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Climate Security: A Pre-Mortem Scenario Planning Approach to Homeland Defense

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Reader Advisory

We recognize that a reader may find the scenarios and recommendations contained in this Article too outlandish or hyperbole. If this is the case, we ask that the reader reflect on current and recent events occurring in the U.S. and globally and the multitude of significant events that occur in any single year. Please consider the scenarios and recommendations in that context. Thank you for your consideration.

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Abstract

Climate change is a viable threat to U.S. homeland defense and the most significant risk facing the Department of Defense (DOD). The implications for the DOD include challenges for its primary mission, deterring war and protecting the security of our nation as well as its ancillary homeland defense, defense support to civil authorities, and foreign humanitarian assistance missions. A consensus of the scientific community affirmed by the U.S. intelligence community concludes that climate change is occurring, is relatively irreversible, and that aggressive mitigation of climate-change drivers is necessary. Climate-change impacts include surface-air temperature rise; sea level rise; potable water scarcity; drought; heat waves; fires; changes in precipitation patterns; disastrous changes in natural land cover and ocean chemistry; and an increase of the frequency and intensity of extreme-weather events. We argue that DOD is ill-prepared for the risks presented by climate change and that the Department has a duty to prepare for and securitize climate change *a priori* rather than *a posteriori*, as is typically the case for focusing events such as the nation's reactive responses to Pearl Harbor, the 9/11 terrorist attacks, and the current COVID-19 pandemic. Acting to prevent and mitigate future global warming now will result in lower military and societal costs and other benefits in the near term while providing for the security and prosperity of future generations To achieve climate security, the DOD must, in consonance with its domestic and foreign partners identify, acquire, and sustain the capabilities required to protect the nation from climate change and related threats.

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Introduction

Climate change is a critical threat to U.S. *homeland defense* (HD).[1] The scientific community has determined that climate change is the most significant challenge that humanity has faced in the Common Era (the last 2,000 years).[2] Global, regional, and local climate change impacts include mean surface air temperature rise; mean sea level rise; water scarcity; drought; heat waves; fires; changes in precipitation patterns; disastrous changes in natural land cover and ocean chemistry; increased erosion; and an increase of the frequency and intensity of extreme weather events. Climate change effects are likely to pose wide-ranging challenges to the Department of Defense (DoD) and its key partners, including heightened social, political, and economic tensions; loss of critical military infrastructure and outposts; increases in forced migrations, transnational crime, terrorism, and local, regional, and global competition; and conflict over limited resources including water, food, and energy.[3]

We argue that climate change is a *slow-moving disaster*[4] and that DoD and the nation are unprepared for the risks presented by climate change. DoD has a duty to prepare for and *securitize* climate change *a priori* rather than *a posteriori*, as is typically the case for *focusing events*[5] such as the nation's reactive responses to Pearl Harbor, the 9/11 terrorist attacks, and the current COVID-19 crisis.[6] Securitization in its traditional sense is the advancement of an issue to the highest levels of the national security agenda. Securitization of climate change, as used here, refers to the coordinated and sustained implementation of prevention, mitigation, and resilience measures necessary to permit the responsible management of risks inherent to climate change throughout DoD and all levels of U.S. governance.[7]

To achieve climate security, DoD must effectively partner with all elements of U.S. governance and especially members of the *homeland security enterprise* to identify, acquire, and

sustain the capabilities required to prevent, protect against, mitigate, respond to, and recover from climate change risks.[8] The homeland security enterprise's six missions, preventing terrorism, border security, and immigration enforcement; cyber security and critical infrastructure protection; preservation of the nation's prosperity and economic security; national preparedness and resilience; and workforce development[9] are inextricably linked with DoD's homeland defense (HD)[10], defense support to civil authorities (DSCA)[11], and foreign humanitarian assistance (FHA)[12] missions as well as the Department's primary mission to provide combat-credible military forces needed to deter war and protect the security of our nation and to sustain American influence abroad.[13] In this sense, DoD and the homeland security enterprise are entwined siblings with a *shared purpose*.[14] It is important to note that homeland security encompasses much more than DHS. While DHS has operational control of its 22 agencies, the same does not hold true for the State, local, and tribal governmental and private sector elements of the homeland security enterprise. Rather, the homeland security enterprise is a collaborative effort of its constituent parts to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risks to the nation.

We employed the scenario-based premortem method to identify potential impacts of climate change on DoD's mission space with a focus on the Department's HD, DSCA, and FHA missions. The method reframes problems to identify threats *a priori* rather than *a posteriori*, as in the case of an autopsy (postmortem). A premortem analysis is a management tool that is the hypothetical opposite of a postmortem in which the question "What *might* go wrong?" is evaluated instead of the postmortem question of "What *did* go wrong?" to anticipate potential problems that can be avoided. This scenario-planning process challenges key assumptions and provides insights into alternate future trajectories, and is a tool for anticipating and managing

change on an industrial or environmental scale.[15] The analysis demonstrated that while DoD has done much in the way of climate change preparedness, the Department and the nation remain unprepared for climate change.

