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Chairwoman McCollum, Ranking Member Calvert, and distinguished Members of the Subcommittee, thank you for the opportunity to testify before you today.

I have over 30 years of experience as a national security professional. I served as the first Deputy Undersecretary of Defense (Environmental Security). I currently serve as the Secretary General of the International Military Council on Climate & Security, Founding Board Chair of the Council on Strategic Risks (CSR) and as Senior Strategist at the Center for Climate and Security, an institute of the CSR. I also am the Founder and former Executive Director of CNA's Military Advisory Board, and Senior Fellow at the Woodrow Wilson International Center's Polar Institute and Environmental Change & Security Program. The views I am presenting today are my own.

I would like to thank the Subcommittee for holding this important hearing today.

The U.S. House of Representatives, on a bipartisan basis, has consistently included important provisions in the National Defense Authorization Acts (NDAA) on climate change, including a recognition that "climate change poses a direct threat to the national security of the United States." President Biden's Executive Order on Tackling the Climate Crisis at Home and Abroad reflects this assessment, and Secretary of Defense Austin has indicated his agreement as well, stating, "We know first-hand the risk that climate change poses to national security because it affects the work we do every day." Secretary Austin's concerns are shared by many of his predecessors, including former Secretary of Defense Jim Mattis who

noted in 2017 that, "Climate change can be a driver of instability and the Department of Defense must pay attention to potential adverse impacts generated by this phenomenon."

Let me start with a short history of how I came to determine that climate change is a security threat, and why it is in America's interest to understand the magnitude of this issue and the urgent need to address it.

I am the first born child of Holocaust refugees who arrived in the US in the late 1930s, among the fortunate few Jews who were able to escape Nazi Germany. Most were not so lucky, and that awareness became part of the ethos that pushed me to focus on combating the greatest security challenges of our time. Following World War II, America's next great security challenge was the Cold War. During that era, the most important national security threat we faced was of nuclear annihilation, a "bolt out of the blue" nuclear attack by the Soviet Union. We characterized such an attack as a "low probability, high consequence event." Fortunately, we succeeded and celebrated the end of the Cold War more than 25 years ago, when the Berlin Wall fell. At around the same time that the threat of nuclear war seemed to be diminishing, President George H.W. Bush was the first American President to acknowledge the serious implications of a changing climate for the United States.

When I served as the Deputy Undersecretary of Defense for Environmental Security in the 1990s, we were primarily focused on cleaning up hazardous waste from Cold War-era military activities. Over time, environmental issues evolved and became part of our National Security Strategy, when we began to consider the fact that conflicts over access to, or control of, natural resources compromised U.S. national security interests. The focus then was on regional cooperation between countries to reduce nuclear risks, including from nuclear waste, prevent transnational environmental crime such as overfishing and illegal logging, to promote cooperation among various stakeholders both within and outside of government, and to better understand and address the consequences of environmental threats. The U.S. Department of Defense (DoD) began integrating environmental concepts into planning under its Preventive Defense Strategy, and it took on the role of "…[helping] deter or mitigate the impacts of adverse environmental actions leading to international instability."[1] The DoD went from being a laggard to a leader on environmental and energy security matters.

[1] Sherri Wasserman Goodman, Deputy Under Secretary of Defense, (Environmental Security), Statement Before the Subcommittee on Installation and Facilities, House Armed Services Committee, May 13, 1993.

These developments at DoD, along with the implications of climate change coming into sharper focus, led to a marked increase in concerns about the security risks of climate change, from both the Department of Defense and the Intelligence Community,[2] during the George W. Bush Administration. While at CNA during that time, I founded the CNA Military Advisory Board (MAB), comprised of senior retired generals and admirals, to assess the national security implications of climate change. In 2007, we identified climate change as a "threat multiplier." In a seminal report on this topic, the CNA MAB stated, "[t]he potential consequences of climate change are so significant that the prudent course of action is to begin now to assess how these changes may potentially affect our national security, and what courses of action our nation should take."[3] We recommended that the national security implications of climate change be incorporated into the broad range of national security strategy and planning documents. In the FY2008 NDAA, Congress directed that DOD include the national security implications of climate change in the National Security Strategy, National Defense Strategy and Quadrennial Defense Review (QDR).

