

Department of Defense Climate Risk Analysis

October 2021



To the National Security Council

Department of Defense Climate Risk Analysis

EXECUTIVE SUMMARY

Climate change is reshaping the geostrategic, operational, and tactical environments with significant implications for U.S. national security and defense. Increasing temperatures; changing precipitation patterns; and more frequent, intense, and unpredictable extreme weather conditions caused by climate change are exacerbating existing risks and creating new security challenges for U.S. interests. The risks of climate change to Department of Defense (DoD) strategies, plans, capabilities, missions, and equipment, as well as those of U.S. allies and partners, are growing. Global efforts to address climate change – including actions to address the causes as well as the effects – will influence DoD strategic interests, relationships, competition, and priorities. To train, fight, and win in this increasingly complex environment, DoD will consider the effects of climate change at every level of the DoD enterprise.

The DoD Climate Risk Analysis (DCRA) responds to requirements specified in Executive Order (EO) 14008, “Tackling the Climate Crisis at Home and Abroad.”¹ The DCRA is organized as follows:

- Section I introduces key security implications of climate change to DoD, including DoD’s role supporting whole-of-government and international efforts in concert with allies and partners.
- Section II reviews DoD climate policy and responsibilities, highlighting key documents.
- Section III presents a review of climate hazards, risks, and security implications. *Sections on specific regions have been identified as Controlled Unclassified Information (CUI) and not releasable to the public. These sections were removed to allow this to be a publicly-releasable document.*
- Section IV outlines how DoD will incorporate consideration of climate into relevant strategy, planning, and processes.
- Section V describes interagency scientific and intelligence products and experts, which could support future analyses of climate risk, as well as expected funding for exercises, wargames, analyses, and studies related to climate change.
- Section VI concludes the DCRA.

The DCRA is an important step towards integration of climate change considerations at DoD. To understand specific climate effects on plans, resourcing, operations, and missions, DoD Components will include climate considerations in relevant risk analyses, leveraging high-quality data, scenarios, and analytical tools tailored to DoD needs.

Working within the whole-of-government, and in coordination with allies and partners, DoD will strive to prevent, mitigate, account for, and respond to defense and security risks associated with climate change.

¹ EO 14008, Section 103(c) requires the Secretary of Defense to develop “an analysis of the security implications of climate change (Climate Risk Analysis) that can be incorporated into modeling, simulation, war-gaming, and other analyses.”



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FOREWORD

To keep the nation secure, we must tackle the existential threat of climate change. The unprecedented scale of wildfires, floods, droughts, typhoons, and other extreme weather events of recent months and years have damaged our installations and bases, constrained force readiness and operations, and contributed to instability around the world.

Climate change touches most of what this Department does, and this threat will continue to have worsening implications for U.S. national security.

To meet this complex challenge, the Department of Defense (DoD) is integrating climate change considerations at all levels, including in our risk analyses, strategy development, planning, modeling, simulation, and war gaming.

The DoD Climate Risk Analysis (DCRA) is a critical step for incorporating climate change security implications at a strategic level. As the global and cross-cutting consequences of climate change increase the demands on the Department, the DCRA provides a starting point for a shared understanding of the mission risks of climate change—and lays out a path forward.

For example, climate considerations will be included in key DoD documents, such as the forthcoming National Defense Strategy, which guides the ways that DoD meets national security challenges. Coupled with the Climate Adaptation Plan, which will help the Department operate under changing climate conditions, the DCRA reflects the Department's focus on confronting climate change.

Climate change presents serious risks, but DoD, along with the entire U.S. government, as well as our allies and partners, is determined to address this common threat. The Department will work to prevent, mitigate, and respond to the defense and security risks associated with climate change. By doing so, we will ensure that we continue to fulfill our mission of defending the United States.



Lloyd J. Austin III, Secretary of Defense



I. INTRODUCTION

“There is little about what the Department does to defend the American people that is not affected by climate change.”

— Secretary of Defense Austin, Statement Released in January 2021

Climate change is reshaping the geostrategic, operational, and tactical environments with significant implications for U.S. national security and defense. Increasing temperatures; changing precipitation patterns; and more frequent, intense, and unpredictable extreme weather conditions caused by climate change are exacerbating existing risks and creating new challenges for U.S. interests. Without adaptation and resilience measures, climate hazards, particularly when combined with other stressors, are likely to contribute to political, economic, and social instability around the world. In many cases, the physical and social impacts of climate change transcend political boundaries, increasing the risk that crises cascade beyond any one country or region. Box 1 provides definitions of key terms used in this document.

