO's "High Risk List" included several government agencies and programs threatened by the direct or indirect effects of climate change, including the National Flood Insurance Program, the Nation's Surface Transportation System, and gaps in weather satellite data.^{31,32,33,34}

INTERNATIONAL THREATS

Environmental Refugees and Internally Displaced Persons

One of the biggest risks posed by climate change is the potential for massive population displacement. This possibility is particularly concerning because people who are forced to migrate due to the effects of climate change do not currently meet the definition of a refugee, meaning they are left without the rights and legal protections conferred by such a classification. The International Organization for Migration (IOM) has since proposed three classifications of "environmental migrants" to differentiate this unique subset: emergency migrants (people who temporarily flee a sudden environmental disaster), forced migrants (people who are currently directly impacted by long-term environmental factors), and motivated migrants (people who seek to avoid future environmental hazards).³⁵ Climate change threatens to dramatically increase the number of both refugees and internally displaced persons (IDPs), creating additional strains on the humanitarian and economic capabilities of the United States and other countries around the world. Climate change is also unique in that the losses inflicted upon a population's homeland (whether from sea level rise, desertification, flooding, or a surge in deadly heat conditions) is most likely permanent. While refugees of war may one day be able to return, environmental refugees could face permanent displacement.

Joseph Cassidy, the former Director for Policy, Regional, and Functional Organizations at the U.S. Department of State, identified three categories of risk associated with climate-induced migration and displacement and how governments respond: **direct risks**, **indirect risks**, and **third-order risks**. **Direct risks** would include an increased need for border security and global humanitarian assistance, the latter being of particular concern to DOD given the large role it plays in such efforts. **Indirect risks**, such as disruptions to the global economy brought on by mass migration, would also have significant ramifications for the United States. **Third-order risks** would primarily be conflicts sparked or worsened by an influx of climate migrants, exemplifying climate change as a threat multiplier.^{36,37}

Examples of the devastating impacts climate-related migration could have on the social, economic, and political stability of countries are abundant today. Perhaps one of the most well-known examples is the conflict beginning in 2003 in Sudan's Darfur region, which has been partly attributed to climate- and drought-related migration that led to competition for scarce resources before escalating into a full-scale war.³⁸ Syria's ongoing civil war emerged in 2011 and holds parallels to Darfur. Syria's historically severe drought stretching from 2006 to 2010 acted as one of multiple contributing factors that led to migration, civil unrest, and ultimately armed conflict. Scientists concluded that a prolonged drought of this severity became more than twice as likely to strike Syria due to impacts from anthropogenic climate change.³⁹

Water Conflict

Another major impact of climate change on the international stage will be on water supply and the increased likelihood of intra- and inter-state conflict over this finite resource. Beyond being a basic life necessity, water is also crucial for enabling agriculture and energy generation. Although struggles over water resources are not a new occurrence, climate change will only intensify and increase the frequency of such issues—similar to migration. A 2012 report from the Office of the U.S. Director of National Intelligence warned that when water problems combine with “poverty, social tensions, environmental degradation, ineffectual leadership, and weak political institutions,” social disruptions and the threat of a failed state may emerge.⁴⁰

The report notes that North Africa, the Middle East, and South Asia are all likely to face major challenges coping with water-related issues such as water shortages, poor water quality, and floods by 2040. This is primarily due to water management concerns regarding key river basins in these regions, such as the Nile, Tigris-Euphrates, and Indus. A number of threats could materialize, including degraded food security, reduced flood resilience, and greater public health risks, if these issues were to go unaddressed. In rating the management capacity for seven different river basins in these hot spots based on the “strength and resilience” of their governance mechanisms, the report cautioned that “even well-prepared river basins are likely to be challenged by increased water demand and impacts from climate change.” Only two of the seven river basins received favorable ratings for their ability to avoid and manage future crises, with the other five receiving capacity ratings of “limited” or “inadequate.”⁴¹

Severe water scarcity could also lead to the “weaponization of water.” According to a report on water issues by the Center for Climate and Security, the Middle East and Africa are particularly susceptible to sub-national and trans-national conflicts when groups use water resources to further their own interests. The report identifies three types of weaponization: strategic, tactical, and coercive, all of which are already underpinning conflicts today. The Islamic State used both strategic and tactical weaponization when it threatened to destroy a major dam in Mosul and diverted water to stop the advancement of the Iraqi Army, respectively. A notable example of coercive weaponization comes from Al-Shabaab, which cut off water to cities in Somalia to demonstrate its power.⁴² As water weaponization tactics continue to be used by groups the U.S. military is actively opposing, policies to bolster weakened governments and strengthen national water policies could prove to be a valuable toolkit for implementing American foreign policy.

