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To help ensure the receptibility of climate change policies and operational execution, a new climate-aware generation of future defense leaders, planners, and decision-makers would help drive the process of infusing climate change policies into the center of security strategy. This paper presents a survey of student interagency future leaders, planners, and decision-makers at select National Defense University colleges. The survey is designed to sample their awareness, understanding, and appreciation of climate change impacts to national security readiness and operations. Understanding where future strategic planners lie in their understanding of climate change risks to defense readiness and operations is relevant to ensuring their ability to craft long-term strategic plans and policies designed to mitigate, at the minimum, or prevent them, at best. Leaders who possess a broader and deeper appreciation of climate change and its effects will enable the Department of Defense to successfully address climate change impacts. Based in part on the findings from the survey responses, this paper includes recommendations for achieving comprehensive, informed strategic guidance on climate change impacts to national security readiness and operations.

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NATIONAL DEFENSE UNIVERSITY

JOINT FORCES STAFF COLLEGE

JOINT ADVANCED WARFIGHTING SCHOOL

CLIMATE CHANGING MINDS:
REINTRODUCING CLIMATE CHANGE INTO NATIONAL STRATEGY

By:

Ronald D. Perkel

FS-01 / U.S. Department of State

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CLIMATE CHANGING MINDS:

REINTRODUCING CLIMATE CHANGE INTO NATIONAL STRATEGY

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FS-01 / U.S. Department of State

A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning Strategy. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

This paper is entirely my own work except as documented in footnotes (or appropriate statement per the Academic Integrity Policy).

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Abstract

A new administration commenced at the start of 2021 in which climate change again takes center stage of U.S. national policy. However, a current divided body politic and the absence of climate change reference within past national and defense strategic guidance indicates a significant portion of national policy makers are not yet appreciative of climate change risks. This suggests the need for better informed strategic guidance at national and Departmental levels regarding climate change impacts on military readiness and operations specifically. To help ensure the receptibility of climate change policies and operational execution, a new climate-aware generation of future defense leaders, planners, and decision-makers would help drive the process of infusing climate change policies into the center of security strategy. This paper presents a survey of student interagency future leaders, planners, and decision-makers at select National Defense University colleges. The survey is designed to sample their awareness, understanding, and appreciation of climate change impacts to national security readiness and operations. Understanding where future strategic planners lie in their understanding of climate change risks to defense readiness and operations is relevant to ensuring their ability to craft long-term strategic plans and policies designed to mitigate, at the minimum, or prevent them, at best. Leaders who possess a broader and deeper appreciation of climate change and its effects will enable the Department of Defense to successfully address climate change impacts. Based in part on the findings from the survey responses, this paper includes recommendations for achieving comprehensive, informed strategic guidance on climate change impacts to national security readiness and operations. Ultimately, the idea is to create a national security climate-change-community-culture; a shared, whole-of-government, societal understanding of climate change implications to national security. The promise is that a consistent and enduring policy will catch up with a reality of a climate change-driven future.

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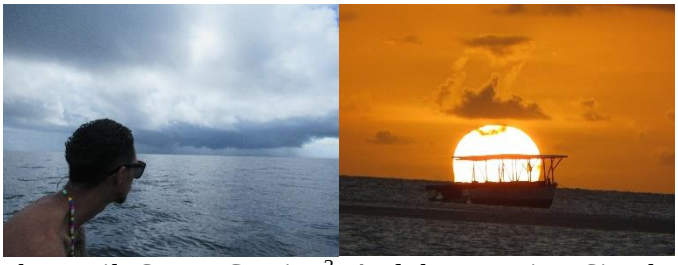
Dedication

To my father, of course, Dr. Robert Jules Perkel, who turned 95 this February, 2021, spending a life, so far, in unstinting service to his family and dedication to the principles of integrity, honesty, and science. And to my mother, Sylvia Perkel, who will turn 95 in early July, shortly after this paper's publication, and who has remained unshakably consistent in attractive, artistic, and curiosity-interested appearance, both outward and inward, since 40. 71 years of marriage together in August. Timeless.

The Irony of the Anthropocene[1]

To the planet, Earth, whose geologic-time imperturbability in the face of human-induced climate change holds both promise and peril. To the nation-states of the planet at risk of existential extinction, from the small and atoll island countries-territories, to cities and city-states at risk of submersion. To wholesale regions at risk of desertified, heat-imposed, and water-scarce inhabitability. To all of Earth's inhabitants, sentient and not, who will learn to cure, mitigate, adapt, or perish.



The Peril: Storm Coming[2] *And the Promise: Simpler Times*[3]

[1] Photos of Tuvalu, South Pacific, 05-28, 30, and 06-1, 2019, respectively.
[2] Photo at Funafuti Conservation Area, Tuvalu, 05-31-2019.
[3] Photo at North Tarawa, Kiribati, Equatorial Pacific, 01-26-2018.

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To family, friends, and colleagues whose reviews helped ensure some cogency, coherency, and consistency in analysis, readability, and understanding in presentation.

Then, my profoundest appreciation to my Thesis Advisor Dr. Charles Davis for his invaluable, careful, and patient input into every aspect of the paper; from conceptualization, organization, survey interpretation and use, clarity, and sentence construction. Sentences as long as occurring in this Acknowledgement you won't find in the main body . . .

Lastly, to my JAWS seminar leads, Colonel James Bain, Dr. Keith Dickson, and Colonel Greg Sawyer for their guiding me on the path to question assumptions and leading me towards new historical realizations about conflict, society, power, and, hence, the human condition. To my Seminar 1 classmates for key insight and their unflinching acceptance.

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Chapter 1: Introduction

> Man and not nature initiates, but nature in large measure controls.
> —H.J. Mackinder, "The Geographical Pivot of History"[1]

The character of conflict has changed.[2] Well into the 21st century, the geopolitical environment, including transregional threats, has altered the military strategic and operating environment.[3] Climate change, a fundamental aspect of this environment, will pose varied consequences to many aspects of our lives. Depending on the level of severity, these consequences will have impacts ranging from personal to national policy, including defense. A premise of this paper is that the phenomenon of climate change is a real, empirically-supported, scientifically-measured, and incontrovertible fact. Uncertainty and variability exist only within the level of severity of its impacts and consequences. Suppose these impacts indeed fall towards the moderate to the severe side of the spectrum.[4] In that case, as appears to be increasingly modeled, climate change will

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[1] Halford J. Mackinder "The Geographical Pivot of History." The Geographical Journal 23, no. 4 (1904), p. 422.

[2] Chairman of the Joint Chiefs of Staff, *Implementing Global Integration*, CJCSI 3050.01 (Washington, DC: Joint Chiefs of Staff, December 31, 2018), B-1.

[3] Joseph Dunford, Jr., "The Character of War and Strategic Landscape Have Changed," *Joint Force Quarterly* 89, no. 2 (2018): 2, accessed December 28, 2020, https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-89/jfq-89.pdf?ver=2018-04-19-153711-177.

[4] Peiran R. Liul and Adrian E. Raftery, "Country-based rate of emissions reductions should increase by 80% beyond nationally determined contributions to meet the 2°C target," *Communications Earth & Environment* 2, no. 29 (February 9, 2021): 2, 6, accessed February 11, 2021, https://www.nature.com/articles/s43247-021-00097-8; S.C. Sherwood et al., "An Assessment of Earth's Climate Sensitivity Using Multiple Lines of Evidence," *Reviews of Geophysics* 58, no. 4 (December 2020), accessed April 14, 2021, https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2019RG000678; Joeri Rogelj et al., "Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development," in *Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, ed. Valérie Masson-Delmotte et al. (Intergovernmental Panel on Climate Change, 2018), 116, accessed February 11, 2021, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf.

have profound consequences to national security policy, strategy, and operations affecting multiple aspects of military readiness.[5]

A changing climate presents innumerable implications to our national security. However, there was a complete absence of any reference to climate change consequences and risks within the last national security and defense strategies. This absence suggests an underappreciation of the future impacts of climate change on military matters and the joint force by then-senior leaders in the Department of Defense (DoD). Even with a new administration placing climate change at the center of national security policy, a current divided body politic and past guidance indicate that a significant portion of national policy makers still do not fully appreciate the risks. Risks to military readiness and operations from climate change effects are manifold. At a minimum, rising seas and greater storm surge will increasingly impinge upon DoD facilities and basing, especially along coastal and low-lying regions.[6] Arctic ice melt will enhance competition for natural resource extraction and military posture.[7] As the Northwest Passage opens, surface travel on the polar route, with resource extraction possibilities previously locked away, will increase competition and opportunities for commercial shipping and the extractive

[5] Office of the Director of National Intelligence, *Global Trends 2040: A More Contested World* (Washington DC: National Intelligence Council, March 2021), 41, accessed April 14, 2021, https://www.dni.gov/files/ODNI/documents/assessments/GlobalTrends_2040.pdf; Berardelli, Jeff. "Some new climate models are predicting extreme warming. Are they correct?" Yale Climate Connections, Yale School of the Environment, July 1, 2020, accessed November 7, 2020, https://yaleclimateconnections.org/2020/07/some-new-climate-models-are-projecting-extreme-warming-are-they-correct/.

[6] Committee on National Security Implications of Climate Change for U.S. Naval Forces (hereinafter Naval Climate Committee), Naval Studies Board, Division of Engineering and Physical Sciences, and National Research Council, *National Security Implications of Climate Change for U.S. Naval Forces.* Washington, D.C.: National Academies Press, 2011, 9, 66, accessed March 6, 2021, http://search.ebscohost.com.nduezproxy.idm.oclc.org/login.aspx?direct=true&AuthType=ip,url,uid&db=nlebk&AN=372508&site=eds-live&scope=site.

[7] U.S. Department of the Air Force, *Arctic Strategy, Ensuring a Stable Arctic Through Vigilance, Power Projection, Cooperation, and Preparation* (Washington, DC: US Air Force, US Space Force, June 21, 2020), 2, accessed December 28, 2020, https://www.af.mil/Portals/1/documents/2020SAF/July/ArcticStrategy.pdf.

industries.[8] Climate change-induced population migration will also increasingly burden military capabilities and response.[9]

Strategic leaders who possess a broader and deeper appreciation of climate change and its effects will enable DoD to successfully address the impacts to national security. This paper analyzes the results of a survey that queries rising strategic leaders within DoD and other executive agencies attending select senior-level War Colleges to assess the likelihood of this outcome. It will do so by assessing their awareness and appreciation of climate change and its impact on military readiness and operations. Informed leaders can incorporate greater consideration of climate change into future national-level strategy and military planning.

The term "climate change" has a comprehensive scope. Specialized scientific institutions provide legitimacy to claimed effects and definitions concerning climate change. This paper and its survey adopt the definition and impact statement from the National Aeronautics and Space Administration (NASA) and the Intergovernmental Panel on Climate Change, respectively, as its reference:

> Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates … [whose] broad range of observed effects . . . are synonymous with the term [climate change . . . and whose] changes observed in earth's climate since the early 20th century are primarily driven by human activities, particularly fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere, raising Earth's average surface temperature. . . . Human influence on the climate system is clear and growing, with impacts observed across all continents and oceans.[10]

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[8] Ronald O'Rourke et al., *Changes in the Arctic: Backgrounds and Issues for Congress,* CRS Report No. R41153. (Washington, DC: Congressional Research Service, Updated January 6, 2021), 11, 25, 54-55, 59, accessed January 8, 2021, https://fas.org/sgp/crs/misc/R41153.pdf.

[9] Naval Climate Committee, 11; *Shirley V. Scott and Shahedul Khan, "*The Implications of Climate Change for the Military and for Conflict Prevention, Including through Peace Missions," *Air & Space Power Journal Africa & Francophonie* 7, no. 3 (September 2016): 84, accessed December 27, 2020, https://www.airuniversity.af.edu/Portals/10/ASPJ_French/journals_E/Volume-07_Issue-3/scottkhan_e.pdf.

[10] Earth Science Communications Team, "Overview: Weather, Global Warming and Climate Change," NASA Jet Propulsion Laboratory, California Institute of Technology, last modified March 8, 2021, https://climate.nasa.gov/resources/global-warming-vs-climate-change/; IPCC, 2014: *Climate Change*

The planet, its ecosystems, and populations can expect to see (and are already seeing) detriment to systems, habitats, economics, property, livelihood, and life as a result of rising global temperatures. Rising temperatures lead to rising sea levels, warming oceans and acidification, droughts, wildfires, severe flooding, shrinking ice sheets, glacial retreat, and Arctic ice melt. These effects, in turn, generate unstable weather patterns, including precipitation change, increased frequency and intensity of storms, and accompanying storm surges. Selective or mass species extinction follows and is already occurring.[11] Further, intensifying climate change will increase the collateral risk of armed conflict within or among countries.[12]

Chapter 2 of this paper will link the implications of climate change to national security as climate change affects military readiness and operations. In 2010, DoD stated that climate change would shape the operating environment, roles, and missions undertaken.[13] The chapter introduces three examples of climate change to include consequences to military facilities and basing, Arctic ice melt, and rising instability leading to population migration. These examples will demonstrate how climate change profoundly affects operational readiness and core national security interests. Turning to

2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (ed.)]. IPCC, Geneva, Switzerland, v.

[11] A major, exhaustive, 2017 assessment of the science of climate change, mandated by the Global Change Research Act of 1990, the U.S. Global Change Research Program (USGCRP) Climate Science Special Report is an authoritative source on the multiple impacts and aspects of climate change. USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume 1* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (ed.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp. doi: 10.7930/JOJ964J6, https://science2017.globalchange.gov/; Sarah Kaplan, "The Undeniable Link Between Weather Disasters and Climate Change," *Washington Post*, October 22, 2020, https://washingtonpost.com/climate-solutions/2020/1-/22/climate-curious-disasters-climate-change/.

[12] K.J. Mach et al., "Climate as a risk factor for armed conflict." *Nature* 571 (2019): 193–197, accessed May 8, 2021, https://doi.org/10.1038/s41586-019-1300-6.

[13] U.S. Department of Defense, Quadrennial Defense Review Report, February 2010, p. 84, accessed January 15, 2021, https://archive.defense.gov/qdr/QDR%20as%20of%2029JAN10%201600.pdf.

classical conflict theory, the chapter then establishes the relationship between balance of power disequilibria and conflict. Climate change-induced environmental disruption is one such destabilizing influence. It is a contributor in its own right to the increased potential for military conflict.[14] These theories, and the uncertainties resulting from environmental systems' complexities, create imbalances to nation-state power and interests which generate the potential for conflict.[15] Therefore, beyond the effects of a changing climate on military facilities and basing, Arctic ice melt, rising instability and population migration, and climate change-induced environmental disequilibria demand military preparedness and response.

The impacts mentioned above will affect U.S. national military operations and operational readiness, whether exercised as part of defense preparedness at home or abroad. However, the previous national-level strategies either minimized or ignored references to climate change impacts. Chapter 3 examines current national-level security strategies in relation to earlier, similar national guidance and those expected in the future. The current 2017 National Security Strategy (NSS) and 2018 National Defense Strategy (NDS) of the United States do not mention climate change.[16] This was not always the case. It will also not be the case in the current administration.[17] However, there can be no

[14] `Quincy Wright, A Study of War, 2d. ed. Abridged, (Chicago: University of Chicago Press, 1983), 40.

[15] Dietrich Dörner, *The Logic of Failure: Recognizing and Avoiding Error in Complex Situations* (New York: Metropolitan Books, 1996); National Intelligence Council, Global Trends 2040, 40-41.

[16] U.S. President, National Security Strategy (Washington DC: Government Printing Office, December 2017); U.S. Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, (Washington, DC: Department of Defense, January 2018).

[17] WH.Gov, The White House, "Fact Sheet: President Biden Takes Executive Actions to Tackle the Climate Crisis at Home and Abroad, Create Jobs, and Restore Scientific Integrity Across Federal Government," January 27, 2021, accessed April 14, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/; Defense.Gov, US Dept of Defense, "Statement by Secretary of Defense Lloyd J. Austin III on Tackling the Climate Crisis at Home and Abroad," January 27, 2021, accessed February 6, 2021,

guarantee that all national leaders, strategic planners, and implementers will recognize and understand climate change impacts in a timely manner. If not, they will not be able to prepare well enough in advance should adverse risk projections, indeed, begin to match reality. To gain strategic consistency, strategies and plans must fully consider climate change consequences and risks through successive administrations.

Chapter 4 analyzes the results of a survey sent to a select group of future defense planners and policymakers to gauge their levels of awareness of and appreciation for climate change and its potential effects on operational readiness. (Survey at Appendix A; Results at Appendix B). The survey results indicate how well these future leaders understand and appreciate the potential impacts of climate change on strategy and future military planning. Climate change poses significant risks to national security posture and international balances of power. Understanding where future strategic planners lie in their understanding of these risks is relevant to ensuring their ability to craft long-term strategic plans and policies designed to mitigate, at the minimum, or prevent them, at best. An absence of understanding and appreciation for the consequences and risks of climate change would translate to a lack of planning focus. Rising leaders who fail to understand and appreciate climate change's significance to national security imperatives and operational readiness are less likely to put sufficient emphasis on the importance of these impacts and implications into national strategy. By contrast, those who make the connection are more likely to lead a change in focus towards inclusion of the impacts.

The survey results demonstrate an apparent disconnect between the climate-change-aware rising strategic leaders and recent national leadership on the issue. New

https://www.defense.gov/Newsroom/Releases/Release/Article/2484504/statement-by-secretary-of-defense-lloyd-j-austin-iii-on-tackling-the-climate-cr/.

leadership, however, is showing acknowledgement of climate change as a legitimate national security imperative.[18] Sustaining this level of engagement on the part of national leaders both at the political and military defense levels infuses the same into organizational and strategic cultures. Effective change, whether guided from the top-down or pushed, bottom-up, can then really occur as climate change impacts on national security strategy are placed at the forefront. Chapter 5 therefore makes recommendations for achieving a comprehensive, informed strategy to address climate change impacts to national security readiness and operations. To focus attention to the problem of climate change as a national security imperative, this paper proposes a "plus one" addition to the current NSS/NDS priority challenges of Russia, China, North Korea, Iran, and Violent Extremist Organizations (VEO).[19] The focused attention signifies climate change's unique contribution into the environmental domain, requiring new, creative, and critical strategies to legitimately address. An initial step includes a systematic effort to inculcate climate change awareness and values through education, dialogue, exercises, and messaging. Seeking greater institutional permanency, the Joint Concept and Force Development process can help DoD combat climate change implications by formalizing focused warfighting concepts and practices into existing capabilities Ultimately, the ambition is to create a national security climate-change-community-culture to epitomize a shared, whole-of-government, societal understanding of climate change implications to national security interests. The promise is that a consistent and enduring policy will catch up with the reality understood by these surveyed practitioners.

[18] White House, Fact Sheet; DoD Statement by SecDef Austin.
[19] CJCSI 3050.01, B.1.c., B-1.