BOX 1. DEFINITIONS OF KEY TERMS

Adaptation - Adjustment in natural or human systems in anticipation of or response to a changing environment in a way that effectively uses beneficial opportunities or reduces negative efforts. (DoD Directive (DoDD) 4715.21)

Climate Change - Variations in average weather conditions that persist over multiple decades or longer that encompass increases and decreases in temperature, shifts in precipitation, and changing risk of certain types of severe weather events. (DoDD 4715.21, Joint Publication (JP) 1-02)

Climate Change Mitigation - Measures to reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing carbon dioxide from the atmosphere. (U.S. Global Research Program)

Hazard - A condition with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment or property; or mission degradation. (DoD Dictionary, 2021)

Resilience - The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions. (DoDD 4715.21)

Risk - Probability and severity of loss linked to threats or hazards and vulnerabilities. (DoDD 3020.40)

The risks of climate change to DoD strategies, plans, capabilities, missions, and equipment, as well as those of our allies and partners, are growing. Therefore, analyses based on historical frameworks will not be sufficient to prepare for future risks complicated by a changing climate. To train, fight, and win in this increasingly complex strategic, operational, and tactical environment, DoD will consider the effects of climate change at every level of the DoD enterprise. The Department will consider how crises exacerbated by climate change are likely to increase demand for defense missions and impact critical supply chains, infrastructure, and readiness. Mission success will depend on planning and operational adaptability that account for climate-related complexities and contingencies, and on forces, equipment, and capabilities engineered to adapt to and withstand more extreme environments. Box 2 includes examples of the security implications of climate change both at home and abroad.



BOX 2. EXAMPLES OF SECURITY IMPLICATIONS OF CLIMATE CHANGE AT HOME AND ABROAD

- For the homeland, extreme weather events exacerbated by climate change have caused hardships for millions of Americans, and have the long-term potential to undermine training capability and readiness. Extreme events have cost the United States billions of dollars in damages in recent years, such as at Tyndall Air Force Base and Marine Corps Base Camp Lejeune.
- In the Arctic, climate change is dramatically altering the natural environment and creating a new frontier of geostrategic competition.
- In the Indo-Pacific, sea-level rise and more extreme weather events complicate the security environment, place key DoD warfighting infrastructure and surrounding communities at risk, and challenge local capacity to respond. For example, the United States has important defense assets located in Guam, the Marshall Islands, and Palau, all of which are vulnerable to these hazards. Additionally, competitors such as China may try to take advantage of climate change impacts to gain influence.

Even with aggressive international and whole-of-government action to mitigate future climate change, many effects to the physical environment are now unavoidable and will continue to shape our security environment. DoD will adapt to and mitigate the impacts of these changes to the climate as outlined in the DoD Climate Adaptation Plan (CAP) as well as the Sustainability Report and Implementation Plan (SRIP). The CAP details pathways to achieve an end-state where “DoD can operate under changing climate conditions, preserving operational capability and enhancing the natural and manmade systems essential to the Department’s success.”

DoD plays an important role in the whole-of-government effort to address climate change security risks, which includes working closely with allies, partners, and multilateral institutions to mitigate future climate change and adapt to those changes that are unavoidable. The challenges posed by climate change demand on-going analysis of evolving risks as well as investments in resilience, international development, and governance. As many areas of U.S. Government (USG) response are primarily the responsibility of civilian agencies, DoD will work closely with state and local governments and other parts of the Federal Government, including the Department of State, U.S. Agency for International Development (USAID), the Department of Homeland Security (DHS), intelligence agencies, and science agencies. DoD will often be in a supporting role to other agencies in working with local stakeholders and governments to counter climate-related risks to U.S. national security.

U.S. allies, partners, and competitors are assessing the implications of climate change on their respective strategic objectives. Malign actors may try to exploit regional instability exacerbated by the impacts of climate change to gain influence or for political or military advantage. Global efforts to address climate change – including actions to address the causes as well as the effects – will influence DoD strategic interests, relationships, and priorities. Cooperation with international partners to address the security implications of climate change can strengthen alliances and partnerships. Building awareness of how other nations are preparing for climate change is critical to understanding the risks and opportunities across strategic, operational, and tactical environments.



There is evidence that climate change is making hurricanes stronger and more destructive.

II. DOD CLIMATE POLICY AND RESPONSIBILITIES

The foundation for DoD's climate policy is based on U.S. policy, statutes, executive orders, international agreements, and administrative guidance. A list of relevant documents is provided in Appendix 1. Both the 2010 and 2014 Quadrennial Defense Reviews considered the impacts of climate change on DoD. The 2014 DoD Climate Change Adaptation Roadmap, building off of a previous 2012 roadmap, identified climate change as a national security threat and detailed vulnerabilities to a changing climate. Statutory requirements include Section 335(b) of the National Defense Authorization Act for Fiscal Year 2018 (Public Law 115-91), which stated that "climate change is a direct threat to the national security of the United States and is impacting stability in areas of the world both where the United States Armed Forces are operating today, and where strategic implications for future conflict exists." The statute includes the sense of Congress that DoD "must ensure that it is prepared to conduct operations both today and in the future and that it is prepared to address the effects of a changing climate on threat assessments, resources, and readiness," and that installations should consider climate damage in their master plans.

Last updated in 2018, DoD Directive (DoDD) 4715.21, "Climate Adaptation and Resilience," states that DoD must assess and manage risks associated with the impacts of climate change on DoD missions and installations and strengthen resilience to those impacts. Given that climate change has implications for nearly all that DoD does, the CAP describes how no Component can "opt out." Looking forward, DoD will consider all the strategic implications of climate, as well as continue to assess the ways climate impacts DoD installations, operations, and planning.

