

CLIMATE
21
PROJECT

**Department
of Defense**

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Department of Defense

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This memo is part of the **Climate 21 Project**, which taps the expertise of more than 150 experts with high-level government experience, including nine former cabinet appointees, to deliver actionable advice for a rapid-start, whole-of-government climate response coordinated by the White House and accountable to the President.

The full set of Climate 21 Project memos is available at climate21.org.

CLIMATE 21 PROJECT

Department of Defense

Executive Summary

The President has made clear that tackling the climate crisis is a core mission of the Department of Defense (DoD) on par with the Pentagon's highest obligations to the American people. Countering this existential threat to the Nation and humanity is unlike any mission our military has faced before. This report shows, in concrete terms, how DoD can deploy its formidable assets to meet this moment which calls for leadership, boldness, and creativity.

DoD is already dealing with the mounting and accelerating impacts of climate change. As Secretary Austin explained, DoD has acknowledged since 2010 that climate change is having a “dramatic effect on missions, plans, and installations.”¹ And President Biden's Executive Order is unequivocal: “climate considerations shall be an essential element of United States foreign policy and national security.”²

This memo is part of *The Climate 21 Project* (climate21.org) and does not represent the views of DoD or any agency. It incorporates input from interviews with more than 30 experts, and it focuses on implementable solutions that can be undertaken within existing authorities.

Meeting the climate challenge cannot be stove piped in traditional environmental channels and is an all-hands on-deck evolution. This report assists senior leadership across the entire enterprise, to include the Joint Staff and Combatant Commanders, in organizing for and implementing climate action. To help drive this cultural shift, the Department must empower and train the entire force, down to individual soldiers, sailors, airmen, and Marines, to innovate and shape both local and force-wide solutions for this unfamiliar mission.

Viewed through the lens of assets DoD can bring to bear, we see new opportunities for action. DoD can utilize its deep history of global engagement and capacity building with partner nations to build climate resilience competence, making fragile nations more water and food secure to avert crisis and conflict. DoD can marry its unique land- and space-based imaging capabilities with improved land management of its 27 million acres for soil and ecological health, ensuring resilience, training, and mitigation benefits. DoD's R&D and acquisition system can spur innovation and drive markets and prosperity by developing breakthrough clean energy technologies and demanding systems adapted to environments of the future. Low-tech and cost-saving solutions like green infrastructure can improve service member quality of life and build resilience against drought, wildfire, flooding, and sea level rise.

The President has moved quickly to mobilize the whole of government, empowering a National Climate Advisor and a Presidential Climate Envoy. DoD will be an indispensable partner to both in executing this national imperative. DoD can lead within the intelligence community to better prioritize collection, analysis, and dissemination of intelligence on climate security, partner with other federal landholders to amplify carbon sequestration and conservation benefits, and promote shared resilience opportunities for communities neighboring DoD installations.

DoD has an essential responsibility to safeguard American security by preparing for the impacts of our changing climate, and by addressing the causes of climate change head on. To that end, this report seeks to provide a wide range of implementable solutions for the entire Department and its interagency partners. Ultimately, for DoD to succeed in all its critical missions, the Nation must lead a global effort to head off the existential consequences of climate change.

¹ <http://bit.ly/3pBGpXz>.

² <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>.

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TOP RECOMMENDATIONS: ORGANIZE DOD TO MEET THE CLIMATE SECURITY MISSION

- Issue a Climate Risk Secretarial Directive
- Establish and convene a DoD climate action Strike Team
- Establish climate action capacity in the Office of the Secretary of Defense
- Direct DoD leaders to identify and manage climate risk reduction actions within their purview

TOP RECOMMENDATIONS: SEIZE THE GEOPOLITICAL IMPERATIVE TO BUILD CLIMATE SECURITY CORE COMPETENCIES AROUND THE GLOBE

- Build regional capabilities and alliances around climate change resilience
- Advance theater engagement on climate with militaries around the world
- Build climate capacity among partner nations

TOP RECOMMENDATIONS: DEPLOY DOD'S UNIQUE CAPABILITIES TO DRIVE INNOVATION, IMPROVE RESILIENCY, AND REDUCE GREENHOUSE GASES

- Accelerate energy transition, innovation, and financing
- Harness the power of DoD's lands for climate resilience and carbon sequestration
- Integrate climate into acquisition and procurement

TOP RECOMMENDATIONS: MANAGE INSTALLATIONS AND THE FORCE FOR CLIMATE MITIGATION AND RESILIENCE

- Fully deploy a Climate Adaptation/Risk Assessment Tool to assist installation planners
- Develop more detailed guidelines to consider climate change when approving and implementing individual homeport, home base, and hub shifts
- Reward incremental progress on building energy efficiency
- Implement food waste diversion and composting
- Add climate security curricula in DoD education and training programs to teach a culture of climate awareness and innovation within DoD
- Build climate security awareness and competency across DoD

TOP RECOMMENDATIONS: BUILD A TOTAL FORCE CULTURE OF CLIMATE AWARENESS

- Establish climate career paths as well as career enhancing assignments related to climate security for those in standard career tracks
- Integrate the climate mission set into DoD hiring, promotions, evaluations, and awards
- Establish fellowships and sabbaticals focused on climate security
- Recruit the climate engaged generation

1 Organize DoD to Meet the Climate Security Mission

KEY RECOMMENDATIONS

- Issue a Climate Risk Secretarial Directive
- Establish and convene a DoD Climate Action Strike Team
- Establish climate action capacity in the Office of the Secretary of Defense
- Direct DoD leaders to identify and manage climate risk reduction actions within their purview

The Department of Defense (DoD) is one of the largest and most complex organizations on earth and has the organization, budget, and infrastructure to match. It is the nation's largest employer with more than 1.3 million active-duty service members, 750,000 civilian personnel, and more than 800,000 National Guard and Reserve service members. An additional 600,000 private sector employees are under contract to the Department. DoD's base budget for FY2021 is \$671 billion. It executes a multibillion-dollar global supply chain and is one of the world's largest holders of real estate, managing a global portfolio that consists of more than 568,000 assets (buildings and structures), located at nearly 4,800 sites worldwide, covering 27.2 million acres of land.

The following high-level recommendations are essential but not sufficient. Climate is a mission that cannot be stovepiped and thus considered “somebody else’s job” but rather must be integrated into the command culture. Like DoD’s approach to safety, climate must be an all-hands effort.

The initial high-level recommendations directly below are key to setting the broad policies and clear goals to support the Commander in Chief's intent: climate is a mission that cannot be stovepiped in a series of bureaucratic silos but rather must be integrated in every corner of the enterprise. A culture of climate security awareness will give voice to DoD's diverse workforce in an extraordinary array of locations around the country and the world. The environment and climate impacts they experience at those locations are unique, and the innovation and ideas they can provide will be invaluable.

One of DoD's greatest assets is its highly trained, motivated, diverse, and service-oriented workforce. Its human capital is what truly sets it apart and makes it the envy of nations around the world. DoD will be most successful when every team member across the enterprise must embody climate security as a core duty.

It will also be essential that the entire senior leadership team is firmly committed to the Administration's climate priority and that each key actor understands addressing these impacts is part of their “day job.” Understanding a potential candidate's views on climate risk and security should be integrated as a key component of the interview process in filling leadership positions.

MONTH ONE RECOMMENDATIONS

Issue a Climate Risk Secretarial Directive

The Directive should signal climate change as a core DoD mission, on par with the highest mission priorities of the Department, and provide initial guidance to the Services, combatant commands, and defense agencies in accomplishing the climate mission.

The Chairman of the Joint Chiefs of Staff, in consultation with the Service Chiefs, should issue the first in a series of directives to the Joint Force outlining the National and DoD policy on climate action and providing guidance to the combatant commands, forces assigned to those commands, and defense agencies in accomplishing the climate mission.

The Service Secretaries, Service Chiefs, Combatant Commanders, and heads of Defense Agencies should then issue appropriately coordinated and timed directives aligned with the directives issued by the Secretary of Defense and Chairman of the Joint Chiefs.

On January 27, 2021, Secretary Lloyd Austin issued a statement in response to the President's Executive Order on Tackling the Climate Crisis at Home and Abroad, in which the Secretary of Defense (SECDEF) stated that he "fully support[s] the President's direction ... to include climate considerations as an essential element of our national security and to assess the impacts of climate change on our security strategies, operations, and infrastructure."³

Establish and convene a DoD Climate Action Strike Team

A Strike Team chaired by the Deputy Secretary and reporting directly to the Secretary should quickly issue or update a Secretarial Directive and effectively plan, tailor, and implement the most time-sensitive and high-level recommendations in this report over the first 100 days of the Administration. The Strike Team should be composed of senior leaders from OSD, the services, the Joint Staff, the Combatant Commands and the defense agencies. Once hired and in place, DoD's overall climate lead (see below) will serve as the primary coordination POC for the team. The Strike Team should be term-limited and charged with securing the Secretarial Directive's near-term mandates such as review of existing policies and establishing a standing Climate Action Group (CAG) chaired by the Deputy Secretary. The CAG would lead intra-departmental coordination and execution upon dissolution of the Climate Strike Team.

An additional part of the function of the Departmental Climate Action Strike Team should be to assess the DoD role and contribution to both planning and execution of President Biden's proposed 100-day global climate summit. The U.S.-led Leaders' Climate Summit in April 2021 will represent an early opportunity to advance climate security efforts. A core theme of the summit should be "preparing for and preventing climate threats," and world leaders can come ready to engage with both defense and diplomatic colleagues on mitigating these growing security risks. On the sidelines or soon after this summit, the U.S. should convene a Climate Security Defense Ministerial, in the style of the Obama-era Clean Energy Ministerial, to allow senior security leaders a space to discuss these topics and American innovators a chance to showcase next generation clean technologies. The recommendations in the programs and policy section and in particular those focused on DoD's international partnerships should be closely evaluated for discussion at these important international fora.

Establish climate action capacity in the Office of the Secretary of Defense (OSD)

Establish an overall climate lead in the Office of the Secretary of Defense, reporting to either the Secretary or Deputy Secretary (DSD), and empowered to coordinate the Department's climate risk reduction goals.⁴ A recommended title would be the Climate Risk Reduction Officer (CRRO) in order to send a clear signal to both the military and civilian

³ Statement by Secretary of Defense Lloyd J. Austin III on Tackling the Climate Crisis at Home and Abroad, Jan. 27, 2021, available at <http://bit.ly/3pBGpXz>.

⁴ Since 2016 the Undersecretary for Acquisition and Sustainment (formerly the Undersecretary of Defense for Acquisition, Technology, and Logistics) has been designated as the official having overall responsibility for DoD climate change adaptation and resilience.

leadership within DoD that addressing climate risk is a top priority beyond business as usual. The CRRO will work through the appropriate Secretary Principal Staff Assistants and Component Heads to achieve the Secretary's goals. Hiring the right person for the CRRO as well as providing a small but highly capable staff commensurate with the responsibilities of the office detailed below is vital.

Working closely with the CCMDs and the Services, through day-to-day management of the CAG process, the CRRO will be responsible for the development and coordination of DoD actions to:

- Anticipate climate changes and impacts on U.S. and overseas regions of interest to our nation's security;
- Adapt our defense forces to the changing climate to ensure maximum readiness at an affordable cost;
- Mitigate and reduce greenhouse gas emissions to enhance readiness and reduce cost;
- Train and educate both military and civilian DoD personnel to understand climate risks, their impacts, and actions the DoD takes to manage the risk;
- Develop authoritative climate projection data for U.S. and key overseas locations. Wherever possible, develop such data in collaboration with other federal agencies e.g., NOAA, NIST, FEMA, NASA, USGS;
- Review existing DoD climate-related documents and revised as needed;
- Develop relevant and measurable metrics by which to assess climate risk reduction progress. Report those metrics on a regular basis to the Secretary and DSD;
- Work across the federal government with senior climate officials and through the DSD and Secretary, to coordinate with the Presidential Envoy for Climate Change;
- Address impact on defense materiel requirements of climate and changes in global technology markets likely to impact the defense industrial base;
- Establish a mechanism for assessing DoD equities and contributions to support the President's domestic climate action and a staff to work with the team being assembled by the President's National Climate Advisor to drive whole-of-government climate action.

The Office of the Undersecretary for Policy should establish a Deputy Assistant Secretary of Defense, or senior advisor position, to support the Undersecretary's responsibilities and participation in an NSC process that will now include climate considerations in all its decision making. Coordinating closely with the CRRO, this position will attend all NSC interagency policy meetings below the Deputies Committee level, which will be a new and intense demand signal. This position will also support OSD(P) interaction with the Presidential Envoy for Climate Change and his team as part of the NSC process.

Direct Principal Staff Assistants (PSAs) reporting directly to the Secretary or Deputy Secretary to identify and manage climate risk reduction actions within their purview

The PSAs should be provided with dedicated climate staff (possibly titled Climate Risk Action Officers or CRAOs), who will be responsible for climate risk actions within the authority of the respective Deputy Undersecretary or Assistant Secretary (see sidebar next page).