The climate change scenarios included military tensions/conflicts in the Arctic and South America as well as multiple climate related disasters worldwide. In the aggregate, the post-mortem scenario planning exercise showed a degraded ability for DoD to achieve its overarching mission readiness. Our findings provide insights and policy recommendations to assist the DoD in mitigating risks inherent to climate change, including integrating climate change risks into core DoD strategies and policies and particularly HD, DSCA, FHA and DoD's partnerships with each of the 16 *critical infrastructure sectors*.[16]

Genesis and Scope

The genesis of this conference paper was the authors' recent journal Article, *Climate Security: A Pre-Mortem Approach to a Sustainable Global Future.* Employing a scenario-based premortem analysis, the authors identified potential impacts of climate change on the homeland security threat environment and found that the homeland security enterprise and the nation was unprepared to prevent, protect against, mitigate, respond to, and recover from climate change risks.[17] Notably, two U.S. Army scenario-based strategy papers, *Imagining Defeat in 2030: Mitigating Strategic Surprise to the U.S. Army by Envisioning the Worst* (2014) and *Implications of Climate Change for the U.S. Army* (2019) greatly informed the Article's methodology and scenario development.[18] The strategy papers and other DoD policies demonstrated the Army's strategic foresight as well as the implications of climate change for DoD and its key partners.[19] We applied the scenario-based premortem methodology to identify potential impacts of climate

change on DoD's mission capacity and resiliency and particularly its HD, DSCA, and FHA mission space. We did so with the homeland defense-homeland security nexus in mind.

Methodology

The authors developed a hypothetical climate change–induced scenario based upon DoD and the National Intelligence Council's (NIC) intelligence assessments, DoD and FEMA's national preparedness doctrines, climate change forecasts, and other sources.[20] Predicated on research that found that *prospective hindsight* — imagining that an event has already occurred increases the ability to correctly identify reasons for future outcomes by 30%; premortem analyses reframe problems to identify threats *a priori* rather than *a posteriori* as in the case of an autopsy.[21] Premortem analyses challenge key assumptions and provide insights into alternate future trajectories. Premortem analyses assume that an initiative has failed and asks participants to identify reasons why the initiative failed.[22]

Scenario-planning is a tool for anticipating and managing change on an industrial or environmental scale to reduce complex environments into manageable amounts of uncertainty.[23] Scenario-planning is not a forecasting tool; instead, it employs *possibilistic thinking* to provide accounts of what can conceivably happen. Possibilistic thinking is a conceptual tool that imagines future scenarios. The approach draws attention to the consequences of a potential event, permitting consideration of alternative future scenarios based on the consequences.[24] The approach is similar to counterfactual history, a form of historiography that attempts to answer "what if" questions from which historians attempt to understand what did happen based upon what did not happen.[25] The analogy is made here because history teaches us what we don't know can often hurt us…and hurt us badly.[26]

Slow Onset Disaster (2030-2040)

Even though the twenty-first century is still young, it is already marred by a pandemic, dotcom crash, terrorism, devastating financial collapse (twice), global conflict, the nation's longest war, unsettling climate change effects (e.g., Syrian Crisis and the evolution of the Islamic State), extreme weather, evolution of new viruses, cyber-attacks (e.g., Stuxnet and the Ukrainian Denial of Service attacks), a renewed Cold War dubbed the Second Cold War, and an evolving socio-political shift caused by lightning speed advances in technology. Compared with the twentieth century, the first two decades of the twenty-first century were as eventful and significant as the last 75 years of the previous century.[27] The twenty-first century promises to be more chaotic, unpredictable, and challenging, in large part due to the effects of a warming climate.

A dramatic increase in the number and intensity of extreme-weather events, public-health crises, supply-chain interruptions, large-scale critical-infrastructure failures, and the resultant competition for scarce resources and conflicts globally continue to strain U.S. national resources and DoD's deterrence and response capabilities. Cumulative effects become increasingly evident: diagnoses of and measures to deal with these issues become divisive. Governments worldwide struggle to balance energy and sustainability policies.

Various political-advocacy organizations resort to violence and terror tactics to advance their goals, which include access to water, food, energy, shelter, and basic medical needs in many parts of the world. Ethnically fractionalized regions descend into intractable conflicts over resource stresses, human migration, widespread desertification, and thawing permafrost. Political forces exploit those stresses to combat their adversaries. Demonstrations turn violent, incidents of global and domestic terrorism increase...crime rates soar.

Military posturing by Russia and China in areas of critical U.S. national interest including the Arctic and the South China Sea and vital shipping lanes draw heavily on DoD resources. Ongoing operations in the Middle East and Europe, sporadic threats from North Korea, Venezuela, and Iran, and crises in Afghanistan, India, Pakistan, and elsewhere draw heavily on DoD and U.S. and allied government resources.