Building on the work of the CNA MAB, the Center for Climate and Security (CCS), where I am now a Senior Strategist, assembled an Advisory Board of 30 senior retired military leaders and national security professionals, who have served across both Democratic and Republican Administrations, and in all branches of the U.S. military and the U.S. Coast Guard. Since 2011, CCS has been at the forefront of conducting research on the national security risks of climate change, with a steady stream of reports and articles, and was the first organization to highlight the climate change dimension in Syria's political instability.[4] CCS also hosts a climate and security "community of practice," the Climate and Security Advisory Group, that includes participation from over 300 national security, military and intelligence leaders. In 2019, this Climate and Security Advisory Group released a Climate Security Plan for America, which laid out a roadmap for the federal government to tackle the security risks posed by climate change and, in 2020, the Group assembled a National Security, Military and Intelligence Panel (NSMIP) to produce the first of its kind Security Threat Assessment of Global Climate Change. Additionally, with our partners in Europe, CCS has established an International Military Council on Climate and Security, including representatives from 38

[2] The Center for Climate and Security Resource Hub, accessed at: https://climateandsecurity.org/resources/u-s-government

[3] CNA Military Advisory Board. "National Security and the Threat of Climate Change." Report. 2007.

[4] " Military Expert Panel Report: Sea Level Rise and the U.S. Military's Mission." Eds 1 & 2. The Center for Climate and Security. September 2016 & February 2018

countries, to meet the growing concerns about climate change from our allied and partner nations 'militaries.

These entities and developments underscore that my assessment of the security implications of climate change is not a partisan one. It's about security. It comes from the careful analysis of our nation's leading national security, defense and intelligence thinkers and practitioners, both inside and outside of government. These analysts have been taking the climate crisis seriously since 1989, across two Democratic and three Republican Administrations.

With that background, let me tell you what I plan to cover today. An overarching theme throughout my remarks will be the fact that the Department of Defense is poised to "lead by example" in a way that both serves and protects the military mission and enables American leadership. First, I will discuss the unprecedented threats posed by climate change and how they must be integrated into defense strategy and planning at the highest levels. Second, I will address how the US military can make climate a priority in its global military engagements. Finally, I will talk about how the Department of Defense can lead by example in both clean energy and resilient infrastructure – in large part by leveraging its buying power across a range of procurements and investments that support the mission.

1. Climate change presents an unprecedented threat to U.S. national security

Since we first characterized climate change as a "threat multiplier" in 2007, the national security community has concluded that climate change now contributes to unprecedented security threats for the United States – and the world. Growing evidence demonstrates that climate change is increasing the likelihood of conflict in key regions.[5] In 2016, the Climate Security Consensus Project stated that "the effects of climate change present a strategically-significant risk to U.S. national security." The FY2018 NDAA included the sense of Congress that "climate change presents a direct threat to national security." Also in 2018, research supported by USAID, further demonstrated the effects of climate change on state fragility around the world. The Director of National Intelligence has repeatedly emphasized that the United States will have to manage the negative effects of a changing climate in the Worldwide Threat Assessment, and publicly released papers from the National Intelligence Council on topics such as water security,

[5] Schleussner, Carl-Friedrich, Jonathan F. Donges, Reik V. Donner, and Hans Joachim Schellnhuber. "Armed-conflict Risks Enhanced by Climate-related Disasters in Ethnically Fractionalized Countries." PNAS. August 16, 2016.

food security, and overall climate change developments have noted the national security implications.

The Biden Administration has not only recognized these threats, but has both elevated and operationalized that recognition by putting climate security front and center in its foreign and security policy, calling for the integration of climate considerations across the work of all agencies that engage in extensive work abroad. Secretary of Defense Austin has indicated his support for this focus, and just last week launched a new senior-level Climate Working Group to coordinate the Department's response to the climate change Executive Order and track the Pentagon's progress. Further, Secretary Austin noted in his March 2021 message to the force, "We face a growing climate crisis that is impacting our missions, plans, and capabilities and must be met by ambitious, immediate action. In line with the President's direction, we will elevate climate as a national security priority, integrating climate considerations into the Department's policies, strategies, and partner engagements."

This integrative approach is critical as these unprecedented changes in the climate arrive during a time of other rapid and unprecedented changes in the geostrategic environment. China's rise as strategic competitor, combined with population growth, rising powers, an increase in the political fortunes of authoritarians, weakening norms against the use of weapons of mass destruction, rapid and disruptive technological change, among other major risks, are combining to challenge us in dizzying ways. The impacts of rapid climate change arrive in this already unstable and volatile world, threatening to further destabilize the international order. While there are many ways in which climate change threatens U.S. security, today I'm going to focus primarily on how it exacerbates geopolitical tensions and contributes to political instability.