A RECOMMENDED BUT NOT EXHAUSTIVE LIST OF AREAS OF RESPONSIBILITY FOR KEY PSAS

Undersecretary of Defense for Acquisition and Sustainment [installation adaptation; installation resilience; installation energy efficiencies (mitigation); C4I, domain awareness, and weapon system adaptation and resilience (co-chair with J-8 as Secretary, JROC)]

Undersecretary of Defense for Policy, co-chaired with the J-5 [assessing geostrategic threats, including climate-forced migration; international collaboration and cooperation on climate-related issues; Arctic; climate-related humanitarian assistance and disaster relief and climate-related defense support to civil agencies]

Undersecretary of Defense for Personnel and Readiness [training and education of climate and security awareness to the total force using the entire spectrum of DoD education and training assets]

Undersecretary of Defense for Intelligence, co-chaired with the J-2 [climate impact predictions, insights and awareness that would lead to a rapid increase in instability or a failing state or region; other country's or nonstate actor's efforts or actions with respect to climate intervention (or geoengineering); coordinating with the Intelligence Community to monitor greenhouse gas emissions by country in event there are future treaty obligations; coordination with the Director of National Intelligence Climate Security Advisory Council to include setting intelligence collection and analysis priorities for climate related environmental intelligence in line with the President's climate priorities; coordinating with the heads of DoD intelligence agencies on monitoring and verification of climate optimization of DoD and federal lands]

Undersecretary of Defense for Research and Engineering [DoD-sponsored research for non-carbon-based energy generation, storage, transmission, and assurance; CO₂ removal and sequestration research and demonstrations; Earth System (to include weather, ocean, and climate) Modeling; develop authoritative data for key variables for climate projections on DoD-relevant timescales; wherever possible, coordinate with and standardize across federal agencies (USACE, NOAA, NIST and FEMA should be lead Agencies)]

Comptroller [review the budget to ensure that each part of the DoD has budgeted sufficiently for their assigned missions to include tasks on climate risk reduction; assess any area that might require or where it may be advantageous to maintain or create a climate specific program element/budget line item]

*DoD Directive 47152**, "Climate Change Adaptation and Resilience," was issued on January 14, 2016 in order to assigned responsibilities to provide the DoD with the resources necessary to assess and manage risks associated with the impacts of climate change. Section 2 of Directive 47152 details responsibilities for the following positions:

- 2.1. Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L))
- 2.2. Assistant Secretary of Defense for Energy, Installations, And Environment (ASD(EI&E))
- 2.3. Assistant Secretary of Defense for Logistics and Materiel Readiness
- 2.4. Assistant Secretary of Defense for Acquisition
- 2.5. ASD(R&E)
- 2.6. Director, Test Resource Management Center
- 2.7. USD(P)
- 2.8. Assistant Secretary of Defense for Homeland Defense and Global Security (ASD(HD&GS))
- 2.9. Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict
- 2.10. Under Secretary of Defense for Personnel and Readiness
- 2.11. Under Secretary of Defense for Intelligence
- 2.12. DCMO
- 2.13. DoD Component Heads
- 2.14. CJCS
- 2.15. CCDRS

*DoD Directive 47152, "Climate Change Adaptation and Resilience," available at <https://dod.defense.gov/Portals/1/Documents/pubs/471521p.pdf>.

Establish a senior level Climate Advisor within each Combatant Command (CCMD)

The Climate Advisor should be a direct report to the Combatant Commander, advising on climate theater risks, partner nation resilience and mitigation opportunities, and theater engagement efforts on climate. Having this capacity at the respective CCMDs will be tremendously helpful in carrying out some of the most substantive geopolitical recommendations in this report.

Reestablish a Deputy Assistant Secretary of Defense for Energy and a Deputy Assistant Secretary of Defense for Installations and Environment

These positions should report to the reauthorized Assistant Secretary of Defense for Energy, Installations, and Environment (ASD EI&E), as reinstated in Section 904 of the 2021 NDAA.⁵

Designate a Deputy Director responsible for the climate mission portfolio on each Directorate on the Joint Staff

Each Directorate on the Joint Staff should designate a Deputy Director responsible for the climate mission portfolio. In the case of the J-5 (Plans and Policy), a Deputy Director and supporting staff should be established to also support the Chairman, Vice Chairman, and J-5 actual for their respective responsibilities and participation in an NSC process that will now include climate considerations in all its decision making. This capability will support Joint Staff interaction with the Presidential Envoy for Climate Change and his team. Other prominent examples include J-8 integration of climate considerations into the capability requirements process underpinning DoD acquisition as well as its assessments and gaming enterprise; integration of climate into all aspects of J-2 intelligence support; and J-7 integration of climate considerations into doctrine, training, exercises, and curriculum at the service colleges.

⁵ The ASD EI&E reports to the Undersecretary of Defense for Acquisition and Sustainment.

2 Seize the Geopolitical Imperative to Build Climate Security Core Competencies Around the Globe

KEY RECOMMENDATIONS

- Build regional capabilities and alliances around climate change resilience
- Advance theater engagement on climate with militaries around the world
- Build climate capacity among partner nations

One of the Administration's highest priorities is to reestablish the nation's global leadership role and reintegrate the United States into the international community. President Biden has made clear that working closely again with our allies and partners to solve mutual challenges, such as climate change, will be an immediate priority. The President's appointment of a Presidential Climate Envoy with full NSC membership will provide DoD with a powerful partner in these efforts. DoD is exceedingly well positioned to lead through the strength of its alliances, partnerships, and forward, global presence.

Although climate change manifests itself through changes in the environment, it is at its core a threat to humanity, not the planet. Climate change is quite simply threatening human life on earth; earth itself will continue even if humanity does not. When we look at climate change through the lens of humanity, we see clearly that as conditions underpinning the viability of communities and societies are undermined, instability will result. DoD will inevitably play an integral role in adapting to and responding to instability driven by climate change both at home and around the world.⁶

Key to success and regional stability will be building regional capabilities and alliances around climate change resilience, and to do this well before situations deteriorate into conflict.⁷

"[V]ery few, if any, of Africa's challenges can be resolved using only military force. Consequently, U.S. Africa Command emphasizes military support to diplomacy and development efforts. ...Over the next decade, Africa will be shaped by the increased presence of external actors and the effects of environmental change. ... Poor land-use policies, changing weather patterns, rising temperatures, and dramatic shifts in rainfall contribute to drought, famine, migration, and resource competition. ... Armed groups and criminal networks exploit this situation, leading to human trafficking, slavery, and more violence.

—General Thomas Waldhauser, then commander of U.S. Africa Command (AFRICOM), February 2019⁸

⁶ Report of the Defense Science Board Task Force on "Trends and Implications of Climate Change for National and International Security," Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

⁷ Report of the Defense Science Board Task Force on "Trends and Implications of Climate Change for National and International Security," Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

⁸ Quote from AFRICOM posture statement to SASC February 7, 2019: General Thomas D. Waldhauser, United States Marine Corps available at https://www.armed-services.senate.gov/imo/media/doc/Waldhauser_02-07-19.pdf.

BUILD REGIONAL CAPABILITIES AND ALLIANCES AROUND CLIMATE CHANGE RESILIENCE

Identify and organize around Joint Staff global climate security equities under leadership of the Director of the Joint Staff and establish parallel Combatant Command staff roles

Although the Department of State has the executive responsibility to conduct foreign assistance on behalf of the U.S. Government, DoD is a close partner in providing security assistance to foreign militaries, governments, and in some cases even to foreign civilians. In many regions of the world, environmental degradation and climate change are driving conflict and undermining local capacity.

In addition to identifying climate security and resilience as a mission and top priority, the Secretary of Defense should direct key elements of the Joint Staff like the J-5 (strategy, plans, and policy) and J-7 (doctrine, education, and training) to engage. This would signal that climate is not an isolated responsibility of the individual military services who are charged with manning, training, and readiness, or even of the Joint Staff J-4 who typically handles environmental matters.

CCMDs include climate security in theater campaign plans

Working with the Department of State, USAID, and the National Security Council, CCMDs should consider climate change and disaster risk reduction strategies—specifically considering food security, water security, and disaster risk—in formulating campaign plans and assessing their ability to conduct their missions.⁹

Adaptation and resilience planning will need to address more effective water management, changes in agricultural practices, planning for migration, clean energy transition, and dealing with extreme weather events.¹⁰ As stated earlier, and echoed by the Defense Science Board, the single greatest direct driver of impact on human habitat is water—too much or too little.¹¹ Water and water management are key factors to food, health, energy, and economic development, and how effective given regions are in these areas will have significant national and international security implications. In addition, population increases in already fragile parts of the globe require increased agricultural productivity at a time when climate change and years of poor land management are making food production more precarious.

Identify security dilemmas where climate cooperation could help solve conflict

The Undersecretary of Defense for Policy and Joint Staff J-5 should lead a DoD effort to identify areas of U.S. forward engagement marked by security dilemmas and long-standing intractable conflict that climate cooperation could be creatively employed to solve problems.

The Revolutionary Armed Forces of Colombia (FARC) controlled vast swaths of the Colombian rainforest for decades, essentially keeping them off limits to economic exploitation and development. Recognizing that unsustainable logging and slash and burn agriculture were likely to devastate a critical global carbon sink when the FARC disbanded, the Colombian government sought to enlist those most invested in preserving its forests. Northern European nations led by Norway had invested billions in rainforest carbon offsets. Bogota brought them into the peace process as highly capable, well-funded stakeholders. In 2017 Colombia instituted a nationwide carbon tax to in part pay for FARC reintegration. Additional financial commitments by the Europeans helped underwrite sustainable implementation of the accords.

⁹ Report of the Defense Science Board Task Force on “Trends and Implications of Climate Change for National and International Security,” Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, page 97.

¹⁰ Report of the Defense Science Board Task Force on “Trends and Implications of Climate Change for National and International Security,” Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

¹¹ Report of the Defense Science Board Task Force on “Trends and Implications of Climate Change for National and International Security,” Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

The Colombia peace process is an example of climate cooperation as a creative tool to help resolve a decades-old, intractable conflict. It's also instructive on the benefits of comprehensive, integrated climate security outcomes that a more inclusive, diverse, climate conscious national security decision-making apparatus can identify and deliver. Years of involvement managing U.S. national security challenges in Colombia by DoD and other federal agencies and billions of taxpayer dollars did not conceive of such a grand bargain. Such creative outcomes will become more frequent with a climate-security-focused decision-making process for national security.

The Colombian peace process provides a powerful example of how creative application of climate policy to seemingly unrelated challenges can solve intractable conflicts. The Colombian Peace Agreement was the first in history to have climate, sustainability, and rural economic development as core principles.

ADVANCE THEATER ENGAGEMENT ON CLIMATE WITH MILITARIES AROUND THE WORLD

Internationally, climate actually tends to be a unifying rather than a divisive issue amongst most partner militaries and multilateral security organizations. When DoD developed its Climate Adaptation Roadmap in 2014 under the Obama Administration, the roadmap was well received both within DoD by the Services, Joint Staff, and Combatant Commanders, and served as a great diplomacy and capacity building opportunity with partner nations like Chile, Korea, Japan, and Caribbean nations who all wanted to create their own versions of the roadmap and to collaborate on climate. Similarly, DoD officials reported that some of the few occasions when DoD or Combatant Commanders could get Russia or China to engage in international military forums were on discussions about climate change.

There are several specific initiatives that DoD leadership could undertake to advance engagement on this issue with militaries around the world.

Develop a strategic communication message that links water and food security and overall climate resilience to regional stability and U.S. national security

Strategic communication is essentially communicating in support of national objectives. The Department of Defense and the Joint Force communicate strategically with general populaces, governments, and other organizations in friendly and adversary nations alike, in the contexts of conflict and competition as well as cooperation.¹² The Department's efforts on climate change will need to be sustained over a long period of time and must be undergirded by strategic communications that engage multiple audiences. Water and food security, in particular, will be pervasive challenges in all theaters of operation, and it is critical that both internal and external audiences understand DoD's interest in maintaining food and water security around the globe to prevent these climate-induced threats from leading to further instability.

Revive funding for the Defense Environmental International Cooperation Program

For many years, until it was cancelled at the end of 2018, the Defense Environmental International Cooperation Program (DEIC) was a tool that OSD and CCMDs used as part of their security cooperation engagement efforts. DEIC money would fund initiatives such as an annual Pacific Environmental Security Forum in Asia to discuss climate change (which U.S. Indo-Pacific Command (INDOPACOM) leadership viewed as a prime security cooperation engagement tool). U.S. Southern Command (SOUTHCOM) leveraged DEIC assets to promote partner nation environmental and energy capability and to sponsor international conferences that discussed resilience, humanitarian assistance and disaster relief. Several DEIC projects in AFRICOM were related to water security, and Caribbean nations used funds to assess risks of saltwater intrusion and hurricanes.¹³

¹² Strategic Communication Joint Integrating Concept, Jul. 2009, available at https://www.jcs.mil/Portals/36/Documents/Doctrine/concepts/jic_strategiccommunications.pdf?ver=2017-12-28-162005-353.

¹³ Institute for Defense Analyses, A History of the Defense Environmental International Cooperation Program, Susan L. Clark-Sestak, April 2019, available at <https://www.ida.org/research-and-publications/publications/all/a/ah/a-history-of-the-defense-environmental-international-cooperation-program>.

Although funding for the program was modest (averaging around \$2 million or less per year), over the life of the program 90 nations hosted at least one DEIC-funded event, and more than 50 others participated in multilateral or regional DEIC-funded events.¹⁴ In its final year of operation, with a budget of only \$960,000, DEIC was able to execute 25 projects involving 67 countries.

Officials we spoke with agreed that the DEIC program was an example of how a little money could get a lot done in terms of promoting engagement on important global environmental issues like climate change. Strengthening environmental security engagements through a reinstated DEIC presents opportunities to support stability and international cooperation, advancing national defense objectives such as strengthening alliances and attracting new partners.

Leverage the National Guard State Partnership Program for climate resilience and security engagement

The National Guard State Partnership Program (SPP) began as a way to constructively engage with newly independent former Soviet Republics. The thought process was that engagement with National Guard units would raise less suspicion from the Kremlin than engaging with U.S. active forces, and today 89 countries around the world are involved in SPP, including virtually every country in SOUTHCOM.¹⁵

The program has been hugely important for building and sustaining relationships, as there is less turnover in the National Guard than the active force and relationships in partner militaries have endured. In recent years, the Pentagon agreed with a GAO report which found that SPP needed a more defined strategic plan, as well as measurable goals and performance metrics.

