

A SECURITY THREAT ASSESSMENT OF GLOBAL CLIMATE CHANGE

HOW LIKELY WARMING SCENARIOS INDICATE A CATASTROPHIC SECURITY FUTURE

PRODUCED BY
THE NATIONAL SECURITY, MILITARY, AND INTELLIGENCE PANEL ON CLIMATE CHANGE (NSMIP)

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Front cover image: Soldiers from the Florida National Guard's Alpha Battery, 1-265th Air Defense Artillery, perform high water search and rescue with members of the Coast Guard, St. Johns Fire Rescue, first responders, in Flagler Estates, Florida. (Photo by Ching Oettel/The National Guard/Flickr).

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An International Security Threat Assessment of Two Warming Scenarios Conducted
by U.S. National Security, Military and Intelligence Professionals

FEBRUARY 2020

Hon. John Conger

Director, Center for Climate and Security
Former Principal Deputy Under Secretary of Defense
(Comptroller), U.S. Department of Defense (DoD)

Francesco Femia

Co-Founder, The Center for Climate and Security
Research Director, The Council on Strategic Risks

Hon. Sherri Goodman

Senior Strategist and Advisory Board Member, Center
for Climate and Security
Secretary General, International Military Council on
Climate and Security (IMCCS)
Former Deputy Undersecretary of Defense
(Environmental Security), U.S. Department of Defense

Kate A. Guy

Senior Research Fellow, Center for Climate and Security
Panel Chair and Principal Investigator

Rear Admiral Leendert “Len” Hering Sr., USN (Ret.)

Advisory Board Member, Center for Climate and
Security
Former Commander, Naval Surface Group Pacific
Northwest, Navy Region Northwest, and Navy Region
Southwest

Alice C. Hill

Advisory Board Member, Center for Climate and
Security
Former Special Assistant to the President and Senior
Director for Resilience, National Security Council

Lieutenant General Arlen D. Jameson, USAF (Ret.)

Advisory Board Member, Center for Climate and
Security
Vice Chairman of the Air Force Academy’s Board of
Visitors
Former Deputy Commander-in-Chief of U.S. Strategic
Command

Ambassador Richard D. Kauzlarich

Distinguished Visiting Professor, George Mason
University
Former National Intelligence Officer for Europe, and
former U.S. Ambassador to Azerbaijan and Bosnia and
Herzegovina

General Ronald Keys, USAF (Ret.)

Advisory Board Member, Center for Climate and Security
Former Commander, Air Combat Command
Chairman, CNA Military Advisory Board

Dr. Marcus D. King

Senior Fellow and Advisory Board Member, Center for
Climate and Security
John O Rankin Associate Professor, and Director of the
Master of Arts in International Affairs Program (MAIA),
Elliott School of International Affairs, George Washington
University

Dr. Rod Schoonover

Advisory Board Member, Center for Climate and Security
Founder and CEO, Ecological Futures Group
Former Senior Analyst and Senior Scientist, Bureau of
Intelligence and Research, U.S. Department of State and
as Former Director of Environment and Natural Resources
at the National Intelligence Council (NIC)

Joan D.B. VanDervort

Advisory Board Member, Center for Climate and Security
Former Deputy Director for Ranges, Sea and Airspace,
Office of the Deputy Assistant Secretary of Defense
(Readiness)

Swathi Veeravalli

Advisory Board Member, Center for Climate and Security
Interdisciplinary Research Scientist, Geospatial Research
Laboratory, Engineer Research and Development Center,
US Army Corps of Engineers

Caitlin E. Werrell

Co-Founder, The Center for Climate and Security
Research Director, The Council on Strategic Risks

Admiral Paul Zukunft, USCG (Ret.)

Advisory Board Member, Center for Climate and Security
Former Commandant, U.S. Coast Guard

TABLE OF CONTENTS

EXECUTIVE SUMMARY	6
INTRODUCTION	14
THE CLIMATE SECURITY NEXUS	18
REGIONAL CLIMATE SECURITY THREAT ASSESSMENTS	24
AFRICOM: AFRICA	29
CENTCOM: MIDDLE EAST AND CENTRAL ASIA	35
EUCOM: EUROPE AND RUSSIA	40
INDOPACOM: INDO-ASIA-PACIFIC	46
NORTHCOM: NORTH AMERICA AND POLAR REGIONS	52
SOUTHCOM: SOUTH AND CENTRAL AMERICA AND THE CARIBBEAN	58
GLOBAL CLIMATE SECURITY THREAT ASSESSMENT	64
GLOBAL CLIMATE SECURITY THREAT PROFILE	71
CONCLUSION	72
<hr/>	
ANNEX: SCENARIO METHODOLOGY	73
REFERENCES	75

EXECUTIVE SUMMARY

As national security, military and intelligence professionals with decades of experience, we have dedicated our careers to anticipating, analyzing and addressing security threats to the United States, with the goal of protecting all citizens from harm. That includes threats ranging from the proliferation and use of nuclear weapons, to the likelihood of terrorist attacks striking our shores.

With this report, we set out together to fully assess one of the most pressing threats to both national and global security in the 21st Century - climate change.

Climate change is an evolving and multidimensional threat, caused by no single actor, but perpetuated by current human systems of energy, transportation, agriculture, and resource use. According to the world's top empirical research, the impacts of climate change have the potential to destabilize human life at all levels. Using our unique expertise in the national security, military and intelligence fields, we assess the risks posed by climate change through a security lens.