Arctic Access

The Arctic Ocean presents one of the most distinct connections between the way global warming is simultaneously changing the natural environment and long-standing geo-political relationships. In 2016, the annually-averaged ocean surface temperature for the world was 1.35 degrees Fahrenheit (0.75 degrees Celsius) higher than the 20th century average, continuing a steady climb in ocean surface temperatures over the past three decades.^{43,44} Record ocean temperatures have contributed to a decline in sea ice levels. In 2017, scientists observed the lowest combined levels of Arctic and Antarctic sea ice levels since satellite observations began nearly 40 years ago, with the Arctic's minimum sea ice extent decreasing 13.5 percent per decade since 1979.⁴⁵ The absence of ice will unlock previously inaccessible navigation routes and will open the possibility for oil and natural gas extraction. According to the U.S. Geological Survey, 30 percent of the world's undiscovered natural gas and 13 percent of its undiscovered oil may be located north of the Arctic Circle, most of it offshore.⁴⁶ The opportunity to engage in commerce through new trade routes and to stake old territorial claims on portions of the sea bed for mineral, oil, and natural gas extraction has drawn the attention of many competing nations, including those without a historical presence in the Arctic region.

According to a 2014 assessment by the U.S. Navy, there is a low chance these nations will come into armed conflict over Arctic claims. Indeed, the U.S. Navy has characterized the Arctic as a "challenging operating environment, with a harsh climate, vast distances, and little infrastructure."⁴⁷ However, the report advises that the United States maintain a watchful presence in the region due to the possible tensions that could flare up given the value of the resources being contested.⁴⁸ International collaborative bodies, such as the eight-nation Arctic Council, provide a forum to discuss how to adapt to regional climate impacts, coordinate with stakeholders, and bring together national ministers to discuss common goals, helping to ensure cooperation and transparency will continue to be a part of Arctic development in the future. Yet, the United States could be at a disadvantage in keeping up with the shifting balance of power in an increasingly ice-free Arctic. Despite being an Arctic nation, the United States currently lacks the operational assets that will be needed to deal with the surge in commercial (and possibly military) vessels traversing northern waters. While naval submarine units are experienced in Arctic operations, the U.S. military's surface and air forces are not as seasoned.⁴⁹ The United States has only a single, aged icebreaker in operation, compared to 27 ocean-going icebreakers under the Russian flag.⁵⁰

Due to the rapid environmental changes occurring across the Arctic, DOD anticipates having to take a more active role in managing future risks and ensuring their facilities and personnel are resilient to those changes. The

If we fail to act upon climate change, instability around the globe will inevitably intensify, and even our bases will risk being lost. A modern energy revolution, a strategic resolve to respond to climate change can transform how we fight. And it, too, gives us a combat edge. This is the new normal for the Navy and Marines.

– former Secretary of the Navy
Ray Mabus⁵³

development of Arctic shipping and extraction, for instance, will likely increase the need for rescue operations, which is of particular concern to DOD. Other federal, state, local, and tribal entities, as well as allied nations, are also involved in responding to disasters in conjunction with DOD given their geographic proximity and capabilities.⁵¹ The U.S. Navy's 2009 Arctic Roadmap, updated in 2014, is one of the major guiding documents behind the military's efforts to integrate climate impacts on the Arctic Ocean into DOD's operations, procurement, and strategic planning. Additional analysis, such as a 2016 report to Congress on strategies for protecting national security interests in the Arctic, offers insight into how DOD perceives its limitations and projected challenges in this remote region. Extreme cold and adverse weather conditions, constrained mobility and navigation capabilities, limited communication tools, and insufficient mapping for terrain and waterways conspire to make basic operations in the Arctic a challenge for military units. Personnel would also require specialized training and equipment to adapt to and successfully operate in the harsh conditions.⁵²