DoDD 4715.21 also describes responsibilities related to climate in the Department. The Under Secretary of Defense for Policy (USD(P)) is responsible for developing policies, plans, programs, forces, and posture needed to implement the DoD strategy including, as appropriate, adapting actions to increase resilience to climate change. In doing so, USD(P) responsibilities include defining strategic climate risks and those that might contribute to demand for defense missions, including consideration of climate into relevant strategic and operational documents; interfacing with interagency efforts related to the links between climate and stabilization; supporting USAID humanitarian assistance and disaster response; leading international engagements including security cooperation; and overseeing mission assurance. USD(P)'s staff also convene a group of DoD subject matter experts to share information and inform strategic thinking about the links between climate change, resource competition, and other aspects of environmental security.

Additionally, DoDD 4715.21 states that the Under Secretary of Defense for Acquisition & Sustainment (USD(A&S)) leads the development and oversees the implementation of DoD policy on climate change adaptation and resilience. These efforts support the delivery and sustainment of secure and resilient capabilities to the Warfighter, to include energy, climate, and water resilience and adaptation to the effects of climate change. Recent USD(A&S) climate-focused documents and tools include the CAP, an evaluation of resilience measures installations can deploy to reduce vulnerability to climate hazards ("*DoD Installation Exposure to Climate Change at Home and Abroad*," 2021), and the DoD Climate Assessment Tool (DCAT).

Many other offices play critical roles related to climate change. DoDD 4715.21 provides details on roles specifically related to climate change adaptation and resilience, including roles for additional Office of the Secretary of Defense (OSD) staff, as well as the Chairman of the Joint Chiefs of Staff, Combatant Commanders, and other DoD Components.

In January 2021, President Biden signed EO 14008, "Tackling the Climate Crisis at Home and Abroad," which elevates climate considerations to be "an essential element of United States foreign policy and national security" and highlights the urgency of tackling climate change to "avoid the most catastrophic impacts." The DCRA is in response to the requirements specified in Section 103(c) of EO 14008. The Secretary of Defense's March 2021 Memorandum established the OSD Climate Working Group to (1) coordinate Department responses to EO 14008 and subsequent climate- and energy-related directives, and (2) track implementation of climate- and energy-related actions and progress against future goals.



III. CLIMATE HAZARDS, IMPACTS, AND SECURITY IMPLICATIONS

Across the globe, climate change is contributing to an array of hazards including higher temperatures; changing precipitation patterns; and more frequent, intense, and unpredictable extreme weather conditions. These climate hazards can lead to impacts due to natural or social vulnerabilities, which have security implications for DoD. Some security implications may result directly from climate change, but many result from direct or indirect impacts of climate change (Figure 1). For example, the climate hazard of changing precipitation patterns is expected to cause more frequent and intense droughts in certain regions of the world. Primary impacts of drought include reduced water availability. Secondary impacts include reduced agricultural yields, which, in certain situations, could contribute to migration. Particularly when climate hazards converge and compound, there will likely be unprecedented challenges for governments to respond. For example, drought increases the chance of wildfires, which, in turn, contribute to more frequent and severe flooding; combined, these hazards can compound exponentially on populations.