Chapter 2: Climate Change and Implications to National Security

> The military has an obligation to do things that are in the service of our national defense, whether those are strictly military or not. And addressing climate change is one of those huge things that the military has to do.
>
> —Secretary Ray Mabus, Virtual National Security Briefing[1]

There already exists a scientific consensus on climate change. Greater than ninety-seven percent of actively publishing scientists agree that the past century's climate-warming trends are attributable to human activities.[2] Any existing scientific variability lies not in the reality of the phenomenon but in the severity of its predicted impacts. Climate change models are tending to project higher levels of impact severity.[3] With severe impacts trending ever more to the norm, even moderate increases from an already severe baseline would hold significant ramifications for national security operational readiness and infrastructure.[4]

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[1] Ray Mabus, "Climate Change and Renewable Energy – Present and Future Implications for National Security," Virtual National Security Briefing, National Defense University Foundation, September 30, 2020, audio, 20:15, transcript, 3, accessed January 18, 2021, https://ndufoundation.org/media/watch-climate-change-renewable-energy-present-future-implications-national-security; https://ndufoundation.org/sites/default/files/media/nduf-vnsb_transcript-200930.pdf.

[2] Earth Science Communications Team, "Scientific Consensus: Earth's Climate is Warming," NASA Jet Propulsion Laboratory, California Institute of Technology, last modified November 5, 2020, https://climate.nasa.gov/scientific-consensus/; Herring, David, "Isn't there a lot of disagreement among client scientists about global warming?" NOAA Climate.gov, February 3, 2020, accessed March 28, 2021, https://www.climate.gov/news-features/climate-qa/isnt-there-lot-disagreement-among-climate-scientists-about-global-warming; "Skeptical Science," Explaining climate change science & rebutting global warming misinformation, The 97% consensus on global warming, accessed November 7, 2020, https://www.skepticalscience.com/global-warming-scientific-consensus-advanced.htm.

[3] "For the past year, some of the most up-to-date computer models from the world's top climate modeling groups have been 'running hot' – projecting that global warming may be even more extreme than earlier thought." Berardelli. The new Biden/Harris Executive Order on Tackling the Climate Crisis states that "the scale and speed of necessary action is greater than previously believed." The White House, "Executive Order on Tackling the Climate Crisis at Home and Abroad," January 27, 2021, Accessed April 14, 2021, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/.

[4] Naval Climate Committee, 1; La Shier, Brian, Stanish, James. *The National Security Impacts of Climate Change*, Journal of National Security Law & Policy. 2019, Vol. 10 Issue 1, pp. 27-43, accessed November 12, 2020, http://eds.a.ebscohost.com.nduezproxy.idm.oclc.org/eds/pdfviewer/pdfviewer?vid=4&sid=00a7cb53-37d9-48ec-985e-95a32e1b63ac%40sessionmgr4008.

Climate change presents profound implications to military readiness and operations. As far back as 2010, the former U.S. Joint Forces Command identified climate change as "one of the ten trends most likely to impact the Joint Force," specifically citing storm impacts on military infrastructure, sea level rise, and Arctic ice melt.[5] The 2010 Secretary of Defense Quadrennial Defense Review report (QDR) already had noted climate change's effects upon the operating environment and DoD roles and missions.[6] The consequences of climate change are many, varied, and well documented. Among the many impacts of climate change, those affecting base facilities, Arctic sea ice melt, and population migration and displacement hold particular salience.

Analyzing the results of a survey sent to rising student leaders at the National Defense University (NDU) gauges their level of awareness and appreciation of climate change risks to national security readiness and operations. The survey assesses the sample population's understanding of climate change upon four highlighted effects as impacts upon operational readiness, being: base facilities, Arctic sea ice melt, foreign humanitarian assistance/disaster response (FHA/DR), and conflict incidence. Understanding where future strategic planners lie in understanding these risks then becomes relevant. The relevancy lies in ensuring the ability to craft long-term strategic plans and policies to mitigate and prevent these risks. The paper now addresses each of these four in turn regarding their implications upon military readiness.

Risks to Facilities and Basing

[5] U.S. Joint Forces Command, *The Joint Operating Environment (JOE) 2010* (Norfolk, VA: February 2010), 32, 33. accessed January 24, 2021, https://fas.org/man/eprint/joe2010.pdf.

[6] QDR 2010, 84.

Most directly, climate change's impacts upon temperature and storm intensity create rising seas, heightened storm surge, and stronger storms. Climate change impacts on DoD facilities' will demand adjustments and adaptations to their capabilities. impairing access, disrupting training, and threatening to inundate military bases.[7] These consequence will directly impinge upon DoD facilities and basing, especially along coastal and low-lying regions, as is already happening.[8] Within the last three years, hurricanes at Camp Lejeune, North Carolina, Tyndall Air Base, Florida, and major flooding at Offutt Air Base, Nebraska caused an estimated $4.2 billion in damages.[9] In an amendment to the 2018 National Defense Authorizations Act, the House Armed Services Committee required each Service to report their military facilities most vulnerable to climate.[10] The "climate-related event" vulnerabilities taken into account were recurrent flooding, drought, desertification, wildfires, and thawing permafrost.[11] In March 2019, the Department published a "top ten" list for each Service branch, culled down from the original 79 facilities. Responsive to Congress' request, the list, replicated in Appendix C, demonstrates that various Service members do recognize climate change-related threats to facilities.[12] This recognition, of course, is a good foundation to build further awareness

[7] QDR 2010, 85; Travis J. Tritten, and Roxana Tiron, "Pentagon Games Out Climate Change Future While Avoiding the Term." *Bloomberg Government* (September 15, 2020). https://about.bgov.com/news/pentagon-games-out-climate-change-future-while-avoiding-the-term/.

[8] Naval Climate Committee, 9, 66, 69, 73.

[9] Tritten.

[10] Ellen Mitchell, "House Lawmakers Back Amendment Requiring Pentagon Climate Change Report," *The Hill*, June 28, 2017, accessed March 31, 2021, https://thehill.com/policy/defense/339924-house-lawmakers-back-amendment-requiring-pentagon-climate-change-report.

[11] Office of the Undersecretary of Defense for Acquisition and Sustainment, *Report on Effects of a Changing Climate to the Department of Defense* (Washington, DC: Department of Defense, January 2019), accessed March 31, 2021, https://climateandsecurity.files.wordpress.com/2019/01/sec_335_ndaa-report_effects_of_a_changing_climate_to_dod.pdf.

[12] New Secretary of Defense Lloyd Austin referenced these 79 installations assessed for climate-related impact in his short statement on tackling the climate crisis five days into his term. DoD Statement by SecDef Austin.

throughout the Department. Flooding and drought show the most significant impact (with wildfires third and desertification and permafrost thawing negligible to non-existent).[13] For example, rising sea levels threaten the world's largest naval base, Naval Station Norfolk.[14] The Hampton Roads area, where Norfolk is located, is vulnerable to rising sea flooding and land subsistence.[15] The American Security Project listed Norfolk as the fifth most vulnerable military installation because it is "at risk of sea-level rise and storm surge, but it may also face threats from hurricanes in the Atlantic."[16] The Hampton Roads area is experiencing the highest sea level rise rate on the U.S. Atlantic coast.[17] The Committee on National Security Implications of Climate Change for U.S. Naval Forces, under the auspices of the Naval Studies Board, recommended in 2011 to include sea-level rise and, in particular, storm surge into naval planning purposes.[18]

Climate change impacts military base and military readiness. Piers, utilities, freshwater, training, exercises, and access are all affected. Naval station piers and waterfront structures will require modification as seas rise.[19] Similarly, flooding will damage or destroy utility infrastructure, including sewage treatment, communication

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[13] Office of the Undersecretary of Defense for Acquisition and Sustainment, *Supplement to DoD Report on Effects of a Changing Climate to the Department of Defense* (Washington DC: Department of Defense, March 22, 2019), accessed March 13, 2021, https://fas.org/man/eprint/dod-climate-2019-supp.pdf.

[14] "If we don't do something fairly fast, the largest naval base in the world, Norfolk, Virginia, will go underwater, and it will go underwater in the lifetimes of people who are already adults today." Mabus, audio, 07:30, transcript, 1; Elizabeth Kolbert, "The Case For Catastrophe," *National Geographic: How We Lost The* Planet, April 2020, 17; Katherine Hafner, "From space, ODU researchers can see Hampton Roads sinking," *The Virginia Pilot,* September 13, 2020, accessed December 12, 2020, https://www.pilotonline.com/news/environment/vp-nw-odu-satellite-research-20200913-veyg2cxv25fwxhh34siaeyzbwi-story.html.

[15] Office of the Undersecretary of Defense, 12.

[16] Catherine Foley, "Military Basing and Climate Change," *American Security Project,* November 2012: 3, 4-5, http://www.americansecurityproject.org/wp-content/uploads/2012/11/Military-Basing-and-Climate-Change.pdf.

[17] B. Buzzanga et al., "Toward Sustained Monitoring of Subsidence at the Coast Using InSAR and GPS: An Application in Hampton Roads, Virginia," *Geophysical Research Letters*, 47, no. 18 (September 28, 2020): 1, https://doi.org/10.1029/2020GL090013.

[18] Naval Climate Committee, 72.

[19] Ibid., 74.

interchanges, and electrical substations.[20] Likewise, increased storm strength, winds, and lightning threaten to devastate above-ground utility systems.[21] Saltwater intrusion from rising seas will adversely impact freshwater availability and cost.[22] Sea-level rise, extreme storms, and dangerous temperatures will compromise military training grounds, disrupt training operations and schedules, and risk the safety of personnel.[23] Finally, civilian employees and support and services contractors will be disrupted and impeded from base access due to ancillary effects on the community[24] The 2011 Naval Climate Committee on National Security Implications of Climate Change stated succinctly in this observation: "The Navy has billions of dollars in assets exposed to the threats of climate change, and it must make strategic decisions in the face of considerable uncertainty about the pace, magnitude, and regional manifestations of climate change."[25]

Growing Military Competition (Arctic Ice Melt)

> Not All is Quiet on the Arctic Front.
>
> —Elizabeth Buchanan, "Not All Is Quite On the Arctic Front"[26]

Projections confidently show that the Arctic is warming more rapidly than the global mean.[27] The loss of Arctic ice will uncover navigation routes that were previously inaccessible, with profound implications to global sea lanes, shipping, and access to polar natural resources. Absence of ice flows will provide new, cheaper opportunities and

[20] Ibid., 74-75.
[21] Ibid.
[22] Ibid., 75.
[23] La Shier, 29, 36.
[24] La Shier, 27.
[25] Naval Climate Committee, 16, 127.
[26] Elizabeth Buchanan, "Not All Is Quite On the Arctic Front," *The Moscow Times,* March 25, 2019, https://www.themoscowtimes.com/2019/03/25/not-all-is-quiet-on-the-arctic-front-a64904.
[27] IPCC, 2014, 10, 60.

access to the extraction of Arctic oil, natural gas, and minerals, and poses varied consequences to military operations, posture, and readiness in the Arctic.[28] Military forces will need to be ready and able to respond to new realities of Arctic maritime traffic, search and rescue, competition for natural resources, and all aspects of Great Power Competition. Russia stands to gain at long last direct access to warming ocean ports and naval basing, which are ideal for Russian military operations and power projection.[29] This will also bring increased competition for Arctic resources and increased potential for conflict.

Russia is anticipating the coming changes in the Arctic. It is "militarizing" its Arctic areas, demonstrating long-term planning predicated on a warming climate.[30] Increasing territorial exposure from a more accessible Arctic fuels Russian vulnerability to perceptions of potential NATO aggression made more viable by a new, direct NATO access to its Arctic territories.[31] Therefore, Russia is reconstructing, reactivating, and modernizing military bases, airfields, and outposts in the Arctic.[32] Similarly, the Russian Arctic force structure is significantly more Arctic-capable than the U.S.[33] Conversely, with limited surface ship presence and bases in the far northern latitudes, the U.S. lacks

[28] La Shier, 35; Naval Climate Committee, 45

[29] O'Rourke, 23-24.

[30] Mathieu Boulègue, "Russia's Military Posture in the Arctic: Managing Hard Power in a 'Low Tension' Environment," *Chatham House, The Royal Institute of International Affairs* (June 2019): 25, accessed January 31, 2021, https://www.chathamhouse.org/sites/default/files/2019-06-28-Russia-Military-Arctic_0.pdf; Peggy M. Britton, "Greenland and the Arctic: Strategic High Ground of the 21st Century" (MS diss, National Defense University, Joint Forces Staff College, Joint Advanced Warfighting School, Norfolk, 2020) 24, 35, 47, 58; "[The Russians] are seeing this thawing as a strategic advantage for them and they're weaponizing it. They are militarizing it and we're moving in that direction too." Mabus, audio, 50:56, transcript, 9; For a contrary interpretation of intentions, Boulègue makes the point that Russian activities and capabilities, at this point, are not intended to project any offensive means. Rather, they are attempting to reestablish a prior Cold War presence, "more eyes and ears than muscle." Boulègue.

[31] Boulègue, 11.

[32] Boulègue, 12-13; O'Rourke, 38.

[33] Boulègue, 16. 22-23.

the operational assets necessary to cope with expected commercial and military traffic increases.[34] Even more, the U.S. military has lost competency and practice in cold-weather operations, leaving it less prepared for potential hostile Arctic action.[35] Accordingly, the U.S. needs to focus military capability and capacity on the Arctic, to include: operations, icebreakers, ice-capable ships, increased submarine presence, navigation, communications, and cold-weather training.[36]

Arctic ice melt enhances competition for natural resource extraction and implicates Russia's military basing posture, potentially increasing tension and the potential for conflict. As a major world power, China has also increased its diplomatic, economic, and scientific activity in the Arctic.[37] China has an icebreaker capability, interest in commercial shipping opportunities through the Northern Sea Route (NSR), and investments (with Russia) in oil, gas, and mining in Greenland and the Canadian Arctic.[38] A melting Arctic threatens the strategic balance of power between the U.S. and Eurasia (Russian and China). As the Arctic melts, North America, and the U.S.in particular, will no longer be as insular or isolated. The NSR organically connects with the "World-Island" of Eurasia. Meanwhile, the melting Arctic finally provides Russia with navigable, "warm" water, ocean access, changing the strategic balance of power by offering a capability long sought.[39]

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[34] La Shier, 35.
[35] Naval Climate Committee, 59.
[36] Ibid., 57, 59, 94, 113.
[37] O'Rourke, 29-31; "China says that they are an Arctic nation." Mabus, audio, 51:43, transcript, 9.
[38] O'Rourke, 29-31; Mabus, audio, 51:43, transcript, 9.
[39] "Russia gains the warming waters of its northern Arctic seaboard." Robert Kaplan. *Revenge of Geography: What the Map Tells Us About Coming Conflicts and the Battle against Fate*. New York, NY: Random House, 2013, 102.

Simultaneously, as the NSR and the Northwest Passage open, surface travel on the polar route opens as well. This provides access to resource extraction possibilities previously locked away. A warming Arctic will heighten strategic considerations for air and sea power projection. Author and Foreign Correspondent Robert Kaplan writes, "The increased use of polar routes will lock the United States, Russia, and China in an ever tighter embrace."[40] And into greater potential for conflict. Kaplan again writes, "The breaking down of globalization's geographic walls inevitably will increase contact intensity, thereby increasing the chances of both political conflict and cooperation."[41] While there currently exists a low possibility of armed conflict in the Arctic, the 2011 Naval Climate Committee found that "it cannot be ruled out."[42] A thawing Arctic creates new opportunities, and with this comes new competition for strategic advantage. For example, the receding ice facilitates increased shipping as well as NATO access to the Arctic, which are renewing old Russian fears of encirclement and pushing the Kremlin to refocus on border control in its Arctic territories.[43] Increased Arctic traffic will lead to more travel, search and rescue missions, and chances of accidents, escalation, or even conflict.[44] In short, Arctic ice melt due to climate change makes the classical, geopolitical case for a Russian aggressive posture. In control of Asia's "heartland," Russia gains access to its Arctic areas and northern Siberian coastal regions as viable warm-water-ocean military port bases. Of relevance, but beyond this paper's scope, is the agricultural and economic impacts of climate change moving agricultural centers northward in the

[40] Kaplan, R., 101.
[41] Kaplan, R., 101-02.
[42] Naval Climate Committee, 12, 93; La Shier, 35.
[43] Boulègue, 11.
[44] Mabus, audio, 10:14, transcript, 1.

northern hemisphere.[45] This regional production shift could markedly increase Russia's potential economic and strategic power at the United States' expense, further involving national security posture and larger national interests.[46]

Rising Instability (Migration and FHA/DR Events)

> Help, I need somebody; Help, not just anybody . . .
> —John Lennon and Paul McCartney, "Help"[47]

Population migration in the form of climate change-induced refugees will task military capabilities and response. Mass population migrations will result from climate-induced desertification, water scarcity, coastal flooding, and intolerable heat. Both impacted and allied partner nations will likely request U.S. FHA/DR assistance in support of mass population migration.[48] Climate change will exacerbate other global stresses prevalent in the strategic environment, including population growth, poverty, famine, and

[45] Marshall Burke, "Global non-linear effect of temperature on economic production," *Nature* 527 (October 2015), accessed January 22, 2021, https://www.nature.com/articles/nature15725; Elena Parfenova et al, "Assessing landscape potential for human sustainability and 'attractiveness' across Asian Russia in a warmer 21st century," *Environmental Research Letters* 14, no. 6 (June 2019), accessed January 22, 2021, https://iopscience.iop.org/article/10.1088/1748-9326/ab10a8/pdf.

[46] Sharon E. Burke, "There's No Containment Strategy for Climate Change," *War on the Rocks* (September 1, 2020), accessed January 22, 2021, https://warontherocks.com/2020/09/theres-no-containment-strategy-for-climate-change/; Abraham Lustgarten, "Catastrophe's Harvest / Climate Change is Propelling Enormous Human Migrations as it Transforms Global Agriculture and Remakes the World Order – and no Country Stands to Gain More than Russia," *New York Times,* December 20, 2020, accessed January 22, 2021, https://www.nytimes.com/interactive/2020/12/16/magazine/russia-climate-migration-crisis.html.

[47] John Lennon and Paul McCartney, *Help,* Capitol and Parlophone Records, June 19, 1965. Given the expected magnitude of population migration and climate refugees generated from climate change impacts upon vulnerable regions and nations, not just *anybody* will be able to manage these tasks. The singular power, resources, and abilities of the U.S. military will be necessary and will be called on for the job. "The Biden Plan for a Clean Energy Revolution and Environmental Justice," Biden/Harris, accessed April 1, 2021, https://joebiden.com/climate-plan/; Mabus, audio, 8:22, transcript, 1; audio, 11:07, transcript, 2; U.S. Department of Defense, Quadrennial Defense Review, March 2014, vi, accessed January 15, 2021, https://archive.defense.gov/pubs/2014_quadrennial_defense_review.pdf.