THREATS TO U.S. MILITARY FACILITIES

DOD has been working to better understand and prepare for the risks climate change poses to its facilities and built infrastructure around the world. The vast geographic distribution of these facilities, their often advanced age, and the less severe environmental conditions they were originally built to withstand has been a cause for grave concern among base commanders.⁵⁴ Extreme weather events—flooding, drought, and wildfire—all pose a real threat to DOD's assets. Damage inflicted upon defense facilities and the interdependent assets they host (such as aircraft, hangars, and radar equipment) can cripple the military's ability to respond to a crisis, in addition to costing taxpayers millions of dollars to repair and replace these resources. Changes to installation landscapes can compromise military training grounds meant to simulate realistic field conditions, such as deserts or amphibious landing zones. Hazardous temperatures and storms can also disrupt scheduled training activities and put personnel at risk.

DOD leaders have advocated for greater climate resilience across the service branches through updated emergency planning, the hardening of infrastructure, and commonsense solutions to avoid loss and damage.⁵⁵ Considering DOD's global real-estate portfolio has an estimated replacement value of roughly \$850 billion, spread across 555,000 buildings, on 28 million acres of land, the potential cost of climate change impacts would likely be severe if left unaddressed.⁵⁶ The Office of Management and Budget (OMB) requested all federal agencies to account for climate change when preparing their budget requests for Fiscal Year 2017, including building and infrastructure proposals.⁵⁷ DOD has begun accounting for climate change threats in its short- and long-term installation planning, supply chain management, and training, as documented in its 2014 Climate Change Adaptation Roadmap.⁵⁸ DOD also has undertaken a baseline assessment of its facilities to better understand which sites are the most vulnerable and may require additional protections or even relocation in order to sustain operations as climate impacts begin to exact a steady toll in the future.⁵⁹

The discussion on national security and climate resilience should also involve local officials and residents who live near military bases. These communities often house many active-duty and civilian personnel who work on-base and have strong economic ties with the military's presence. Vital infrastructure, such as roads, electricity, and water, are often shared between towns and bases.⁶⁰ There is a strong connection between bases across America and the adjacent communities found "beyond the gate." These relationships foster deep economic benefits across the local economy, but also present underlying challenges in the event of a natural disaster or other disruption. In the same way a company's productivity suffers when its employees are unable to make it to the office, DOD operations can be severely hindered if staff are unable to safely and reliably travel from their homes to the base. These facilities rely upon more than just uniformed personnel to operate at full capacity. Support services ranging from security to food service to information technology may be carried out by civilian employees, who number 742,000 (compared to 1.3 million active duty personnel).⁶¹ Given the shared risks posed by climate impacts, future partnerships between base managers and local government leaders could be mutually beneficial. The joint-development of natural disaster response plans could improve public safety, while investment in climate-resilient infrastructure projects could stimulate the local economy and improve assets used on a daily basis by residents and base personnel alike.

Members of Congress who have previously sought to decouple climate change considerations from national security planning are beginning to show a greater openness toward backing institutional solutions to these challenges. In June 2017, the House Armed Services Committee passed an amendment to DOD's annual appropriations bill that would require each of the service branches to report to Congress their ten military facilities deemed most vulnerable to climate change over the next 20 years.⁶² The amendment, which passed by a voice vote, also stated in clear terms that "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."⁶³ A proposal to strip the amendment language from the bill was later struck down by a recorded vote of 185-234 on the House floor.⁶⁴

DOD Service Branch Actions and Proposals

The Navy, Marine Corps, and Coast Guard

The Navy has long been at the forefront of climate change awareness and integrated climate considerations into its strategic planning years before DOD-wide policies were enacted. The Navy established Task Force Climate Change (TFCC) in 2009 in response to changing conditions in the Arctic and other regions due to climate change.⁶⁵ TFCC would go on to publish the Navy's 2009 Arctic Roadmap, which served as the key operating guide for the far north until the publication of a DOD-wide Arctic Roadmap in 2014. TFCC also published a broader Climate Change Roadmap in 2010, two years before the first DOD-wide edition was released, which outlined three phases of climate change adaptation. The phases called for improved climatic prediction capabilities, the integration of climate impacts into academic training exercises and strategic guidance documents, investments in resilient infrastructure, and partnerships to position the military to better respond to climate change.⁶⁶ The Navy's "Energy Vision for the 21st Century," released in 2010, laid out numerous alternative energy-related goals, including drawing half its energy consumption afloat from non-petroleum sources by 2020.⁶⁷ Among these goals was a significant push by the Navy to develop, test, and deploy drop-in biofuels for its supply chain to lessen DOD's reliance on petroleum. After a series of smaller-scale field tests beginning in 2012, the "Great Green Fleet" deployed for a year in 2016 and featured a Carrier Strike Group and other naval platforms running on a 10 percent biodiesel blend derived from waste beef fat. Ships participating in the tests also used a variety of energy-efficient technologies and modifications, allowing them to stay deployed longer than conventional vessels by cutting their refueling frequency.^{68,69}