Exacerbating Geopolitical Tensions and Political Instability

Climate change is affecting the very geostrategic landscape in which we operate, which, in turn, is heightening tensions around the world, opening new areas of competition, and emboldening others to exert their influence, whether that is China, Russia, or other hostile political forces and terrorist networks. Three regions in which these geopolitical challenges are particularly acute and generating new defense missions are the Indo-Pacific, the Arctic, and Sub-Saharan Africa.

The Indo-Pacific: The China Dynamic

The Indo-Asia Pacific region is highly exposed to climate change-driven hazards, including extreme weather events and sea level rise. The disruption of the annual monsoon cycle across the Indian subcontinent could put millions of people at risk, beyond those already experiencing such threats, of increased flooding and food insecurity. These unprecedented hazards arrive in a region that already faces a broad spectrum of conventional, unconventional and hybrid security risks and challenges. Upon the release of two new reports from the Center for Climate and Security earlier this year, focused on South Asia and Southeast Asia, former U.S. Pacific Commander Admiral Samuel J. Locklear III, U.S. Navy (Ret) stated:" We have entered an age in which multiple, converging risks define our security environment. In the Indo-Pacific region, climate change is the biggest long-term security threat. I testified to this effect to the U.S. House of Representatives in 2013, and it's even more true now. Climate impacts are getting more potent, dialing up the threats from existing conflict patterns and resource scarcities. At the same time, climate projections are getting more precise. This combination of potency and precision translates into an obligation for militaries to anticipate, train, equip and prepare for increasingly dangerous climate security scenarios."

Across the region, climate impacts are inducing or exacerbating physical and socio-economic stressors, leading to resource competition, health impacts, societal tensions and irregular migration and displacement — which in turn can amplify existing security challenges or create new ones. Climate-related migration can stress densely-packed urban areas and increase intercommunal conflict and grievances with governments. It can also compromise scarce or shared water (and other) resources , amplifying tensions between states or domestic provinces and ethnic groups.

Such scenarios are already playing out in the Philippines, in the South China Sea, and in the context of the India-Pakistan and China-India security rivalries, among other locations. In particular, disputes over transboundary rivers subject to climate-induced floods and droughts are worsening the already-intense adversarial relationships between nuclear weapons-possessing states.

For militaries in the region, climate change both impedes operational preparedness and expands military missions. Military installations, like cities, are vulnerable to extreme weather which damages buildings, infrastructure and assets. Yet militaries must contend with such impacts even as they are called upon to perform additional humanitarian assistance and disaster response missions. ASEAN has taken up coordinated disaster management and emergency response in its new Disaster Management Framework 2021-2025, and South Asia has the institutional

framework to do the same in the broader regional organization, the South Asian Association of Regional Cooperation.

The geopolitical dynamics of climate security in the region are driven in large part by China. For example, China's control over the origins of Asia's major river systems contributes to tensions with other countries in the region. With 22 percent of the world's population but only 7 percent of its fresh water, China's efforts to secure freshwater resources, including building dams, are in some cases contributing stress to its regional relationships. Upstream dam-building and other control measures taken or planned for the Tibetan Plateau are contributing to regional hostilities among the 60 million people in China, Myanmar, Laos, Cambodia and Vietnam, that rely directly on the Mekong River Basin for livelihoods and food security.[6] At the same time, U.S. allies and partners in the Asia-Pacific remain concerned about the U.S. commitment and investment in the region, and may ultimately find it more practical to accept the reality of a regionally-dominant China, and the economic and political consequences of that reality. Indeed, many nations in the region, in the face of an uncertain level of U.S. engagement, seem to be hedging their bets as they attempt to both accommodate an increasingly powerful Beijing, while also maintaining positive relationships with the United States.[7] While a number of nations in the Asia-Pacific are engaged in disputes with China over contested areas of the South China Sea, China is expanding its influence not just within the region, but beyond, to Latin America, Africa, the Arctic (as I will elaborate on in a moment), and elsewhere. China remains the largest trading partner for Southeast Asian nations and is increasing its military force significantly in relation to other countries in its neighborhood, including through the deployment of a "blue-water navy" that has ventured as far from home as the Straits of Hormuz.[8]