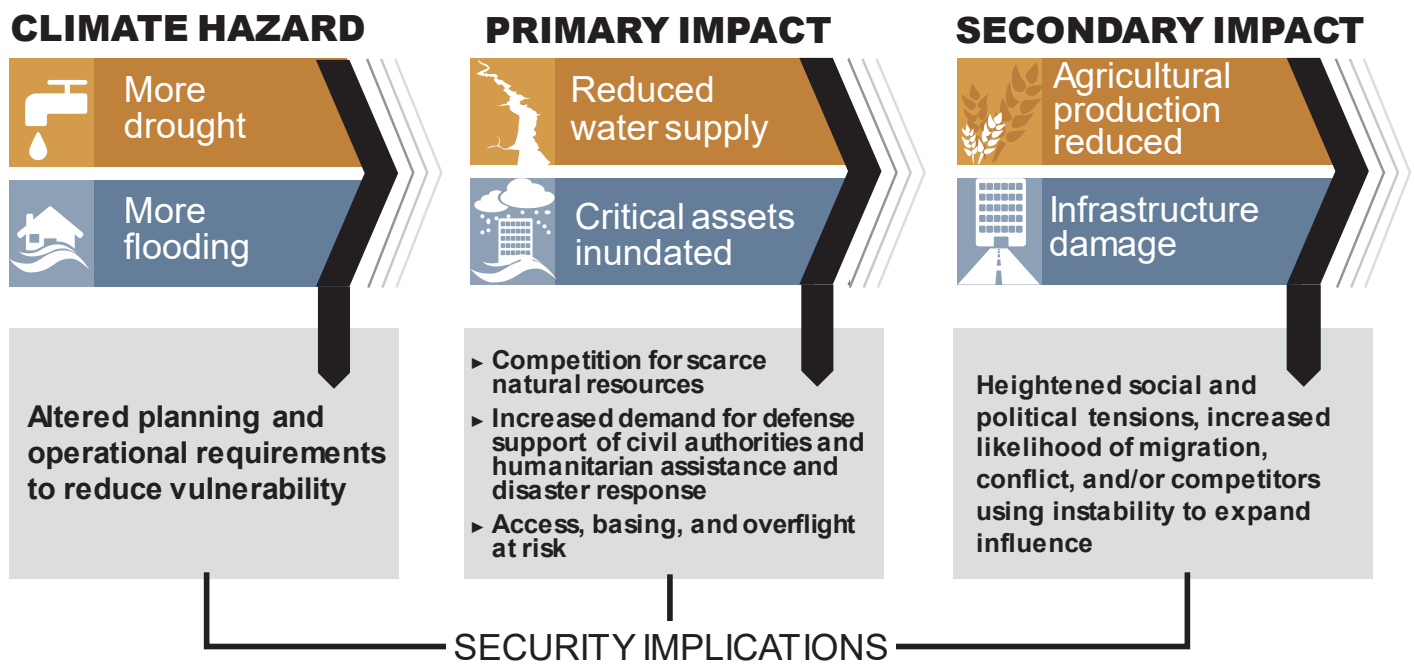


Figure 1. Examples of connections between climate hazards, primary and secondary climate impacts, and security implications.

As the frequency and intensity of these hazards increase, impacts are likely to expand competition over regions and resources, affect the demands on and functionality of military operations, and increase the number and severity of humanitarian crises, at times threatening stability and security. Climate change is one of many factors that contribute to instability and conflict; resilience and strong governance responses can reduce the likelihood of climate hazards having security implications. However, in worst-case scenarios, climate change-related impacts could stress economic and social conditions that contribute to mass migration events or political crises, civil unrest, shifts in the regional balance of power, or even state failure. This may affect U.S. national interests directly or indirectly, and U.S. allies or partners may request U.S. assistance.



While the effects of climate change are global, specific hazards, impacts, and risks associated with climate change will differ by region. The majority of climate hazards are not new; however, climate change is altering the frequency, intensity, and location of the hazards, contributing to vulnerability and compounding risks. Additionally, when climate change intersects with other forms of environmental degradation, such as deforestation and erosion, the impact can be even greater. Climate impacts, such as increased competition over scarce resources, are likely to contribute to internal tensions within countries, as well as external tensions between countries. As the likelihood of multiple converging extreme events increases with climate change, risks can compound and put enormous pressure on any government's capacity to respond, increasing the possibility of cascading security impacts. Box 3 provides examples of some of these crosscutting risks.

BOX 3. CROSSCUTTING CLIMATE CHANGE RISKS

While certain climate hazards and impacts are specific to particular regions of the world, many are cross-cutting, cascading, and/or global. Some examples include:

- Shifts in agricultural production in one region can impact global food prices and availability, contributing to food shortages, protests, and instability in other parts of the world.
- Impacts to marine ecosystems and resources have implications for fisheries and food security across the globe, which could become a source of friction.
- As temperatures and precipitation patterns shift, distribution and range of vector-borne diseases, such as malaria, will change.
- Increasingly unpredictable rainfall related to climate change could make it harder to resolve disputes over transboundary rivers such as the Nile and Mekong Rivers.
- Climate change that exacerbates insecurity and instability in one region may disrupt nomadic population movements and/or contribute to temporary or permanent migration that impacts other regions.
- Global supply chains are at risk to extreme weather events exacerbated by climate change. For example, the 2011 floods in Thailand disrupted production of components for global companies including computer disk drives and cars.
- Policy responses to climate change could also have unintended consequences and become sources of dispute, such as policies that impact supply chains or critical minerals.



DoD supports the US Government Assistance to Haiti after Hurricane Matthew in 2016.

Figure 2 illustrates some representative climate change hazards and potential impacts on DoD missions around the world.