The largest growing demand on the battlefield today is for electricity and how we create that. We are going to more efficient. We have got to be.

– former Marine Corps Commandant
 Gen. James T. Conway⁷³

The other two members of the United States' "sea services," the Marine Corps and Coast Guard, are also actively working to address the operational challenges of climate change.⁷⁰ Although the Coast Guard operates under the Department of Homeland Security (DHS), it remains a key partner of DOD. Like the Navy, the Coast Guard has published an Arctic Strategy and has concentrated most of its efforts on increasing its operational capacity in the Arctic as the region continues to open up due to reductions in sea ice cover.⁷¹

The Marine Corps has been particularly focused on energy efficiency and supply chain vulnerabilities. The USMC Expeditionary Energy Office (E2O) was established in 2009 to develop and help implement guidance to reduce the service's dependence on fossil fuels for both expeditionary forces and permanent installations.⁷² Drawing upon lessons from Afghanistan, Marine Corps leadership recognized the high rate of fuel consumption for its expeditionary forces and the life-threatening risks faced by supply convoys tasked with meeting energy needs in remote areas. To better understand these challenges, the Marines conducted the first-ever energy audit in a combat zone in 2009. The results of the audit informed later efforts to reduce electricity and liquid fuel demand through the use of energy efficient structures and renewable energy technologies.⁷³ In 2009, an annual Expeditionary Energy Concepts (E2C) exercise was initiated to further reduce energy and water demand for units in the field, thus extending their operational capabilities. The week-long event allows Marines to field test new technologies alongside engineers, who collect feedback and data.⁷⁴

The Army

The Army also has taken an active stance on addressing climate change, with many of these actions originating in broader DOD directives or presidential executive orders. The Net Zero Initiative was launched in 2011 as a pilot program to encourage a number of installations to create as much energy as they use by 2020, with the goal of having 25 such installations by 2030.⁷⁵ As of 2015, there were nine facilities participating in the energy program, in

addition to eight Net Zero waste and eight Net Zero water bases, located in the United States and abroad.⁷⁶ In setting up the initiatives, the Army cited the environmental and security benefits of having its facilities consume fewer resources, while recognizing the importance of allowing each base to tailor its own distinct approach to achieving its sustainability goals.⁷⁷

A major force behind the Army's pursuit of cleaner energy sources is the Office of Energy Initiatives (OEI). Established in 2014 by the Secretary of the Army, OEI is the department's primary management office for renewable and alternative energy projects, which must have a minimum generating capacity of 10 megawatts.⁷⁸ The office leverages the Army's vast acquisition network and private sector financing to build new renewable energy projects both on and adjacent to Army facilities. OEI's mission seeks to preserve base operational capabilities during a potential grid disruption, while also working toward the Army's mandate to draw 25 percent of its electricity from renewable sources by 2025, in accordance with the 2007 *National Defense Authorization Act*. As of 2017, there are 17 facilities across the country hosting OEI-backed projects in various stages of development, including 60 MW of biomass generation at Ft. Drum, NY; 50 MW of wind at Ft. Hood, TX; 30 MW of solar at Ft. Benning, GA; and 14 MW of solar at Camp Shelby, MS. Several of the projects are classified as "islandable," meaning they feature electricity generation, energy storage, and controls all onsite.⁷⁹ The Army Corps of Engineers (USACE) first issued a Climate Change Adaptation Plan in 2011 and has updated the document four times in accordance with executive orders calling for the development of a comprehensive climate change strategy for federal agencies.⁸⁰ USACE's adaptation guidance largely focuses on preparing the agency's water management practices, built infrastructure, and other services to better withstand anticipated climate impacts.⁸¹