As laid out in *A Climate Security Plan for America*, climate security and resilience could be a focus area for SPP.¹⁶ Specifically, in this low key and collaborative environment, partner nations could build interoperability for climate-induced humanitarian disasters and implement some of the policies described in this report to actually build resilience and mitigate risks from these events. All of this can be done without adding more burden to active forces, and leveraging skill sets that exist in the National Guard.

BUILD CLIMATE CAPACITY AMONG PARTNER NATIONS

There are several existing authorities and defense institutions that can be leveraged to build climate resilience capacity among partner militaries and nations, such as: joint training exercises, training foreign military counterparts and relevant organizations, and providing humanitarian assistance before and during disasters. DoD has the requisite fiscal authorities and institutions to make meaningful progress.

The list below is illustrative, not exhaustive, highlighting how existing authorities can be brought to bear to make our partners much more interoperable, capable, and resilient.

Establish a climate security and resilience focus for Humanitarian Assistance administered by the Defense Service Cooperation Agency

DSCA, working through the CCMDs, is DoD's primary vehicle for conducting Humanitarian Assistance (HA). DSCA is charged with advancing "U.S. national security and foreign policy interests by building the capacity of foreign security forces to respond to shared challenges."¹⁷ It does so through a three-pronged approach of developing

¹⁴ Institute for Defense Analyses, *A History of the Defense Environmental International Cooperation Program*, Susan L. Clark-Sestak, April 2019, available at <http://bit.ly/2Nk2Z8P>.

¹⁵ Bradley Bowman and Thomas Pledger, "Modernize the National Guard's State Partnership Program," *Breaking Defense*, Aug. 10, 2020, available at <http://bit.ly/3cyjvVz>.

¹⁶ *A Climate Security Plan for America*: A product of The Climate and Security Advisory Group. The Center for Climate and Security, in partnership with George Washington University's Elliott School of International Affairs. Edited by Conger, J; Femia, F; Werrell, C. September 2019. Accessed at https://climateandsecurity.org/wp-content/uploads/2019/09/a-climate-security-plan-for-america_2019_9_24-1.pdf.

¹⁷ <https://www.dsca.mil/about-dsca/mission-vision-values/our-mission>.

people through training and education; developing effective systems by identifying solutions that fit the partner's need, and helping to develop security institutions by advising partners on things like organization, doctrine, and leadership.¹⁸ Its Humanitarian Assistance programs "build the capacity of partner nation civilian and military institutions to provide essential services to civilian populations."¹⁹ This approach is exceptionally well suited and easily adapted to the climate security and resilience problem set.

The FY2021 National Defense Authorization Act authorized \$74 million in HA funds and the program is generally regarded as providing low cost, nonobtrusive and highly effective activities that support SECDEF and CCMDs theater strategies while helping partners help themselves, building collaborative relationships with host nation civil society, and strengthening alliances.

Under the fiscal authority of 10 U.S.C. § 2561, the Overseas Humanitarian, Disaster, and Civic Aid (OHDACA) appropriation funds HA activities such as the construction or refurbishment of local infrastructure facilities, disaster preparedness or refugee repatriation training, exercises or seminars, assessment visits, and technical and logistics assistance for foreign recipients.²⁰ A lot of climate resilience and capacity building could be done under this authority.

One specific idea is to establish climate resilience pilot projects in concert with the State Department, USAID, the U.S. Department of Agriculture (USDA), and other relevant agencies, to work on specific adaptation approaches and challenges in hot spots like coastal southeast Asia, the Sahel region of Africa, or the northern triangle in Central America.²¹ These projects could focus on local scale risk assessment and planning for things like the combined challenges of sea level rise, storm surge, and inadequate built and natural water infrastructure,²² or how to produce crops in drought conditions while building healthy soil that retains more water. Building regenerative agricultural capacity around the world is key to sustaining harvests and water cycles now and in a future that we know is going to be even more precarious. DoD can initiate convenings and training through these existing programs and authorities, working closely with USDA's Foreign Agricultural Service, USAID, and the State Department.

Establish a Center of Excellence for Climate Security and Resilience at a DSCA Regional Center

DSCA has five regional centers for strategic studies around the world, and several other capacity building institutes. We recommend designating one of these centers, such as the Daniel K. Inouye Asia-Pacific Center for Security Studies, as a Center of Excellence for Climate Security and Resilience. This would be similar to how the Marshall Center in Europe was designated a Center of Excellence for Transnational Security because of its focus and programs on cybersecurity.

We recommend putting the Center of Excellence in the Asia-Pacific Center because a climate security and resilience curriculum and expertise will be incredibly important in this part of the world, and because of the prominence that the Asia-Pacific region has in global affairs. Putting the Center of Excellence for Climate Security and Resilience in Asia will ensure that climate is not viewed as a marginal concern.

DoD conducts Humanitarian Assistance (HA) to relieve or reduce endemic conditions such as human suffering, disease, hunger, and privation, particularly in regions where humanitarian needs may pose major challenges to stability and prosperity. This supports partner nation efforts to reduce the risk of, prepare for, and respond to humanitarian disasters thereby reducing reliance on international disaster relief. These mission sets are closely aligned with the types of issues that acute and chronic climate change impacts pose.

¹⁸ <https://www.dsca.mil/about-dsca/mission-vision-values/our-vision>.

¹⁹ <https://www.dsca.mil/humanitarian-assistance>.

²⁰ Army Jag School, 2020 Fiscal Law Deskbook, Ch. 10, available at <https://tjaglcspubli.army.mil/documents/27431/37168/2020+Fiscal+Law+Deskbook.pdf/0d31d563-9b36-4895-ba52-042fe8b48acd?version=1.5>.

²¹ Report of the Defense Science Board Task Force on "Trends and Implications of Climate Change for National and International Security," Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

²² Report of the Defense Science Board Task Force on "Trends and Implications of Climate Change for National and International Security," Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

We recommend that climate capacity building and resilience curricula be built out and that there be extensive collaboration with other regional centers, as well as with other relevant U.S. agencies such as USAID, State, and the Department Agriculture. Creating climate resilience is a multidisciplinary problem set, and the curriculum developed and offered through the Center of Excellence could serve the needs of several U.S. agencies (as already contemplated by existing law).²³

We also recommend that pursuant to existing fiscal authorities,²⁴ SECDEF (with concurrence from the Secretary of State as required) waive costs to attend climate security and resilience-focused programs for foreign military officers, for other foreign defense and security personnel from developing countries, and for representatives from nongovernmental and international organizations. This will ensure that capacity is built broadly in areas that are most at risk and least resilient to climate impacts.

Develop climate security and resilience training curricula and exercises with foreign partners

The U.S. offers several foreign military training program opportunities, with literally thousands of foreign military members participating each year. The International Military Education and Training Program (IMET) was established by Congress to enhance regional stability through mutually beneficial military-to-military relations and enhanced interoperability between the U.S. and its allies.²⁵ Participants have the opportunity to take courses from around 150 different U.S. military schools around the country like the U.S. Army War College and National Defense University at a reduced or no cost, as well as to get specific, on-the-job technical training. Topics can range from weapons training to human rights and leadership.

IMET and similar programs provide a tremendous opportunity to enhance interoperability for responding to climate-related disasters, as well as to build a common base of knowledge on climate security risks and best practice solutions, sharing experiences and lessons learned. As recommended by the Defense Science Board, in developing curricula, DoD should collaborate with other relevant federal agencies and offices like the USDA Foreign Agricultural Service and USAID, as well as partner nations, to build programs in the fields most relevant to adapting to climate change such as hydrology, land use, civil engineering, agriculture, energy, and infrastructure planning.²⁶

Several thousand military personnel from foreign nations participate in IMET and other military education programs each year, spanning all ranks and seniority and skill levels.

In addition to individual or unit professional military education, DoD should use existing fiscal authorities like 10 U.S.C. § 321²⁷ to conduct and pay for joint climate security training exercises with partner militaries and security forces to achieve interoperability that advances U.S. interests in strategic areas of the world which are particularly vulnerable to climate threats. Examples would be training around mass migration and instability triggered by water and food shortages, traditional humanitarian relief exercises simulating natural disasters, as well as more technical exercises around construction of natural and built infrastructure to increase resilience.

Deepen the U.S. Army Corps of Engineers climate resilience mission and capacity building with foreign partners

DoD has an additional incredible resource that it can bring to bear in building climate resilience capacity between the U.S. and partner nations. The U.S. Army Corps of Engineers (USACE) is the world's largest public engineering, design, and construction management agency. Flood risk management and natural infrastructure are central to its

²³ 10 U.S.C. § 342(g).

²⁴ 10 U.S.C. § 342(f).

²⁵ <https://www.dsca.mil/international-military-education-training-imet>.

²⁶ Report of the Defense Science Board Task Force on "Trends and Implications of Climate Change for National and International Security," Office of the Undersecretary of Defense for Acquisition, Technology and Logistics, October 2011, Executive Summary.

²⁷ 10 U.S.C. 321 Training with Friendly Foreign Countries: Payment of Training and Exercise Expenses.

mission.²⁸ It routinely works to reestablish ecological processes in water-related ecosystems that have been degraded, damaged, or destroyed, such that these systems will be resilient under current and future conditions. The USACE has deep expertise in working with wetlands, submerged aquatic vegetation, oyster reefs, and riparian forests, and can work on relatively small-scale projects as well as large-scale projects such as the Chesapeake Bay and the comprehensive restoration of the Florida Everglades.²⁹

Domestically, the Corps is very well versed in working with sister federal environmental agencies like the U.S. Fish and Wildlife Service. Crucially, it has deep experience working abroad with U.S. agencies like the Department of Homeland Security, the Department of State, and the independent U.S. Millennium Challenge Corporation, as well as with partner nations.

For example, the USACE Middle East District provides service in 16 of the 20 nations in this region.³⁰ USACE Europe District's International Engineering Center supports both U.S. European Command (EUCOM) and AFRICOM, providing facility planning, design, and construction in the Balkans, Caucasus, and Baltic as well as 52 countries in Africa.³¹ Humanitarian Assistance funding is a major source of programming, and the USACE routinely provides things like schools, medical clinics, orphanages, community centers, and other beneficial structures to impoverished people in developing countries. It is easy to see how a natural marriage between the USACE's core mission of water-related ecosystem restoration and its deep relationships in key regions of the world would be incredibly valuable for building partner capacity around climate resilience and restoration. USACE leadership, with direction from DoD, should plan through the lens of climate security and affirmatively develop Humanitarian Assistance and other projects that build ecological resilience to the water-related climate challenges of today and tomorrow.

Under the authority of 33 USC 2323a, Interagency and International Support Authority, the Corps of Engineers is authorized to “engage in activities (including contracting) in support of Federal departments or agencies, nongovernmental organizations, international organizations, or foreign governments to address problems of national significance to the United States”; “to use the technical and managerial expertise of the Corps of Engineers to address domestic and international problems related to water resources, infrastructure development, and environmental protection and restoration”; and to “accept and expend additional funds from Federal departments or agencies, nongovernmental organizations, international organizations, or foreign governments to carry out this section.”³²

Given this authority for the Army Corps to “pool” funds from the operational side of DoD with funds from USAID and other federal agencies, NGOs, and (after coordination with the Department of State) international organizations and foreign governments, this authority should be used by the operational side of DoD much more extensively to address the security implications of climate change, and especially in areas of strategic concern to the United States that are vulnerable to the impacts of climate change on freshwater systems, precipitation patterns, and flooding in particular.

²⁸ Isidro Reyna, “What is Ecosystem Restoration,” Galveston District, U.S. Army Corps of Engineers, July 12, 2012, available at <https://www.usace.army.mil/Media/News-Archive/Story-Article-View/Article/477888/what-is-ecosystem-restoration/#:~:text=The%20focus%20of%20the%20Corps,wetland%2C%20riparian%20and%20aquatic%20systems.>

²⁹ Isidro Reyna, “What is Ecosystem Restoration,” Galveston District, U.S. Army Corps of Engineers, July 12, 2012, available at <https://www.usace.army.mil/Media/News-Archive/Story-Article-View/Article/477888/what-is-ecosystem-restoration/#:~:text=The%20focus%20of%20the%20Corps,wetland%2C%20riparian%20and%20aquatic%20systems.>

³⁰ <https://www.tam.usace.army.mil/Missions/>.

³¹ <https://www.nau.usace.army.mil/Business-With-Us/International-Engineering/>.

³² 33 U.S.C. 2323a.

3 Deploy DoD's Unique Capabilities to Drive Innovation, Improve Resiliency, and Reduce Greenhouse Gases

KEY RECOMMENDATIONS

- Accelerate energy transition, innovation, and financing
- Harness the power of DoD's lands for climate resilience and carbon sequestration
- Integrate climate into acquisition and procurement

We next look at unique capabilities DoD has that can move the needle in driving innovation, improving resiliency, and reducing greenhouse gases at scale. Specifically, we recommend that DoD resume its previous leadership on alternative liquid fuels, operational energy innovation, and that DoD fully fund programs that transition critical new energy technologies to deployable new systems for the military and that spin off innovation to the private sector. DoD can also drive markets and adoption in areas like distributed energy, battery storage and electric vehicles.

We also look at some less discussed opportunities, such as how to manage DoD's vast landholdings for climate resilience and mitigation gains. We end this "unique capabilities" section considering how DoD can use its massive procurement power to demand more sustainable (and more cost effective) systems from the defense industrial complex that supplies DoD, and to ensure that both the systems and supporting infrastructure DoD purchases will be suited for environmental conditions of the future.