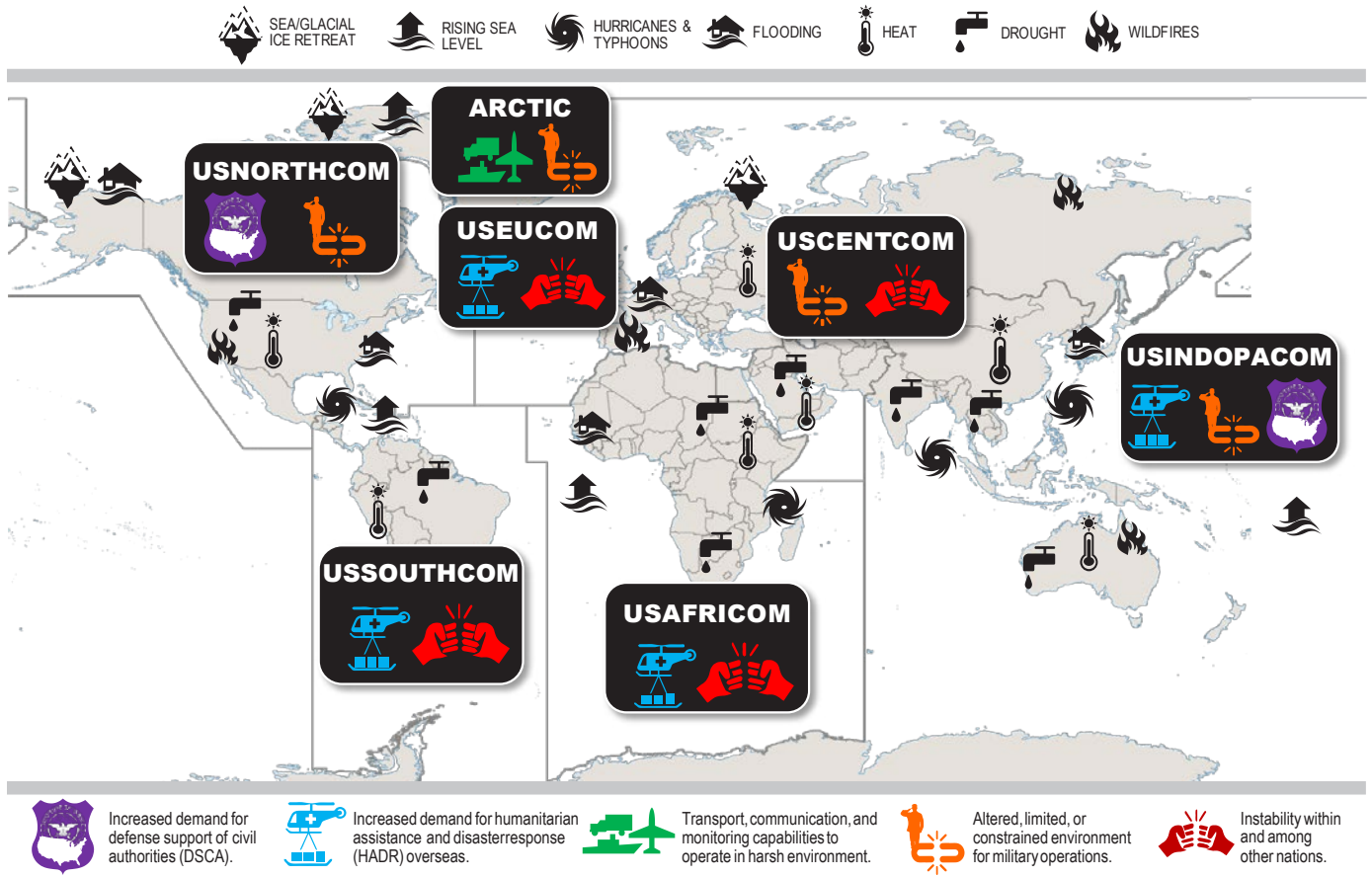


Figure 2. Selected regional hazards worsened by climate change (key to symbols on the top row above map) and identified security implications (key to symbols on the bottom row below the map). This map illustrates some of the key risks by region, but is not comprehensive of all risk.

The regional sections have been identified as Controlled Unclassified Information (CUI) and not releasable to the public. These sections were removed to allow this to be a publicly-releasable document.



IV. INCORPORATING CLIMATE RISK

DoD will integrate the security implications of climate change into key strategic documents, programs, and international partner engagements. DoD will also consider how to integrate climate considerations into DoD educational institution curriculums.

A. KEY DOD DOCUMENTS

Strategic documents signed by the Secretary or other senior DoD leaders guide DoD Components, formalize priorities to direct resource allocation, and drive action to accomplish desired ends. As required by EO 14008, Section 103(d), DoD will incorporate climate considerations into the National Defense Strategy (NDS); Defense Planning Guidance (DPG); the Chairman’s Risk Assessment; and other relevant strategy, planning, and programming documents and processes. A report on progress of this integration is due annually to the National Security Council starting in January 2022. Climate change will be integrated into several of these documents through the office of the Assistant Secretary of Defense for Strategy, Plans, and Capabilities under the USD(P). In addition to the guidance in EO 14008, Section 103(d), DoD will also include consideration of climate across all relevant strategy, planning, force management, force employment, force development, and budget documents as discussed below and summarized in Figure 3.

 STRATEGY	 PLANNING	 FORCE MANAGEMENT, DEVELOPMENT, & EMPLOYMENT	 BUDGET, ANALYSIS, & ASSESSMENT	 PARTNERED ACTIVITIES & ACQUISITION
<ul style="list-style-type: none"> • National Defense Strategy • National Military Strategy • Combatant Command Theater Strategies 	<ul style="list-style-type: none"> • Unified Command Plan • Contingency Planning Guidance • Joint Strategic Campaign Plan • Operation Plans • Global/Functional Campaign Plans • Service Planning Guidance • Combatant Command Campaign Plans 	<ul style="list-style-type: none"> • Defense Planning Guidance • Global Force Management Guidance • Contingency Planning Guidance • Global Force Posture Recommendations • Guidance for Employment of the Force • Joint Warfighting Concept • Service Warfighting Concepts 	<ul style="list-style-type: none"> • Strategic Portfolio Reviews • Analysis of Alternatives • Annual Joint Assessment • Chairman's Risk Assessment • Defense Planning Scenarios • Program Objective Memorandum • Service and Independent Cost Estimates 	<ul style="list-style-type: none"> • Security Cooperation Programs • Partnership Plans • Acquisition Strategy • Major Defense Service and Acquisition Programs • State Partnership Program • Joint and Service Capability Development Processes and Oversight

Figure 3. Examples of DoD documents in which climate will be incorporated.