In this context, the United States will need to develop more expansive approaches to maintaining and enhancing its regional influence, and supporting the interests of its allies, partners and prospective partners in the Asia-Pacific, including through

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[6]" Climate and Security in the Indo-Asia Pacific 2020." Product of the Expert Group of the International Military Council on Climate and Security. Authors: Shiloh Fetzek (CCS), Bastien Alex (IRIS), Laura Birkman (HCSS), Steve Brock (CCS), Brigitte Dekker (Clingendael), Francesco Femia (CCS), Sherri Goodman (CCS), Tom Middendorp (Clingendael), Michel Rademaker (HCSS), Louise van Schaik (Clingendael), Julia Tasse (IRIS), Caitlin Werrell (CCS). Edited by Francesco Femia & Caitlin Werrell. Published by the Center for Climate and Security, an institute of the Council on Strategic Risks. July 2020.

[7] Femia, Francesco, and Caitlin E. Werrell. "A Climate-Security Plan for the Asia-Pacific Rebalance: Lessons from the Marshall Plan" A Climate and Security Correlation Series, The Center for Climate and Security, November 2015.

[8] John Kemp, "In search for security, China's navy enters Strait of Hormuz," Reuters, September 22, 2014, available at http://www.reuters.com/ article/2014/09/22/china-navy-iran-kempidUSL6N0RN2FK20140922

robustly supporting climate resilience efforts in the region. As I wrote with a colleague in *The National Interest* earlier this year, "In some cases, the United States will need to compete for influence where China is taking advantage of climate change to improve its military posture in the South China Sea or become the relief provider of first resort to vulnerable Pacific Island nations."

The Arctic: Developing a Low Tension, High Effort Agenda

The Arctic has emerged as a region of potential geostrategic competition, primarily because rising temperatures, melting sea ice, and collapsing permafrost now grant access to this region previously locked in ice most of year. While the Arctic has historically been a region characterized by cooperation and diplomacy, it has more recently become a zone of increased tensions over valuable energy and mineral resources, and access to shipping routes. The rapid melting of the multi-year sea ice has given rise to significant growth in economic and military activities, including shipping, resource extraction, and other commerce. This rapid change in the Arctic is feeding into China's and Russia's strategic ambitions, both regionally and globally.

Defense Secretary Austin recognizes these challenges. In response to questions about the Arctic from the Senate Armed Services Committee ahead of his confirmation hearing earlier this year, he said, "Climate change is drastically altering the natural environment of the Arctic--and the strategic balance. This is fast becoming a region of geopolitical competition, and I have serious concerns about the Russian military buildup and aggressive behavior in the Arctic--and around the world. Likewise, I am deeply concerned about Chinese intentions in the region."

A recent report by the Center for Climate Security and the Norwegian Institute of International Affairs that I co-authored made the following high-level observations about Arctic climate security risks: the report found that as the Arctic becomes increasingly navigable, the uptick in commercial, civilian, and military activity creates more opportunities for conflicts, accidents, and misunderstandings. There is also an expanding likelihood of states like Russia and China using civilian and commercial actors for strategic positioning or risky gray zone operations. Russia envisions a toll road for shipping and transit across its Northern Sea Route, and seeks to enforce this maritime route as internal waterway— a claim which the U.S. and many other nations dispute. In 2018, China declared itself a "near Arctic state," with ambitions to build a Polar Silk Road across the region. China is an active "Observer" in the Arctic Council, and is increasingly participating in a

variety of Arctic efforts, seeking to increase its presence and influence in the region through dual-use scientific exploration and providing foreign direct investment for infrastructure such as ports and airfields. The institutions that have helped depoliticize and produce stability in the Arctic for several decades may not be resilient enough to withstand new demands resulting from climate change, as climate change introduces significant uncertainties about established rules and norms and puts stress on existing institutions.[9]

Aggressive Russian state behavior both in the Arctic and elsewhere poses a particular challenge in this context. Prior to Russia's illegal annexation of Crimea in 2014, Moscow was engaged in the Arctic Security Forces Roundtable and the Arctic Chiefs of Defense — two forums for discussing cooperation among military forces both to deconflict or to support non-military activities such as search and rescue and oil spill response. Since 2014, Russia has not been included in these dialogues. Lack of coordination raises the risk of misunderstandings, miscommunications, accidents, or spillover tensions from another regional conflict. As I noted with some colleagues in a recent *Arctic Today* article, the priority in the Arctic must be to establish mechanisms for dialogue and communication so as to increase clarity of what is and is not acceptable behavior, to communicate grievances, and to manage risk. To help manage these challenges, the eight Arctic nations would benefit from a venue for regular dialogue among security forces, both to build confidence and to reduce risk from accidents that could lead to miscalculation or escalation.