Increased surface temperatures lead to chronic droughts and flooding worldwide. The unrelenting droughts and flooding result in widespread desertification and erosion that have long-lasting impacts on agriculture, energy production, public health and safety, and other facets of the economic, social, and cultural well-being of communities. Worldwide migration and refugee patterns exceed post-World War II era mass diasporas. Nationally, over twenty million people migrate from the Great Plains states northward towards Canada. The most recent severe acute respiratory syndrome coronavirus epidemic, COVID-39 (2039-2040), exacerbates an already desperate situation.

Nationwide applications for unemployment, welfare, and disability benefits and State disaster declarations exceed the COVID-19 pandemic. The implications are global in scope as U.S. food exports are limited, while at the same time, nearly all other nations also experience ultra-extreme weather, including record short-term precipitation, flooding, long-term droughts, and record erosion. U.S. gross domestic production is at an all-time low. The Risk and Insurance Management Society (RIMS) reports that globally 129,000 people lost their lives or went missing in disasters, while tens of millions were left homeless in 2039. Total economic losses exceed $8 trillion of which $3 trillion (a new historic high) was uninsured. News reports suggest a sense of *national trauma*.[28] The American Psychological Association reports a nationwide increase in post-traumatic stress disorder, depression, and anxiety and relays grave concerns

about the state of the nation's mental health. Suicide rates soar. Politicians, military leaders, government officials, civic leaders, and faith-based groups struggle to assuage a growing sense of impending catastrophe.

The 2040 National Preparedness Report warns that the nation's state of preparedness has degraded to a perilously low level. Highlights include 41 disasters exceeding $1 billion each in damages, including the COVID-39 epidemic, five Category 4 hurricanes along the East and Gulf Coasts, unprecedented wildfires in the Southwest, and critical infrastructure failures. The report notes multiple incursions on the USA–Mexico border requiring National Guard and DoD assistance that strain border security, immigration enforcement, and other federal resources. The 2040 Report identifies 12 persistent core-capabilities challenges: public health, emergency medical services, operational coordination, infrastructure, housing, economic recovery, cybersecurity, logistics and supply chain management, mass-care services, mass search and rescue, long-term vulnerability reduction, health and social services, and most importantly, community resilience.

The 2040 National Defense Strategy Commission (NDSC) warns that America's military power has degraded to an unacceptable dangerous level. Countering Russian and Chinese aggressions, maintaining military balances in Eastern Europe, the Middle East, and the Western Pacific; countering terrorists and non-state actors; maintaining cyber and space operations; as well as HD, DSCA, and FHA humanitarian missions have overwhelmed DoD's capabilities. The NDSC Report identifies five key challenges the first amongst those challenges is the strategic insolvency of the National Defense Strategy, its "means" are severely out of line with its "ends." Additional challenges include political dysfunction and concomitant mixed messaging to DoD

officials; adversarial *gray zone aggression*[29]; cyber and space operations; and nuclear proliferation.

Congress passes the Coronavirus-39 Aid, Relief, and Economic Security Act of 2040, a four trillion-dollar stimulus package to address the economic fallout. Economic watchdogs warn that the stimulus package, which doubled the amount of relief provided by the 2020 CARES Act, has weakened the U.S. and global economy from a point from which it may never fully recover.

The U.S. Intelligence Community's 2040 Worldwide Threat Assessment, the World Economic Forum's 2040 Global Risk Report, as well as the 2040 annual reports of RIMS and the three leading global reinsurers, Swiss Re, Munich Re, and Hanover Ruck paint a dire picture. We are witnessing the unimaginable. The near-term impacts of climate change add up to a "planetary emergency" that includes a great loss of human, animal, and plant life and unprecedented geopolitical and socio-economic consequences.

Pax Americana Collapse (2040)[30]

A seemingly endless sequence of climate change–induced crises has left an indelible mark on homeland defense and security and the fabric of American culture. The new norm is perpetual emergency declarations exacerbated by failing critical infrastructure resulting in increasing supply-chain and lifeline service interruptions. These following 2040 events lead to dystopian-like conditions and a desperate call for immediate and sustained action.

January to August-The Great 2040 Flood. The U.S. experiences its wettest winter on record and intense rainfall occurred in the spring and summer along the Missouri, Upper Mississippi, Arkansas, White and Ohio Rivers followed by catastrophic floods throughout the entire Mississippi River basin. Flooding begins March 3rd and continues through August 30th (181 days), a record setting flood duration, eclipsing the previous record of 145 days experienced

during the Great Flood of 2019.[31] Flooding causes at least 64 deaths and billion-dollar losses in 22 of the 31 states within the Mississippi River watershed, with damages exceeding $57 billion. Flood damages totaling $24.6 billion were reported in the 11 states bordering the Mississippi River.[32]

In addition to property damage, crop losses, and significant infrastructure damages, commercial navigation on the Mississippi River is interrupted repeatedly by high currents, low bridge clearances, closed locks, and damaged docks. Shipments of agricultural commodities, military supplies, and other goods are interrupted, adding to the economic stress of crop losses, property damage, and business interruption caused by flooding. As of June 2040, grain shipments to export terminals in Louisiana are 44% lower than in same period in 2039. The National Guard is deployed for assistance with rescues and humanitarian assistance and distribution of food, water, and essential supplies in 19 states. FEMA reported an inability to adequately serve those in need and process applications for relief.[33]