As the capstone strategic guidance for DoD, the NDS will examine ways in which climate change affects the security landscape and defense missions, activities, and resources. The NDS will also identify priorities and outcomes and direct the integration of climate considerations into nested strategy documents, including the National Military Strategy.



The Secretary of Defense updates the NDS at least every four years. Under Section 113 of Title 10 U.S. Code U.S.C., the NDS must include: DoD’s priority missions; assumed force planning scenarios; assumed strategic environment, including the most critical and enduring threats, as well as strategies for countering threats; a strategic framework for prioritization of threats and risks; the roles and missions of the armed forces; elements of the defense program necessary to support the strategy; and a five-year plan for major investments that support the strategic framework. In the intervening years, the Secretary is required to assess the NDS implementation and any needed revisions. The 2021 Interim National Security Strategic Guidance clearly identifies climate change as one of the most significant threats facing the United States. As an important element of the strategic environment, now and in the future, climate change will be integrated into the NDS.

Section 113 also requires the Secretary to provide guidance on the preparation and review of contingency and campaign plans, which is provided through Contingency Planning Guidance (CPG) and the Guidance for Employment of the Force (GEF).

The CPG addresses preparation and review of contingency and campaign plans, including homeland defense and military support to civil authorities. The 2021 CPG includes prioritization of severe weather challenges to war plan development, and future CPGs will include consideration of other aspects of climate change.



A Texas Army National Guard UH-60 Black Hawk helps fight wildfires.

The GEF includes a prioritization of forces and resources; prioritization of contingency and campaign plans; prioritization of global, regional, and functional policy objectives; policy and strategic assumptions; guidance on global posture and global force management; security cooperation priorities; and nuclear policy. Climate change will be integrated into the GEF through the identification of priorities and planning, including global, regional, and functional considerations. The GEF provides a set of strategic assumptions that reflect the implications of climate change, such as impacts on competition over resources, likelihood of increased demand for humanitarian assistance and disaster response (HADR), and vulnerabilities of allies and partners’ in each Combatant Command (CCMD). A new GEF will be released in spring 2022 and will reflect climate guidance.

B. INTERNATIONAL PARTNER ENGAGEMENT

Tackling climate change is a USG priority, and DoD will incorporate climate considerations into its engagements with allies and partners. For example, DoD worked closely with NATO allies to develop a Climate Change and Security Agenda and subsequent Action Plan in June 2021. There are opportunities for DoD to share its climate tools, resources, and experts, and to learn from partners and allies who have climate change mitigation and adaptation expertise. The DoD CAP also describes the importance of coordination with allies and partners in its Line of Effort 5 “Enhance Adaptation and Resilience Through Collaboration.”

There are many ways for the Department to integrate climate considerations into international partner engagements, including supporting interagency diplomacy and development initiatives in partner nations; providing humanitarian assistance amid climate-affected crises; countering malign actors who seek to exploit climate change to gain influence; and sharing best practices. Some specific tools, funds, and programs, which are summarized in Appendix 2, include: the DCAT; Overseas Humanitarian, Disaster, and Civic Aid (OHDACA) funds; USINDOPACOM’s Pacific Environmental Security Partnership (PESP); DoD Regional Centers for Security Studies; U.S. Army Corps of Engineers (USACE) technical assistance to partner countries on climate resilience; the State Partnership Program (SPP) as a forum for disaster-response planning and communication; the Institute for Security Governance engagements building global partner resilience; and the Defense Institute of International Legal Studies (DIILS) advising, education, training engagements, and courses.



V. INFORMING AND FUNDING FUTURE CLIMATE RISK ANALYSES

The DCRA serves as a first step towards inclusion of the security implications of climate change across the DoD enterprise. Tailored analyses of climate risk will be needed to inform specific modeling, simulation, and exercises. The following subsections detail scientific and intelligence information, as well as relevant interagency groups, that can help support future analyses of climate hazards, impacts, risks, and security implications for DoD.

A. SCIENTIFIC INFORMATION

DoD relies on data, science, and evidence in decision-making, including planning, policy, and decisions related to climate risk. Risk analyses are not meant to be fixed in time; rather, they must be frequently updated through an iterative process that captures evolving risks and new scientific advances. To understand specific climate effects on plans, resourcing, operations, and missions, DoD Components will include climate considerations in relevant risk analyses, leveraging high-quality data, scenarios, and analytical tools tailored to DoD needs.

Current DoD-specific resources for climate data, analysis, and assessments include, but are not limited to, the DCAT; the U.S. Army Climate Assessment Tool (ACAT); the U.S. Air Force 14th Weather Squadron within the 557th Weather Wing under Air Combat Command; and the Climatology Division at Fleet Numerical Meteorology and Oceanography Center. DoD relies on authoritative scientific data and modeling provided by USG science agencies.