[48] Naval Climate Committee, 11.

resource shortages.[49] On its own, however, through sea-level rise, floods, freshwater degradation and salinity, intolerable heat conditions, fires, desertification, and drought, climate change will create at-risk regions and populations. Focusing on developing nations, these demographic and climate-induced stresses will generate social and political instability in already vulnerable regions.[50] From there, climate change generates an immense potential for massive population displacement and mass migration.[51]

A direct effect on military operations will be an increase in FHA/DR missions, upon which the military will be called upon to execute and to manage "in a humane way."[52] The U.S. military, and particularly its Navy and Marine Corps, is the world's first FHA/DR responder.[53] As storms, droughts, and floods increase in frequency, intensity, and strength, instability is an inevitable result. Secretary Mabus stated, "instability can lead to chaos, and chaos can lead to crisis."[54] These crises then put military personnel in harm's way, should we fail to address climate change effects.[55]

While climate change has already affected migratory stress and civil conflict today, unchecked climate change could see unimagined consequences. Most directly and

[49] Naval Climate Committee, 4, 43; USAID Humanitarian Assistance Advisor Dr. Jeff Miller highlighted the possibility of climate change altering commodity growing seasons thereby potentially increasing food insecurity and leading to crisis, in addition to affecting the availability and distribution of needed food relief at times of need. Lecture to Joint Advanced Warfighting Class, 13 Apr 2021, Norfolk, VA. Permission granted to use remarks. The Family Early Warning Systems Network (FEWS) provides early warning and analysis on acute food insecurity around the world, including on factors that contribute to or mitigate food insecurity, including weather and climate. "FEWS NET," Family Early Warning Systems Network, accessed May 4, 2021, https://fews.net/.

[50] Naval Climate Committee, 5.

[51] Ibid., 43; National Intelligence Council, Global Trends 2040, 36; La Shier, 32.

[52] The Committee identifies three categories of risk associated with climate-related migration/displacement: (i) Direct risks to border security and global FHA/DR needs; (ii) Indirect risks of global economic disruption; and (iii) Third-order risks of collateral conflict generated by climate refugees overwhelming borders and sovereignty. Naval Climate Committee, 5. 44; La Shier, 33; Mabus, audio, 11:07, transcript, 2.

[53] Mabus, audio, 8:22, transcript, 1

[54] Ibid., audio 8:28; transcript, 1.

[55] Ibid., audio 9:14; transcript, 1.

visibly threatened are the small, low-lying ocean atoll island nations that may disappear entirely from sea level rise in the coming decades and require naval evacuations.[56] Aside from direct threats, current conflicts such as Syria and Sudan's Darfur region are already attributed to the destabilizing contributions of climate change.[57] In 2017, there were an estimated 68.5 million environmental refugees around the world.[58] This number could rise to 200 million forced climate migrants by 2050.[59]

Even in the U.S., the military can be expected to have a greater role in climate-related migrations. Defense Support of Civil Authorities (DSCA) provides military support in response to domestic emergency, incident response, and other domestic activities requested by civil authorities.[60] In these events, DoD provides support to state,

[56] Naval Climate Committee, 43; Pacific Islands Forum Secretariat, Circular No: 183/19, CP/13/1, Summary Record – 31st Forum Dialogue Partners Session with Forum Leaders, September 12, 2019, 3, 4, 7, 11; Enele Sopoaga, former Prime Minister of Tuvalu, "Enele Sopoaga from Tuvalu: Message to Australia at #XOP25," Climate Citizen, December 11, 2019, audio, 01:26, https://takvera.blogspot.com/2019/12/enele-sopoaga-from-tuvalu-message-to.html; *Anote's Ark*, directed by Matthieu Rytz (EyeSteelFilm, 2018), https://www.imdb.com/title/tt7689934; Kennedy Warn, "Will Pacific Island Nations Disappear as Seas Rise? Maybe Not," *National Geographic*, February 13, 2015, https://www.nationalgeographic.com/news/2015/02/150213-tuvalu-sopoaga-kench-kiribati-maldives-cyclone-marshall-islands/#close.

[57] Colin P. Kelley et al., "Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought," *Proceedings of the National Academy of Sciences* 112, No. 11 (March 17, 2015): 3241, https://www.pnas.org/content/112/11/3241; Jame Huang, "Can Climate Change Increase the Likelihood of State Fragility?" (MS diss., Johns Hopkins University, Baltimore, MD, April 2018), ii, accessed December 27, 2020, https://jscholarship.library.jhu.edu/bitstream/handle/1774.2/59876/Huang%2c%20Jame.pdf?sequence=1&isAllowed=y; "Sudan; post-conflict environmental assessment," *Reference & Research Book News*, November 2007, *Gale Academic OneFile*, accessed November 26, 2020, https://link.gale.com/apps/doc/A172602316/AONE?u=wash60683&sid=AONE&xid=1163ce06. Note contrary assertions in the literature, i.e., Francesca De Châtel, "The of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution," *Middle Eastern Studies* 50, no. 4 (January 27, 2014): 521, accessed December 27, 2020, DOI: 10.1080/00263206.2013.850076, which is why this paper uses the term "destabilizing contributor," as opposed to a direct trigger.

[58] John Podesta, "The Climate Crisis, Migration, and Refugees," Brookings, July 25, 2019, accessed November 26, 2020, 2, https://www.brookings.edu/wp-content/uploads/2019/07/Brookings_Blum_2019_climate.pdf.

[59] Oli Brown, "Climate change and forced migration: Observations, projections and implications," Human Development Report 2007/2008, Geneva: UNDP, 2007, 2, 6, 21, 21, http://hdr.undp.org/sites/default/files/brown_oli.pdf.

[60] Chairman of the Joint Chiefs of Staff, "Joint Publication 3-28: Defense Support of Civil Authorities," (Washington DC, October 29, 2018), xiii, I-2, accessed January 14, 2021, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_28.pdf.

local, territorial, or tribal authorities.[61] Climate change can drive mass migration to the U.S. from the neighboring countries of the Caribbean, Mexico, and Central America, while the U.S. will not be immune to its own climate change migration.[62] Climate change-induced domestic emergencies can lead to civil authority requests for DoD assistance. Already with its own climate displaced persons, damage from rising seas to populated, industrial, and agricultural regions of the U.S., including New York, California, Florida, and Texas, could lead to massive depopulation of coastal regions.[63] While the Coast Guard has primary responsibility for mass migration response within the U.S., the Navy is tasked when the level of migrants reaches 1,000 per day.[64]

As one of the countries most severely affected by climate-induced migration, Bangladesh can serve as an example of the very challenging scenarios confronting U.S. FHA/DR operations, at the least, or even vital national security interests, at worst.[65] Bangladesh, with a population of 163 million and a growth rate twice the national average, is highly susceptible to sea-level rise and flooding, with 80% of the country composed of floodplains.[66] This portends future refugee migratory flows requiring

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[61] JP 3-28, x, I-6-7; Climate change impacts will likely increase future DSCA missions. QDR 2014, vi.

[62] Naval Climate Committee, 11, 90.

[63] "Internally in the US, we already have internally displaced climate refugees. People who have had to flee [referencing Louisiana and Maryland]." Mabus, audio, 11:34, transcript, 2; Kurt M. Campbell and Richard Weitz, "Conclusion: The Clear Implications of Global Climate Change," in *Climate Cataclysm: The Foreign Policy and National Security Implications of Climate Change,* ed. Kurt M. Campbell (Washington, D.C.: Brookings Institution Press, 2008), 218, 221, accessed November 28, 2020, http://eds.b.ebscohost.com.nduezproxy.idm.oclc.org/eds/ebookviewer/ebook/ZTAwMHhuYV9fMjc2ODI5X19BTg2?sid=f18ff8f5-ec5e-4eae-a1f0-fc9434a44607@pdc-v-sessmgr04&vid=0&format=EB&rid=2.

[64] Naval Climate Committee, 44.

[65] Reazul Ahsan, Jon Kellett, and Sadasivam Karuppannan, "Climate Induced Migration: Lessons from Bangladesh," *The International Journal of Climate Change: Impacts and Responses* 5 (2014): 1,3, accessed November 26, 2020, https://www.researchgate.net/publication/281549970_Climate_Induced_Migration_Lessons_from_Bangladesh; Naval Climate Committee, 43.

[66] Ahsan, 3, 5-6; The World Factbook, Washington, DC: Central Intelligence Agency, 2020, accessed November 26, 2020, https://www.cia.gov/library/publications/the-world-factbook/geos/bg.html; USJFC JOE, 33.

humanitarian assistance beyond the country's capabilities. Large, uncontrolled flows into neighboring India could have destabilizing effects on that country. A destabilized India presents regional challenges. Rival neighbors Pakistan and China could seize a distracted India to exploit outstanding territorial and demographic bilateral issues of contention. Or climate refugees along the Indo-Bangladesh border region, close to China and Tibet, could itself provoke massive regional instability in population management and resource competition. All of this could in turn lead to significant regional destabilization impacting India, Pakistan, and China, all nuclear-equipped nations.[67] As much as 20% of armed conflicts over the last century are climate-influenced, with that influence likely to increase dramatically in the years ahead.[68] While such projections of conflict may seem far-fetched today, the ramifications of unchecked population growth and its climate-induced impacts will become more realistic at some future point.

The Increasing Risk of Military Conflict

> In the long run, those who are working in harmony with environmental influences will triumph over those who strive against them.
>
> —W.H. Parker, Mackinder: Geography as an Aid to Statecraft[69]

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[67] Office of the Director of National Intelligence, *Annual Threat Assessment of the US Intelligence Community* (Washington DC: Director of National Intelligence, April 9, 2021), 2, 4, 18, accessed May 8, 2021, https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-Unclassified-Report.pdf.; Md Rafiqul Islam and Md Touhidul Islam, Environmental Degradation, Migration and Conflict: A case between India and Bangladesh, *South Asian Affairs* 4, nos. 1&2 (2011), https://www.researchgate.net/publication/275346869_Environmental_Degradation_Migration_and_Conflict_A_case_between_India_and_Bangladesh; Sanjeev Tripathi, "Illegal Immigration from Bangladesh to India: Toward a Comprehensive Solution," Carnegie India, June 29, 2016, accessed November 26, 2020, https://carnegieindia.org/2016/06/29/illegal-immigration-from-bangladesh-to-india-toward-comprehensive-solution-pub-63931; Karan Singh, "Climate change and nuclear conflict between India, Pakistan are real dangers. They need to be addressed," *The Indian Express* (Mumbai), October 22, 2019, accessed May 7, 2021, https://indianexpress.com/article/opinion/columns/climate-change-india-pakistan-nuclear-conflict-kashmir-special-status-article-370-paris-accord-6080912/.

[68] Devon Ryan, "Stanford-led study investigates how much climate change affects the risk of armed conflict," *Stanford News*, Jun 12, 2019, accessed December 20, 2020, https://news.stanford.edu/2019/06/12/climate-change-cause-armed-conflict/.

[69] W.H. Parker, *Mackinder: Geography as an Aid to Statecraft* (Oxford: Clarendon Press, 1982), 121.

U.S. policy can prevail, perhaps, over environmental catastrophe if it works in harmony with the reality of climate change's potential for environmental destabilization.[70] Beyond the empirical evidence of climate effects to practical defense interests, classical conflict and systems theories establish the relationship between conflict and climate change. Classical conflict theory posits conflict arising from an imbalance in the power equilibrium among states. As environmental instability creates disequilibria in the strategic environment, military preparedness to meet this risk must also develop.[71] According to Quincy Wright, when states fail to adapt to changing or changed conditions the environment falls out of balance, tensions increase, and conflict and war can result.[72] Wright specifically references equilibrium changes resulting from environmental catastrophes such as "mountain formations, widespread glaciations, land elevations or submergencies," themselves "leading to mass migrations and exterminations."[73] Climate change, then, will be a catalyst for this same kind of cataclysmic change today, a catalyst to war.

Collateral effects from climate change impacts on the geopolitical and strategic environment will create ever-widening intrastate, regional, and potentially large-scale, interstate, international conflicts. These conflicts could well threaten American interests and power.[74] Environmental tensions will create imbalances in the global distribution of power, creating disequilibrium, then possible war.[75] Consultant Harry Yarger writes,

[70] Kaplan, R., 70.
[71] Wright, 40.
[72] Ibid.
[73] Ibid., 96-97.
[74] Scott, 84.
[75] Campbell, 220-221.

"[A]n imminent, credible threat of massive disruption to the transportation and informational systems that under gird national existence and a stable world order may also reach survival intensity."[76] Climate change, as described herein, can reach such a potential of disruption to strategic lines of supply, communication, and transportation as to implicate key security and defense imperatives.

Due to the complexity of nonlinear networks of causation, the potential for massive environmental disruption and disequilibrium caused by yet unknown climate change impacts appears even more likely.[77] The failure to take into account complex interactions can accelerate and cascade problems towards unknown, unforeseen, and potentially catastrophic consequences.[78] The impacts wrought from climate change will have remote and not-yet-fully understood cascading, layered, and compounding higher-ordered effects. These effects will form the basis of complex interactions and interdependencies between varied and disparate physical and natural processes. These processes include ocean and atmospheric currents, air pressure and water vapor concentration levels, acidity, salinity, chemical composition, material heat absorption capacities, species adaptability and tolerance, and temperature interactions.[79] The destabilizing environmental consequences the result of these interactions classically demonstrate a complex system in action. As complexity theory warns, cascading effects can inexorably run with unpredictable and perhaps dangerous speed to unexpected,

[76] Harry Yarger, "The Strategic Appraisal: The Key to Effective Strategy," in *U.S. Army War College Guide to National Security Issues, Volume1*, ed. J. Boone Bartholomees, Jr. (Carlisle, PA: Strategic Studies Institute: 2008), 55.

[77] Dörner, 33; National Intelligence Council, Global Trends 2040, 1-3.

[78] National Intelligence Council, Global Trends 2040, 1, 2.

[79] IPCC, 2014, 40-42, 52, 56, 122, 125; David N. Fisher and Jonathan N Pruitt, "Insights from the study of complex systems for the ecology and evolution of animal populations," *Current Zoology* 66, no.1 (February 2020): 1, 8, https://doi.org/10.1093/cz/zoz016; D. Rind, "Complexity and Climate," *Science* 284 no. 5411 (April 2, 1999): 105-107.

unknown, and potentially catastrophic consequences.[80] Hence, the secure ordering of international relations becomes riskier, further implicating national security prerogatives.

Both Wright and Everett Dolman, writing at different periods, warned of the danger of complacency in ignoring the lag between an unaware status quo and the inevitable collapse that results from a disequilibrium caused by unanticipated change.[81] As mentioned above, climate already influences conflict to varying degrees.[82] A group of climate and conflict experts asserts that climate change will amplify conflict risk.[83] They further claim that the larger the magnitude of climate change, for example, above four degrees Celsius of the global mean, the greater the uncertainty, but the higher the likelihood of substantial conflict risk.[84] Climate change could impose significant risks to national security posture and international balances of power.[85] Understanding where future strategic planners lie in their understanding of these risks is the purpose of this paper's survey sample. Their level of understanding is relevant to their ability to craft long-term strategic plans and policies designed to mitigate the risks of climate change.

[80] Dörner, 33.

[81] Everett Carl Dolman, "Seeking Strategy," in *Strategy: Context and Adaptation from Archidamus to Airpower*, ed. Richard Bailey, James Forsyth, and Mark Yeisley (Annapolis: Naval Institute Press, 2016), 32.

[82] National Intelligence Council, Global Trends 2040, 40-41, 83; Ryan. Indeed, the 2010 USJFC JOE specifically identifies climate change as one of the ten trends setting the stage for potential future conflict. USJFC JOE, 12.

[83] Mach, 193, 194.

[84] Ibid., 195; Ryan; Andrew Hill and Dale Watson, "The Competitive Environment," in *Strategic Leadership: Primer for Senior Leaders (Fourth Edition)*, ed. Tom Galvin and Dale Watson (Carlisle, PA: United States Army War College, 2019), 14, 17, 18, 20, accessed January 24, 2021, https://publications.armywarcollege.edu/pubs/3689.pdf.

[85] Another climate change-induced risk is "the pace of energy transition to a net-zero-emissions economy increases dramatically causing a collapse in demand for hydrocarbons and instability in export-dependent countries." Samuel Brannen, Center for Strategic and International Studies, Lecture to Joint Advanced Warfighting Class, 12 February, 2021, Norfolk, VA. Permission granted to use remarks.

Chapter 3: In Search of a National Strategy and Strategic Guidance

> The good thing about science is that it's true whether or not you believe in it.
> —Neil deGrasse Tyson, @neiltyson[1]

Climate change is a national security concern. Any or all of the climate change impacts mentioned previously can affect the United States' military readiness and operations, whether exercised as part of defense preparedness at home or abroad. Within the last administration, national-level strategies failed to consider, much less address, the threat posed by climate change. Its U.S. National Security Strategy (NSS), National Defense Strategy (NDS), and the National Military Strategy (NMS) make no mention of climate change.[2] The term is absent entirely; no reference to the phenomenon nor its implications to a changing environment. Instead, the NSS's one use of the word "climate," under the heading "Embrace Energy Dominance," is referenced within the context of "countering . . . anti-growth energy . . . climate policies . . . detrimental" to resource extraction and energy security interests."[3] This was not always the case.[4]

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[1] Neil deGrasse Tyson (@neiltyson, Twitter, June 14, 2013); WH.Gov, The White House, "Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking," January 27, 2021, accessed February 6, 2021, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/; White House Fact Sheet.

[2] NSS 2017; NDS 2018; "Description of the 2018 National Military Strategy Released." *States News Service*, July 12, 2019, *Gale OneFile: News*, Published by the Joint Staff, Strategy Development Division, 2019,] accessed December 25, 2020, https://link.gale.com/apps/doc/A593138405/STND?u=wash60683&sid=STND&xid=3f4f13df.

[3] NSS 2017, 22; In a video teleconference with JFSC faculty in Feb 2018, a principal author of the NSS stated that the term "environmental stewardship" was the euphemism substitute in the strategy for climate change. Non-attributable due to the National Defense University Non-attribution policy, NDU Non-Attribution Policy. However, within the NSS itself, the only uses of the term reference "energy dominance," citing clean energy including coal, and extractive resource energy infrastructure. NSS 2017, 22, 23.

[4] Former Secretary of Homeland Security "Jeh Johnson: Global warming main threat to our world," *Morning Joe*, MSNBC, September 11, 2020, audio, 03:50, accessed May 8, 2021, https://www.msnbc.com/morning-joe/watch/jeh-johnson-global-warming-main-threat-to-our-world-91527749620.

Only two years earlier, the 2015 NSS characterized climate change directly as a threat to national security on its first page, along with cybersecurity, Russian aggression, and the outbreak of infectious disease.[5] Thereafter, climate change is listed as a top security strategy, with national defense, homeland security, terrorism, capacity building, and weapons of mass destruction.[6] With a dedicated subheading, the 2015 NSS states unequivocally that "Climate change is an urgent and growing threat to our national security, contributing to increased natural disasters, refugee flows, and conflicts over basic resources like food and water."[7] Whereas the 2018 NDS does not even reference climate change, both the 2010 and 2014 QDR recognize climate change as a key geopolitical and environmental trend.[8] The 2014 QDR acknowledges climate change's impacts to the "frequency, scale, and complexity" of future missions.[9] The 2010 QDR states, "Climate change [is one of] two key issues that will play a significant role in shaping the future security environment."[10] Commencing 2021, of the five permanent members of the UN Security Council, only the United States and China do not include a reference to climate change in their security strategies.[11]

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[5] U.S. President, National Security Strategy (Washington DC: Government Printing Office, February 2015), Statement from the President, i.

[6] NSS 2015, Table of Contents, iii.

[7] Ibid., 12.

[8] There were no NDS between 2008 and 2018.

[9] QDR 2014, 25.

[10] The other "key" issue referenced is energy security, specifically energy supply access and reliability. U.S. Department of Defense, Quadrennial Defense Review Report, February 2010, 7, accessed January 15, 2021, https://archive.defense.gov/qdr/QDR%20as%20of%2029JAN10%201600.pdf, vi; QDR 2010, 84, 87-88.