The Coast Guard and U.S. Army Corps of Engineers struggle to address multiple river closings and navigation accidents involving damaged aids to navigation (buoys, beacons, fog signals) that facilitate the safe navigation of the Mississippi River. A chemical transport barge carrying 1100 tons of compressed liquified chlorine collides with the I-74 bridge spanning the Mississippi River and separating Davenport, Iowa and Moline, Illinois. The collision ruptures several chlorine tanks, resulting in a chlorine gas plume directly over Rock Island Arsenal (home of the First Army), Moline's Broadway National Historic District, and Davenport's Hamburg Historic District. The leak lasts for three days. The Rock Island Arsenal suffers 34 military and 70 civilian support personnel fatalities, over 130 severe injuries, and over 350 hospitalizations. The First Army's Deputy Commanding General for Operations and Command Sergeant Major

are killed, and the Commanding General is severely injured. The surrounding communities in Moline and Davenport suffers 120 fatalities, 400 severe injuries, and over 800 hospitalizations. The Rock Island Arsenal, Moline, and Davenport emergency capabilities are quickly defeated, requiring mutual aid hazardous materials from Cedar Rapids, Indianapolis, Iowa City, Chicago, Milwaukee, and elsewhere. The National Guard's 5th, 54th 55th, 71st, and 73rd Civil Support Teams (Chemical, Biological, Radiological, Nuclear, and Explosive specialists) were dispatched to assist. Economic losses exceed $230 billion.

March to November-Panama Canal Crisis. Rising temperatures, droughts, and mosquito infestations plague Panama. Recurrent climate change induced droughts threaten Panama Canal operations. Lake Gatun, an artificial lake that mediates the canals, locks, and passageways' water supply as well as providing drinking water to Panama City, sinks to 23 meters (norms 26 meters in the dry season). Lake Gatun experiences increased salinity levels. The Panama Canal Authority imposes draft limits on ships, forcing many of the ships to lighten their loads so they will not run aground. This has resulted in hundreds of millions of dollars of lost revenues for the Authority.

At the same time, the maritime trade industry, enticed by the extended Northwest Passage season, begin to bypass the Panama Canal resulting in further losses of revenue. Exacerbating Panama's situation, warmer temperatures result in an increase in mosquito infestations leading to resurgent malaria outbreaks. China, sensing an opportunity to extend its global reach, negotiates a multi-billion-dollar trade agreement with Panama. The U.S. Intelligence Community and Department of State assesses the China-Panama trade agreement to be nothing short of gray zone aggression that threatens the balance of power in the region.

May to October-Summer Heat Stroke. An oppressive summer heat wave results in at least 2,800 heat-related deaths and 50,000 hospitalizations in the United States. Military service members experience over 900 incidents of heat stroke and 6,200 diagnoses of heat exhaustion. Heat stroke is most common for male soldiers less than 20 years of age, primarily recruit trainees and those in combat-specific occupations. Annual rates of incident heat stroke diagnoses in the military increase steadily between 2034 and 2040. The 2040 summer forces the closure of all but three military recruit basic training facilities[34], leaving only the Cape May, New Jersey (Coast Guard); Great Lakes Naval Training Center (Navy); and Waynesville, Missouri (Army) training facilities available for training recruits for military service. The effects prevent recruits from entering the military for 4 months. The increased use in energy for air conditioning forces rolling blackouts in the West, South, Southwest, Midwest, and Northeast, affecting military installations. The lack of recruiting, training, and ability to maintain operations hinder military readiness, further straining an already stressed military.

Understaffed hospitals and public-health agencies struggle to care for the surge of heat-wave–related victims. Public health officials in Puerto Rico and the Gulf Coast states report a sudden uptick in vector-borne diseases including Zika, which are attributed to increased temperatures and humidity levels and a longer growing season. Outdoor work and recreation schedules are modified nationwide. Energy demands result in large-scale blackouts in Baltimore, Washington DC, Philadelphia, Chicago, New York, Dallas-Fort Worth, Houston, San Antonio, Greater Los Angeles, the San Francisco Bay Area, San Diego, and other major metropolitan areas nationwide. Public sentiment on the use of fossil fuels forces the closure of over half of the nation's 60 coal fired power plants, straining the nations already overtaxed electrical utility providers.