Improvements in predictive capacity of short- to medium-term weather anomalies are needed to have

scientific information at time scales required for DoD strategy and planning. DoD will validate its selection and use of climate data and projections internally and through consultation with scientific agencies and other partners such as DoD's Climate Working Group, DoD's Strategic Environmental Research and Development Program (SERDP), Federally Funded Research and Development Centers (FFRDCs), and the U.S. Global Change Research Program (USGCRP)—(of which DoD is a member)—within the White House Office of Science and Technology Policy (OSTP). DoD will continue to review and assess how to integrate climate science, data, and scenarios into Department documents and processes.



Coast Guard crews train in high surf to ensure they are prepared to respond to any maritime emergency during rough weather conditions.

B. INTELLIGENCE PRODUCTS

There are various classified and unclassified U.S. intelligence products regarding the security risks associated with climate change, including Annual Threat Assessments, the quadrennial Global Trends reports, and the 2016 National Intelligence Council White Paper. In 2020, consistent with 50 U.S.C. § 3060, the Director of National Intelligence established the Climate Security Advisory Council (CSAC), bringing together the Intelligence Community and Federal Science Agencies to advance insights on the national security impacts of climate change. As required by EO 14008, Section 103(b), the Intelligence Community is developing a National Intelligence Estimate (NIE) on the national and economic security impacts of climate change. Both the CSAC and the climate NIE will be important resources to inform future DoD climate security risk analyses.



C. FUNDING

The Department intends to prioritize funding DoD Components in support of exercises, wargames, analyses, and studies of climate change impacts on DoD missions, operations, and global stability. The President's FY 2022 Budget request included funds to incorporate climate risk into exercises, wargames, analyses, and studies. Appropriated funds will be allotted via existing governance structures including the Combatant Commander Exercise Engagement and Training Transformation program and the Wargaming Incentive Fund. Box 4 provides a list of examples of climate risk that could be included in future modeling, simulation, and wargaming.

BOX 4. EXAMPLES OF CLIMATE RISK TO BE INCORPORATED INTO MODELING, SIMULATION, AND WARGAMING

- Sensor operations: changes in the operating environment due to temperature extremes or extended rainfall; loss of effectiveness based on climate conditions.
- Information operations: how changes in "normal" climate cycle affect operations.
- Aircraft performance (fixed wing and rotary wing): loss of payload capacity, range, and loiter time based on increased temperatures.
- Wildfires: loss of range or accuracy due to extreme weather conditions.
- Ground mobility: extended monsoon season and trafficability; impact on medical evacuation and resupply by ground means.
- Naval operations: underway replenishment in altered sea conditions; loss of capability/efficiency in fuel transfer (e.g., ship to shore).
- Non-combatant Evacuation Operations: conflict exacerbated by climate change impacts; embassy security or evacuation considerations.
- Access, basing, and overflight constraints.
- Exercises: extreme weather-related cancellations and effects on readiness.
- Threat icons: integrate irregular threat icons that represent non-state actors, transnational criminal organizations, or other unofficial competitors motivated to disrupt operations during an exercise or wargame.
- Critical infrastructure: climate-related delays, disruption, and/or degradation of DoD to produce, package, repair, and distribute materiel and ammunition and its effects on readiness and/or operations.
- Degradation of Joint Force performance due to extreme weather events associated with climate change.
- Consideration of the impact of increased demand for HADR and DSCA.



VI. CONCLUSION

“No nation can find lasting security without addressing the climate crisis.”

— Secretary of Defense Austin, April 2021

The DCRA provides an initial review of the security implications of climate change specific to DoD missions and identifies strategy, planning, and other documents that will incorporate consideration of climate change. Guidance will be included in Secretary-level strategic documents, such as the NDS, DPG, and GEF, as well as other DoD core guidance documents to drive prioritization of climate considerations throughout the Department. The authors thank DoD and interagency counterparts for reviewing and contributing to this document. The DCRA provides a critical step towards integration of climate change considerations at every level of the DoD enterprise. Working within the whole-of-government, and in coordination with allies and partners, DoD will work to prevent, mitigate, account for, and respond to defense and security risks associated with climate change.



APPENDIX 1. CLIMATE-RELATED STATUTES, DOD ISSUANCES AND POLICIES, AND EXECUTIVE ORDERS

Climate-Related Statutes

10 U.S.C. § 118, Quadrennial Defense Review
10 U.S.C. § 2802, Military Construction Projects
10 U.S.C. § 2864, Master plans for major military installations
10 U.S.C. § 2902, Strategic Environmental Research and Development Program Council
15 U.S.C. § 2904, National Climate Program
50 U.S.C. § 3060, Climate Security Advisory Council

Climate-Related Issuances

DoDD 3020.40, Mission Assurance
DoDD 4715.21, Climate Change Adaptation and Resilience
DoD Instruction (DoDI) 3020.45, The Mission Assurance Construct
DoDI 3200.21, Sustaining Access to the Live Training Domain
DoDI 4170.11, Installation Energy Management
DoDI 4715.03, Natural Resources Conservation Program
DoD Manual 4715.03, Integrated Natural Resource Management Plan