Sub-Saharan Africa: Contributing to Instability and Risk of Extremism

Sub-Saharan Africa's geographic vulnerability to extreme climate outcomes and lower economic development and institutional strength will severely challenge the region's capacity to cope with climate change and its attendant consequences for instability and conflict.

Already, changes in precipitation patterns and droughts are exacerbating existing tensions among farmers and herders in the Sahel. At the same time, in the past year climate change-related flooding contributed to instability in East Africa, a region already strained by the pandemic, rising food insecurity and a locust plague. As

[9]" Climate Change and Security in the Arctic." A product of The Center for Climate and Security (CCS), an institute of the Council on Strategic Risks (CSR), and The Norwegian Institute of International Affairs (NUPI). Authors: Sherri Goodman, Kate Guy, Marisol Maddox (CCS); Vegard Valther Hansen, Ole Jacob Sending, Iselin Németh Winther (NUPI). Edited by Francesco Femia and Erin Sikorsky (CCS). January 2021.

the head of the World Food Program in East Africa described the events of 2020 in that region "it's shock upon shock upon shock."

Also of concern is the intersection of climate change and extremism on the continent. For example, the rise of Al Qaeda in the Islamic Maghreb (AQIM) in Mali, which sparked significant instability across the country and region, contains a climate change signature.[10] More specifically, this situation was shaped in 2012-14 by an intersection of three salient trends: desertification and food insecurity, exacerbated by climate change; an ongoing rebellion by Tuareg nomadic herdsmen in northern Mali; and weak government institutions that could not address the marginalization of the Tuareg and their increasing clashes with sedentary agriculturalist tribes in the southern and central areas of the country.[11] Overwhelmed by these challenges, the fragile government was overthrown by a coup in March 2012. Following the coup, the Malian political system was unable to maintain influence in northern Mali; AQIM and other groups moved in and took control.[12]

While climate change alone did not cause the conflict, it certainly was a factor in harming the once-coexistent relationship between the Arab Tuareg and non-Arab Muslim ethnic groups in central and southern Mali. In fact, the recent Malian conflict fits a pattern of other such conflicts in Africa's Sahel region, including Darfur, South Sudan, Niger, and Nigeria. Drought and desertification have impacted the region for hundreds of years; yet climate change now is worsening these conditions across sub-Saharan Africa, and has contributed to movement within and across borders, which can further lead to conflict dynamics in these countries that lack adequate governance and sufficiently-robust institutions to settle conflicts over vital resources. Add to this the involvement of transnational terrorist groups and militias, such as AQIM and the *Janjaweed* (in Mali and Darfur, respectively), and these conflicts become more complex, transforming resource competition into ethnopolitical conflict.

2. Prioritizing Climate Change in U.S. Security Engagements

[10] Femia, Francesco and Caitlin E. Werrell, "Mali: Migration, Militias, Coups and Climate Change," The Center for Climate and Security, April 2019; and The CNA Military Advisory Board, "National Security and the Accelerating Risks of Climate Change," CNA Corporation, May 2014

[11] Alexis Arieff, Crisis in Mali (Washington, DC: Congressional Research Service, January 14, 2013), http://www.fas.org/ sgp/crs/row/R42664.pdf

[12] Ibid

In addition to integrating climate into our assessments of security threats and our strategies for addressing those threats, the United States can further "climate proof" security by bringing climate considerations into our security assistance programs with other countries. Addressing the geopolitical dynamics of climate change risks requires the United States to step up and play a leadership role in helping allies and partners build resilience to the effects of climate change on their, and consequently on our collective, security. As the Department of Defense carries out the global posture review, with the goal of aligning force posture with security strategy, DoD should consider how it can better enhance the resilience of allies and partners and build within them the capacity to endure the stresses imposed by climate change. As I mentioned earlier, China is already trying to expand its influence by doing just that – embracing the climate and energy goals of U.S. allies and partners, providing direct and tangible assistance to climate-vulnerable nations, and securing influence and economic gains through energy investments.