Food and water shortages abound. Videos of looters fill the evening news and social media outlets. Major League Baseball postpones multiple outdoor day games and considers a modified schedule for the remainder of the season. The National Basketball Association delays the playoffs due to the rolling blackouts. The Southwest experiences a historic wildfire season and a California electrical utility provider turns off power to millions of homes and businesses several times when high winds are forecasted, resulting in billions of dollars in losses. The West Coast's power grid collapses, and the main electrical provider for the state of California indicates that there will be intentional rolling blackouts and power outages for at least the next decade. The lack of reliable and constant electrical energy strains the communications, public health, manufacturing, chemical, water, and emergency service critical infrastructure sectors nationwide. Economic damages exceed $198 billion.[35]

June-Arctic Security Crisis. With the continued retreat of Arctic sea ice and a greatly reduced maximum Arctic sea ice cover, the Arctic Ocean has become a viable yet precarious corridor for maritime traffic. While the Northern Sea Route (NSR), along the Northern Coast of Russia, has seen an increase in traffic, it has not been without incident. Once thought to have been nothing more than a fantasy, the Transpolar Sea Route (TSR), likewise, has become reality with a dramatic increase in maritime activity.

The U.S. was unprepared and lacked capability to respond adequately to events within the Arctic and as a result finds itself in the midst of a Great Powers competition. With an increased amount of maritime traffic via the TSR, cruise companies capitalize on the prospects of conducting a voyage on this newly year-round route. In June, an ice class cruise ship takes on passengers in Anchorage and transits North through the Bering strait before experiencing mechanical problems approximately 300 nautical miles north of Utqiagvik (formerly known as

Barrow). As the mechanical problems prove to be more severe than initially thought, the cruise ship declares an emergency and begins evacuating 500 passengers and 200 crew.

The United States Coast Guard (USCG) summer operating base in Utqiagvik supports the initial evacuation with the two helicopters assigned on location. Recognizing the need for additional evacuation and life support needs, the DoD via U.S. Alaskan Command (as a Sub-Unified Command of U.S. Northern Command), the state of Alaska, and its National Guard capabilities are mobilized to support the effort. Issues immediately begin to develop as numerous organizations from DoD, the Alaska National Guard (AKNG), and others begin to converge in Utqiagvik, a community which has already been devastated due to coastal erosion and the latent effects of permafrost thaw. With a second stage of Native Alaskan community relocation in progress, the sudden influx of DoD, DHS, State of Alaska, and aid organizations (American Red Cross and others) has significant and unintended consequences.

As the resources meant to provide sustainment for the local community are procured by visiting organizations in support of the evacuation, the native population's resources are exploited, impacting every household. Further complicating the matter are the ongoing concerns that neither the state nor federal authorities have provided the support necessary to assist the native community in its ongoing relocation effort. The friction proves significant enough to cause community push back on any further efforts to support the rescue effort until food stocks and other sundry items, which are stockpiled locally for long-term sustainability of the community, are replenished.

On an almost daily basis, the Russian Coast Guard and the USCG communicate regarding the life rescue coordination requirements of the two nations. The lines of communication between the two maritime safety organizations remained stable over time, unlike

those of defense related consequence. As such, the USCG becomes the primary coordinator for the incident, although a DoD Joint Task Force (JTF) as part of DSCA efforts has been established to oversee the rescue. With the coordination well underway prior to the establishment of the JTF, the Russian Coast Guard indicate that it is willing to support evacuation operations in the wake of the crisis and subsequently mobilize both a Russian and Chinese vessel in the area to respond. Those rescued are evacuated to a Russian military installation on Wrangel Island,[36] which has been upgraded recently with the construction of a port to support NSR maritime activity.

August to October-Hurricane Wilfred. A category-5 hurricane with sustained winds of over 160 miles per hour strikes Puerto Rico, the U.S. Virgin Islands, Haiti and the Dominican Republic with devasting effects. All four are left without power for over two weeks with parts of Puerto Rico, Haiti, and the Dominican Republic not regaining power for months. The death tolls in Puerto Rico and Haiti exceed 18,000 and 4,200 people, respectively, and damages exceed $100 billion dollars. DoD's DSCA missions to Puerto Rico and the Virgin Islands and FHA missions to Haiti and the Dominican Republic further strain DoD's capabilities and supply chain.

August to December-Border Crises. Climate-induced conflict in the Northern Triangle countries (Guatemala, Honduras, and El Salvador) results in an exodus of over one million refugees who caravan through Mexico seeking refuge in the United States. Mexican and U.S officials attempt to stem the tide by stabilizing the beleaguered nations.

DoD, DHS, and the Department of State (DoS) commence *Operation Stabilize Northern Triangle*, an interagency initiative that includes military and foreign aid. Climate-induced dengue fever outbreaks in Northern Mexico exasperates the crisis. Mexican and U.S. public health

officials struggle to contain the outbreaks that impact the Mexican populace as well as the Northern Triangle refugees many of whom have been housed in makeshift tent cities. Desperate migrants coalesce at border crossings in Texas, New Mexico, and California. Multiple groups of up to 1,000 migrants each storm the border crossings and overwhelm Customs Border Protection and Border Patrol officials. National Guard, Coast Guard, and military units rush to the land and maritime borders to provide support. Several border crossings are temporarily closed.