Climate-Related DoD and Departmental Policies and Guidance

Air Force Instruction (AFI) 32-1015, Integrated Installation Planning
AFI 90-2001, Mission Sustainment
Air Force Manual (AFMAN) 32-7003, Environmental Conservation
Air Force Severe Weather/Climate Hazard Screening and Risk Assessment Playbook
Army Climate Resilience Handbook
Army Directive 2020-08, U.S. Army Installation Policy to Address Threats Caused by Changing Climate and Extreme Weather
Army Memorandum Consideration of Greenhouse Gas Emissions and the Effects of Climate Army Regulation 210-20, Real Property Master Planning for Army Installations
Climate Adaptation for DoD Natural Resource Managers Report
DoD Installation Exposure to Climate Change at Home and Abroad, April 2021
Marine Corps Order (MCO) 11000.5, Facilities Sustainment, Restoration and Modernization Program
MCO 11000.12, Real Property Facilities Manual, Facilities Planning and Programming
Office of the Chief of Naval Operations Instruction 11010.40A, Encroachment Management Program
NAVFAC Climate Change and Installation Adaptation and Resilience Planning Handbook
Unified Facilities Criteria (UFC) 2-100-01 Installation Master Planning

Recent Climate-Related Executive Orders (EOs)

EO 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, January 20, 2021
EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, January 20, 2021
EO 14008, Tackling the Climate Crisis at Home and Abroad, January 27, 2021
EO 14013, Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration, February 4, 2021
EO 14017, America's Supply Chains, February 24, 2021
EO 14027, Establishment of the Climate Change Support Office, May 7, 2021
EO 14030, Climate-Related Financial Risk, May 20, 2021



APPENDIX 2. EXAMPLES OF TOOLS, FUNDS, AND PROGRAMS THAT SUPPORT INTERNATIONAL PARTNER CLIMATE RESILIENCE.

Note: This list is intended to provide some examples but is not exhaustive.

- The DoD Climate Assessment Tool (DCAT) uses data from past weather events and projections of some future climate changes to provide high-level assessments of exposure to climate change for critical infrastructure. To date, the Department has used the DCAT on hundreds of domestic installations and a selection of overseas installations (see the DoD *Installation Exposure At Home and Abroad* report for more information about these assessments and the DCAT). Many of these locations are important for operational plans and ongoing operations. The Department will incorporate the results of these exposure assessments into military construction requests, partnership activities, and relationships with allies. DoD is committed to share the DCAT with allies and partners to help build climate resilience.
- One of the Department's most effective tools for helping partners cope with extreme events exacerbated by climate change is through its Overseas Humanitarian, Disaster, and Civic Aid (OHDACA) appropriation and associated Title 10 authorities. The majority of the annual OHDACA funding supports steady-state humanitarian assistance projects, including those related to the effects of climate change. DoD-supported projects include sponsoring disaster assessments to identify gaps; training our partners to conduct disaster planning and disaster management; assisting partners with disaster response exercises; constructing disaster warehouses, emergency operations centers, and hurricane shelters; and building up a partner's health capacity. Joint DoD and USAID disaster risk reduction efforts in Bangladesh, the Philippines, and Nepal continue to be encouraging examples of ways to reduce adverse effects of extreme weather events on vulnerable populations.
- The Pacific Environmental Security Partnership (PESP), an initiative of USINDOPACOM, brings together a network of environmental security partners with an interest in cooperation and capacity development. Their annual event, the Pacific Environmental Security Forum, has been held for over a decade. This could be an example for other CCMDs.
- DoD Regional Centers for Security Studies build partners' capacity to forecast, assess, and mitigate the security impacts of climate change by conducting bilateral and multilateral research, workshops, subject matter exchanges, and training and education activities for U.S. and partner military and civilian participants. For example, the Daniel K. Inouye Asia-Pacific Center for Security Studies teaches climate security modules in every resident course and includes climate change security impacts in partner exercises and gray zone games.
- Under its Title 10 authorities, the U.S. Army Corps of Engineers (USACE) provides technical assistance to certain partner countries and inter-governmental organizations on climate resilience and risk mitigation. For example, USACE supports Mekong River Commission climate resilience efforts in the Mekong basin and collaborates with the United Nations on climate risk-informed water management, including flood and drought monitoring and forecasting in Southern Africa.
- The State Partnership Program (SPP) partners State National Guard organizations with 92 countries and provides an opportunity for DoD and partner-nation governments to coordinate on all aspects of force readiness. It also provides a forum for disaster-response planning, ensuring the United States remains a partner of choice. The SPP provides a channel of communication for discussion of military implications of climate change and mitigation efforts with partner and allied nations.
- The Institute for Security Governance builds global partner resilience capacity via engagements specifically designed to enhance partner whole-of-government, all-hazards readiness, and resilience to face the full range of crises and emergencies. These engagements incorporate consideration of issues directly related to climate security such as: comprehensive risk assessment, energy security, secure and sustained provision of essential goods and services, civil preparedness, and governance under degraded or de-stabilizing conditions.
- The Defense Institute of International Legal Studies (DIILS) builds global partner legal capacity via advising, education, training engagements, and courses. Some of these address legal issues directly related to climate security and destabilizing conditions, such as those associated with military support to civilian authorities for border security or disaster response operations, Civilian Harm Mitigation (CHM) efforts, rights and obligations associated with refugees and displaced persons, maritime security and interdiction operations, and hybrid warfare and malign influence operations.