ACCELERATE ENERGY TRANSITION, INNOVATION, AND FINANCING

To date, most of the discussion around what DoD should be doing on climate change, both within the Pentagon and in civil society, has focused on energy and facilities. This has been for good reason.

To its credit, DoD has recognized the need, and in 2019, DoD's investment in energy-related research, development, testing, and evaluation (RDT&E) alone was over \$1.6 billion.³³

On the facilities side, the department has also made progress in revising facilities codes to require better planning to adapt to climate change, as well as restricting construction in floodplains. Rather than attempting to summarize all the work that has been done in the world of DoD energy and facilities policy, and all the work left to do, we will provide some tailored recommendations for some gaps that we believe remain and are important going forward. Our discussion of desired energy and facilities initiatives will by no means be an exhaustive one.

DoD is the world's largest consumer of fossil fuels, and DoD owns and manages hundreds of thousands of buildings located at nearly 4,800 sites worldwide, many of which are decades old.

Set a few clear, ambitious goals for energy transition, innovation, and financing

The Secretary of Defense should request a plan for the Department to complete a transition to renewable energy within the coming decade, and request that the Services, Defense Agencies, and combatant commanders produce this execution plan within four months. This can be done, and must be done, to meet the moment with leadership by the world's largest consumer of energy to counter the existential threat of runaway warming.

³³ Dorothy Robyn and Jeffrey Marqusee, "Clean Power from the Pentagon," *Issues in Science & Technology*, Summer 2019, available at <https://issues.org/clean-power-from-the-pentagon/>.

Deployed Marines now make much of the energy they need wherever they happen to be, using portable solar and wind. This allows them to be less tethered and vulnerable to resupply convoys and avoids carrying heavy batteries that need to be replaced. Navy SEAL teams are similarly net zero energy and water in many cases and have reported that when they do not need to rely on a diesel generator for power, they can better hear the enemy and are less detectable themselves.³⁴

At sea, the hybrid electric drive ship like USS Makin Island (LHD 8) realized fuel savings of \$18,000 per day (which translates to \$250 million over the life of the ship) and was able to reduce its crew by 80 to 90 personnel because it no longer has a steam plant onboard.³⁵ Ashore, roughly two-thirds of the energy the Navy uses at its installations is from renewable sources, which will save the Navy \$400 million over conventional energy.³⁶

DoD can simultaneously focus on its traditional mission set while also meeting the Commander in Chief's new charge to defeat the existential threat of climate change. That mission—both to counter the threat of climate change and to be as formidable a force as possible in great power competition—demands energy flexibility and autonomy.

Several years ago, the Department of the Navy tested and certified various biofuels for drop-in use on every Navy tactical engine in the fleet. With the preponderance of DoD energy usage in aviation fuels, DoD should accelerate collaboration with the private sector on the development, and deployment of low-emission fuels that ensure life-cycle sustainability. Sustainable aviation fuels (SAF) offer by far the most effective way of reducing the environmental impact of flying in the short-term. In recent years the U.S. commercial aviation industry, oil companies, and start-ups have made significant progress developing a new generation of biofuels from various feedstocks, including algae, agricultural waste, forestry residue, municipal solid waste, and other non-food sources.

Criteria for advanced biofuels should include: 1) drop-in fuels not requiring platform modification; 2) fuel production that does not require removing land from food production; 3) fuels that significantly reduce carbon footprint; and 4) fuels that are cost competitive.

DoD should take measures to accelerate the production and use of biofuels and sustainable aviation fuels (SAF) in particular. Although SAF is already commercially-available in limited amounts, it requires greater scale to be economically viable. DoD should increase funding for R&D to drive down the cost of development and production, including the use of new feedstocks and production processes. A DoD commitment to helping grow the market by increasing military procurement and use of biofuels will help rural economies in particular build back better. Those rural interests will allow for broad bipartisan support.

After setting ambitious, measurable goals, SECDEF and DoD should then empower the Services and subordinate commands to innovate and tailor solutions locally. Mechanisms like competitions that solicit, spotlight, and reward good ideas from the field should be employed to empower local commands, who best understand the complex problem sets they face, to develop local solutions. As discussed below, this innovation should be paired with a vibrant energy community of practice for cross-training and learning.

DoD Components should be empowered to innovate on financing of energy solutions as well as new technologies. For example, commands should be encouraged to fully leverage non-DoD financing opportunities such as energy savings performance contracts (which allow federal agencies to procure energy savings and facility improvements with no up-front capital costs or special appropriations from Congress by partnering with utilities/other energy service providers) or power purchase agreements to save energy and water, improve energy resilience, contribute to mission assurance, and reduce DoD's utility costs.

³⁴ Ray Mabius, "Under President Biden the U.S. Military Must Lead the Way on Climate Change," *Time*, Nov. 13, 2020, available at <https://time.com/5911084/military-lead-climate-change-transition/>.

³⁵ Henrik Segercrantz, "USS Makin Island: Proven Fuel Efficient," *Marine Link*, Jan. 23, 2013, available at <https://www.marinelink.com/news/efficient-island-proven350998>.

³⁶ Ray Mabius, "Under President Biden the U.S. Military Must Lead the Way on Climate Change," *Time*, Nov. 13, 2020, available at <https://time.com/5911084/military-lead-climate-change-transition/>.

Fund R&D breakthrough energy technologies

Innovation is at the heart of what DoD does and has done throughout history. Energy is one of the next great opportunities for DoD leadership to have ripple effects throughout the entire economy (in particular, sectors focused on non-carbon-based energy generation, storage, transmission, and reliability; as well as on alternative vehicle fuels, carbon dioxide sequestration and small modular nuclear reactors).³⁷

DoD can lead on clean energy by harnessing its massive research and development capabilities to create breakthrough energy technologies. From developing high-energy power sources, to renewable energy and battery storage, energy innovation is critical to the future battlefield. Every energy innovation from DoD has the dual opportunity to alleviate a mission concern while simultaneously creating a civilian market for the new technology. If a soldier or autonomous system can wear a renewable power source, that means their unit can travel further from base, and that there is a reduced logistics tail in a contested wartime environment.

*DoD is the largest employer of scientists and engineers in the nation and has been the primary catalyst for advanced technological breakthroughs for decades to include the Internet, the Global Positioning System (GPS), virtual reality, voice recognition technology, autonomous vehicles, and cloud computing.*³⁸

These innovations from DoD will catalyze further innovation and possibly result in the growth of novel energy industries as technologies are adapted for commercial civilian use. For example, DoD is investing in the development of a broad range of portable energy sources, such as fuel cells, wearable solar PV, and devices to harvest kinetic energy created by the soldiers' own motions.³⁹ Autonomous vehicles are another focus area with goals of developing better batteries, long-running fuel cells, solar-powered drones, and long-distance recharging of drones.⁴⁰ Directed energy weapons such as high energy lasers, as well as advanced capabilities like the rail gun, also require high power levels and advanced storage.

The military services are also looking at how to make platforms more energy efficient. The more energy has to go to power a ship, for example, the less energy is available to power critical weapons systems. The Navy had experimented with a dashboard that would allow a ship's bridge team to see how much energy was being used at various locations on the ship. Many, if not most, of these initiatives have slowed over the past few years. Understanding energy use is a critical step in becoming more efficient, and initiatives like these should be reinvigorated.

DoD should direct ASD(R&E) to coordinate a joint effort to develop carbon neutral or carbon negative sources of operational energy in coordination with DARPA and service organizations such as NREL (Navy Renewable Energy Laboratory) and AFWERX to accelerate efforts to develop, mature and field breakthrough options to reach net-zero emissions.

Investments should be made in research around alternative metals necessary for battery storage technologies, and recycling programs for existing rare-earth minerals, led by a partnership between the Department of Defense (DARPA) and the Department of Energy (ARPA-E and the national labs).

DoD should use its procurement power with GSA to require that replacement nontactical vehicles be electric to the greatest extent practicable or utilize low-emission technologies. DoD leases approximately 200,000 noncombat vehicles on four- to five-year contracts. A policy requiring EV replacements for the 40–50 thousand leases expiring every year would be a major market driver for the industry. The number of battery electric vehicles sold in the United States came to about 250,000 in 2019 or 1.5% of the 17 million new light vehicles sold that year. A DoD demand signal for an additional 40–50 thousand EV leases a year would constitute a 20% increase in the domestic EV market.

³⁷ <https://www.whitehouse.gov/presidential-actions/executive-order-promoting-small-modular-reactors-national-defense-space-exploration/>.

³⁸ <https://dodstem.us/about>.

³⁹ Dorothy Robyn and Jeffrey Marqusee, "Clean Power from the Pentagon," *Issues in Science and Technology*, Summer 2019, available at <https://issues.org/clean-power-from-the-pentagon/>.

⁴⁰ Dorothy Robyn and Jeffrey Marqusee, "Clean Power from the Pentagon," *Issues in Science and Technology*, Summer 2019, available at <https://issues.org/clean-power-from-the-pentagon/>.

The DoD should explore opportunities to collaborate and coordinate with the commercial sector for the electric vehicle fleet goal. In particular, it should work with organizations such as the Corporate Electric Vehicle Alliance to help establish a market capable of providing adequate EV options beyond sedans, specifically utility trucks and vans which DoD needs.⁴¹ These EV market incentives should be paired with investments in charging stations, facility low-emission retrofits. It is also imperative that DoD send a demand signal to catalyze breakthroughs in tactical vehicle electric propulsion, to support the strategic development of a national industrial base capable of manufacturing high technology electric vehicle components currently dominated by overseas competitors. This would have direct mission benefits in the form of increased ranges for these systems, reduced sustainment costs and more supportable logistics tails.

DoD should explore potential pilot programs with adjacent communities where DoD vehicles could be charged on community infrastructure to drive usage demand and cost sharing.

Fully fund the Operational Energy Capability Improvement Fund (OECIF) to transition validated technologies into energy projects

The 2018 National Defense Strategy stated, “Success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting.”⁴²

The OECIF program exists to guide innovation in operational energy technologies via targeted science and technology investments. The program focuses on bridging the gap between technology development and its integration in the field for testing of suitable operational use cases.

OECIF could be expanded beyond its present role to demonstrate technologies for military operational use, and specifically mandate that it guide energy technology transition for the DoD enterprise writ large, whether technologies are ultimately for tactical or nontactical use. This would build on a proven program and therefore more fully leverage the successful OECIF construct.

Improve mission assurance by boosting energy resilience, energy security, and energy conservation of DoD’s fixed installations

DoD has done quite a bit of work on, and is increasingly focused on, a concept called mission assurance.⁴³

DoD must be able to protect these assets in the face of both humanmade and natural threats (like climate change), both of which may disrupt energy supplies to a base which houses critical infrastructure, networks, equipment, and mission functions.

The Department spends around \$4 billion a year on energy that powers its bases, and for the most part, these more than 500 installations are largely dependent on a commercial power grid that is vulnerable to disruption from aging infrastructure, weather-related events and direct attack.⁴⁴ Energy autonomy and energy resilience are therefore critical components to mission assurance.

We recommend appropriating \$5 billion over the course of the next four years to deploy clean energy sources to power critical missions and assets so that these assets are able to function around the clock, for a prolonged period of

Since its inception in 2012, OECIF has successfully transitioned 76% of the technologies that it has selected to acquire or insert into military operations. As such, the program has served a critical role for DoD, and by extension, has accelerated development of key operational energy technologies which can then be adapted for civilian use.

“Mission Assurance: A process to protect or ensure the continued function and resilience of capabilities and assets—including personnel, equipment, facilities, networks, information and information systems, infrastructure, and supply chains—critical to the performance of DoD mission essential functions in any operating environment or condition.”

⁴¹ <https://www.ceres.org/our-work/transportation/corporate-electric-vehicle-alliance>.

⁴² <https://rt.cto.mil/ddre-rt/dd-rtl/oe-i/about-us/policy-strategy/>.

⁴³ https://policy.defense.gov/Portals/11/Documents/MA_Strategy_Final_7May12.pdf.

⁴⁴ https://www.acq.osd.mil/eie/IE/FEP_index.html.

time, even when the grid is disrupted. DoD is already in the process of deploying renewable energy (mainly large-scale solar) and demonstrating precommercial microgrid and storage technologies. These systems will allow for more sustained and robust back-up energy capabilities as compared to today's typical back-up diesel generators which can power only certain critical loads, are expensive to operate, and break down when they are run for a prolonged period of time.

DoD should seek to increase funding for the Energy Resilience and Conservation Investment Program to improve energy efficiency, energy resilience, energy security, and energy conservation of DoD's fixed installations. As a Military Construction (MilCon) program, ERCIP has traditionally funded projects that promise a significant payback via reduced energy costs. Moving forward, ERCIP should focus on improving energy resilience, efficiency, security, availability, and economic performance as well as supporting water efficiency and resilience projects.⁴⁵

Evaluate using the Defense Production Act to develop manufacturing capabilities and to secure critical materials in areas like microgrids and advanced battery storage

In order to make the necessary investments in these types of systems across the entire department, there is a supply chain element to mission assurance that needs to be addressed as well. The critical materials and manufacturing capability to produce advanced battery storage either do not exist in this country or exist at too limited a scale to be able to supply all of the DoD installations that will need these systems. DoD should evaluate using the Defense Production Act to develop manufacturing capabilities and to secure critical materials in areas like microgrids and advanced battery storage.