The border closings coupled with confusion over the contagiousness of dengue fever, kindled in part by anti-immigrant extremists, hampers relief efforts. At the same time, emerging Mexican drug cartels seize the opportunity to challenge their rivals, sparking a cartel war that results in hundreds of casualties on both sides of the border. U.S. and Mexican officials decide the time is right to fully engage the drug cartels. DoD is instructed to mobilize the necessary forces in support of *Operation Halibut*, a U.S.-Mexican military and law enforcement initiative to defeat the drug cartels.

November-Typhoon Ophelia. A category-4 typhoon with sustained winds of over 170 miles per hour devastates Guam and outlying areas in the Mariana islands. The vast majority of Guam is left without power for over two weeks and thousands of Guamanians are left homeless. Critical supplies including water, food, and medicine are in short supply.

Anderson Air Force Base and ancillary aircraft are badly damaged. Fortunately, accurate storm forecasting allowed the Air Force to relocate aircraft prior to storm landfall. Damaged airfields degrade Indo-Pacific Command's (INDOPACOM) long range capabilities in the short term. In addition, storm winds destroy multiple submarine sea cable landing stations, causing significant internet disruptions that interfere with military and critical civil defense

communication systems. Repairs of the sea cables reveal covert wiretapping devices. U.S. intelligence officials suspect that Chinese military/intelligence officials placed the wiretapping devices and fear that other parts of the international submarine sea cable system may be compromised.

DoD Climate Change Policy Assessment

Prior to assessing DoD's level of climate change preparedness for the 2030–2040 scenario, we examined the Department's overarching assessment of environmental security and particularly climate change through the lens of the Quadrennial Defense Review (QDR) process and related DoD documents.[37] The 1997 *Report of the Bottom Up Review* (BUR) called for the performance of defense operations in an "environmentally responsible manner." The most notable threat to U.S. security to which DoD must respond were global in nature, such as warming, ozone depletion, loss of biodiversity, and nuclear proliferation.[38] The BUR was followed by a 2003 Pentagon funded study, *An Abrupt Climate Change Scenario* which recognized that global warming could impact the Earth's human carrying capacity and destabilize the geopolitical environment.[39]

The 2001 and 2006 QDRs did not identify environmental security or climate change concerns per se. The 2010 QDR noted and called for additional environmental stewardship at DoD installations as well as international environmental security initiatives such as the Defense Environmental International Cooperation Program which promoted environmental security.[40] The 2014 QDR and DoD Directive 4715.21 *Climate Change Adaptation and Resilience* (2016) identified climate as a significant threat to national security and particularly as a threat multiplier that would exacerbate competition for scarce resources and aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions.[41] Environmental

security and climate change were not noted per se in the most recent QDR, the 2018 *National Defense Strategy*.[42] In addition, the following DoD documents provided specific climate change policy and guidance:[43]

- Implications of Climate Change for the U.S. Army (2019),[44]
- The Operational Environment and the Changing Character of Warfare (2019),[45]
- Climate Adaptation for DoD Natural Resource Managers (2019),[46]
- Report on Effects of a Changing Climate to the Department of Defense (2019),[47]
- Report to Congress: Department of Defense Arctic Strategy (2019),[48]
- The United States Navy: Strategic Outlook for the Arctic (2019),[49]
- U.S. Coast Guard. Arctic Strategic Outlook (2019)[50] (*non-DoD),
- Department of Defense High Performance and Sustainable Buildings (2019),[51]
- Climate Change: Installation, Adaptation, and Resilience (2017),[52]
- Department of Defense Strategic Sustainability Performance Plan (2015),[53]
- Department of Defense Climate Change Adaptation Roadmap (2014),[54]
- Army Corp of Engineers Climate Change Adaptation Statement (2011),[55] and
- U.S. Navy Climate Change Roadmap (2010).[56]

Collectively, the documents directed DoD to:

1. Identify and assess climate change impacts on DoD missions, infrastructure, and personnel,
2. Consider and integrate changes in doctrine, organization, equipping, and training to anticipate changing environmental requirements,
3. Assess and build DoD resources' adaptive capacity to climate change impacts,

4. Leverage existing partnerships with other federal agencies, state governments, local governments, nongovernmental organizations, and local communities as well as international partners to increase preparedness and resilience,
5. Ensure DoD's supply chain continuity and resilience, and
6. Ensure the safety, stability, security, and environmental protection of the Arctic.

Also worth noting are four ambitious DOD climate change initiatives that strive to ensure that the U.S. military meets its energy needs while minimizing the climate impacts of its environmental footprint. The initiatives are the 2020 DOD base and infrastructure survey,[57] the Navy's Great Green Fleet[58], the Army's New Zero initiative,[59] and the Air Force' Energy Flight Plan.[60]

Great Powers Climate Change Assessment

Climate change will impact every nation, albeit in different degrees and time horizons. Key stakeholders on the Great Powers stage with the ability to effect change in the climate security domain include members of the U.N. Security Council, G-20, G-8, and the Arctic Council. Member states will experience similar climate change challenges as the U.S. In particular, their militaries will be called upon to conduct more nontraditional/ancillary missions similar to DoD's HD, DSCA, and FHA missions. The nontraditional/ancillary missions will similarly drain and strain the Great Power's military capabilities.