[11] UK Cabinet Office, *National Security Capability Review* (March 2018): 7, 30, 38, 41, 42, accessed January 20, 2021, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/705347/6.4391_CO_National-Security-Review_web.pdf; République Française, Office of the President, *Strategic Review of Defense and National Security 2017 Key Points* (October 2017): 29-30, accessed January 20, 2021, https://www.defense.gouv.fr/layout/set/popup/content/download/520198/8733095/version/2/file/DEFENCE+AND+NATIONAL+SECURITY+STRATEGIC+REVIEW+2017.pdf; Russia Matters, *English*

The need to adjust to climate change impacts upon military facilities, capabilities, roles, and missions has direct resonance to defense operational readiness.[12] Funding authority followed these policy pronouncements. The National Defense Authorization Act for Fiscal Year 2017 legislated that "decisions relating to climate change . . . should prioritize the support and enhancement of the combat capabilities of the Department . . . in the manner that best serves [U.S.] national security interests."[13] Even in 2010, however, there was anecdotal evidence of institutional resistance in the Joint Staff and the Office of the Secretary of Defense to institute mandated climate change remediation.[14] It is for this reason rising leaders must be prepared to accept the mandates of the new administration and incorporate them into effective planning strategies.

Moreover, major policy shifts can occur between administrations. Climate change's current prioritization in policy is not guaranteed in future administrations.[15] However, the greatest strategic risks confronting U.S. national security cannot have changed so drastically in the short periods between administrations. Disparate change makes crafting effective, long-term strategies difficult. Otherwise, strategic planning is

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*Translation of the 2015 Russian National Security Strategy (*Harvard Kennedy School: Belfer Center for Science and International Affairs, December 2015), 4, 6, 15, accessed January 22, 2021, https://russiamatters.org/node/21421; People's Republic of China, State Council Information Office, *China's National Defense in the New Era*, (Beijing: Foreign Language Press Ltd. Co., July 2019), accessed January 22, 2021, http://www.xinhuanet.com/english/2019-07/24/c_138253389.htm.

[12] QDR 2010, 84.

[13] National Defense Authorization Act for Fiscal Year 2017, Public Law 114-328, 114th Cong. (December 23, 2016), 76.

[14] OSD contractors addressing an NDU War College faculty, admitting that they had to "hold our noses" at the congressional mandate in the 2009 NDAA for climate change consideration in the QDR and funding allocation therefrom. Non-attributable due to the National Defense University Non-attribution policy, NDU Non-Attribution Policy.

[15] Even the *New York Times* has come to the same conclusion, writing in their lead Sunday editorial shortly after President Biden's inauguration and executive actions on climate change policy, "Mr. Biden's executive orders on climate . . . do not have the permanence or bipartisan imprimatur of laws, and are subject to reversal by later administrations . . ." Editorial, "The Task Ahead for Biden on Climate," *New York Times*, February 7, 2021, accessed February 14, 2021, https://www.nytimes.com/2021/02/06/opinion/biden-climate-change-environment.html.

not demonstrating sufficiently realistic, long-term forecasting to offer national strategic consistency, durability, and credibility.

As the new administration commenced in 2021, climate change policies are returning to the forefront.[16] The administration has put climate change "at the center" and as "an essential element" of national security.[17] Its Interim National Security Strategic Guidance references climate change or crisis 19 times.[18] On his first day in office, President Biden submitted the U.S. instrument of acceptance to rejoin the Paris Climate Agreement.[19] Mr. Biden's climate plan addresses explicitly the same risks outlined herein.[20] The plan and Executive Order mention the "existential" nature of the threat at the outset, in the first sentence of his plan for the environment, health, economy, and national security.[21] The Interim NSS Guidance references climate change as an existential risk twice.[22] The president created a new Special Presidential Envoy for Climate, with a seat on the National Security Council, to "underscore commitment to elevating climate change in U.S. foreign policy."[23] The Secretary of Defense and the Chairman of the Joint

[16] Alex Ward, "Joe Biden in victory speech: 'Let this grim era of demonization in America begin to end,'" *Vox*, November 7, 2020, accessed April 14, 2021, https://www.vox.com/2020/11/7/21554701/joe-biden-acceptance-speech-2020-election.

[17] White House Executive Order; DoD Statement by SecDef Austin; Biden Plan.

[18] WH.Gov, The White House, "Interim National Security Strategic Guidance," March 3, 2021, 1, 6, 7, 8, 9, 11, 12, 13, 16, 17, 21, accessed March 7, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/03/interim-national-security-strategic-guidance/, https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf.

[19] WH.Gov, The White House, "Paris Climate Agreement," January 20, 2021, accessed February 7, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/20/paris-climate-agreement/; White House Executive Order; White House Fact Sheet.

[20] The plan specifically references facilities infrastructure and operational resiliency, Arctic implications, military-supported relief activities, and conflict risk. White House Executive Order; White House Fact Sheet; Biden Plan; New Secretary of Defense Lloyd Austin in his short statement on tackling the climate crisis specifically references as threats to military operations "instability in societies strained by desertification, the threat of adversary access to homelands through the Arctic, and the demands for humanitarian assistance worldwide." DoD Statement by SecDef Austin.

[21] Biden Plan; White House Executive Order.

[22] Interim NSS Guidance, 7, 17.

[23] White House Fact Sheet; White House Executive Order; John Kerry, Special Presidential Envoy for Climate, "Press Briefing by Press Secretary Jen Psaki, John Kerry, and Gina McCarthy," The White

Chiefs of Staff will report annually on "progress made in incorporating the security implications of climate change" into defense strategy, planning guidance, and risk assessments.[24] Secretary of Defense Lloyd Austin vows that DoD will "elevate climate as a national security priority" and "immediately prioritize climate change security implications in [defense] strategy development and planning guidance," including incorporation into the next NDS.[25] The latest Annual Threat Assessment of the Intelligence Community identifies climate change as creating varied direct and indirect economic, political, and geopolitical global threats.[26] Finally, in a whole-of-government-wide approach, the administration will "deploy the full capacity of its agencies to combat the climate crisis," including requiring all agencies to submit strategies and implementation plans integrating climate considerations into their international duties.[27] As the new administration implements these guidelines and policies, it again lends consistency and credibility back to strategic climate planning. Then, from a cadre of climate-informed military leaders will come the climate-informed military strategies necessary to craft the force structure and capability to cope with and manage the future climate-impacted defense and operational environment.

House, January 27, 2021, audio, 9:43, accessed February 7, 2021, https://www.youtube.com/watch?v=XtKXI94aBNs&feature=youtu.be; Jeff Goodell, "Will America Finally Lead on Climate?" Interview with John Kerry, *Rolling Stone*, April 2021, 45, accessed May 8, 2021, https://www.rollingstone.com/politics/politics-features/john-kerry-climate-crisis-china-glasgow-1134293/.

[24] White House Executive Order.

[25] Lloyd Austin, Secretary of Defense, to All Department of Defense Employees, memorandum, March 4, 2021, accessed March 7, 2021, https://media.defense.gov/2021/Mar/04/2002593656/-1/-1/0/SECRETARY-LLOYD-J-AUSTIN-III-MESSAGE-TO-THE-FORCE.PDF; DoD Statement by SecDef Austin.

[26] National Intelligence Council, Annual Threat Assessment, 25.

[27] White House Executive Order.

Chapter 4: Rising Military Leaders – Assessing Beliefs and Understanding

Lies, Damn Lies, and Statistics . . .

—Unattributed[1]

Future strategic military leaders can make a difference in responding to the effects of climate change through incorporation into policy, guidance, planning, and operational implementation. To do so, however, they will need to understand and appreciate the implications of climate change to the strategic and operational security environments. They will need to understand its implications to operational readiness, base, infrastructure and exercise vulnerabilities, Arctic ice melt and Great Power Competition, and migration, refugees, and FHA/DR, among other things.[2] They will need to understand the implications of climate change as a driver of conflict. They will need to understand the constraints imposed upon the strategic environment by competitive, ever- declining budgets. Finally, they will need to understand the difficult resource and budgetary priority choices required in consequence from there.[3]

Surveying Military Officers to Answer Overarching Questions on Climate Change and National-Level Strategy

This paper aims to assess the awareness and attitudes of rising strategic leaders to predict what difficulties future strategies and plans should consider in addressing climate

[1] Paul F. Velleman, "Truth, Damn Truth, and Statistics," *Journal of Statistics Education* 16, No. 2 (August 2008): 2, accessed December 26, 2020, http://jse.amstat.org/v16n2/velleman.pdf; Peter M. Lee, "Lies, Damned Lies and Statistics,"University of York, retrieved May 23, 2007, accessed December 27, 2020, https://www.york.ac.uk/depts/maths/histstat/lies.htm.

[2] One influential analyst acknowledges that any great power relations assessment must incorporate climate change. Bruce Jones, "China and the Return of Great Power Strategic Competition," *The Brookings Institution* (February 2020): 8, accessed January 17, 2021, https://www.brookings.edu/wp-content/uploads/2020/02/FP_202002_china_power_competition_jones.pdf.

[3] National Intelligence Council, Global Trends 2040, 40.

change and its effects. It assesses climate change awareness and attitudes through a survey tool used to gauge this understanding. The survey, replicated in Appendix A, consists of eight questions querying respondents' beliefs regarding climate change, its impacts on specifically enumerated aspects of operational readiness, and strategy inclusion and guidance preferences. Students attending the War College Programs within the NDU campuses of the Joint Forces Staff College, the Eisenhower School for National Security and Resource Strategy, and the National War College received the survey.[4] Some of these respondents will become future operational defense planners, analysts, and policymakers. Except for one question, the survey used a Likert scale of "strongly agree" to "strongly disagree" to assess respondent attitudes to the series of seven closed-ended

[4] The survey was developed through the on-line application of SurveyMonkey. The total population size was an estimated 536 respondents per the chart below:

College	Program	Year/Class	Enrollment
ES		AY20-21	283
NWC		AY20-21	210
JFSC	JAWS	AY20-21	43
TOTAL			536

118 respondents answered the survey, for a 22% response rate [118/536], a rate not atypical for survey responses. "Average Survey Response Rate – What You Need to Know," Customer Thermometer, accessed December 23, 2020, https://www.customerthermometer.com/customer-surveys/average-survey-response-rate/#:~:text=A%20survey%20response%20rate%20of,range%20are%20far%20more%20typical; "Survey Response Rates," PeoplePlus, accessed December 23, 2020, https://peoplepulse.com/resources/useful-articles/survey-response-rates/; "What is a Good Survey Response Rate, Indeed! Here's the Answer We Found," SurveySparrow, accessed December 23, 2020, https://surveysparrow.com/blog/what-is-a-good-survey-response-rate-indeed-heres-the-answer-we-found/. The confidence interval is 7.97. This interval means if a response on a specific question choice is 60%, for example, the survey results predict a 95% assurance that the actual percentage of the population who would answer that same question, in the same way, is between 52.03% and 67.97%. "The Survey System," Sample Size Calculator, Creative Research Systems, accessed December 23, 2020, https://www.surveysystem.com/sscalc.htm.

questions regarding climate change attitudes.[5] Not presenting a neutral or neither/nor option, the survey required respondents to choose between agreeing or disagreeing sides. The intent of the survey's data call was to answer and incorporate three overarching questions fundamental to climate change awareness and military operations. One, do rising leaders have an appreciation of climate change in the strategic environment? Two, do they believe climate change presents risks to military readiness and operations? Three, should these risks be reflected in policy guidance?

The data strongly points in one direction in all cases. All eight questions produced responses falling preponderantly (86% average) on the side of recognizing climate change risks. Preponderance, in a legal context, is defined as an excess of 50%.[6] The survey used the same NASA definition of climate change from the beginning of this paper.[7] Given the preponderance of responses in agreement with climate change relevancy—varying from 79 to 97% (the 86% average)—congruence between future leadership awareness and the need for strategic policy and guidance appears well-grounded from the data.

Appraising the Beliefs and Understanding of Rising Strategic Leaders

[5] A Likert scale survey question uses a numerical-point scale measuring satisfaction that ranges from two polar extremes. "What is a Likert Scale?" What's the definition of Likert scale? SurveyMonkey, accessed December 23, 2020, https://www.surveymonkey.com/mp/likert-scale/; A closed-ended question type "does not allow the respondent to provide unique or unanticipated answers, but rather, choose from a list of pre-selected options." "Closed-ended vs open-ended questions," Closed-ended question, SurveyMonkey, accessed December 23, 2020, https://www.surveymonkey.com/mp/comparing-closed-ended-and-open-ended-questions/.

[6] David Kaye. "The Limits of the Preponderance of the Evidence Standard: Justifiably Naked Statistical Evidence and Multiple Causation," *American Bar Foundation Research Journal* 7, no. 2 (1982): 487, accessed December 24, 2020, http://www.jstor.org/stable/828193; "Preponderance of the Evidence," Legal Information Institute, Cornell Law School, accessed December 24, 2020, https://www.law.cornell.edu/wex/preponderance_of_the_evidence; While a 50% preponderance, burden of proof standard from a legal standpoint can be statistically difficult to demonstrate, this paper does not need to carry such a substantial burden of responsibility. 86% is simply mathematically greater than 50%.

[7] Earth Science Communications Team, NASA JPL, "Overview."

Overall, the survey results, included at Appendix B, show a deep and predominantly concerned appreciation by the respondents of climate change's impacts on national security planning and operations. The findings reveal an understanding of and concern about climate change's potentially severe, even extreme, consequences. This understanding and concern, in turn, demonstrates this cohort's amenability and readiness, perhaps even need, to account for climate change impact realities into military readiness and operations planning and strategy. Furthermore, this readiness translates into amenability, perhaps a latent expectation or even demand, for Departmental leadership and guidance to drive changing attitudes on climate change evaluations into defense imperatives.

Do Rising Leaders Have an Appreciation of Climate Change in the Strategic Environment?

The survey began with a general test of the awareness and relative importance of climate change, assessing respondents' appreciation of climate change as a real and present phenomenon in the first instance. The largest majority of respondents—97.5%—approaching unanimity, in fact, agreed.[8] For reference, a 2018 Pew Research Global Attitudes Survey found 82% of U.S. respondents citing climate change as a threat.[9]

The final question assessed respondent attitudes towards climate change as an existential threat, to the U.S., other countries/regions, or both. This question took the assessment of overall climate change appreciation to its ultimate extreme, assessing

[8] Ninety-seven-point-five percent of respondents (115) answered in the affirmative, with 60% (71) strongly agreeing and 37% (44) agreeing. Only 1.7% of respondents (2) strongly disagreed, with one more at 0.85% disagreeing, for a total 2.5% disagreement rate. Survey question Q1.

[9] Within the 82%, 59% chose major, 23% minor, with another 16% citing no threat. Moira Fagan and Christine Huang, "A look at how people around the world view climate change," *Pew Research Center*, April 18, 2019, accessed December 23, 2020, https://www.pewresearch.org/fact-tank/2019/04/18/a-look-at-how-people-around-the-world-view-climate-change/.

attitudes on the farthest-reaching consequences of climate change to national existence itself. “Do you see Climate Change as a potential existential threat?” the survey asked. However, the survey did not define “existential threat,” leaving it to the respondents’ interpretation. Nevertheless, an existential threat is generally understood as a threat to existence, a threat to continued life and survival.[10] The question intended to assess .respondents’ views on climate change’s potential threat to the existence of nation-states or peoples themselves. Eighty-seven percent of respondents agreed that climate change poses an existential threat.[11] Only 13% did not. Of those who do, a preponderant (as that term is defined herein)—61%—saw an existential threat in climate change to the U.S. *and* other global countries/regions. Twenty-six percent saw it *only* as a threat to other countries/regions. Given the respondents’ strong belief in climate change’s reality (97.5%), per the first question, this question’s strong showing of existential threat (87%) is not that far a leap. At the outset, then, a preponderance of the survey sample, well in

[10]“Existential threat entails the individual becoming aware of the tenuous nature of her own, unique existence . . .” Daniel Sullivan, Mark Landau, and Aaron Kay, “Toward a Comprehensive Understanding of Existential Threat: Insights from Paul Tillich,” *Social Cognition* 30, no. 6 (November 2012): 738, accessed December 26, 2020, http://lemmalab.com/wp-content/uploads/2017/01/Sullivan_Tillich_social-cog-2012.pdf. The literature generally follows polar trends. On the one side are proponents of major global threats, such as climate change or nuclear war, as existential. "Existential threats: Stop and redressal (I)," *Daily Times* [Lahore, Pakistan], November 29, 2020, NA, *Gale OneFile: News* (accessed December 26, 2020), https://link.gale.com/apps/doc/A643227189/STND?u=wash60683&sid=STND&xid=8565754d; Sivananth Ramachandran, "Climate Change Is An Existential Threat Finance Professionals Must Rise To The Challenge," *Business World*, November 10, 2020, NA, *Gale OneFile: News* (accessed December 26, 2020), https://link.gale.com/apps/doc/A641190852/STND?u=wash60683&sid=STND&xid=a985d578. On the other are those skeptical of the term’s overreach and dilution. Gregory Foster, “The Existential Threat of Existential Threat Rhetoric,” *The Globe Post*, May 17, 2019, accessed December 26, 2020, https://theglobepost.com/2019/05/17/existential-threat-rhetoric/; Dot Wordsworth, “Existential threat: the birth of a cliché, *The Spectator*, January 24, 2015, accessed December 26, 2020, https://www.spectator.co.uk/article/existential-threat-the-birth-of-a-clich-.

[11] Eighty-seven percent of respondents (103) agreed that climate change poses an existential threat; 13% (15) did not. This 87% was the second largest rate of agreement only behind the initial question’s 97.5% assessing climate change’s objective reality. Survey question Q8.

excess of national rates, concluded that climate change is an extant phenomenon. How it should be reckoned with are the determinants of the following questions.

Do Rising Leaders Believe Climate Change Presents Risks to Military Readiness and Operations?

The survey then turned to address climate change risks in relation to military readiness and operations. The survey's second question presented the crux of the matter, assessing attitudes on whether climate change poses risks to military readiness and operations. Indeed, the survey results showed that 86% of respondents agreed with the proposition that climate change poses readiness and operational military risks.[12]

Then, following the outline of the specific operational challenges introduced in chapter 2 of the paper, the survey focused on specific climate change threats towards: basing, unit readiness, and training; Arctic sea ice melt and conflict relating to Great Power Competition, commercial shipping, and natural resource extraction; FHA/DR deployments; and the potential for increased conflict incidence the result of climate refugee migration. Only nine of the 118 respondents (8%) chose "no risks exist." All others (92%) chose one or more of the proffered selections.[13] The greatest number agreed that an "increasing risk of conflict [over] natural resources, commercial shipping, and . . . military basing access due to Arctic Sea ice melt" impacts military readiness and

[12] Eighty-six percent of respondents (102) agreed that, "climate change poses risks to military readiness and/or operations." Only 13.5% of respondents (16) held views in disagreement, with only three respondents (2.5%) strongly so. Survey question Q2.