The United States has many tools in its toolbox with which it can and should compete. As the Center for Climate and Security outlined in its Climate Security Plan for America, the Defense Department should develop a "Security Forces Climate Engagement Plan" to promote regular military-to-military and civil-military international engagement on climate change preparation, to enhance the resilience of U.S. allies and partners, and to enhance U.S. influence vis-à-vis its primary competitors. The Department of Defense should revitalize the Defense Environmental International Cooperation Program (DEIC) with sufficient resources to make military-to-military environmental cooperation a robust engagement tool for each regional combatant command.

Additionally, Combatant Commanders should engage allied and partner nations ' militaries on adapting to climate change and working to mitigate impacts to military operations, energy resilience, infrastructure and readiness through a variety of pathways, ranging from formal intergovernmental NATO Summits to Track II-focused fora such as the Munich Security Conference, Halifax International Security Forum, the Pacific Environmental Security Forum, and the International Military Council on Climate and Security.

3. Leading by Example in Resilient Investment and Infrastructure

The Defense Department is the nation's single largest energy user, at approximately 1 percent of U.S. energy. It has already made important investments in clean energy, from solar-powered housing to microgrids and renewables for remotely-deployed forces and at facilities here in the U.S. – saving

energy, water, money, and advancing these technologies for both military and commercial applications. As it implements the requirements in the President's Executive Order on Tackling the Climate Crisis at Home and Abroad, such as the federal clean electricity and vehicle procurement strategy, DOD will deepen these investments.

Resilient Energy and Technology Investments

DOD can lead by example in key energy and climate technologies that align with the military mission. Here are a few examples:

1. Electric vehicles – DoD leases 166,000 vehicles from the General Services Administration according to the FY20 Strategic Stability Performance Plan. The department can help reduce its own carbon footprint, reduce reliance on fossil fuels, and help advance the transition to net zero through the use of electric vehicles and rapid deployment of charging stations on DoD installations.
2. Microgrids and resilient transmission infrastructure – DOD needs to be able to operate critical military installations, even if subject to a cyber-attack, ice storm, hurricane, flood, or deliberate terrorist attack. That is why military bases practice "Black Start" exercises, to recover from a power outage, and maintain operations for extended periods even if the grid is down. The technologies and practices needed to ride out these threats, including microgrids, distributed energy systems, and advanced energy storage methods will have the added benefit of promoting resilient infrastructure in our communities. More transmission infrastructure is needed to create redundancies – this does not mean duplicating the paths of existing lines. It means being able to provide power from another area or region to the facility (and surrounding community, in many instances) in need.
3. Climate predictive capabilities – From military operations planning to resilient base infrastructure, a new generation of earth system observation and prediction capabilities, that provides asset-level climate data analytics for shorter-term (hours to weeks to months) planning, is becoming increasingly available, both in government labs and in the private sector. Technological developments, including quantum computing, 5G, artificial intelligence, data analytics, and more, are further increasing our capacity to forecast, predict, and plan for climate security risks, from extreme weather events and their impacts, to food scarcity, water shortages and beyond. These improved predictive capabilities are also being used by city planners, insurers, and across a range of critical infrastructure sectors to reduce

climate risk. As DOD adapts these technologies for the military mission, it will further reduce risk to both operations and infrastructure.

One example of such a predictive capability is the Navy's Earth System Prediction Capability (ESPC) model, which has significant potential for regional climate projections. ESPC uses an Earth System Model that includes interactions between multiple component models (atmosphere, ocean, waves, land, and sea ice), and is typically run at much higher spatial resolutions than current climate models. The Office of Naval Research (ONR) developed ESPC for naval operations and is focused on providing both tactical decision and strategic planning support. ESPC could be used for high-resolution forecasts of the operational environment in future decades, enabling regional estimates of sea level rise, understanding of changes in the frequency and severity of extreme weather events around the globe, and refining projections of the opening of new sea routes in the Arctic due to diminishing sea ice. At present, such climate applications are beyond the scope of the ONR S&T applied research portfolio that emphasizes short-term prediction and predictability of weather and ocean behavior for Naval operations; however, these climate applications could be invaluable for Combatant Command theater engagement planning on a regional basis, and for working with partner and allies.