Russia and China and the Arctic merit special attention. As illuminated by the 2017 National Security Strategy and the 2019 Worldwide Threat Assessment, both nations have reemerged on the Great Powers stage.[61] Russia and China may see the global impacts of climate change as an opportunity to elevate their status in world affairs. The Arctic region is on the front lines of climate security. Climate change induced Arctic sea ice decline will likely further warm

the planet.[62] At the same time, the sea ice decline has rendered the waterways more navigable and accessible for fossil fuel exploitation, fishing, natural resources, and rare earth minerals.

Russia, a former Cold War superpower, is reasserting itself globally. Recent offensive cyber and gray zone operations, conflicts in Georgia and the Ukraine, and its Arctic buildup as well as interference in the 2016 U.S. election are emblematic of Russia's reemergence.[63] The Arctic buildup including military maneuvers and the reoccupation of as many as 50 former Soviet air-basses, radar stations, border posts, and rescue stations in the region illuminate the Kremlin's security posturing. The buildup enhances Russia's homeland defense, secures its economic future, and creates a staging platform from which it can project power.[64] Moreover, the Arctic buildup underscores the strategic value of the Northern Sea Route (NSR) which is a critical part of the Northeast Passage and geolocated in Russia's Exclusive Economic Zone (EEZ).[65] The NSR, controlled by Russia by virtue of its EEZ claims poses challenges to international maritime shipping and DoD's Freedom of Navigation Operations (FONOPS).[66]

China's rapid emergence as a Global Power includes an on-going trade war with the U.S. and the West, cyber and gray zone aggressions, and aggressive naval behavior in the South China Sea as well as recent encroachments in the Arctic depict China's military and political posturing.[67] China published its first Arctic Strategy in 2018, asserting that they are a "Near Arctic" state, and that they were signatories to both the Spitbergen Treaty and U.N. Convention of Life at Sea treaty and, therefore, have significant rights and interest in the region.[68] In 2019, U.S. Secretary of State Michael Pompeo identified China's Arctic Strategy and naval activity in the region as a hazard to security in the North Atlantic and Sino-U.S. relations. Pompeo noted that China had observer status rather than member status in the Arctic Council. He suggested that China's previous aggressive investments in foreign infrastructure in Sri Lanka, Malaysia, and

Ethiopia had been a prelude to manipulative and even predatory nation state influence. Moreover, China's Arctic Strategy and activities might be a similar attempt to assert influence in the region.[69]

Though a microcosm of geopolitical and military affairs, Arctic security provides prescient insights into the climate change challenges that lie ahead for the DoD. The threat landscape will continue to evolve precipitously, and the Department will be asked to do more with less (resources).

Discussion and Recommendations

DoD has a duty to prepare for climate change. To achieve climate security, DoD must effectively partner with all levels of U.S. governance and particularly the homeland security enterprise to acquire, and sustain the capabilities required to prevent, protect against, mitigate, respond to, and recover from climate change risks. The recommendations were informed by our premortem scenario exercise and policy analysis as well as a consensus of the scientific community, which was summarized by Mora et al. as "climate change will pose a heightened threat to humanity that will be greatly aggravated if substantial and timely reductions of GHG [greenhouse gasses] emissions are not achieved."[70] GHGs are gases including carbon dioxide (CO2), methane (C4), nitrous oxide (N20), and other fluorinated gases that trap heat in the atmosphere.[71] Anthropogenic GHGs are the dominant driver of recent global warming.[72]

Many of the recommendations mirror recommendations made by the authors in a previous work, *Climate Security: A Premortem Approach to A Sustainable Global Future,* which focused on the homeland security enterprise. This study and its recommendations focused on DoD and particularly its HD, DSCA, and FHA missions. Many of the recommendations were based upon past and current DoD strategies and policies as well as the extraordinary work of the

Center for Climate and Security on climate change implications for national and homeland security.[73] The implications of climate change are far too extensive to be fully addressed here, and the following recommendations are intended to be useful guidelines and tools to mitigate climate change's systemic risks to the DoD and the nation, earth, and humanity itself.

Some of the recommendations made here require the will of the highest levels of U.S. governance, that is the White House and Congress, their subordinate Departments, and U.S. partner nations' governing bodies. DoD leadership, however, has a duty to assess all military and related threats and to report findings to the White House, Congress, and in certain cases to NATO and other allies. All of the recommendations require an all-of Nation as well as an international effort. Considering the successes and failures of past, current, and evolving national and international collaborative efforts for international peace and prosperity, the recommendations require shared goals and sacrifices and unprecedented cooperation, coordination, and collaboration.