[13] Ninety-two percent of respondents (109) understood and chose risks among the proffered survey selections. Eight percent of respondents (9) saw no existing risks to military readiness and operations from climate change. As all 118 respondents replied to every survey question, it is revealing to note that only nine of the 16 respondents of Q2, who disagreed that climate change risks to military readiness/operations exist, then conclude "no risks exist" in Q3. This means that seven of these respondents holding no-risk views in Q2 then selected some form of operational risk from climate change in Q3. Survey question Q3.

operations.[14] This finding validates and reinforces the important focus Arctic nation-state interests must take in future strategic planning. A preponderant majority agreed that increasing incidence of military conflict around the world will result in population displacement impacting military operations.[15] A nearly equally large amount agreed that climate change will "increase military deployments in response to weather events and natural disasters, both in the U.S. and globally."[16] These population displacement findings strongly validate and reinforce the military's future expected role in both FHA/DR and DSCA response due to climate refugee migration and disaster response internationally and domestically. A later question addresses in more detail attitudes towards the military's role in disaster response solely *in* the U.S.

The survey results also validated the understood and appreciated risks to readiness and operations from climate change-induced damage to bases and installations.[17] A sizeable preponderance of respondents identified basing risks from climate change, including "reduced access, infrastructure deterioration, flooding, and declining water quality," as implicated. As with Arctic, FHA/DR, and DSCA issues, this finding bodes well for rational and intelligent prioritization of basing remediation and preparation, more so if supported by Department and establishment policy, guidance, and doctrine. The

[14] Eighty-point five percent of respondents (95) chose "Increasing risk of conflict, for natural resources, commercial shipping access, Great Power Peer Competitor military basing access, due to Arctic Sea Ice Melt" as a climate change risk to military readiness/operations. Survey question Q3.

[15] Seventy-eight percent of respondents (92) selected "Increasing incidence of military conflict around the world resulting from population displacement, water scarcity, etc." as a climate change risk to military readiness/operations. Survey question Q3.

[16] Seventy-seven percent of respondents (91) selected "Increasing military deployments in response to weather events and natural disasters, both in the US and globally." Forty-two percent of respondents (50) believe that climate change will impede rapid response, selecting, "Declining ability to rapidly respond to crises and/or conflict" as a climate change risk to military readiness/operations. Survey question Q3.

[17] Seventy-eight percent of respondents (92) selected "Damage to bases and installations (Reduced Access, Infrastructure Deterioration, Flooding, Declining Water Quality, Etc.)" as a climate change risk to military readiness/operations. Survey question Q3.

impact upon unit training and exercise, a focus of the literature, however, will require additional education, exposure, and understanding, as a minority viewed unit readiness and training diminished by climate change impacts.[18] Interestingly, embedded within the responses, as seen in the prior paragraph, was the preponderance of respondents who saw conflict (80.5% RE the Arctic and 78% RE population displacement) incidence increasing as a result of climate change impacts.[19]

Addressing the question of a link between climate change and national and social conflict directly, a large preponderance of respondents (80.5%) agreed that "over time, climate change will lead to more conflict between people, societies, groups, territories, and nation-states."[20] This result validates the literature establishing linkages between a changing climate and potential conflict as a threat multiplier. More so, it validates the observations and prescience of conflict theorists that climate-induced disequilibria to established balance of power interests are determinants of conflict potential. Since deterring, defeating, and denying conflict is a traditional national military objective, anticipating and mitigating the sizeable potential for climate change-induced conflict is a legitimate strategic planning defense imperative.[21] The survey results show future strategic planning leadership to be well-positioned to address this challenge.

[18] Thirty-six percent of respondents (42) selected "Diminished unit readiness and/or training exercises" as a climate change risk to military readiness/operations. Survey question Q3.

[19] Survey question Q3.

[20] Eighty-point-five percent of respondents (95) agreed that, "over time, climate change will lead to more conflict between people, societies, groups, territories, and nation-states." Most interesting is the number who "strongly agreed," at 50.85% (60) [30% (35) agreeing]. Of all eight questions of the survey, this is the second highest number of respondents to "strongly agree" on a question, only behind introductory question one's query of climate change as a real and present phenomenon, with 60% (71). Survey question Q7.

[21]NMS 2018, 4; Joint Chiefs of Staff, *National Military Strategy of the United States of America* (Washington, DC: Joint Chiefs of Staff, 2015), 5, accessed December 25, 2020, https://www.jcs.mil/Portals/36/Documents/Publications/2015_National_Military_Strategy.pdf.

As indicated above, the survey specifically queried attitudes on a DoD role in disaster response to catastrophic environmental events in the U.S. The idea behind this question was to assess attitudes towards perhaps even a heightened role for the military. Beyond its traditional role of Homeland Defense from threats outside of, or directed towards, U.S. borders, the question queries about a more active military DSCA role involving climate events *within* the homeland itself. Yet a sizeable preponderance of respondents agreed that DoD should play such a role.[22] While DoD has a traditional support role in assisting civil authorities in national emergencies, the results could be interpreted to anticipate a larger role in climate defensive operations, depending on future climate impact severity. In any event, the result is revealing in demonstrating a high level of acceptance towards domestic military emergency support. More so, in what it will inevitably mean for the difficult task of budget allocation amongst competing military imperatives.

Do Rising Leaders Believe that Policy Guidance Should Reflect Climate Change Risks?

Two survey questions specifically addressed the role of national strategic guidance. One assessed attitudes specifically towards NSS and NDS considerations, and

[22] Seventy-nine percent of respondents (93) agreed that, "because the DoD functions in part to 'Defend the Homeland,' it's important we consider the DoD role in disaster response to catastrophic environmental events in the United States, such as out-of-control wildfires or extensive flooding." Twenty-one percent of respondents (25) did not agree with such a domestic defense role, the largest minority response, with a mere 1.7% (2) strongly disagreeing. Survey question Q6. Of interest, a nonscientific survey of attendees of a U.S. Naval War College conference event on climate change found that the greatest number of respondents, 44%, concluded that the "diminishing security of our homeland" is the "most dangerous" climate change threat. The other two choices were the "diminishing security of our allies and partners," 37%, and of our adversaries, 19%. U.S. Naval War College, "The National Security Significance of a Changing Climate: Risk and Resilience in the 21st Century: Panel 3 - Domestic Security Implications: Operations within the Homeland," January 8, 2021, audio, 0:40, accessed February21, 2021, https://www.youtube.com/watch?v=zTT5jS8ngFM&feature=youtu.be. A conference organizer caveats that this was an informal poll of attendees whose participation may have self-selected their interest therein, thereby skewing poll results towards those inclined to be predisposed to the topics discussed.

one towards DoD leadership guidance. Eighty-seven percent of respondents agreed that "national defense and national military *strategies* should explicitly consider the military implications of the effects of climate change" (emphasis added).[23] A slightly smaller number—80.5%—agreed that DoD should provide *guidance* on climate change mitigation and adaptation.[24] These results combine to demonstrate a preponderant willingness for strategic guidance to be forthcoming on dealing with future climate change threats. This finding especially demonstrates the relevance of factoring in climate change into grand strategic NSS, NDS, and NMS. Two takeaways can be inferred. One, a national grand strategic policy that fails to address or ignores climate change realities is out of synch with rising strategic leadership. Such a policy absence would apply to the last NSS, NDS, and NMS, as well as any future administration that would again follow such a disposition. Two, these leaders, inclined to expect strategy on guidance on climate change realities, are well-placed to receive, adopt, and implement such a strategy on the part of the new administration.

The data demonstrates that these rising strategic leaders do recognize and appreciate climate change as a serious concern (97%); even an existential one (87%). The survey demonstrates that these rising strategic leaders see the direct connection between climate change impacts and the risk imposed to military readiness/operations (86%). They recognize these risks specifically to basing, facilities and infrastructure (78%), in

[23] Eighty-seven percent 87% of respondents (103) agreed that, "the national defense and national military strategies should explicitly consider the military implications of the effects of climate change." [40% (47) strongly, 47% (56) agreeing]. This inclination towards receipt of national strategic guidance is revealing; it is the second-highest overall agreement response after Q1's query about the actuality of climate change itself, (and shared with Q8's query over climate change as existential threat). Survey question Q4.

[24] Eighty-point-five percent of respondents (95) agreed that, "Department of Defense leadership should provide guidance to the force on how to mitigate and/or adapt to the effects of Climate Change." Survey question Q5.

the Arctic (80.5%), and from refugee migration (78%). A similarly large number of respondents (79%) demonstrate even a direct, perhaps heightened, DoD role in domestic disaster relief. Similar majorities, again, show that climate change will lead to heightened social conflict (80.5%). By a similar preponderance of agreed results, the survey demonstrates a potential glaring gap between the last national NSS, NDS, and doctrinal guidance on climate change appreciation and that understood by these future leaders. The results showed respondents in agreement that NSS/NDS/NMS should explicitly reference climate change (87%) and for more or better DoD guidance on climate change (80.5%). These results demonstrate a useful readiness for these leaders to respond favorably to the new administration's national strategy and policy guidance on climate change. This conclusion of a latent awareness yearning for more guidance leads towards the contention that the Department should develop programs to develop and inculcate a greater appreciation and understanding of climate change implications to defense operations. Finally, it demonstrates these future leaders' readiness to rationally and intelligently prioritize competing operations demands in light of potentially declining budgets and resources. The following chapter, then, discusses what the data represents within the context of developing and supporting a cadre of climate-informed planners and decision-makers, including several recommendations towards that end.

Chapter 5: Achieving More Informed and Comprehensive Strategy and Guidance

> I have been described as the grandfather of climate change. In fact, I am just a grandfather and I do not want my grandchildren to say that grandpa understood what was happening but didn't make it clear.
>
> —James E. Hansen, "We have only four years left to act on climate change"[1]

This paper hypothesizes that better-informed leaders will give more consideration to climate change and its effects on military readiness in the future. The current 2017 NSS outlines four "Pillars" of security imperatives: Homeland Protection; Prosperity; Military Readiness, including the domains of the strategic environment (industrial base, nuclear, space, cyberspace, and intelligence) and Diplomacy; and Alliances and Value Promotion.[2] The 2018 NDS elaborates on these. Neither the 2017 NSS nor 2018 NDS discusses or even mentions climate change (unlike prior NSS/NDS), either as a phenomenon of the strategic environment or as a threat. However, as the implications of climate change to operational readiness and the larger strategic environment make clear, climate change is a determinant requiring both acknowledgment and recognition. The only question is one of degree. On the other hand, the new Biden administration is putting climate change at the top of its agenda, in accord and consistency with policy from prior administrations.[3] Assessing the views of upcoming rising strategic leaders provides an understanding of the readiness of these new leaders to assume the mantle of responsibility that comes with tackling climate change as a national security imperative.

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[1] James Hansen, "We have only four years left to act on climate change - America has to lead," *The Guardian*, January 17, 2009, accessed December 29, 2020, https://www.theguardian.com/environment/2009/jan/18/obama-climate-change.

[2] NSS 2017, v-vi, 4.

[3] Interim NSS Guidance; White House Executive Order; White House Fact Sheet; Biden Plan.

The survey results bode well for the adoption, reception, and execution of significant changes in defense/military strategy and guidance to account for climate change. Preponderant majorities of survey respondents see climate change as a real and present threat, potentially existential. They acknowledge the risks evident to operational readiness, military bases and infrastructure, Arctic ice melt competition, and FHA/DR incidence by similar margins. They appear to go even farther than these three threat identifiers in anticipating a potentially expanded role for DoD domestic environmental disaster response. Tellingly, from the standpoint of future national security roles and operations, they agree that increased social and national conflict is a likely result of climate change impacts. Finally, then, they agree that national policy should reflect climate change implications into high-level strategy (at the NSS, NDS, and NMS levels) and that Departmental policy guidance on the same should be forthcoming. These results present a firm foundation to set the stage for policies and recommendations, perhaps even far-reaching, to achieving a more comprehensive and informed strategy and guidance on climate change impacts to national security readiness and operations. What follows, then, are recommendations grounded by the science and doctrine cited within this paper, and supported by the awareness and understanding of the survey respondents.

Recommendations

Directly Define the Problem of Climate Change as a Legitimate National Security Imperative.

Within both the 2017 NSS and 2018 NDS, a ranking of the leading national security threats facing the U.S. came to be known by the appellation of "two-plus-three," which orders China, Russia, North Korea, Iran, and transnational threat groups as our

priority challenges.[4] National strategic guidance and defense doctrine then go further to require preparation for "new actors that could threaten the United States and its allies and partners."[5] As proposed herein, climate change security ramifications, if approaching even close to projections of severity, pose significant risks to defense operational readiness and security strategic preparedness.[6] As such, they should warrant inclusion as a singular defense imperative in their own right. Therefore, this paper advances an addition to the appellation to include a 2 + 3 [+1], the latter signifying this environmental domain's singular character requiring new, creative, and critical strategies to address. Hence, the call herein for a Departmental recognition of climate change's "plus-one" addition to the palette of core, vital national security threats. Formalizing climate change risks as a national security imperative also establishes its reality against potential future political backsliding while ensuring its scientific empiricism. The survey results show that rising strategic defense leaders would seem to agree, with over 97% in agreement that climate change presents a real and present phenomenon, and over 87% agreeing that national strategies should consider climate change implications.

Doctrine builds a globally integrated force posture upon a foundation recognizing the transregional and all-domain challenges of today's strategic environment.[7] As

[4] Michael O'Hanlon, "From the Pentagon's '4+1' threat matrix, to '4+1 times 2,'" Brookings, May 11, 2020, accessed December 31, 2020, https://www.brookings.edu/blog/order-from-chaos/2020/05/11/from-the-pentagons-41-threat-matrix-to-41-times-2/; Michael O'Hanlon, "American Defense Matters In This Era," *The Hill*, May 8, 2020, accessed October 5, 2020, https://thehill.com/opinion/national-security/496830-american-defense-matters-in-this-era; Garamone, Jim, "U.S. Benchmarking Capabilities Against China, Russia, Dunford Says," U.S. Dept of Defense, News, November 6, 2018, accessed January 17, 2021, https://www.defense.gov/Explore/News/Article/Article/1683762/us-benchmarking-capabilities-against-china-russia-dunfo%20rd-says/.

[5] CJCSI 3050.01, B.1.c., B-1.

[6] Berardelli; Liul; Sherwood; Rogelj.

[7] Chairman of the Joint Chiefs of Staff, "Joint Publication 3-0: Campaigns and Operations," (Washington, DC, 2020), 3.

analyzed in this paper, climate change epitomizes the transregional, all-domain challenge. Climate change impacts defense operations across all regions and all commands, implicating every engagement domain and Service. It will also require a whole-of-government approach demanding efforts from every instrument of national power. Finally, the survey's results indicate a high level of awareness of climate change operational relevance on the part of rising strategic military planners and leaders and a strong preference for strategic guidance regarding climate change impacts on defense operations. With the Biden administration putting climate change at the center of national foreign policy, administration policy and rising defense leaders share common cause on the greater strategic precedence of climate change. This presents a unique opportunity to align national security policy, strategy, guidance, and operations to a new, climate-centric reality. In this way, DoD can position itself to better meet the formidable challenges climate change will present to readiness, operations, and the addressing of future conflict. To be ready for a challenge, one must first define it.

Undertake Efforts to Instill Climate Change Awareness Through Education, Exercises, and Messaging.

Rising strategic leaders demonstrate a strong appreciation of climate change risks, the survey shows. Given the connection between administration policy and rising leader awareness, this is a time to not just maintain a status quo understanding, but to increase and reinforce this understanding and awareness across the Department. As foreign policy expert Simon Serfaty noted in the context of Euro-Atlantic security partnership, this is "no time for a time out."[8] The formal inclusion of climate change in Professional Military

[8] Simon Serfaty and Sven Biscop, *A Shared Security Strategy for a Euro-Atlantic Partnership of Equals* (Washington, DC: Center for Strategic and International Studies, 2009), 11.

Education (PME) curriculum development and seminar inclusion is a powerful mechanism to demonstrate both leadership buy-in and long-term instructional awareness of the problem. The survey responses strongly indicate an appreciation of and support for strategic guidance on climate change impacts. Therefore, this recommendation is to commit and execute a systematic effort to inculcate climate change awareness and values throughout the national security establishment through education, research, exercises, messaging, seminars, and dialogue at PME institutions. At the broadest level of DoD strategic planning doctrine, the Joint Strategic Planning System (JSPS) develops statutorily-required strategic outcomes.[9] The JSPS identifies, assesses, and manages strategic and operational risk.[10] In assessing and identifying risks, the JSPS distinguishes threats – harm from state or non-state entities – from hazards.[11] Hazards specifically include "environmental . . . conditions with potential to cause harm."[12] As this paper demonstrates, climate change is such a harm-causing environmental condition of risk to national security readiness and operations. The former U.S. Joint Forces Command explicitly considered climate change a geopolitical trend impacting the Joint Operating Environment.[13] The Command concluded by noting the "critical" function of PME to future officer growth potential in understanding these geopolitical trends' implications.[14]

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[9] Chairman of the Joint Chiefs of Staff, *Joint Strategic Planning System*, CJCSI 3100.01E, Draft v2.1 (Washington, DC: Joint Chiefs of Staff, November 5, 2020), 1.

[10] CJCSI 3100.01E, A-2; Chairman of the Joint Chiefs of Staff, *Joint Risk Analysis*, CJCSM 3105.011 (Washington, DC: Joint Chiefs of Staff, October 14, 2016), 1, accessed January 1, 2021, https://www.jcs.mil/Portals/36/Documents/Library/Manuals/CJCSM%203105.01.pdf?ver=xgdmSDyy6eVjzBaacFU4mA%3d%3d.

[11] CJCSM 3105.01, B-3.

[12] Ibid.

[13] USJFC JOE, 32.

[14] Ibid., 69-70; Michelle P. Jacobs, *Professional Military Education: Analysis and Recommendations*, Military and Veteran Issues (New York: Nova Science Publishers, Inc., 2014), accessed on January 2, 2021, 20, http://search.ebscohost.com.nduezproxy.idm.oclc.org/login.aspx?direct=true&AuthType=ip,url,uid&db=e000xna&AN=675621&site=eds-live&scope=site.

Incorporating the significant risks from climate change would be an appropriate learning objective for PME programming.

PME programs are already required to use broad Joint Learning Areas from which to develop mission-specific Joint Learning Objectives.[15] One learning area, Globally Integrated Operations, requires knowledge mastery for the adaptation over "disruptive change" across all domains of competition, conflict, and war.[16] Again, as this paper demonstrates, climate change is the epitome of disruptive change, including to defense readiness and operations, now and in the future. It is appropriate, then, that joint officers, as well as all students within PME programming, be exposed to a learning objective of climate change implications to their comprehension of an inclusive, comprehensive, all-domain strategic environment. Departmental doctrine and instruction already provide a solid foundation for incorporating specific, climate change-focused learning objectives.

The Navy has already highlighted the need for climate change-oriented PME instruction and training. In its 2010 Climate Change Roadmap, the Navy actioned to include "climate change science and strategic considerations" into formal Naval training and education.[17] The explicit intent was to "ensure that future leaders are prepared to make informed and effective decisions regarding climate change assessment, prediction, adaptation, and mitigation."[18] The Navy recommended the "inclusion of climate change

[15] Chairman of the Joint Chiefs of Staff, *Officer Professional Military Education Policy*, CJCSI 1800.01F (Washington, DC: Joint Chiefs of Staff, May 15, 2020), 3, accessed January 1, 2021, https://www.jcs.mil/Portals/36/Documents/Doctrine/education/cjcsi_1800_01f.pdf?ver=2020-05-15-102430-580.