As I noted in my *National Interest* article, while the department already has a significant number of clean energy research and development efforts, bringing together these efforts into a Climate and Clean Energy Innovation Office with additional investment would enable the Pentagon to more rapidly develop, test and deploy a wide range of technologies. The article stated, "The department needs to lead not only on mission-driven clean energy research and development but also on the transition of these technologies to the fleet and the field. Too often, improved energy and climate technologies do not make it beyond what some call the "Valley of Death" in technology deployment because there is no acquisition requirement for it. This can and should change with a Clean Energy Transition Fund that incentives the military departments and acquisition commands to both try and buy lower carbon products."[13]

Resilient Infrastructure

[13] Sherri Goodman and Kate Guy, "Climatizing Security: Protecting Americans in the Age of Climate Change," The National Interest, 15 January 2021, https://nationalinterest.org/blog/buzz/climatizing-security-protecting-americans-age-climate-change-176454.

The Department of Defense must also make its own infrastructure, including key supporting civilian infrastructure, more resilient to climate risks. It is already paying the price of billions of dollars of damage at Tyndall Air Force Base, Camp LeJeune, and Offutt Air Force Base from recent hurricanes and floods. At the same time, sea-level rise is making recurring flooding more common in coastal communities and at coastal bases, and wildfire season is no longer confined to one season, or one geography. Under current emissions pathways, these risks will only increase in the years to come.

Given this context, the CCS Climate Security Plan for America calls for the implementation of a Climate Security Infrastructure Initiative across DoD and the US government. Such an initiative would be aimed at investing in the resilience of both military installations and critical civilian infrastructure, including low-carbon footprint projects designed to significantly lower the scale and scope of climate change--bolstering national security and creating long lasting employment opportunities. In the face of increasing threats from sea level rise, extreme weather events and wildfires, it should involve a comprehensive program to repair, construct, fortify, and responsibly site the nation's interconnected military, energy, transportation, agriculture, water, and commerce infrastructure in a climate resilient fashion. This should include an emphasis on building resilience to projected climate scenarios--as we've seen again and again in the past few months, what have been considered "worst case" scenarios are increasingly likely. For example, recent studies on sea level rise and ice melt suggest we have underestimated the pace and effects of each.

I am pleased that DOD is already moving to improve base resilience through use of the Defense Climate Assessment Tool (DCAT) and understand that over 1000 military sites have already had at least their preliminary assessments. The next step is for DOD to invest in the resilience actions that follow from these assessments.

To that end, in the FY 2020 NDAA and FY 2021 NDAA, Congress has significantly enhanced the authorities DoD has to address climate-related threats to military installations and key supporting civilian infrastructure, including amendments to the Defense Access Roads (DAR) program[14], the Readiness and Environmental Protection Integration Program (REPI)[15], the military installation

[14] DAR, 23 USC 210

[15] 10 USC 2684a

resilience projects authority[16], the Defense Community Infrastructure Pilot (DCIP)[17], and other new or strengthened authorities. However, increased funding sufficient to allow DOD to take full advantage of these new or expanded authorities has not yet followed and remains more vital than ever. For every $1 spent on mitigation or enhanced resilience now, $6 dollars will be saved in recovery, according to recent research.

Finally, as we all know, "you can't manage what you don't measure." In the 1990s, I led an effort to establish the first Environmental Security metrics for DOD, that included contaminated site cleanup, compliance with air, water and waste laws, and protection of endangered species and cultural resources. I understand that DOD is working on the next generation of climate and energy metrics that will enable the Secretary of Defense to measure the Department's progress on such matters as Military Installation Resilience Plans, Black Start capability, electric vehicles, climate predictive capability, and other goals and objectives of the President's Climate Executive Order. These metrics will be an important tool in enabling DOD leadership to hold the Department accountable and report to Congress and others on progress.

Conclusion

Fortunately, the difference between today and major global disruptions of the past is that we can spot impending disasters earlier and more easily. We do not have to wait for the next pandemic, the next 9/11 or the next Pearl Harbor, to better prepare for the climate crisis we already experience. Though the risks are unprecedented, our foresight is unprecedented as well. Technological developments have given us predictive tools that enhance our ability to anticipate and mitigate threats, to transform energy systems for improved mission performance, and to make bases more resilient and military communities more secure. Congress has strengthened, and must continue to strengthen, the authorities, programs, and funding available to DOD address these threats. In short, we have the ability to make our communities, institutions and individuals more resilient to a broad range of threats. "Climate-proofing" our security is essential to protect America's 21st-century near- and long-term national security interests. Failing to address climate security risks now will both embolden our adversaries to take the lead and result in more costly disasters and loss of American lives.

[16] 10 USC 2815

[17] 10 USC 2391(d)