1. **DoD's climate change actions should be part of a comprehensive national climate security strategy premised on *sustainable development* and national and homeland security realities.** A National Climate Security Strategy and related legislation is the purview of the Executive and Legislative branches of the federal government, respectively. As such the recommendation is directed at the whole of Nation which includes the private sector. Sustainable development used here refers to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[74] The strategy should:
    - Include environmental policies and technologies that balance human security with energy, economic, political, and military realities,

- Implement responsible and sustainable land management and use policies to combat desertification,
- Be *ecocentric* in nature, a perspective that places intrinsic value on all living organisms and their natural environment, regardless of their perceived usefulness or importance,[75]
- Protect those that Randall Abate's *Climate Change and the Voiceless* refers to as the *voiceless* - future generations, wildlife, and natural resources,[76] and
- Prioritize climate change risk communication among all stakeholders.[77]

2. **Integrate prevention and mitigation of and response to systemic climate change risks into the National Defense Strategy.**
3. **Reassess DoD's military and civilian workforce numbers and qualifications for all branches and reserve units.** The assessment should consider DoD's future HD, DSCA, and FHA force requirements with respect to climate security along with DoD's overarching force needs.
4. **Align DoD's HD, DSCA, and FHA mission capabilities with the threats and consequences inherent to climate change.**
    - Update the *Strategy for Homeland Defense and Defense Support to Civil Authorities* to reflect DoD's expanded role in disaster prevention and response activities as well as the use of the military to execute civilian law. Include DHS, FEMA, the Department of Justice, and the National Guard in the planning process and especially with respect to personnel and resource capabilities and *Posse Comitatus* guidance,[78]

- Update *Joint Publication 3-29: Foreign Humanitarian Assistance* to reflect DoD's expanded role in international disaster response activities. Include the Department of State and the US Agency for International Development (USAID) in the planning process,
- Work with DHS to update the *National Response Framework (NRF)* to integrate DoD resources more fully into the NRF, and
- Work with DHS to update the *National Infrastructure Protection Plan* (NIPP) to prioritize DoD bases and related infrastructure. Include the USACE, National Council of Information Sharing Centers, the American Society of Civil Engineers, and other stakeholders in the planning process.

5. **Support allied and partner-nation resilience to climate change risks in strategically significant regions.**
   - Reduce climate change drivers of instability, such as water and food insecurity and desertification,
   - Strengthen allied and partner-nation capabilities and adaptive capacity to withstand destabilizing climate impacts, and
   - Support the reduction of climate change risks to regional and global security through strategic engagements and investments.

Conclusions

> *Politics or ideology must not get in the way of sound planning. Our armed forces must prepare for a future with a wide spectrum of possible threats, weighing risks and probabilities to ensure that we will continue to keep our country secure. By taking a proactive, flexible approach to assessment, analysis, and adaptation, the Defense Department will keep pace with a changing climate, minimize its impacts on our missions, and continue to protect our national security.*
>
> −Charles Hagel, Secretary of Defense, 2014

The thoughts and opinions expressed in this paper are those of the author and do not necessarily reflect the official policy or position of NORAD and USNORTHCOM, the Department of Defense, or the U.S. Government.

The guiding principle of this study was to explore the potential effects of climate change on DoD and particularly its HD, DSCA, and FHA missions. We conclude that DoD and the nation have a duty to prepare for, prevent, and mitigate climate change risks and integrate climate security into our daily fabric. The scientific community's findings, that without substantial and aggressive prevention measures, mitigation efforts, and reductions in GHG emissions, our planet will experience substantial and far-reaching existential impacts, are credible. Prudent risk management suggests that DoD should work to avoid the catastrophic outcome and prepare for and mitigate climate change.

Our analysis demonstrated that climate change poses an existential threat to the United States and the international community and that DoD and the nation are unprepared to prevent, protect against, mitigate, respond to, and recover from climate change risks. We would be remiss, however, if we did not note the many laudable efforts that DoD has made with respect to integration of climate change into its strategic and operational planning. DoD and the nation must push the boundaries of current research so we can better understand the potential implications of climate change. DoD must imagine the unimaginable and then act accordingly.

The thoughts and opinions expressed in this paper are those of the author and do not necessarily reflect the official policy or position of NORAD and USNORTHCOM, the Department of Defense, or the U.S. Government.

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[1] Homeland defense is the protection of US sovereignty, territory, domestic population, and critical infrastructure against external threats and aggression or other threats, as directed by the President of the US." Joint Publication 3-27: Homeland Defense. (Washington, DC. U.S. Department of Defense).

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[8] The enterprise describes "the collective efforts and shared responsibilities of Federal, State, local, tribal, territorial, nongovernmental, and private sector partners—as well as individuals, families and communities—to maintain critical homeland security capabilities." The term "homeland security enterprise" is synonymous with "whole-of-community" and "all-of-nation" and their approaches to homeland security. U.S. Department of Homeland Security, *Quadrennial Homeland Security Review: A Strategic Framework for a Secure Homeland* (Washington, DC: U.S. Department of Homeland Security, 2010); U.S. Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review;* U.S. Department of Homeland Security, *National Preparedness Goal* (Washington, DC: U.S. Department of Homeland Security, 2015).

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