The Air Force

The Air Force, meanwhile, is mostly in the assessment and planning stage of addressing climate change. The Air Force Special Operations Command noted the effect climate change may have in amplifying global conflicts and natural resource pressures, thus making strategic environments more challenging for special forces to operate in.⁸² A 2014 order from the Secretary of the Air Force directed the Air Force Encroachment Management Program (AFEM) to account for short- and long-term "natural factors and climate effects" that may impact the operational capacity of installations and the quality of life of the surrounding communities. The order cites climate-related water restrictions, coastal flooding, wildfires, severe weather, and an influx of invasive species as examples of climate impacts program managers may have to consider.⁸³ The Air Force has also included climate change vulnerability metrics in its comprehensive planning guidelines for installations.⁸⁴ Coastal erosion accelerated by melting permafrost and extreme weather prompted the Air Force Civil Engineer Center (AFCEC) to conduct coastal erosion studies to determine the risks to Air Force airfields and radar stations located in Alaska. The study could help inform future land use planning for the Air Force's vulnerable early-warning infrastructure in the region. Cape Canaveral Air Force Station has partnered with NASA's Kennedy Space Center in Florida to identify vulnerable infrastructure across the two facilities and develop a set of climate adaptation strategies. The effort examined how future hurricanes and storm surges may be amplified by climate change and the risks these events could pose to resources relied upon by the Air Force's 45th Space Wing.⁸⁵

Past Congressional Actions and Proposals

Despite widespread agreement among the scientific, and more recently military, communities on the grave and growing risk of climate change, Congressional action has resulted in relatively few concrete policy proposals and even fewer successfully-passed bills. Although the concept of climate change as a threat multiplier has been common operating knowledge for over a decade now, some of the more enduring climate-security policies have come in the form of budget authorizations housed within broader fiscal authorization acts for the defense and intelligence communities.

In my 30 years in the U.S. Senate, I have not seen an issue as complicated as the challenges posed by national security, energy, and climate change.

– former Senate Armed Services Committee Chair John Warner⁸⁶

The *National Defense Authorization Act* (NDAA) for Fiscal Year 2008 was among the first bills to include specific directives to study the security implications of climate change. Its passage into law resulted in the landmark inclusion of climate-related concerns in the 2010 Quadrennial Defense Review, which has since served as a key guidance document for DOD's climate mitigation and adaptation policies.⁸⁷ As part of the DOD Appropriations Bill for FY2015, the Senate Appropriations Committee ordered the department to deliver a report to Congress identifying the most significant climate-related security risks for the Geographic Combatant Commands, resulting in the July 2015 report, "National Security Implications of Climate-Related Risks and a Changing Climate."^{88,89} However,

the House version of the NDAA for FY2017 expressly forbids any of its appropriated funds from being used to implement climate adaptation measures, which the Pentagon had previously outlined in an official directive.^{90,91} Tensions arising from the military's desire to insulate its operations from climate risks and the fiscal priorities of influential groups within Congress will likely color future national security budget negotiations. Notably, the NDAA for FY2018 was signed into law with language ordering the Secretary of Defense to submit a report to Congress within a year detailing the ten most climate-vulnerable installations for each service branch.⁹²

Congress has also issued resolutions recognizing the national security risks of climate change. Since at least 2005, there have been numerous congressional resolutions that have either acknowledged the threat, expressed a commitment to addressing it, or proposed solutions. However, none of these resolutions has garnered enough support in either chamber to gain passage, despite the bipartisan nature of the proposals.^{93,94,95,96,97,98}

Bills are among the most frequently used vehicles for climate-related policy proposals. Major legislation that has sought to act on the idea of climate change as a threat multiplier in recent years includes the *Global Climate Change Security Oversight Act* of 2007, the *Lieberman-Warner Climate Security Act* of 2007, and the *American Clean Energy and Security Act* of 2009.^{99,100,101} Despite none of these acts becoming law, they still had an impact on the discourse around climate change on the Hill. In particular, key language in the *Global Climate Change Security Oversight Act* was later used in the fiscal authorization act that led to the inclusion of climate considerations in the 2010 Quadrennial Defense Review. In addition, the language used in these bills has frequently reappeared in subsequent bills, demonstrating a common acceptance of climate as a threat multiplier, even if major legislation speaking to this issue has lacked the political capital necessary for enshrinement to date.

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