Establish a closer partnership with the Department of Energy and Department of Homeland Security on grid security

DoD should establish a closer partnership with the Department of Energy and Department of Homeland Security on grid security. Currently, DoD does grid threat analysis, but DoE has the actual responsibility to safeguard electric supply, and DHS is designated authority to respond to grid threats. All of these issues go hand-in-hand, and there must be closer coordination between these three key agencies to truly safeguard the nation's electric grid, as well as for the resilience of DoD installations specifically.

Continue efforts to build a community of practice for energy resilience professionals

In 2019, DoD's environmental technology demonstration and validation program called ESTCP (Environmental Security Technology Certification Program) funded a project called the Military Energy Resilience Catalyst (MERC). The MERC is a cohort model where each year a group of about 20 energy professionals interact with faculty from program offices at headquarters in a way that does not typically occur due to the levels of bureaucracy between them, and each one gains from the perspective of the other.

The program has several objectives, not the least of which is to develop the broader workforce of energy professionals within the military services and DoD, and to create a peer-to-peer network to support ongoing innovation. Substantively, the program aims to streamline DoD project development by identifying and disseminating scalable practices, provide direct facilitation and technical assistance to projects, and establish a knowledge management system for the community. So far, the model has proven effective at bridging bureaucratic barriers and sharing tangible lessons learned on how to develop and execute energy projects.

For energy resilience, as for climate, it is not enough for these efforts to be limited to a handful of individuals at the headquarters level. We need to develop a cadre of trained professionals who know one another and can collaborate and learn from one another's experiences.

⁴⁵ https://www.acq.osd.mil/eie/Downloads/IE/FY2022_2023%20ERCIP%20Guidance.pdf.

HARNESS THE POWER OF DOD'S LANDS FOR CLIMATE RESILIENCE AND CARBON SEQUESTRATION

Optimize DoD's 27 million acres of lands for resilience and carbon sequestration

In the 1930s, after years of damaging land management practices had led to the Dust Bowl, President Franklin Delano Roosevelt said, "The Nation that destroys its soil destroys itself."⁴⁶

That statement rings true today on a global scale. Most soils in the United States are classified as degraded by the U.S. Department of Agriculture, and soils in some of the most unstable parts of the world are even worse off. We have seen in places as different as the Sahel region of Africa, the Middle East, and the northern triangle nations in Central America, that soil degradation—including inability to produce adequate harvests and withstand drought—can drive instability, extremism and mass migration.

The good news: Leading land managers now know how to manage land in a way that it actually regenerates itself, that restores soil and ecosystem function. This is one of the most important tools in our toolkit to both become more resilient to climate impacts, and to sequester carbon at scale to reverse climate change.

DoD's vast land holdings of 27 million acres uniquely position it to decrease its carbon footprint while advancing its mission.

Few entities in the world have as much land and discretion over its management as DoD. When ecologically managed through practices such as reforestation and wetlands/grasslands restoration, DoD's land and waterscapes can significantly increase their CO₂ capture and strengthen resilience to the impacts of climate change, helping put DoD on a path to carbon neutrality and resilience.

DoD's most emission intensive operations can be mitigated. A round trip B-2 mission from Whiteman AFB to the Arabian Gulf emits 135 tons of CO₂ equivalent and can be offset by ~50 acres of reforestation or 90 acres of reintroduced grassland. Conservatively, one acre of new forest can sequester 2.5 tons of carbon (CO₂ equivalent) annually and regeneratively managed grasslands or restored wetlands can sequester several tons per acre annually and are even more resilient carbon sinks.⁴⁷

From a resilience standpoint, military training range lands have been affected by years of training plus the impacts of climate-exacerbated severe weather events.⁴⁸ Hurricanes, unprecedented rainfall events, wildfires, and rising temperatures have resulted in billions of dollars in damage to these lands.

Climate optimizing DoD lands also increases base resilience and benefits service member health through air and water quality, shade relief, and heat reduction. Bases are typically over-cleared, over-paved, over-drained, and over-mowed. Greening bases by restoring tree canopies and perennials, grazing, removing excessive pavement, and installing green or white roofs, and cisterns, will sequester carbon, save water, reduce environmental stress, and enhance health and wellness for all who train, live, and work on or near these sites.

Bases are also starting to undertake living shorelines projects like rebuilding oyster reefs and restoring wetlands to confront sea level rise and lessen damage from extreme weather.⁴⁹ These types of projects make sense fiscally, as well as from a climate resilience perspective.

⁴⁶ <https://www.riceswcd.org/roosevelt-urges-states-to-create-conservation-districts/>.

⁴⁷ Kat Kerlin, "Grasslands More Reliable Carbon Sink Than Trees," U.C. Davis Science & Climate, Jul. 9, 2018, available at <http://bit.ly/3ctfQQG>.

⁴⁸ https://climateandsecurity.org/wp-content/uploads/2019/09/a-climate-security-plan-for-america_2019_9_24-1.pdf.

⁴⁹ Leda Cunningham and Zack Greenberg, "Pew Joins Projects to Boost U.S. Military Base Resiliency Through Conservation," Pew, Nov. 18, 2020, available at <https://www.pewtrusts.org/en/research-and-analysis/articles/2020/11/18/pew-joins-projects-to-boost-us-military-base-resiliency-through-conservation>.

Preventing wildfires and restoring ecosystems through managed grazing

Restoring vegetation and stemming compaction and erosion over thousands of acres of land is a costly and technically challenging undertaking for DoD,⁵⁰ and one that is only getting more troublesome with climate change. Fortunately, there are low-cost practical solutions like adopting regenerative grazing practices, using grazing animals like goats for fire prevention, and applying compost to degraded lands to restore ecosystem function.

Research has shown, and USDA soil health principles reflect, that animal impact is actually an essential ingredient for soil health. But the animals must be professionally managed using regenerative practices. When grazing animals are managed in this way, they stimulate growth of native grasses without the need for planting seeds; more ground cover means less dust, less heat, and fewer impacts to training and mission.

Preventative grazing saved the Reagan Library from destruction from wildfire in 2019.⁵¹ Some bases, like F.E. Warren AFB,⁵² have also used grazing for addressing invasive weeds.

Proper grazing also dramatically increases the soil's ability to hold water (both during drought and during flooding).⁵³ Compared to the millions spent every year on fire suppression, and billions in damages, properly managed grazing is an extremely cost-effective fire prevention and land management tool that should be more widely utilized in the Department, with the caveat that grazers must be properly vetted to ensure experience level and that they are implement regenerative practices.

“Over the next decade, Africa will be shaped by the increased presence of external actors and the effects of environmental change. ... A large number of Africans make their living on the land, whether they grow crops or raise livestock, and many live at a subsistence level. Settled farmers and nomadic herdsman are increasingly engaged in land-use disputes, which are emerging as major driver of conflict. ... Poor land-use policies, changing weather patterns, rising temperatures, and dramatic shifts in rainfall contribute to drought, famine, migration, and resource competition. ... The reduction in arable land for crops and grazing land for livestock has created strong competition between the region's farmers and herders who migrate across borders searching for usable land. ... Armed groups and criminal networks exploit this situation, leading to human trafficking, slavery, and more violence.”

—General Thomas Waldhauser, then commander of U.S. Africa Command, February 2019⁵⁴

Leverage the Readiness Environmental Protection Integration (REPI) to optimize additional lands for climate resiliency and to boost conservation-compatible clean energy production

In addition to its own 27 million acres, since 2005 DoD has partnered with state and local governments and conservation NGOs to pool DoD and non-DoD funding to acquire easements and other interests on approximately 700,000 privately owned acres to prevent incompatible development and loss of habitat for protected species. Many of these protected areas are ideally suited for climate optimized management, and DoD and its partners are expanding this acreage every year.

⁵⁰ Pulverized Paper as a Soil Carbon Source for Degraded Training Lands: Final Report, Busby, Ryan R. et al, Engineer Research and Development Center, Sep. 2019, Final report page x, available at <http://dx.doi.org/10.21079/11681/34203>.

⁵¹ Brigit Katz, “Hungry Goats Helped Save the Reagan Library from a Wildfire,” *Smithsonian*, Nov. 5, 2019, available at <https://www.smithsonianmag.com/smart-news/hungry-goats-helped-save-reagan-library-california-wildfire-180973461/>.

⁵² Nathan Hodge, “The Missileers That Stare at Goats,” *Wired*, Apr. 14, 2010, available at <https://www.wired.com/2010/04/the-missileers-who-stare-at-goats/>.

⁵³ “One percent of organic matter in the top six inches of soil would hold approximately 27,000 gallons of water per acre.” National Resources Conservation Service, Soil Health Key Points, available at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1082147.pdf.

⁵⁴ Quote from AFRICOM posture statement to SASC February 7, 2019: General Thomas D. Waldhauser, United States Marine Corps available at https://www.armed-services.senate.gov/imo/media/doc/Waldhauser_02-07-19.pdf.

The Readiness Environmental Protection Integration (REPI) program is an existing statutory authority, and a proven program with strong bipartisan support. The FY2019 NDAA amended 10 USC 2684a, the statute authorizing the REPI program, to specifically allow REPI projects to be undertaken for resilience purposes, and additional amendments in the FY2021 further strengthened using the REPI program as a means of maintaining and enhancing military installation resilience.

DoD should seize opportunities to fashion REPI projects that promote resilience, such as the restoration of wetlands, creating and expanding living shorelines, and encouraging healthy soils on the protected lands, which will sequester carbon, conserve water, prevent flooding, and reduce wildfire risk while building habitat and biodiversity. These projects are not technologically complicated, are politically attractive (particularly in rural areas), and beneficial to base operations.

The REPI authority, for all of its advantages, is limited to actions involving privately owned land. Action outside military installations to enhance resilience also requires action on lands under other ownership, including lands under the jurisdiction of state, Tribal, and local governments or of other federal agencies. DoD could get even greater encroachment protection and resilience benefits by using existing Sikes Act authorities⁵⁵ to enter into cooperative agreements with State, Tribal, or local governments, as well as private entities (such as local farmers and land managers), to have them agree, with DoD funding support, to manage their lands using regenerative silviculture and agricultural practices.

From a cost effectiveness perspective, these agreements can be brokered under Sikes Act authorities without purchasing a real estate interest. From a mission perspective, such regenerative practices would result in groundwater recharge, would reduce problems with dust, would make these lands less susceptible to wildfire, and would boost habitat and biodiversity off base, rather than forcing endangered species to come onto base seeking habitat.

REPI's new resilience authorities should also be leveraged for conservation-compatible clean energy production. To meet DoD's clean energy goals more acreage will be devoted to renewable energy projects like solar farms. DoD should ensure that land used for renewables is resilient in terms of more than just energy. Specifically, installers should not strip out nature to optimize quick installation of industrial scale renewables. All DoD renewable energy sites—whether on base or off—should integrate ecosystem services, which is to say that the soils underneath a solar project, for example, should be managed for ecosystem benefits.

Work done by the National Renewable Energy Laboratory has shown that swapping vegetation for gravel prevents the “heat island” effect at PV installations, increases water retention, and, most interestingly, improves the performance of the panels themselves.⁵⁶ One can even integrate agriculture into these eco-solar farms,⁵⁷ providing additional opportunities for local farmers. By harnessing the sun's power through the grid and also into the soil, soil carbon sequestration, water quality, and pollinator habitat are all improved; these “symbio-scapes” optimize the co-benefits of renewables, ecosystem services and, where possible, agriculture to restore rural prosperity.

DoD can lead regional partnerships with other large federal landholders and state and local stakeholders to deliver climate managed lands at scale. DoD already partners on a range of issues with federal agencies responsible for over 530 million acres. The Department of Interior's Bureau of Land Management (BLM) and Fish and Wildlife Service (FWS) already work closely with DoD and manage 245 million and 89 million acres, respectively. Another partner, USDA, manages 193 million acres of national forest and 5 million acres of national grasslands.

Many of these federal lands are adjacent or in close proximity to DoD installations and training ranges or corridors. Some are under permanent or routine permitting for DoD use. One such formal partnership is the Sentinel Landscapes Partnership among DoD, USDA, and DOI to cooperate on conservation and resilience programs in areas that include one or more DoD or State-owned National Guard installations which are designated by the partners as

⁵⁵ 16 U.S.C. 670c-1.

⁵⁶ National Renewable Energy Laboratory, “Benefits of Agrivoltaics Across the Food-Energy-Water Nexus,” Sep. 11, 2019, available at <https://www.nrel.gov/news/program/2019/benefits-of-agrivoltaics-across-the-food-energy-water-nexus.html>.

⁵⁷ National Renewable Energy Laboratory, “Benefits of Agrivoltaics Across the Food-Energy-Water Nexus,” Sep. 11, 2019, available at <https://www.nrel.gov/news/program/2019/benefits-of-agrivoltaics-across-the-food-energy-water-nexus.html>.

“Sentinel Landscapes.” DoD should increase its interagency liaison capacity and reinvigorate the Interagency Land Use Coordinating Committee to help advance these initiatives. The National Fish and Wildlife Foundation (NFWF) is another proven partner that DoD can utilize as a vehicle to pool capital amongst invested stakeholder agencies and organizations to maximize climate focused conservation outcomes.

A complementary asset of tremendous capability to assist installation climate security land management resides in DoD’s National Geospatial Intelligence Agency (NGA). A critical component of the intelligence community, NGA operates an integrated array of the world’s best GEOINT sensors supported by tremendous computing power and equally capable data/imaging science professionals. NGA’s exquisite hyperspectral and other phenomenology can collect and assess environmental data at massive scale to include soil moisture, chemistry, erosion, plant health, etc. Following the establishment of critical baseline data, change detection can track and assist management practices on the ground at DoD installations. DoD should initiate a pilot project on select geographically diverse bases, ideally with adjacent Federal landholders, to use its GEOINT imaging capabilities and those it operates within the intelligence community framework to inventory and track soil carbon sequestration at landscape scale to inform climate optimized management practices and potentially to inform USDA policy on its carbon monetization initiatives.