[16] CJCSI 1800.01F, A-A-2.

[17] U.S. Department of the Navy, *"U.S. Navy Climate Change Roadmap,"* (Washington, DC: Vice Chief of Naval Operations, April 2010), 12, accessed January 5, 2021, http://webcache.googleusercontent.com/search?q=cache:_v_dP8nZL_8J:ftp://ftp.oar.noaa.gov/ESPC/Publication%2520Documents/US-Navy-Climate-Change-Roadmap-21-05-10.pdf+&cd=1&hl=en&ct=clnk&gl=us; La Shier, 38.

[18] U.S. Department of the Navy, 12-13.

impacts on national security in Naval War College coursework."[19] Secretary of Defense Austin, five days into his term, said climate risk analysis will be incorporated into modeling, simulation, wargaming, and analysis.[20]

Including a climate change focus need not necessarily incorporate an entirely new and separate subject-matter focus. Instead, already-existing lesson modules can incorporate climate change learning objectives, for example, into conflict and complexity theory or war theory in relation to "new," "hybrid," and "gray zone" conflict and the changing character of war.[21] Case studies, seminar discussions, individual or group project assessments, synergy topic inclusion, and the like can readily be adapted to incorporate a climate change learning objective within existing lesson objectives. For students with a more pronounced interest, specifically-tailored climate change elective seminars can offer more detailed topic exploration while nurturing their heightened interests. Deeper still, students and faculty can undertake academic research and publish on climate change impacts to national security. In this way, institutional climate change education serves as a bridge to help assure deeper and lasting awareness of climate change implications to national security planning, readiness, and operations.

Strategic Planning Principles of Joint Concept and Joint Force Development can Enhance Operational Readiness and Warfighting Practices.

[19] Ibid., 3.

[20] DoD Statement by SecDef Austin.

[21]. Jan Angstrom and J.J. Widen, *Contemporary Military Theory: The Dynamics of War* (New York: Routledge, 2015), 25, 27, 31; Mary Kaldor, *New and Old Wars: Organized Violence in a Global Era* (Stanford: Stanford University Press, 2012); Herfried Münkler, *The New Wars,* (Cambridge: Polity Press, 2002); Rupert Smith. *The Utility of Force* (New York: Vintage Books, 2007), 5; Peter A. Kiss, *Winning Wars Amongst the People: Case Studies in Asymmetric Warfare* (New York: Potomac Books, 2014), 9-16, 26-29; Van Jackson, "Tactics of Strategic Competition: Gray Zones, Redlines, and Conflicts before War," *Naval War College Review* 60, no. 3 (Summer 2017): 39-61, accessed April 15, 2021, https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1069&context=nwc-review; Stacie L. Pettyjohn and Becca Wasser, *"Competing in the Gray Zone: Russian Tactics and Western Responses"* (Santa Monica, CA: RAND Corporation, 2019), accessed April 15, 2021, file:///C:/Users/Ronald%20Perkel/Downloads/RAND_RR2791.pdf.

Beyond incorporating climate change into existing PME curricula at the margins, Joint Concept and Joint Force Development mechanisms can implement a more wholesale, permanent focus on climate change implications to operational readiness and larger warfighting concepts and practices. To help combat climate change, DoD will need to consider its operational and warfighting concepts' and practices' abilities to adapt to climate change's impacts and implications to operational readiness. Operational considerations will also need to include homeland defense, or more, to a changed conflict nature beyond state, non-state, VEO, or social and human-element-driven aggression and defense. The survey shows rising strategic leaders already holding preponderant views (86%) that climate change poses risks to military readiness and operations in the future. Grounding climate change into joint concepts will help ensure that future warfighting capabilities and readiness are best prepared for this future.

Joint concepts provide solutions to compelling current and envisioned challenges "for which existing doctrinal approaches and joint capabilities are deemed inadequate."[22] A Joint Concept is that method for employing a joint force capability to "achieve a stated objective within the context of a specified operating environment" of a specified challenge.[23] The specified operating environmental challenge herein is climate change impacts upon defense readiness and operations, recognized as a reality and problem set by up-and-coming leaders through the survey results. A new Joint Concept is proposed

[22] Chairman of the Joint Chiefs of Staff, "Joint Publication 1: Doctrine for the Armed Forces of the United States," (Washington, DC, 2017), VI-9, accessed March 12, 2021, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp1_ch1.pdf?ver=2019-02-11-174350-967

[23] Chairman of the Joint Chiefs of Staff, *Guidance for Developing and Implementing Joint Concepts*, CJCSI 3010.02E (Washington, DC: Joint Chiefs of Staff, August 17, 2016), A.1.a., A-1, accessed January 3, 2021, https://www.jcs.mil/Portals/36/Documents/Library/Instructions/CJCSI%203010.02E.pdf?ver=pkZ7YbXlQUH65c2EaKhdXg%3d%3d.

through a prospectus addressing expected changes in the future security environment.[24] Herein, climate change is that future expected, and extant, security environment. The prospectus then identifies the "compelling military challenge" to be addressed.[25] Here, that would be addressing the impacts of climate change on operational readiness, specifically in relation to the four areas referenced herein—basing and infrastructure, Arctic ice melt, FHA/DR and DSCA, and potential conflict. Finally, as relevant here, the prospectus should explain any inadequacies or deficiencies in current addresses to the challenge.[26] Once validated and approved, concepts are institutionalized as solutions.[27] As seen herein, while climate change held a place-of-pride in previous national strategies and does so again in the instant, it was poorly appreciated under the last and may fall victim to future politicization.

Anchoring climate change more formally to doctrine and concepts will ensure its permanency in national strategic thinking, development, and execution. Strategic direction, relayed through doctrine, should address the long-term, emergent, and anticipatory challenges that evolve as circumstances evolve.[28] Once developed, concept-required capabilities identify and develop high-level, Departmental policy changes under the rubric of doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P).[29] Referencing climate change directly as an emerging challenge to the strategic environment throughout doctrine will go far in reinforcing its importance to planners and decision makers. In a similar vein, as Joint

[24] Ibid., B.2.a.(1), B-2.
[25] Ibid., B.2.a.(3), B-2.
[26] Ibid., B.2.a.(4), B-2.
[27] JP 1, VI-11.
[28] CJCS, JP 3-0, 6.
[29] CJCSI 3010.02E, A.1.3., A-3.

Concepts are articulations of the Chairman's vision for future joint operations, joint DOTMLPF-P change recommendations will improve future responses to climate challenges by improved material, facilities, leadership, and educational capabilities.[30]

Force Development is the structured mechanism to improve, among others, the resilience and awareness of the current force to improve operational readiness.[31] Understanding the operational environment and developing operational joint concepts are identified mechanisms for executing force development.[32] Already identified, climate change is a significant geopolitical environmental trend impacting the Joint Force. The question is how operationally capable is the Joint Force in managing the climate change impacts outlined herein. Already there is significant awareness of risks to basing, access, and infrastructure in DoD, the Services, and within the survey's respondents (78% recognizing installation operational risk). However, should climate change impacts of sea level rise, flooding, and infrastructure vulnerability exceed current planning expectations, capability gaps will become evident. A greater capacity for operational abilities in cold weather, Arctic environments is also already manifest (80.5% of survey respondents agreeing). Future concept development can lend further necessary impetus and focus to meet and exceed Russian and other adversary capabilities.

The areas of international FHA/DR and domestic DSCA, and a heightened DoD role therein, may prove to be the most compelling for joint concept development focus. As this paper's survey and that of the Naval War College showed, large numbers of rising

[30] Ibid., A.1.3.d., e., and g., A-4-5.

[31] Chairman of the Joint Chiefs of Staff, *Implementing Joint Force Development and Design*, CJCSI 3030.01 (Washington, DC: Joint Chiefs of Staff, December 3, 2019), A.4.a., A-4, accessed January 3, 2021, https://www.jcs.mil/Portals/36/Documents/Library/Instructions/CJCSI%203030.01.pdf?ver=O6zZFkX3mYGe3_WQ3Jva8A%3d%3d.

[32] Ibid., C.2.b.(1) and (2), C-2.

strategic leaders view risks to the security of the homeland as significant—79% and 44%, respectively. Large climate-change induced population migration will task existing operational and lift capacity. More so, large-scale, climate-induced risk to the U.S. itself may entail the power and matchless capabilities of the U.S. military to address and even defend against. In these events, such significant capability gaps will require addressing. Finally, climate-exacerbated conflict (80.5% of survey respondents anticipating) may task the joint force in dramatic and unforeseen ways as multiple, concurrent conflicts require addressing, planning, and action.

The question posed herein is nothing less than the Joint Force's readiness to combat the potentially paradigm-shifting threats to traditional warfighting operations and homeland defense posed by climate change impacts on both the physical and operational environments. Beyond character, climate change poses the possibility of conflict's very nature changing, and DoD's responsive role to meet it.[33] With nature itself acting as an adversarial agent threatening international and domestic tranquility, new national security concepts and capabilities will be demanded. With discretion, and planning, being the better part of valor, joint concept and force development can "significantly improve the ability of the joint force to overcome [the] future challenges" imposed by a changing climate. Such development accords well with the appreciation and understanding of climate change operational impacts shown by future planning leaders in the survey.[34]

Fostering a National Security Climate-Change-Community-Culture.

[33] Gregory Foster, "Urgent: Replacing the Inherited US National Defense 'Strategy'," The Royal United Services Institute (RUSI,) www.rusi,org, accessed May 20, 2021, https://rusi.org/commentary/urgent-replacing-inherited-us-national-defence-strategy.

[34] JP 1, xxvi.

To meet the challenges of climate change effectively will require efforts by all instruments of national power, involving the development of a shared, all-Services DoD, whole-of-government, public and private sector, information and media, community culture of climate change awareness.[35] Fundamentally, the goal is to link a broad social, climate change awareness, understanding, and operational readiness directly to national security.[36] As this paper began, former CJCS Dunford and joint staff policy propose that the character of conflict has changed.[37] Besides traditional threats, the NSS and NDS outline the strategic environment of the nation's core, vital national security interests and priority challenge adversaries. This paper posits the "plus-one" climate change threat will add another layer and dimension to national security operations, challenge, and response. Suppose projections of climate change impacts approach current modeling or even exceed.[38] In that case, strategic preparation will be necessary for the nation to respond

[35] In developing this framework on developing a shared climate change culture, the author has drawn on, and is thereby indebted to, the proposal of "Crafting an Intelligence Community Culture," Roger Z. George and Harvey Rishikof, *Navigating the Labyrinth of the National Security Enterprise* (Washington, DC: Georgetown University Press, 2017), 388. "In the long run, [commercial solutions] won't work. While free-marketers and technology entrepreneurs may advertise otherwise, there is no technological or political silver bullet to solving our environmental problems. . . . While important in the short term, . . . the power of the market alone will not save us in the long term. In the long term, we will have to change the way we think. . . . We don't need to be told about the problem [of climate change] again. We need to know how we can understand it, how we can explain it to others, how we can come to a collective acceptance of why it happened, and how we can fashion a response." Andrew J. Hoffman, "Climate Change and Our Emerging Cultural Shift," *Behavioral Scientist* (September 30, 2019), accessed January 7, 2021, https://behavioralscientist.org/climate-change-and-our-emerging-cultural-shift/.

[36] "It will take a herculean collaboration involving local communities, federal entities, civil society organizations, scientists, and foreign governments to stave off the looming geopolitical threats of climate change." La Shier, 43.

[37] Dunford, JFQ, 2; CJCSI 3050.01, B-1; .

[38] Sea level rise from rapidly melting glacial ice sheets may well exceed IPCC high-end projections for sea level rise, popularly recognized as the worst-case scenario. Martin Siegert and Eric Rignot, "Twenty-first century sea-level rise could exceed IPCC projections for strong warming futures," *One Earth* 3, no. 6 (December 2020): 691, 699, accessed February 11, 2021, https://www.researchgate.net/publication/347464638_Twenty-first_century_sea-level_rise_could_exceed_IPCC_projections_for_strong-warming_futures; The exclusion of climate change-induced ocean undercutting of Greenland's glaciers "may underestimate future [glacial ice] mass loss by at least a factor of two." Michael Wood et al., "Ocean forcing drives glacier retreat in Greenland," *Science Advances* 7, no. 1 (January 2021): 7, accessed January 30, 2021, https://advances.sciencemag.org/content/advances/7/1/eaba7282.full.pdf; A recent NASA-supported,

while maintaining its competitive advantage over the other challenges. The survey results demonstrate rising strategic leaders' appreciation and expectation of the challenge.

The nation confronts increasing priority challenges simultaneously as national budgets and revenues will likely be constrained, however. An example of relevance is DoD DSCA for domestic, environmental disaster response. That a 79% preponderant majority agree is telling and instructive for illustrating the need for difficult tradeoffs. Under the Stafford Disaster Relief and Emergency Assistance Act, DoD must fund from its resources any DoD assistance request for domestic incident response.[39] Thus, future strategic planners, just within the climate change challenge alone, already face the difficult potential future tradeoff of allocating necessary and scarce resource funding to a domestic national emergency versus, say, shoring up base installations from the ravages of rising seas.[40] Regards basing, as was seen in chapter 2, the Services are recognizing climate change threats to infrastructure and energy resiliency.[41] Adding in the remainder of threats, determining which national priorities to address, then, will be challenging, to say the least. Competing and compelling demands against national attention, action, and response will require difficult decisions.

August 2020 study projects a sea level rise from melting ice sheets up to 16.5 inches (420 mm) at the high end by 2100. Thomas Slater, Anna E. Hogg, and Ruth Mottram, "Ice-sheet losses track high-end sea-level rise projections," *Nature Climate Change* 10, no. 10 (August 2020): 1, Fig. 1, accessed January 30, 2021, https://www.researchgate.net/publication/344004443_Ice-sheet_losses_track_high-end_sea-level_rise_projections; The planet has lost 23 trillion tons of ice between 1994 and 2017 alone. The rate of ice loss has risen by 57% during this same period, from 0.8 to 1.2 trillion ton per year. In the same time frame, Arctic and Greenland grounded ice sheet loss has raised global sea levels by 34.6 ± 3.1 mm (1.25 – 1.5 inches), attributable to climate warming." Thomas Slater et al, "Review article: Earth's ice imbalance," *The Cryosphere* 15, no. 1 (January 25, 2021): 233, 239, 240-41, accessed February 11, 2021, https://tc.copernicus.org/articles/15/233/2021/tc-15-233-2021.pdf.

[39] Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, Public Law 100-707, 100th Cong., (1988), 42 U.S.C. §§ 5121-5207, 5170b.(c)(1) accessed January 6, 2021, https://www.govinfo.gov/content/pkg/USCODE-2009-title42/html/USCODE-2009-title42-chap68.htm.

[40] National Intelligence Council, Global Trends 2040, 40.

[41] Report on Effects of a Changing Climate to the Department of Defense; Supplement to DoD Report on Effects of a Changing Climate.

Reflecting a whole-of-government approach, the new administration intends to utilize the full coordinated, capacity "from every corner" of the nation, federal, state, local, tribal, and private sector, to implement climate-aware action.[42] Without such a shared understanding, climate change may not receive deserved prioritization amongst competing demands by an educated cadre of leadership, planners, and decision-makers to best serve national interests. A well-understood military example of shared understanding is the jointness demonstrated by the combination of joint, multi-Service force capabilities to produce a unity of operations and functions in which "the sum is greater than its parts."[43] These joint operations then ensure the achievement of strategic, operational, or other military missions.[44] To fully develop a climate change-national security/interest link will require the inception of a climate change national security culture of awareness.

Each of the previous three recommendations help ground such a climate-aware culture into reality. Climate change's "plus-one" addition as a priority challenge provides the highest-level strategic direction towards incorporating climate change as a key driver of policy development. PME programs, research, training, and exercises can provide an excellent start in reinforcing this shared culture among rising strategic leaders who already demonstrate their awareness of climate change impacts to operational readiness. Interagency participants will gain, and create, a multiagency perspective among participant rising leaders of the emergent culture.[45] Learning climate change—teaching to it—reinforces its grounding and central place in strategy, policy, and operations. Beyond PME, leaders training and serving together will learn not just of each other's respective

[42] White House Executive Order.
[43] CJCS, JP 1, ix.
[44] Ibid., I-16.
[45] George, 388.

cultures but reinforce the emergent culture in their collaborative, shared strategy and decision making.[46] They will then be able to carry forward to their own Services and agencies further dissemination of this shared, understood culture. Through joint concept and force development, a culture of climate-aware institutionalization is not just fostered, but built into the very fabric of warfighting capacity building. Given the potential severity of climate change impacts upon warfighting and defense operations, the Department and the nation will need every ounce of this culture's focus to meet the challenge. From the bottom-up of rising leaders, and the top-down from leadership, strategic guidance, and policy, a shared, whole-of-government, societal understanding of climate change implications to national security interests will gain traction.

The survey results indicate a readiness to accept climate change implications into national security and military policy. In this way, future planning leaders help ensure that military operations include greater awareness and incorporation of climate change mitigation and adaptation strategies. But more is required. When one drops an object, it will fall. So it is with physics, with science. Climate change will create, is creating, operational security impacts and imperatives. Without broad, institutional awareness, however, the Department's rising strategic leadership elite alone may not be enough to join the circle of collective action. The issue is larger than a single institutional focus. Like physics, like science, climate change reality needs to be a point of common strategic culture. In so concluding the loop in this manner of collective culture, then, climate change becomes fully linked to national security as an operational imperative.

[46] Ibid.

Chapter 6: Conclusion

> Ultimately politicians will have to make some bold decisions to change course. Scientists and engineers can help but their real power lies in making positive innovations possible, not in decision making. However, those innovations are central to our future—and like it or not, some of them will come from technocrats or even the military.
>
> —Paul Crutzen, "A Huge Variety of Possibilities"[1]

The next set of national-defense planning decision-makers will have a tremendous role and opportunity in shaping national security planning to ensure that national security and operational readiness consider the impacts of climate change. Understanding their understanding of these impacts will gauge the likelihood of successfully incorporating climate change planning into defense readiness and operations. To that end, this paper examined the results of a survey sent to a sample of potential future defense planners and decision-makers on their understanding and awareness of climate change impacts. The paper first explored the impacts of climate change on defense basing and infrastructure, Arctic issues of Great Power Competition, transportation, and natural resource extraction, and implications to DoD-led FHA/DR and DSCA from population migration and effects. Next, the paper established the link between climate change and conflict. The reason conflict theory resonates is that it *predicts* the risks from environmental disequilibria. The empirical, historical record bears it out. Under theory, then, climate change conflict risks become inevitable (unlike traditionally-understood, social-nation-state conflict, which can result from rational decision-making). As such, theory provides

[1] Paul Crutzen, "'A huge variety of possibilities': Interview with Nobel Laureate Paul Crutzen on his life, his career in research, and his views on the Anthropocene idea," Environment & Society Portal, Rachel Carson Center for Environment and Society, Ludwig-Maximilians-Universität-München/Deutsches Museum, 2013, accessed December 29, 2020, http://www.environmentandsociety.org/exhibitions/anthropocene/huge-variety-possibilities-interview-nobel-laureate-paul-crutzen-his-life.

the imperative and imprimatur to prioritize a climate change risk. These four military risks—basing, Arctic competition, FHA/DR and DSCA, and conflict potential—assert the need for defense planning awareness of climate change.