NGA assets could be used to assist a similar effort on federal lands and in some circumstances on private lands as part of the Civil Applications Committee (CAC) process. DoD can and should partner with NOAA, USGS, and NASA which all have a space-based climate data collection and analysis mission.

INTEGRATE CLIMATE INTO ACQUISITION AND PROCUREMENT

DoD’s immense potential to drive federal climate action and markets is latent in the tens of thousands of decision-making processes in every corner of the defense enterprise. Nowhere is this truer than in its famously complex requirements and acquisition sphere.

Require that climate considerations be integrated as mandatory key performance parameters for acquisition and procurement

The joint requirements oversight process should require that climate considerations be integrated as mandatory key performance parameters. This will offer a range of operational benefits such as increasing system ranges, decreasing logistics and sustainment costs, and making systems resilient to current and future climate conditions.

One past lesson learned is the basing decision for Space Fence, a space object tracking radar recently installed on the Kwajalein Atoll. The basing decision for this system did not take into account that the atoll on which the radar system is sited is expected to be inundated by tides about once a year within the next decade. As with every program, the FCB was required to certify review of possible fuel considerations as a result of the hard lessons of fuel logistics risk in Iraq and Afghanistan. A similar process requiring review of climate considerations likely would have identified sea level and wave surge concerns.

Of the thousands of performance requirements reviewed for Space Fence in 2013, the board never anticipated the consequences of sea level rise and reef degradation and die off on atoll-based strategic DoD assets and the personnel operating them. The \$1 billion U.S. Air Force space object tracking radar, which is critical for keeping astronauts and satellites safe from space debris, was recently installed on Kwajalein Atoll, which is expected to be submerged by tide surge at least once a year.⁵⁸

⁵⁸ *The World Climate and Security Report 2020: A Product of the Expert Group of the International Military Council on Climate and Security.* Authors: Steve Brock (CCS), Bastien Alex (IRIS), Oliver-Leighton Barrett (CCS), Francesco Femia (CCS), Shiloh Fetzek (CCS), Sherri Goodman (CCS), Deborah Loomis (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. Feb 2020. Accessed at https://imccs.org/wp-content/uploads/2021/01/World-Climate-Security-Report-2020_2_13.pdf

Operational systems should no longer be considered in isolation from the infrastructure that supports them. The total support system a weapons system requires to function must be equally resilient. Operators should work closely on climate optimized solutions with their logistics and installations counterparts.

Field systems with minimal or carbon negative lifecycle greenhouse gas emissions

The Joint Requirements oversight process should drive acquisition towards fielding climate-optimized and carbon-negative climate restoration capabilities. Acquisition reform should enable DoD leadership to better understand the true cost of a fielded system, and the true impacts on the climate from a given system over its lifecycle. Acquisition reform should also enable DoD leadership to understand and mitigate the impacts of a changing climate on those fielded systems.

For this reason, DoD should revise DoDD 4180.01 to emphasize Service Secretary responsibility to field systems with minimal lifecycle greenhouse gas emissions, and explore carbon negative technologies. Further, all current and future acquisitions programs should evaluate the anticipated lifecycle greenhouse gas emissions, to be compiled, tracked and reported to ODASD(OE).

In the area of energy acquisition, DoD should update DoDI 4140.25 and DoDM 4140.25 Vol 1, to incorporate solar, wind, nuclear, hydrogen, and geothermal power sources and services.

Develop and implement climate specific defense acquisition workforce training

DoD should develop and implement climate specific defense acquisition workforce training. As part of this initiative, ASD(A) should develop and implement defense acquisition workforce training on methodologies and systems used to evaluate the projected lifecycle carbon emissions of DoD weapons systems, platforms, equipment, modifications, and products.

Achieve climate-aware procurement supply chains amongst DoD's tens of thousands of suppliers

DoD has thousands of supply chains. Beyond climate conscious decision making, there is untapped opportunity to achieve climate aware procurement supply chains amongst DoD's tens of thousands of suppliers. Increasingly, corporate sustainability chiefs are adapting to consumer demand for climate conscious products and supply chains. DoD's buying power can drive similar innovation throughout the defense industrial base. Market opportunity can speed the path to urgent climate outcomes.

4 Manage Installations and the Force for Climate Mitigation and Resilience

KEY RECOMMENDATIONS

- Fully deploy a Climate Adaptation/Risk Assessment Tool to assist installation planners
- Develop more detailed guidelines to consider climate change when approving and implementing individual homeport, home base, and hub shifts
- Reward incremental progress on building energy efficiency
- Implement food waste diversion and composting
- Add climate security curricula in DoD education and training programs to teach a culture of climate awareness and innovation within DoD
- Build climate security awareness and competency across DoD

The FY2021 National Defense Authorization Act included several provisions that will guide important DoD actions on climate. Among these, Section 327 directs DoD to update its 2014 Climate Adaptation Roadmap.⁵⁹ The 2014 roadmap was a broad outline of areas that DoD should consider through a climate lens.

The 2021 NDAA calls for a strategy and implementation plan to address the current and foreseeable effects of extreme weather and sea level fluctuations on the mission of the Department of Defense, and it prescribes in detail the elements Congress wants to see in that plan (e.g., how flooding, drought, desertification, wildfires, melting permafrost, hurricanes, extreme heat, and geopolitical instability are going to impact DoD plans and operations; how changes in land carrying capacity, heat stress, and increased dust and fires will impact training and testing; and what built and natural infrastructure practices can mitigate risks posed by increased flooding, erosion, wind, and fire).

One year earlier, the FY2020 NDAA required that already-mandatory installation master plans now include a component addressing “military installation resilience.”⁶⁰ That term was defined in federal law and tracks closely with the definition of mission assurance referenced in Section 3. In a nutshell, “mission installation resilience” is the ability of an installation to prepare for, minimize the effect of, adapt to, and recover from extreme weather and other changes in environmental conditions that could affect essential functions and assets of the installation, or upon which the installation relies (such as utilities and roadways in the local community).

Every DoD installation is now required to prepare an installation master plan to plan for things like sea level rise, wildfires, flooding, and other changes in environmental conditions, to identify assets and infrastructure that are at risk from these threats, and to include lessons learned from past extreme weather events.

These plans are also required to address climate impacts to key civilian infrastructure outside of the military installation, and address partnerships with non-DoD entities related to resilience of both the installation itself and to key supporting civilian infrastructure. Of note, Congress also directed that DoD utilize projections from groups like the National Academies of Sciences to inform their assessment of these future threats.⁶¹

⁵⁹ FY2021 NDAA available at <https://www.govinfo.gov/content/pkg/BILLS-116hr6395enr/pdf/BILLS-116hr6395enr.pdf>.

⁶⁰ National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, 133 Stat. 1198 (2019) [hereinafter 2020 NDAA], Section 2108, available at <https://www.congress.gov/bill/116th-congress/senate-bill/1790/text>.

⁶¹ Rachel Jacobson and Matthew F. Ferraro, “Environmental Deconfliction 2020: the National Defense Authorization Act for FY2020.” Wilmer Hale, available at <https://www.wilmerhale.com/en/insights/publications/20201202-environmental-deconfliction-2020-the-national-defense-authorization-act-for-fy-2020>.

For some years, these Installation Master Plans have been required by law to include a transportation component developed with local civilian transportation officials. Congress in both the FY2019 and FY2020 NDAs extensively amended 23 U.S.C. 210, authorizing the Defense Access Roads (DAR) program to greatly strengthen the ability of DoD to work with federal and state/local transportation agencies and officials to address the vulnerability of key transportation assets to the impacts of climate change.

DoD should issue detailed policy guidance and resources to assist the military departments in developing the expertise and procedures to develop and implement the resilience components of Installation Master Plans, and extensively revise existing guidance and procedures regarding the Defense Access Roads program and its requirements, budgeting, and implementation processes to take full advantage of the expanded authorities for that program.

The following recommendations include cost-effective and less-discussed solutions that would make meaningful mitigation gains while enhancing the ability of land on military installations to be more resilient in the face of the threats identified in the NDA provisions.

Fully deploy a Climate Adaptation/Risk Assessment Tool to assist installation planners

The Department, led by the U.S. Army Corps of Engineers, is currently beta testing a tool that integrates information from several federal data sets from DoD and sister agencies like NOAA into one geospatial tool for estimating climate risk and exposure. Several dozen installations around the world are currently inputted into the tool and beta testing and development of the associated user guides and fact sheets to guide installation planners on using the tool is proceeding.

Once exposure to climate risk is known, and installation planners overlay what mission sets occur and what critical infrastructure is located on a given installation or in the surrounding communities, then the threat from climate-related events like extreme weather can be assessed much more meaningfully. If a tool like this proves viable, it would make a tremendous difference in pushing the capability and responsibility for planning for climate change impacts down to the local level, rather than a small group of individuals at headquarters.

We heard time and again in our interviews that higher headquarters is trying to instill in the culture, in particular of installation planners, that like DoD's culture of safety, preparing for climate change is everyone's responsibility, not a headquarters pet project. But for that to become a reality, local planners must have the tools and training they need to integrate climate concerns in their planning and adaptation.

Develop more detailed guidelines to consider climate change when approving and implementing individual homeport, home base, and hub shifts

DoD policy currently is to consider climate change adaptation and resilience in installation planning and basing processes.⁶² How the Services do this is not uniform, and in most cases considerations of climate change impacts should be more robust.

Consistent with the overall direction given in the FY2021 NDA for installations, DoD should develop more detailed guidelines for how the Services and defense agencies need to consider climate change when approving and implementing individual homeport, home base, and hub shifts.

Military Services should establish a rigorous and detained basing decision-making process for both installation site selection as well as the basing of critical infrastructure in the face of climate considerations. The cost of not doing so is growing. Hurricane Michael hit Tyndall Air Force Base in 2018. Although most of its valuable F-22 inventory were evacuated, upwards of 17 of the \$377 million apiece aircraft remained in the storm's path.⁶³

⁶² DoD Directive 4715.21 Climate Change Adaptation and Resilience (Aug. 31, 2018), available at <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/471521p.pdf?ver=2018-09-25-081059-330>.

⁶³ <https://www.vox.com/2018/10/15/17978902/hurricane-michael-panama-city-tyndall-air-force-f22-climate-change>.

Rigorous and structured consideration of climate change impacts on security operations and requirements can help the Department make more climate-resilient decisions around critical infrastructure and home basing generally.

Reward incremental progress on building energy efficiency and explore carbon negative building materials

Metrics can be very useful for measuring and incentivizing progress. We heard from several current and former officials interviewed for this report that targets can also be ineffectual in driving the desired change. One example that was cited repeatedly is the federal target for sustainable buildings, which sets very ambitious targets with stringent criteria for meeting them. Most problematically, up until this point, partial credit has not been recognized, so only 1.9% of DoD buildings currently meet the metric.

A report from the Union of Concerned Scientists found that 128 U.S. military bases, valued at roughly \$100 billion, may be at risk of persistent flooding by the year 2100.⁶⁴

On December 31, 2020, the Council on Environmental Quality published *Guiding Principles for Sustainable Federal Buildings* which now does seem to recognize improved building performance. The new guidance clarified how buildings that “demonstrate a level of improved performance and sustainability, but do not meet the requisite criteria, may [nonetheless] be designated as Federal high-performance buildings.”⁶⁵ DoD will now have the opportunity to implement this new guidance and hopefully can make significant incremental progress on a large number of buildings.

Beyond important incremental efficiency gains, President Biden’s climate plan during the campaign committed to setting a target to reduce the carbon footprint of the U.S. building stock by 50% by 2035.⁶⁶ In FY2020 DoD was appropriated \$18.2 billion for military construction projects,⁶⁷ and DoD could truly lead the way if it were to commit to using carbon negative building materials like synthetic coated limestone. The cement industry is responsible for nearly 8% of global annual emissions. Innovative new companies, some here in the U.S., can now take CO₂ emitted in the flue gas of power plants, and use it as a raw material for making carbonate rocks, which are the principal component of concrete. The resulting concrete has the same structural characteristics and performance as conventional concrete, while eliminating the need to mine more material and sequestering CO₂ resulting in carbon neutral or carbon negative concrete.⁶⁸ In keeping with the President’s intention to reduce the carbon footprint of U.S. buildings, all DD Form 1391s should be required to explain what greenhouse gas reduction approaches are being implemented for proposed military construction projects. Implement food waste diversion and composting.

Executive Order 13693, *Planning for Federal Sustainability in the Next Decade* (signed by President Obama and revoked by President Trump), had many practical and impactful objectives. One was to divert from landfills at least 50% of nonhazardous solid waste, including food waste and compostable materials. This objective was important not only from a general stewardship perspective (economic and ecological), but also for greenhouse gas mitigation.

According to the United Nations Environment Program, if global food waste were a country, it would be the third largest greenhouse emitter in the world, behind only China and the United States.⁶⁹ And food waste is the largest component of U.S. municipal solid waste, accounting for about 60% of solid waste streams. Finally, when food

⁶⁴ <https://www.navytimes.com/news/your-navy/2016/07/29/rising-oceans-threaten-to-submerge-128-military-bases-report/>.

⁶⁵ CEQ-OFS-2020-1, Council on Environmental Quality, *Guiding Principles for Sustainable Federal Buildings*, Dec. 31, 2020, available at https://www.sustainability.gov/pdfs/guiding_principles_for_sustainable_federal_buildings.pdf.