Most recently absent from the last NSS, NDS, and NMS, national strategic guidance on climate change is essential to laying a formal, strategic focus upon which defense planners and decision-makers can follow and rely. The survey results indicated a very high preponderance of respondents – between 79 and 97% - in agreement with the seriousness of climate change, its impacts on military readiness and operations, its relevance to conflicts induced, and the need for national-level strategic guidance. Further, 87% recognized climate change as an existential threat to regions of the planet, with 61% seeing such a threat to the U.S. Time is not on our side.[2] As former Secretary of the Navy Ray Mabus said, "This is a mainstream America issue. This is a mainstream military issue[,] . . . an issue that affects the way that we can fight in [sic] and in the way that we can win."[3]

Therefore, the paper proposed recommendations for connecting comprehensive strategic guidance to preparing a new generation of defense, strategic planning leaders to incorporate climate change and its effects into strategic planning and military readiness. The idea is for national strategic guidance and military doctrine to draw and solidify the connections between climate change awareness and appreciation by national security policy leaders, including those of the survey, to impacts on national security and operational readiness. Part of this is to make an undeniable connection of climate change,

[2] "The timeline is speeding up. We used to think that we had decades, now, it's measured, perhaps in years." Mabus, audio 33:40; transcript, 6.

[3]Mabus, audio 33:00; transcript, 6.

a “plus-one” to the “2 + 3” appellation, to the currently identified five major national security threats. PME curriculum development and doctrinal emphasis, informal through existing course curricula and exercises, or formalized through Joint Concept and Force Development processes into warfighting capabilities, has a significant role. Finally, the paper introduced the notion of creating a shared, national security climate-change-community-culture. This would be a culture that would, over time, infuse a whole-of-government, societal understanding of climate change implications to national security interests. These recommendations intend to draw the lines of climate change, national preparedness, operational readiness, conflict risk, great power competition, national policy guidance, doctrine, PME curriculum, force development, and policy-maker awareness altogether. Joint and service doctrine, education, and training are vital drivers of leadership.[4] Written within the context of instilling mission command, former CJCS Martin Dempsey writes, “our doctrine, our education, and our training must institutionalize [these concepts] into all aspects of the joint force.”[5] This statement, in essence, is the encapsulation of the recommendations made herein.

Former CJCS Dunford asserted that the *character* of war has changed, as noted at the outset.[6] This paper has explored the more obvious climate-impacted military operational threats – denial of base access, infrastructure degradation, and training/exercise impairment; Arctic ice melt-generated competition; refugee population migration; and collateral conflict potential from these. What if, however,

[4] Martin Dempsey, *Mission Command*, White Paper (Washington, DC: U.S. Joint Chiefs of Staff, April 3, 2012), 6, accessed January 18, 2021, https://www.jcs.mil/Portals/36/Documents/Publications/missioncommandwhitepaper2012.pdf.

[5] Ibid.

[6] Dunford, JFQ, 2; CJCSI 3050.01, B-1.

climate-change threats exceed even these, as potential nationally, regionally, or globally existential?[7] Implications hinted heretofore include:

- impacts to coastal cities worldwide;
- regional-scale desertification and freshwater degradation;
- permafrost thawing releasing potent greenhouse methane gas;
- tens-to-hundreds of millions of displaced populations;
- the wholesale movement of temperate, national agricultural engines across national boundaries;
- environments conducive to the spread of pandemic and vector-borne disease;
- global loss of ocean, forest biodiversity, and species extinction;
- global changes to ocean and atmospheric currents;
- trillions of dollars in economic damage;
- and complete rearrangements of national strategic balances of power.[8]

[7] This paper has presented in prior footnotes a number of studies indicating climate change-induced consequences to ice sheet melt and global sea level rise happening faster and to a greater degree than previous projections had indicated. Berardelli; Liul; Sherwood; Rogelj; Slater, Ice-sheet losses; Slater, Review article; Wood. Two new studies model sea level rise factoring in Antarctic ice sheet loss. The first finds risk-averse (pessimistic) modeling showing up to 42 cm (16 in.) of sea level rise under current equivalents even keeping warming below a 1.5°C threshold. Tamsin L. Edwards et al, "Projected Land Ice contributions to twenty-first-century sea level rise," *Nature* 593 (May 6, 2021): 74-82, accessed May 8, 2021, https://www.nature.com/articles/s41586-021-03302-y.epdf?sharing_token=fTmQhcKRpIMi3XXmVYqb8tRgN0jAjWel9jnR3ZoTv0NBHKcAC_lrDjYnFOA0lhyL19H0suFTY3jD1u_wNHSNLmcwBTdbQq0hYq1F8VTrY6nDODlK4Oo6RwGSjOzMWOYaTLu51AzNakfedKi_eTEvaWZxeMqMiSmnu9M6DoGll06bUaL0RGVT6LuU-odEkyMb_lOy03u-0dyT_H_MAlDKISZGL3eMYZA_vLs8FBhmm6c%3D&tracking_referrer=www.washingtonpost.com. The second finds that failures to meet Paris Climate Agreement goals could result in "abrupt" increases in Antarctic ice loss after 2060. Robert M. DeConto et al, "The Paris Climate Agreement and future sea-level rise from Antarctica," *Nature* 593 (May 6, 2021): 83–89, accessed May 8, 2021, https://www.nature.com/articles/s41586-021-03427-0.epdf?sharing_token=kW0sl7hL1yL6bDq6xslXSNRgN0jAjWel9jnR3ZoTv0O1wLV2jblnuB2ZPB-nrPqiYIGrpSsWrxM6Zs9mXF_ynjpoFWixT2kst1RYyfsxX2Dw6YIoYLT8z_Vk_7YohwMyprdRpGbnlh240NZ3weWWftejoOaox_I0DMS9w_ihzkI2Z2zzROryHwF5vZj3B3UIrHtrf5KlBZGsILxfC74moQsPOeD5_JEKkcs1AXntYoQ%3D&tracking_referrer=www.washingtonpost.com.

[8] USGRC.

A senior Department of State official characterized climate change within the game theory concept of an "infinite game," as being a complex, intractable problem with no recognizable finite solution.[9] In such a changed, new world, perhaps even the *nature* of conflict will change.

Environmental stress, disequilibria, and destabilization, if extreme enough, could rise to an existential level of threat. At intensities approaching this level, the risks for tensions rising to armed conflict grow. Even more fundamentally, perhaps, would be the need for internal mechanisms of national defense to fight and protect against, not a conventional, social adversary, but the impartial rampages of a runaway, cascading, destabilized complex climate system. No longer will strategic centers of gravity be defined by nation/state/societal determinants like militaries, capital, industry, communication, transportation, or popular will. In such a world, it is nature that is the "enemy." But that natural enemy is driven by us, humanity. The center of gravity becomes what, then? The Kingdom of Heaven? Which is another way of saying, "Us." In this new world, conflict will require an entirely new way of thinking and addressing, a shared, global battle.[10] The start must begin with a national grand strategy beginning to address the significance of the threat. Then to be led by all levers of national power, diplomatic, informational, economic, financial, intelligence, legal, and, yes, military.

[9] Non-attributable due to the National Defense University Non-attribution policy, NDU Non-Attribution Policy; Simon Sinek, *The Infinite Game* (New York: Portfolio/Penguin Random House, 2019).

[10] "The good news is that it is under conditions of existential crisis that Western societies are most capable to find the will to resist and change." Simon Serfaty, "The Folly of Forgetting the West," *Policy Review* 174, Hoover Institution, Stanford University (August & September 2012): 38, accessed February 7, 2021, https://www.hoover.org/research/folly-forgetting-west.

Ultimately, why should any of this matter? Quite simply, if the reader sees the advantage of adopting any of these guidance/training/doctrinal/cultural factors, then the bridge is already crossed. By accepting the legitimacy of these recommendations, the reader has implicitly, if not explicitly, accepted the reality of further fundamental action on climate change mitigation at the national strategic planning level by the next generation of decision-makers and leaders willing and able to accept the mantle. Even further, though, beyond DoD, beyond the interagency, to a full, national, international, social, and inter-social cultural awareness of the stakes. And that makes all the difference.

Appendix A

Climate Change Attitudes Survey

Welcome to My Survey

Thank you for opening and participating in this survey. Your feedback is important. I am a Master's Degree Candidate with the Joint Advanced Warfighting School (JAWS) Program as part of the National Defense University (NDU). I am hoping you could help further my research by completing this survey about the possible impacts of climate change on military readiness. I know how busy you are and anticipate this survey not requiring more than five minutes of your valuable time. Your response within five (5) working days of receipt would be most appreciated. Your responses will remain strictly confidential and unattributable, nor will you receive any further follow-up requests.

If you have questions about the research study itself, please contact the me at ronald.d.perkel.civ@ndu.edu or my faculty advisor, Dr. Charles Davis at Davisc@ndu.edu. If you have questions about your rights or would simply like to speak with someone other than the research team about questions or concerns, please contact the Elizabeth Hoag Carhart, Institutional Research at Joint Forces Staff College at e.h.carhart.civ@ndu.edu.

Informed Consent Statement: By clicking the "OK" and "Next" buttons below, I consent to participate in this study. I understand my participation is strictly voluntary. Thank you once again.

OK

NEXT

Survey Questions

For purposes of this survey, Climate change is defined as "a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates . . .[whose] broad range of observed effects . . . are synonymous with the term [climate change . . . and whose] changes observed in Earth's climate since the early 20th century are primarily driven by human activities, particularly fossil fuel burning, which increases heat-

trapping greenhouse gas levels in Earth's atmosphere, raising Earth's average surface temperature." Earth Science Communications Team, "Weather, Global Warming and Climate Change," NASA Jet Propulsion Laboratory, California Institute of Technology, https://climate.nasa.gov/resources/global-warming-vs-climate-change/

OK

1. Climate Change is a real and present phenomenon.

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

2. Climate change poses risks to military readiness and/or operations.

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

3. Risks to military readiness/operations from Climate Change can include (check all that apply):

- ☐ No Risks Exist.
- ☐ Damage to bases and installations (Reduced Access, Infrastructure Deterioration, Flooding, Declining Water Quality, Etc.).
- ☐ Diminished unit readiness and/or training exercises.
- ☐ Declining ability to rapidly respond to crises and/conflict.
- ☐ Increasing risk of conflict, for natural resources, commercial shipping access, Great Power Peer Competitor military basing access, due to Arctic Sea Ice Melt.
- ☐ Increasing incidence of military conflict around the world resulting from population displacement, water scarcity, etc.

- [ ] Increasing military deployments in response to weather events and natural disasters, both in the US and globally.

4. The National Defense and National Military Strategies should explicitly consider the military implications of the effects of Climate Change?

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

5. Department of Defense leadership should provide guidance to the force on how to mitigate and/or adapt to the effects of Climate Change?

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

6. Because the DoD functions in part to "Defend the Homeland," it's important we consider the DoD role in disaster response to catastrophic environmental events in the United States, such as out-of-control wildfires or extensive flooding.

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

7. Over time, climate change will lead to more conflict between people, societies, groups, territories, and nation-states.

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

8. Do you see Climate Change as a potential existential threat?

- ☐ No.
- ☐ Not to the United States, but yes to other countries/regions of the world.
- ☐ Yes, to the United States and to other global countries/regions.

PREV DONE

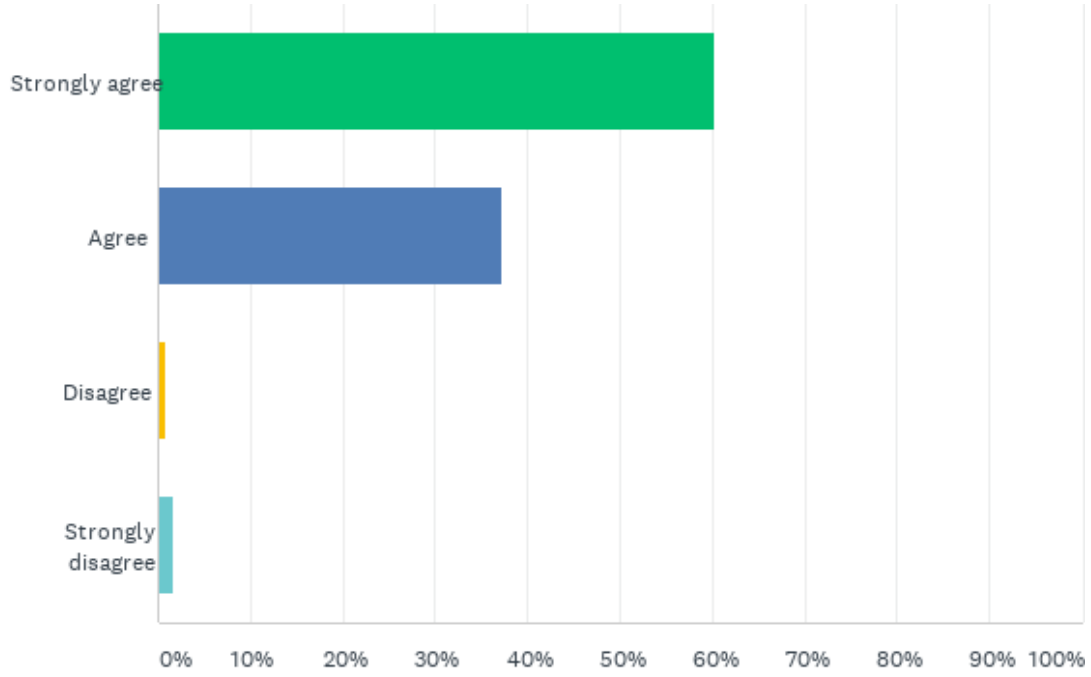
Appendix B

Climate Change Attitudes Survey Results

118
Total Responses
Date Created: Monday, October 26, 2020
Complete Responses: 118

Q1: Climate Change is a real and present phenomenon.

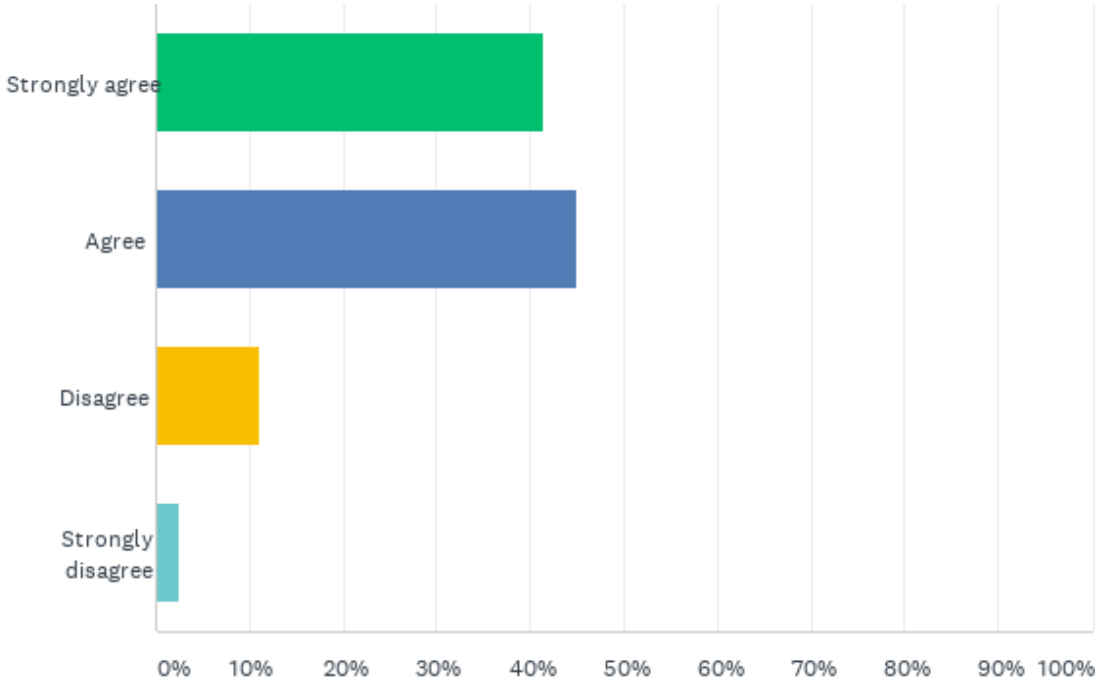
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	60.17%	71
Agree	37.29%	44
Disagree	0.85%	1
Strongly disagree	1.69%	2
TOTAL		118

Q2: Climate change poses risks to military readiness and/or operations.

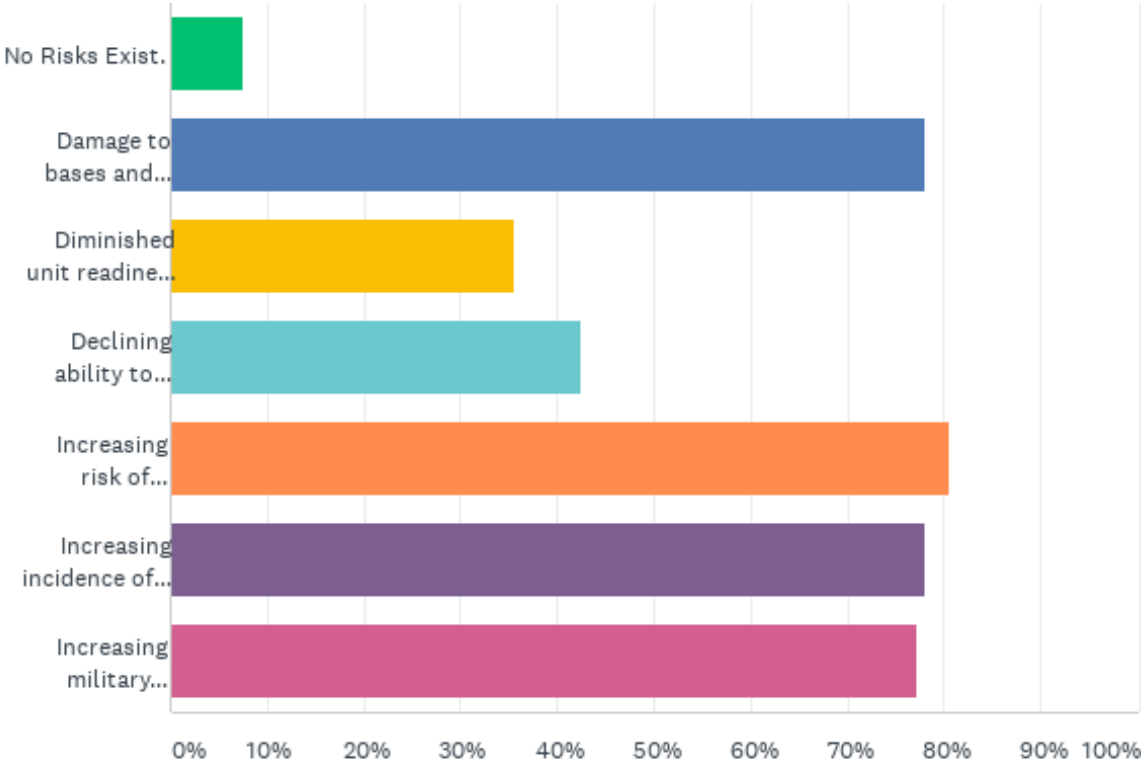
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	41.53%	49
Agree	44.92%	53
Disagree	11.02%	13
Strongly disagree	2.54%	3
TOTAL		118

Q3: Risks to military readiness/operations from Climate Change can include (check all that apply):

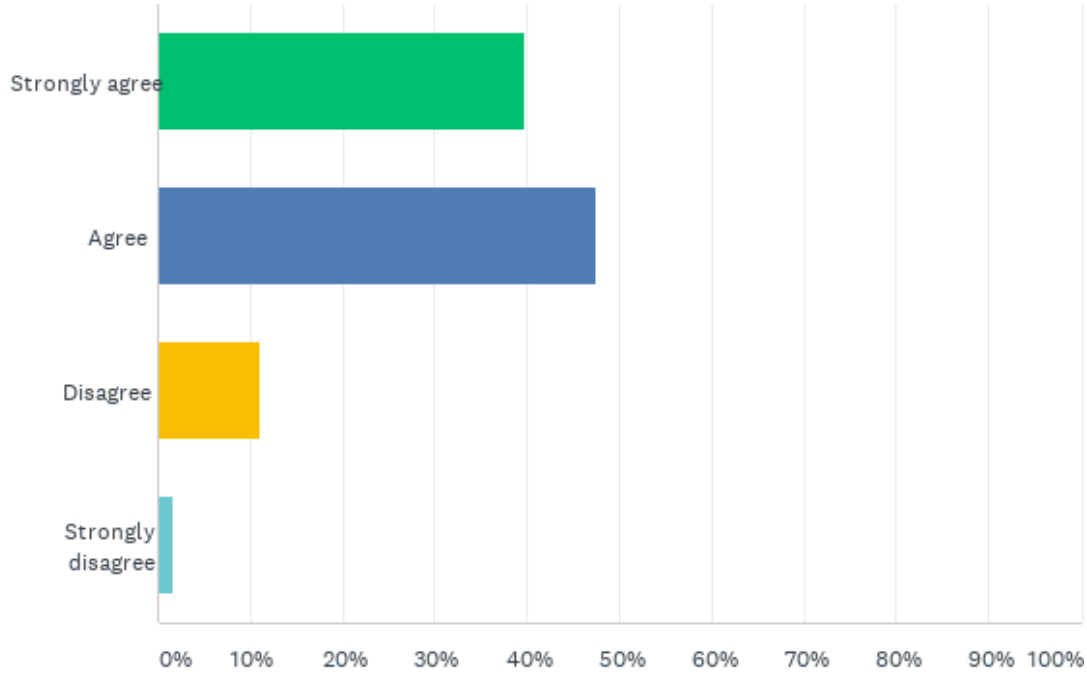
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
No Risks Exist.	7.63%	9
Damage to bases and installations (Reduced Access, Infrastructure Deterioration, Flooding, Declining Water Quality, Etc.).	77.97%	92
Diminished unit readiness and/or training exercises.	35.59%	42
Declining ability to rapidly respond to crises and/conflict.	42.37%	50
Increasing risk of conflict, for natural resources, commercial shipping access, Great Power Peer Competitor military basing access, due to Arctic Sea Ice Melt.	80.51%	95
Increasing incidence of military conflict around the world resulting from population displacement, water scarcity, etc.	77.97%	92
Increasing military deployments in response to weather events and natural disasters, both in the US and globally.	77.12%	91
Total Respondents: 118		

Q4: The National Defense and National Military Strategies should explicitly consider the military implications of the effects of Climate Change?

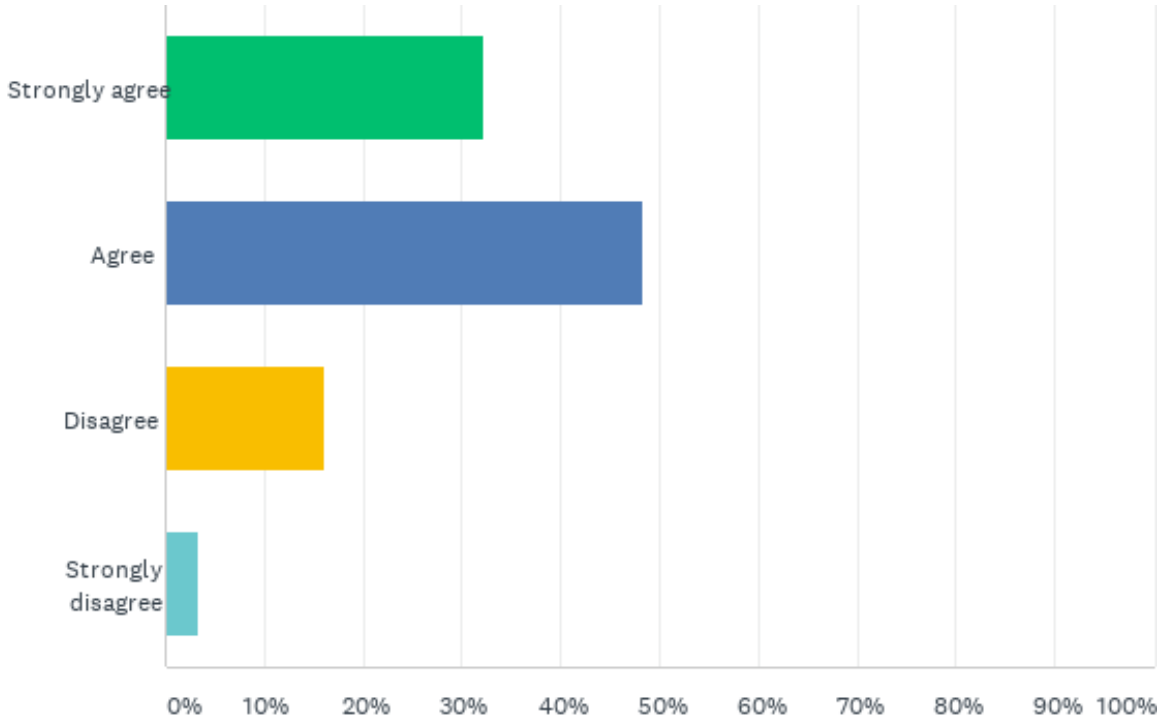
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	39.83%	47
Agree	47.46%	56
Disagree	11.02%	13
Strongly disagree	1.69%	2
TOTAL		118

Q5: Department of Defense leadership should provide guidance to the force on how to mitigate and/or adapt to the effects of Climate Change?

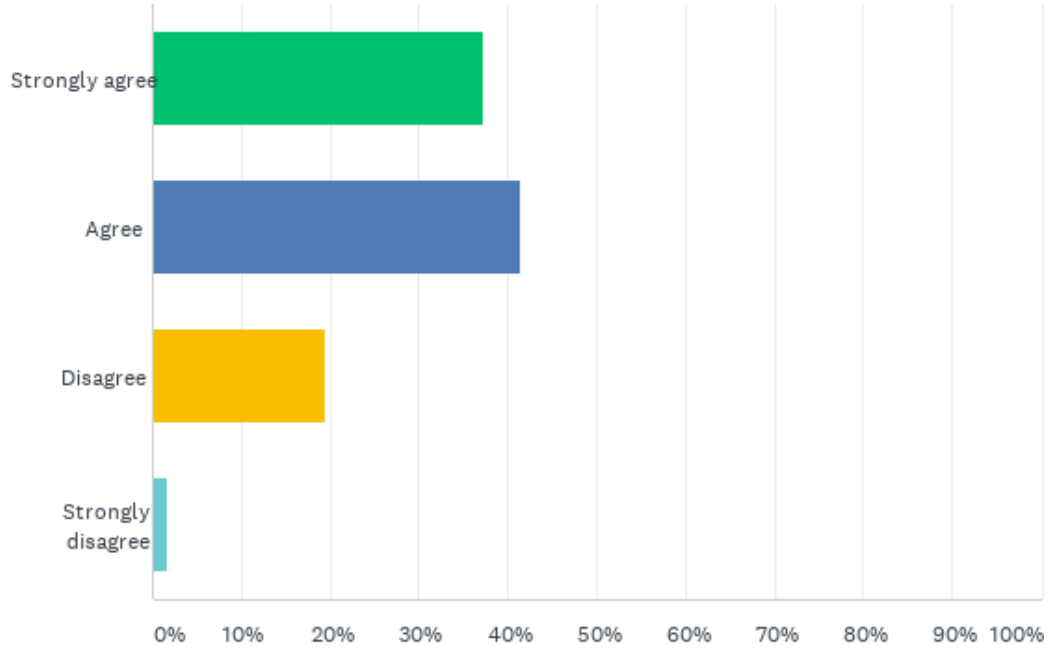
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	32.20%	38
Agree	48.31%	57
Disagree	16.10%	19
Strongly disagree	3.39%	4
TOTAL		118

Q6: Because the DoD functions in part to "Defend the Homeland," it's important we consider the DoD role in disaster response to catastrophic environmental events in the United States, such as out-of-control wildfires or extensive flooding.

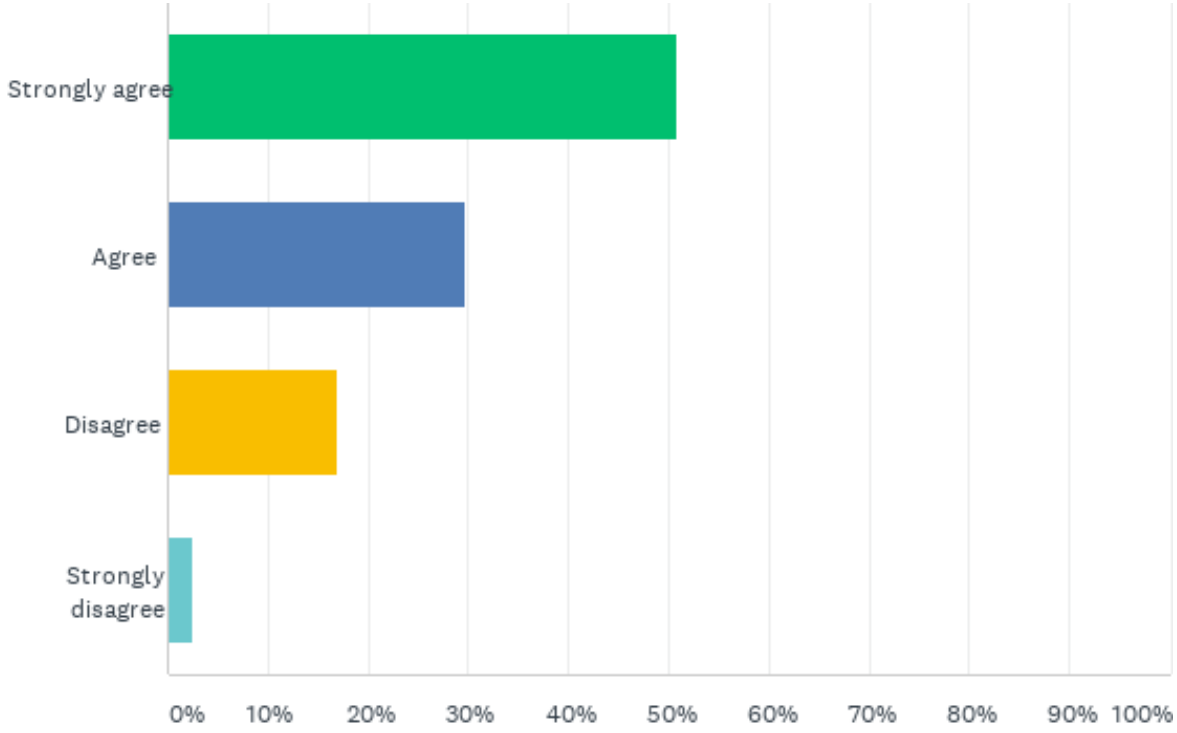
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	37.29%	44
Agree	41.53%	49
Disagree	19.49%	23
Strongly disagree	1.69%	2
TOTAL		118

Q7: Over time, climate change will lead to more conflict between people, societies, groups, territories, and nation-states.

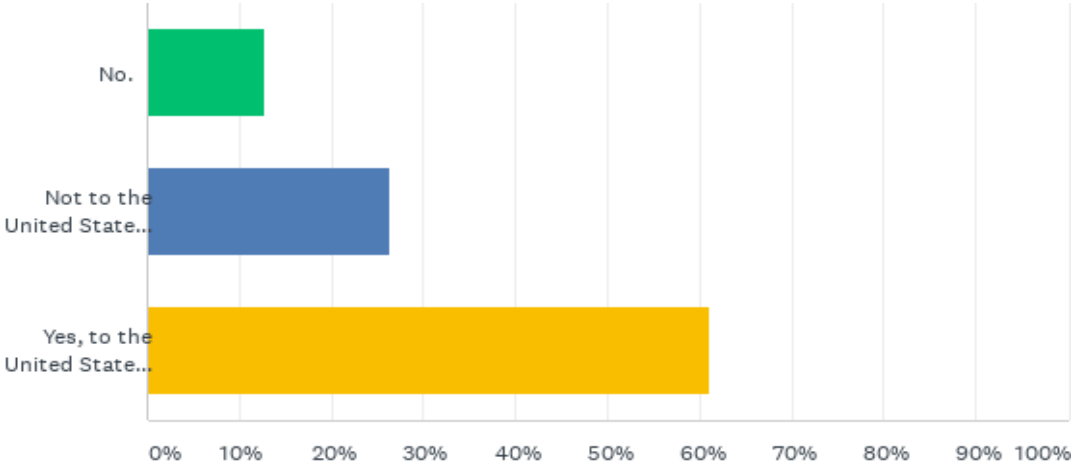
Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	50.85%	60
Agree	29.66%	35
Disagree	16.95%	20
Strongly disagree	2.54%	3
TOTAL		118

Q8: Do you see Climate Change as a potential existential threat?

Answered: 118 Skipped: 0



ANSWER CHOICES	RESPONSES	
No.	12.71%	15
Not to the United States, but yes to other countries/regions of the world.	26.27%	31
Yes, to the United States and to other global countries/regions.	61.02%	72
Total Respondents: 118		

Appendix C

DoD Top Ten Climate Consideration Mission Assurance Priority Installation List[1]

DEPARTMENT OF NAVY		Recurrent Flooding		Drought		Desertification		Wildfires		Thawing Permafrost		Weighted Sum		
Weighting Factor		3.75	3	2.5	2	1.25	1	3.75	3	1.25	1			
Installation	State	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current + Potential
Naval Air Station (NAS) Key West	FL	1	1	1	1	0	0	0	1	0	0	6.25	8	14.25
Naval Submarine Base (NSB) Kings Bay	GA	1	1	1	1	0	0	0	1	0	0	6.25	8	14.25
U.S. Territory - Naval Base Guam	Guam	1	1	1	1	0	0	0	1	0	0	6.25	8	14.25
Joint Base (JB) Pearl Harbor Hickam	HI	1	1	1	1	0	0	0	1	0	0	6.25	8	14.25
Wahiawa Annex	HI	1	1	1	1	0	0	0	1	0	0	6.25	8	14.25
Naval Magazine Indian Island	WA	1	1	1	1	0	0	0	1	0	0	6.25	8	14.25
Naval Base (NB) Coronado	CA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Naval Base (NB) San Diego	CA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Joint Base (JB) Anacostia Bolling	DC	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Washington Navy Yard	DC	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
U.S. Territory - Andersen AFB	Guam	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Naval Support Facility (NSF) Indian Head	MD	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Naval Air Station (NAS) Oceana	VA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Naval Station (NS) Norfolk	VA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Naval Support Activity (NSA) Hampton Roads	VA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Naval Support Activity (NSA) Hampton Roads - Northwest / (former) Naval Security Group Activity (NSGA) Chesapeake	VA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25

AIR FORCE		Recurrent Flooding		Drought		Desertification		Wildfires		Thawing Permafrost		Weighted Sum		
Weighting Factor		3.75	3	2.5	2	1.25	1	3.75	3	1.25	1			
Installation	State	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current + Potential
Hill Air Force Base (AFB)*	UT	1	1	1	1	1	1	1	1	0	0	11.25	9	20.25
Beale Air Force Base (AFB)	CA	1	1	1	1	0	0	1	1	0	0	10	8	18
Vandenberg Air Force Base (AFB)	CA	1	1	1	1	0	0	1	1	0	0	10	8	18
Greeley Air National Guard Station (ANGS)	CO	1	1	1	1	0	0	1	1	0	0	10	8	18
Eglin Air Force Base (AFB)	FL	1	1	1	1	0	0	1	1	0	0	10	8	18
Patrick Air Force Base (AFB)	FL	1	1	1	1	0	0	1	1	0	0	10	8	18
Joint Base (JB) Andrews	MD	1	1	1	1	0	0	1	1	0	0	10	8	18
Malmstrom Air Force Base (AFB)	MT	1	1	1	1	0	0	1	1	0	0	10	8	18
Tinker Air Force Base (AFB)	OK	1	1	1	1	0	0	1	1	0	0	10	8	18
Shaw Air Force Base (AFB)	SC	1	1	1	1	0	0	1	1	0	0	10	8	18
Joint Base (JB) San Antonio (aka JB Lackland / Sam Houston / Randolph)	TX	1	1	1	1	0	0	1	1	0	0	10	8	18

*Applies to Hill AFB Current & Potential Wildfire: Answers are only for installation sites within the main base. When associated ranges are included, answer is Yes.

ARMY		Recurrent Flooding		Drought		Desertification		Wildfires		Thawing Permafrost		Weighted Sum		
Weighting Factor		3.75	3	2.5	2	1.25	1	3.75	3	1.25	1			
Installation	State	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current + Potential
Fort Hood	TX	1	1	1	1	0	0	1	1	0	0	10	8	18
U.S. Southern Command Headquarters-Miami	FL	1	1	0	0	0	0	1	1	0	0	7.5	6	13.5
Military Ocean Terminal Concord (MOTCO)	CA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
National Ground Intelligence Center (NGIC) Charlottesville*	VA	1	1	1	1	0	0	0	0	0	0	6.25	5	11.25
Camp Roberts	CA	0	1	1	1	1	1	0	0	0	0	3.75	6	9.75
Reagan Operations Center-Huntsville	AL	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Pine Bluff Arsenal	AR	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Fort Gordon	GA	0	0	0	0	0	0	1	1	0	0	3.75	3	6.75
Fort Shafter	HI	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Fort Detrick	MD	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Fort Meade	MD	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Lake City Army Ammunition Plant (AAP)	MO	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Fort Bragg	NC	0	0	0	0	0	0	1	1	0	0	3.75	3	6.75
Military Ocean Terminal Sunny Point (MOTSU)	NC	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
White Sands Missile Range	NM	0	0	1	1	1	1	0	0	0	0	3.75	3	6.75
Watervliet Arsenal	NY	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
McAlester Army Ammunition Plant (AAP)	OK	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Fort Belvoir	VA	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75
Radford Army Ammunition Plant (AAP)	VA	1	1	0	0	0	0	0	0	0	0	3.75	3	6.75

*Applies to NGIC, Current Recurrent Flooding - Although the site did not experience flooding, flooding in the local area caused temporary loss of commercial water supply to the site.

Current = Historical occurrence
Potential = Likely to happen within next 20 years

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Vita

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