⁶⁶ <https://joebiden.com/climate-plan/>

⁶⁷ <https://fas.org/sgp/crs/natsec/IF11401.pdf>

⁶⁸ Joe Emerson, “Low Carbon Concrete – Starting from the Ground Up,” Zero Energy Project, Nov. 9, 2020, available at <https://zeroenergyproject.org/2020/11/09/low-carbon-concrete-starting-from-the-ground-up/>.

⁶⁹ <https://www.unenvironment.org/regions/north-america/regional-initiatives/minimizing-food-waste>.

decomposes in a landfill under anaerobic conditions it produces methane,⁷⁰ which is a greenhouse gas on average 33 times as powerful as CO₂ in terms of its global warming potential.⁷¹ So avoiding the production of one pound of methane by not having food decompose in a landfill is like saving 33 pounds of CO₂.

The Army has been working toward a net-zero waste goal (not an enforceable target) for the past decade, and several installations have run promising programs.

In 2016, Fort Hood set out to divert 85% of its waste from landfills by 2020. From 2016 to 2017 the base increased its waste diverted from 42 tons of material to 700 tons. Diverting 700 tons of food waste from a landfill is the equivalent to avoiding between 1,300 and 1,650 tons of CO₂.^{72, 73} And that was just in one year from a small portion of one base.

Following the success of the pilot, Fort Hood installed its own composting facility, so it didn't have to haul its food waste and pay a composting facility in Austin.⁷⁴ Currently, the base composting facility receives waste from the kitchens of nine dining halls, Army and Air Force Exchange Service food courts, and grass clippings and tree trimmings from 12 base housing areas, and there is a desire to expand the program.

Fort Knox ran a pilot program in 2016 that increased the food diversion rate in the dining hall from 12% to 95% through composting and donating excess food to charity.⁷⁵ In addition to the food saved, pilot participants observed reduced water usage and maintenance needs for pulpers, less lifting of trash into dumpsters and reduced use of garbage bags. Fort Jackson similarly ran a pilot in 2017 where they measured food to track waste and donated excess food to a local charity serving homeless veterans.⁷⁶

The Army also innovated on composting, with a research collaboration at Fort Polk between the U.S. Army Engineer Research and Development Center and USDA's Agricultural Research Service.⁷⁷ Every year DoD disposes of tons and tons of shredded paper from classified documents in a landfill because security regulations require it to be ground up too finely to be recycled. Meanwhile, as discussed previously, DoD also has to contend with degraded soils on its training ranges and bases and spends money to maintain these lands.

Current practice is to reseed degraded training ranges with native perennial grasses, but grasses often require multiple attempts to grow because the depleted condition of the soils requires adding massive quantities of organic matter. Locating sources of organic matter is difficult and expensive.⁷⁸

The Army/USDA study found that using shredded classified documents as compost on degraded training range soils was an ideal source of organic matter to rehabilitate these damaged lands. Sites with the shredded paper "compost" saw 42–48% higher plant cover, lower amounts of invasive plant species, and no higher rate of any regulated metal versus the control.⁷⁹

⁷⁰ Rock, S. and A. Lan. Food Waste Reduction in Military Kitchens A Tracking Technology Demonstration at Fort Jackson. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-19/095, 2019.

⁷¹ <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.

⁷² [https://www.biocycle.net/connection-climate-calculations/#:~:text=For%20this%20approximation%2C%20we%20can,kg%20of%20methane%20\(CH4\)](https://www.biocycle.net/connection-climate-calculations/#:~:text=For%20this%20approximation%2C%20we%20can,kg%20of%20methane%20(CH4)).

⁷³ <https://watchmywaste.com.au/food-waste-greenhouse-gas-calculator/>.

⁷⁴ Thaddeus Immerman, "Fort Hood Continues to Make Strides in Removing Waste from its Landfill," *Killeen Daily Herald*, Nov. 24, 2019, https://kdhnews.com/news/local/fort-hood-continues-to-make-strides-in-removing-waste-from-its-landfill/article_8f689ac4-0e40-11ea-b0df-e7680bc04688.html.

⁷⁵ Installation tests compost, pilot program, recycle food, By Ms. Catrina Francis (IMCOM), April 26, 2016

⁷⁵ https://www.army.mil/article/166564/installation_tests_compost_pilot_program_recycle_food.

⁷⁶ Demetria Moseley, "Want Not, Waste Not," *Army Times*, March 23, 2017, available at https://www.army.mil/article/184775/waste_not_want_not.

⁷⁷ The U.S. military is using destroyed, classified documents for compost by Jessica Fu, 10.04.2019, 4:24pm <https://thecounter.org/us-military-classified-documents-compost/>.

⁷⁸ Pulverized Paper as a Soil Carbon Source for Degraded Training Lands: Final Report, Busby, Ryan R. et al, Engineer Research and Development Center, Sep. 2019, Final report page x, available at <http://dx.doi.org/10.21079/11681/34203>.

⁷⁹ Pulverized Paper as a Soil Carbon Source for Degraded Training Lands: Final Report, Busby, Ryan R. et al, Engineer Research and Development Center, Sep. 2019, Final report p. xvi, available at <http://dx.doi.org/10.21079/11681/34203>.

As discussed in other sections, increasing vegetation stems erosion, allows land to absorb more water during heavy rains and flooding, to conserve water during drought, and brings a host of other ecosystem co-benefits like reducing dust and even extreme heat (as bare ground contributes significantly to heat effects). The study authors estimated that using the shredded document “compost” would also save the installation around \$4,672 per acre, or \$292 per ton of paper diverted, compared to current training range land rehabilitation practices and disposing of shredded material in a landfill.⁸⁰

In other studies, many involving DoD, traditional compost was also shown to improve the rehabilitation of wetlands, control erosion on roadway and riverbanks, and even clean up contaminants like arsenic and jet fuel in soils. The bottom line for both food waste diversion and composting is that these solutions do not require new technology or large appropriations (in fact, they typically save money). They meaningfully improve base resilience, and by avoiding methane production in landfills, and stimulating plant growth and photosynthesis also contribute significantly to greenhouse gas mitigation and carbon sequestration. They should be pursued in earnest on a Department-wide basis wherever possible and as quickly as possible.

Add climate security curricula in DoD education and training programs to teach a culture of climate awareness and innovation within DoD

DoD should add climate security curricula in DoD education and training programs that build competency on the risks, challenges and opportunities that climate change brings to the national security enterprise. It is hard to overstate the outsized influence formative military education and training has on the force.

The U.S. military has world-class education and training programs, but curriculum priorities largely do not touch on climate science, resilience approaches, or climate security. Surveys of senior service college attendees on the top national security threats facing the nation invariably leave off climate change. Yet majorities of these same people later agree that climate change is an existential threat. Bridging this collective disassociation of traditional views on military mission sets and an existential threat as daunting as climate change begins in the training and education pipeline.

Building climate knowledge would be especially useful in forums like pre-command courses where those assuming command of a large military installation or an aircraft carrier, for example, are likely to face climate impact and environmental justice responsibilities comparable to those faced by many municipalities. These same topics and more (like basic ecosystem function, hydrology, and water and food security) should be taught in places like service academies, officer pipelines, senior noncommissioned officer academies, and war colleges. The Joint Staff J-7 has a key role to play as part of its Joint Professional Military Education governance and accreditation responsibilities.

Naval Postgraduate School (NPS) has begun incorporating climate in its offerings and research and should expand this research and postgraduate degree services. NPS lessons learned should be actively cross pollinated with the Army and the Air Force. Integration of climate security games and simulations developed in the research components of these institutions should be integrated into planning and exercises as well.

DoD schools on military installations also have a role to play. The Marine Corps installation on Parris Island is facing the acute threat of sea level rise. The former Base Commander said the greatest asset he had for building awareness in his command was the DoD dependent school on his base—the kids bring the climate security mission back to their parents. Fort Hood similarly teaches environmental stewardship and composting in its DoD school on base in support of initiatives described above and has observed that parents are sometimes learning lessons from their kids on these topics.⁸¹

⁸⁰ Pulverized Paper as a Soil Carbon Source for Degraded Training Lands: Final Report, Busby, Ryan R. et al, Engineer Research and Development Center, Sep. 2019, Final report p. xxii-iii, available at <http://dx.doi.org/10.21079/11681/34203>.

⁸¹ Thaddeus Immerman, “Fort Hood Continues to Make Strides in Removing Waste from its Landfill,” *Killeen Daily Herald*, Nov. 24, 2019, https://kdhnews.com/news/local/fort-hood-continues-to-make-strides-in-removing-waste-from-its-landfill/article_8f689ac4-0e40-11ea-b0df-e7680bc04688.html.

Build climate security awareness and competency across DoD

Intra-Departmental climate security awareness and cooperation would be a cascading force for improved climate security performance across the federal government. A first step is to establish communities of awareness of planners, policy leaders, and decisionmakers to ensure that climate and environmental security are considered across all levels of DoD strategic and operational planning.

As part of this effort, the Joint Staff J-8's Studies Analysis Gaming Division (SAGD) should integrate climate security priorities into the DoD wargaming enterprise. The Wargaming Repository and the Wargaming Incentive Fund, established to ensure wargames directly support DoD senior leader priorities, are two initiatives the SAGD can leverage to bring climate security gaming to the fore. As a vehicle to share senior leader priorities, the Defense Wargaming Alignment Group (DWAG) is positioned to both convey climate security imperatives to wargaming designers as well as results and findings of climate security games to DoD leaders. The Joint Staff J-7 can incorporate these findings into its integrated joint training programs for Combatant Commands, Designated Joint and Combined Force Headquarters, and Coalition Partners. Additionally, climate security input will be invaluable to J-7 as it develops comprehensive projections of future operating environments to identify and develop future concepts that address emerging and future joint operational challenges and anticipated capabilities.

One important community of interest started in 2019 under the name Resource Competition, Environmental Security, and Stability (RECESS) has made nascent strides in this area and should be continued and enhanced. Led by the Deputy Assistant Secretary of Defense (DASD) for Stability and Humanitarian Affairs (SHA), RECESS has brought together civilians and military personnel from the Office of the Secretary of Defense, the Military Services, the Joint Staff, the Combatant Commands, and other DoD Components to coordinate DoD efforts on environmental and climate security. To prepare for the growing national security risks of global environmental change and instability, RECESS has worked to inform DoD policy and strategy, promote cooperation, and coordinate messaging on these topics. This group has served to rebuild connections between DoD and the intelligence community on climate security challenges, as well as with the broader interagency and experts outside of the U.S. Government.

Currently, RECESS is working to ensure that global environmental change is considered throughout DoD's strategic and operational planning. RECESS is approaching the challenge from the top down—by supporting the team that writes the National Defense Strategy and at the action officer level to help planners at the geographic Combatant Commands account for RECESS challenges and opportunities.

Understanding and adapting to changed geostrategic threats and opportunities (including the Arctic) will also be key to leveraging climate action to further the Administration's soft power objectives. Another important step to building climate security awareness and action across the force is including it as a priority in DoD keystone documents.

Specifically, we recommend:

- OSD should include climate and natural security threats in the National Defense Strategy and plans to address these threats and risks within the Future Years Defense Program (FYDP).
- The Joint Staff should include climate and natural security threats in the National Military Strategy and plans to confront them within the FYDP and the Regional Combatant Commands (CCMDs) should provide assessments of climate and natural security threats in their annual posture statements to Congress.
- OSD should provide an assessment of peer/near-peer competitors climate and natural resource strategies, and associated security and military plans. OSD should include such work on China in the DoD Annual Report to Congress on Military and Security Developments Involving the People's Republic of China.

5 Build a Total Force Culture of Climate Awareness

KEY RECOMMENDATIONS

- Establish climate career paths as well as career enhancing assignments related to climate security for those in standard career tracks
- Integrate the climate mission set into DoD hiring, promotions, evaluations, and awards
- Establish fellowships and sabbaticals focused on climate security
- Recruit the climate engaged generation

Establish climate career paths as well as career enhancing assignments related to climate security for those in standard career tracks

An assessment should be done on climate career paths both in the military and civilian workforce to include subspecialties in climate security for those in traditional career fields. The Marine Corps, for example, has established officer and enlisted specialties for environmental engineers and both paths have been highly sought after.

Integrate the climate mission set into DoD hiring, promotions, evaluations, and awards

Awards are a powerful incentive within the uniformed military in particular but also throughout DoD's civilian workforce. Establish a board within each military service as well as other DoD components to assess the value of climate competencies being integrated into performance evaluations, promotion boards, and hiring practices. This review can also assess the awards process. Merit based awards should consider climate security contributions and new awards related to climate should be considered.

Fellowships and sabbaticals should be established focused on climate security

Many leaders in the climate sphere would answer a call to serve the nation by helping DoD tackle the challenges in these recommendations. Fellowships designed to bring in diverse, private sector innovators in climate mitigation and adaptation would build awareness and expertise throughout DoD. Likewise, private sector sabbaticals for DoD employees could be designed to expose defense professionals to climate science and technology, thought leadership, best practices, etc.

Recruit the climate engaged generation

Climate security should be considered as a military recruiting tool and an assessment should be carried out on the potential of climate themed recruiting campaigns. The U.S. military has always been characterized by its youth. America's youth are focused on addressing climate change in ways that previous generations were not. A mission set that includes a focus on climate will resonate with a generation seeking to serve the public good in a battle we must win.

6 Collaborate with Other Federal Agencies, States, and Communities

KEY RECOMMENDATIONS

- Bring DoD's formidable intelligence capabilities to bear on the climate threat
- Assess the DoD role in implementation of U.S. global engagement on climate change, including a potential first 100 days U.S. led global climate summit
- Fully fund and leverage the Office of Local Defense Community Cooperation
- Utilize interagency and other cooperative conservation opportunities to expand impact
- Play a leadership role in an interagency research clearinghouse on climate
- Prioritize climate security in strategic compact partnerships in the Pacific
- Establish a public facing website to track DoD's climate goals and other DoD climate information

Bring DoD's formidable intelligence capabilities to bear on the climate threat

With a significant portion of the U.S. intelligence community residing within the Department of Defense, tremendous capability and capacity can be better prioritized to focus on collecting, analyzing and disseminating intelligence to decision makers on climate and security.

USDI, and DoD Intelligence Agency heads, should advocate for climate change and natural resource competition as a priority focus in the National Intelligence Priority Framework (NIPF) and request the Intelligence Community (IC) to provide information on risks associated with climate change and great power competition over natural resources in its analytics and operations. These capabilities and opportunities go beyond the Intelligence Community. For example, DoD (NGA) can partner with other key federal partners NASA, NOAA, and USGS managing similar capabilities to meet the climate mission.

USDI, working closely with the Joint Staff J-2, should work with IC counterparts to integrate climate risk assessment into community planning. Those assessments should be informed by a climate security analysis and warning apparatus to include consideration of a possible interagency climate security watch center. Early warning and surveillance frameworks should also have the capacity to anticipate risks from emergent climate-manipulating technologies such as solar radiation management (SRM) or other geoengineering initiatives. Deliberate and large-scale intervention in the Earth's natural systems to either remove greenhouse gases or reflect a portion of the sun's solar energy can have potentially long-term, world-alerting effects. The extent to which state or nonstate actors are planning or even considering such options should be assessed. DoD should encourage and assist Administration policy development on international mechanisms to govern climate intervention science.

Fully fund and leverage the Office of Local Defense Community Cooperation

The Office of Local Defense cooperation, by statute, serves as the office in the Department of Defense with primary responsibility for providing assistance to States, counties, municipalities, regions, and other communities to foster cooperation with the military. Formerly known as the Office of Economic Adjustment, this office has deep ties to key military communities and state governments around the country. This office should be further leveraged to combine DoD efforts with those of local and state governments to concurrently enhance the military mission, achieve facility and infrastructure resilience, address encroachment and incompatible land uses, support military families, and increase military, civilian, and industrial readiness and resilience.

Specifically, we recommend:

- Establishing a “Resilient Defense Communities” technical assistance program for communities to develop a prioritized military-civilian resilience plan for critical infrastructure (which can then feed into the resilience component of Installation Master Plans) and make local resilience investments using the Defense Critical Infrastructure Program, block grants, and other federal and state funds.
- Requesting \$250 million for the Defense Community Infrastructure Program (DCIP) to enhance resilience for infrastructure that supports priority installation requirements, and to coordinate with local and state partners and infrastructure owners.
- Requesting \$50 million to provide installation resilience planning grants for collaborative resilience planning requirements for all defense communities.

Utilize interagency and other cooperative conservation opportunities to expand impact

Expounding on the REPI discussion above, DoD could get even greater encroachment protection and resilience benefits by using existing Sikes Act authorities to enter into cooperative agreements with local farmers and land managers around bases and have them agree to manage their land regeneratively (rather than farming them conventionally). This would have several benefits. From a cost effectiveness standpoint, doing this would be less costly than securing a real estate interest in the land, which is what is done under REPI. From a mission perspective this would result in groundwater recharge, would reduce problems with dust, make these lands less susceptible to wildfire, and would boost habitat and biodiversity off base, rather than forcing endangered species to come onto base seeking habitat.

We heard from several interviewees that DoD would benefit from the ability to pool money with other federal agencies to achieve greater conservation and climate benefits. The FY2021 NDAA provided one way to do this by now allowing REPI funds to count as a cost match for other federal agency resilience grant programs that require partners to bring matching funds.

As mentioned in an earlier section, the Sentinel Landscapes Partnership with USDA, and DOI is another important interagency conservation and resilience opportunity that should be fully leveraged.

FEMA’s new BRIC (Building Resilient Infrastructure and Communities) grant program awards funds pre-disaster to mitigate future damage from natural disasters. Examples of past BRIC projects which would be relevant to DoD are microgrids, nature-based flood protection like stabilizing riverbeds, and construction of underground cisterns and stormwater gardens.⁸²

Play a leadership role in an interagency research clearinghouse on climate

Close cooperation with civilian and foreign government agencies, academia and relevant NGOs can assist in predicting, projecting and assessing future climate impacts. Several organizations and agencies within DoD have already conducted important climate research and have an ongoing need to do so.

DoD’s Strategic Environmental Research and Develop Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) invested in research focused on improving DoD understanding of environmental risks to installations and mission.⁸³ For example, SERDP conducted a study to assess vulnerabilities on installations in the desert southwest to drought risk.

Other examples: The Air Force’s 14th Weather Squadron provides data sets and decision aids to CCMDs, the Navy is part of the multi-agency National Ice Center providing sea ice forecasting for operations in polar regions, and the Office of Naval Research (ONR) Arctic and Global Prediction Program also seeks to understand and predict the environment in various geographical areas of interest to DoD such as the Arctic. There are many, many more

⁸² https://www.uschamber.com/sites/default/files/bric_base_deck_5-20_final_no_notes.pdf.

⁸³ <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF>.

examples of DoD agencies and organizations that are active in climate-related science and where DoD can provide climate modeling and simulation capabilities which inform other federal agencies.

There could be a National Climate Research Strategy modeled after the IARPC (Interagency Arctic Research Policy Committee) effort which consists of principals from 16 agencies across the Federal government, is charged with enhancing both the scientific monitoring of, and research on, local, regional, and global environmental issues in the Arctic.⁸⁴ IARPC develops a five-year research strategy to guide national research efforts in the Arctic.

Given that climate change impacts all of these same agencies and more, and that a wide range of agencies are already conducting research on climate, a research clearinghouse and five-year research strategy would help ensure collaboration, and hopefully fill research gaps and avoid duplicative studies.

Prioritize climate security in strategic compact partnerships in the Pacific

The U.S. has Compact of Free Association (COFA) agreements with three sovereign Pacific Island states acutely threatened by sea level rise, the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI), and the Republic of Palau. As part of the agreements, DoD is responsible for the COFA states' security and international defense affairs and as such is permitted to operate in Compact areas and to negotiate acquisition of COFA lands for operating bases. The extensive DoD facilities facing sea level rise challenges on Kwajalein Atoll in the RMI are part of this arrangement.

As part of the Compact agreements, DOI's Office of Insular Affairs administers economic assistance to the Compact partners to include access to FEMA disaster response and mitigation as well as to the services of the National Weather Service among many other programs. With the current RMI and FSM agreements expiring in 2023, integrating climate security considerations into State Department-led Compact renewal negotiations with these states should be a DOS, DOI, and DoD priority, both for partner resilience in the face of an existential threat and as an essential component of executing DoD's strategic basing strategy in the Asia Pacific.

Establish a public facing website to track DoD's climate goals and other DoD climate information

Establish a public facing website at www.climate.mil or www.energy.mil or www.resilience.mil to track the Department's climate goals, highlight innovations and award recipients, and to consolidate climate related projects providing a single, more accessible portal for companies and organizations looking to do business or partner with the DoD, and for the media and the public to find information.

In coordinating with other agencies, the Department of Defense Office of Public Affairs should launch a national campaign detailing the need for the Pentagon to engage further on climate security as part of its mission in order to build a greater appreciation across the American public. The Department and the uniformed military services in particular consistently poll with the American public as the most trusted institution in the federal government. A public affairs campaign that educates and raises awareness in the American public of the links between U.S. national security, climate change, natural resource degradation/competition, and environmental degradation, and what the Pentagon is doing to prepare, prevent, and respond to this emerging problem set will set a powerful example.

⁸⁴ <https://www.nsf.gov/geo/opp/arctic/iarpc/start.jsp#:~:text=IARPC%2C%20which%20consists%20of%20principals,environmental%20issues%20in%20the%20Arctic.>

Appendix A: Executive Order 14008

TACKLING THE CLIMATE CRISIS AT HOME AND ABROAD

On January 27, 2021, President Joe Biden issued Executive Order 14008 on Tackling the Climate Crisis at Home and Abroad.⁸⁵ Section 103 on foreign policy and national security follows:

Sec. 103. Prioritizing Climate in Foreign Policy and National Security. To ensure that climate change considerations are central to United States foreign policy and national security:

- (a) Agencies that engage in extensive international work shall develop, in coordination with the Special Presidential Envoy for Climate, and submit to the President, through the Assistant to the President for National Security Affairs, within 90 days of the date of this order, strategies and implementation plans for integrating climate considerations into their international work, as appropriate and consistent with applicable law. These strategies and plans should include an assessment of:
 - (i) climate impacts relevant to broad agency strategies in particular countries or regions;
 - (ii) climate impacts on their agency-managed infrastructure abroad (e.g., embassies, military installations), without prejudice to existing requirements regarding assessment of such infrastructure;
 - (iii) how the agency intends to manage such impacts or incorporate risk mitigation into its installation master plans; and
 - (iv) how the agency's international work, including partner engagement, can contribute to addressing the climate crisis.
- (b) The Director of National Intelligence shall prepare, within 120 days of the date of this order, a National Intelligence Estimate on the national and economic security impacts of climate change.
- (c) The Secretary of Defense, in coordination with the Secretary of Commerce, through the Administrator of the National Oceanic and Atmospheric Administration, the Chair of the Council on Environmental Quality, the Administrator of the Environmental Protection Agency, the Director of National Intelligence, the Director of the Office of Science and Technology Policy, the Administrator of the National Aeronautics and Space Administration, and the heads of other agencies as appropriate, shall develop and submit to the President, within 120 days of the date of this order, an analysis of the security implications of climate change (Climate Risk Analysis) that can be incorporated into modeling, simulation, war-gaming, and other analyses.
- (d) The Secretary of Defense and the Chairman of the Joint Chiefs of Staff shall consider the security implications of climate change, including any relevant information from the Climate Risk Analysis described in subsection (c) of this section, in developing the National Defense Strategy, Defense Planning Guidance, Chairman's Risk Assessment, and other relevant strategy, planning, and programming documents and processes. Starting in January 2022, the Secretary of Defense and the Chairman of the Joint Chiefs of Staff shall provide an annual update, through the National Security Council, on the progress made in incorporating the security implications of climate change into these documents and processes.
- (e) The Secretary of Homeland Security shall consider the implications of climate change in the Arctic, along our Nation's borders, and to National Critical Functions, including any relevant information from the Climate Risk Analysis described in subsection (c) of this section, in developing relevant strategy, planning, and programming documents and processes. Starting in January 2022, the Secretary of Homeland Security shall provide an annual update, through the National Security Council, on the progress made in incorporating the homeland security implications of climate change into these documents and processes.

⁸⁵ <https://tinyurl.com/y3rux54v>.

Appendix B: Climate Change and National Security

KEY RESOURCES

Significant and important work has been conducted over the past decade to address climate change within DoD and as a national security issue. This sidebar provides links and excerpts from a few notable works. A complete list of “Federal, DoD, and Navy requirements relating to climate change” through January 2017 is available in Appendix B of the Naval Facilities Engineering Command, [Planning Handbook on Climate Change Installation Adaptation and Resilience](#) (2017).⁸⁶

[DoD Report on Effects of a Changing Climate to the Department of Defense](#)⁸⁷ (2019)

[DoD High Performance and Sustainable Buildings Report to Congress](#)⁸⁸ (2019)

[DoD Directive 47152, Climate Change Adaptation and Resilience](#)⁸⁹ (2016)

The DoD must be able to adapt current and future operations to address the impacts of climate change in order to maintain an effective and efficient U.S. military. Mission planning and execution must include:

- (a) Identification and assessment of the effects of climate change on the DoD mission.
- (b) Taking those effects into consideration when developing plans and implementing procedures.
- (c) Anticipating and managing any risks that develop as a result of climate change to build resilience.

[DoD 2014 Climate Change Adaptation Roadmap](#)⁹⁰ (2014)

Among the future trends that will impact our national security is climate change. Rising global temperatures, changing precipitation patterns, climbing sea levels, and more extreme weather events will intensify the challenges of global instability, hunger, poverty, and conflict. They will likely lead to food and water shortages, pandemic disease, disputes over refugees and resources, and destruction by natural disasters in regions across the globe.

In our defense strategy, we refer to climate change as a “threat multiplier” because it has the potential to exacerbate many of the challenges we are dealing with today—from infectious disease to terrorism. We are already beginning to see some of these impacts.

A changing climate will have real impacts on our military and the way it executes its missions. The military could be called upon more often to support civil authorities, and provide humanitarian assistance and disaster relief in the face of more frequent and more intense natural disasters. Our coastal installations are vulnerable to rising sea levels and increased flooding, while droughts, wildfires, and more extreme temperatures could threaten many of our training activities. Our supply chains could be impacted, and we will need to ensure our critical equipment works under more extreme weather conditions. Weather has always affected military operations, and as the climate changes, the way we execute operations may be altered or constrained.

[Report of the Defense Science Board Task Force on Trends and Implications of Climate Change for National and International Security](#)⁹¹ (2011)

⁸⁶ <https://tinyurl.com/y2rjm98d>.

⁸⁷ <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/climate-change-report-2019.pdf>.

⁸⁸ <https://tinyurl.com/y3hbyw5v>.

⁸⁹ <https://dod.defense.gov/Portals/1/Documents/pubs/471521p.pdf>.

⁹⁰ https://www.acq.osd.mil/eie/downloads/CCARprint_wForward_e.pdf.

⁹¹ <https://fas.org/irp/agency/dod/dsb/climate.pdf>.