Based on our research, we have determined that even at scenarios of low warming, each region of the world will face severe risks to national and global security in the next three decades. Higher levels of warming will pose catastrophic, and likely irreversible, global security risks over the course of the 21st century.

KEY FINDINGS

- If global emissions are not reigned in, the world will experience destabilizing changes in both the near and medium-to-long terms which pose significant threats to security environments, infrastructure, and institutions.
- At low levels of warming, the areas hit the hardest are those that are already the most vulnerable: dry and arid regions, least-developed countries, small island states, and the Arctic polar region. These are areas of significant military engagement, and climate impacts threaten to further destabilize these fragile regions.
- Northern, industrialized regions will also face significant threats at all levels of warming. In longer term, high emissions warming scenarios, these countries could experience catastrophic security risks, including high levels of migration and a breakdown of key infrastructure and security institutions.
- The world is currently on track for a high level of global average warming, and our emission trajectory is proceeding. Even proposed international commitments, like those made under the Paris Climate Agreement, are not nearly commensurate to contain the threat.
- Without concerted efforts at both climate change mitigation and adaptation, we risk high-impact and catastrophic threats to our collective and national security.

On current, high-end emissions trajectories, warming levels could reach between 2.3 and 4.1°C / 5.0 and 7.4°F above pre-industrial temperature levels by the end of the century. Even if all existing climate policies are implemented, we are on track to increase global temperatures by as high as 3.2°C/5.8°F by the end of the century.^{1 2 3}

These ranges represent a wide span of potential climate futures, in which humans could mitigate emissions to contain warming to the lower end of the threat spectrum or allow relatively unabated actions to warm the planet to even more dangerous thresholds. On current emissions trajectories, global warming levels could reach 2°C/3.6°F as soon as mid-century and 4°C/7.2°F as soon as the end of the century.^{4 5}

Climate change will have significant impacts on security across the globe but is dependent on our actions in the decades ahead. Thus, it is vital that the security and policy-making communities begin to analyze the implications of various warming levels, comparing the effects expected in near-term, low warming scenarios with long-term, high warming scenarios.

This report synthesizes the latest in both climate science and security analyses to offer **a threat assessment of global climate change**. Its key products include:

1. An overview of how climate change interacts with physical, social and political systems to create or intensify security threats (“The Climate Security Nexus,” p. 18).
2. A synthesis of the climate security threats impacting each region of the globe (“Regional Climate Security Threat Assessments,” p. 24), divided by U.S. Geographic Combatant Commands.
3. An assessment of intersecting global threats (“Global Climate Security Threat Assessment,” p. 64), and a threat profile for global climate change (“Global Climate Security Threat Profile,” p. 71).

These analyses present a detailed, sobering picture of the future of global security under climate change. We hope that these scenarios will energize the security community to immediately mitigate these risks, and support policies that: achieve net-zero global emissions as quickly as possible; build resilience to current and expected impacts; and integrate climate considerations across all areas of security planning.



FLORIDA NATIONAL GUARD RESPONDS TO HURRICANE IRMA, 2017.

CHING OETTEL/THE NATIONAL GUARD

CLIMATE SECURITY THREAT PROFILES AND ASSESSMENTS

This report compiles separate threat profiles and threat assessments for each region of the world, under two scenarios of warming in the 21st Century – ‘Near Term’ and ‘Medium-Long Term.’

NEAR TERM SCENARIO (1-2°C WARMING)	MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)
Temperature: Global average temperature rises between 1 - 2°C / 1.8 - 3.6°F.	Temperature: Global average temperature rises between 2 - 4°C / 3.6 - 7.2°F, or higher.
Timeframe: Between now and 2050; reaching high-end of spectrum as soon as mid-century.	Timeframe: Between 2050-2100, reaching high-end of spectrum as soon as end of century.

Scientists believe that the implementation of current mitigation policies would put us on track for between 2.8 and 3.2°C / 5.0 and 5.8°F of warming by the end of the century. However, worst case scenarios of rapid emissions could lead to over 4°C/7.2°F by the end of the century.⁶ Thus, we have based our two scenarios on the warming that is possible on this high-emissions trajectory, in which the planet warms an average of 2°C/ by mid-century, and 4°C/7.2°F or higher by the end of the century.

These two scenarios illustrate potential effects of warming impacts tied to bounded levels of temperature rise and time scales. They represent descriptive risk scenarios of possible futures, and *not* predictions or likelihoods of certain events occurring. Each regional assessment can be read on its own for a snapshot of climate security risks facing human populations.

Following our synthesis of the climate impacts expected for each region, we used our collective security experience and knowledge to assess and then rank all scenarios by their risk to security environments, infrastructure, and institutions, on a scale from “Low” to “Catastrophic.”

LOW: some material risk to human social and security systems

MEDIUM: consequential risk to human social and security systems

HIGH: severe risk to human social and security systems

VERY HIGH: severe and systemic risk to human social and security systems

CATASTROPHIC: disastrous and irreversible risk to human social and security systems

Based on this scale, we determine the following threat profiles and threat assessments for each climate scenario. These are an aggregation of conclusions drawn from separate regional and intersecting risk assessments, detailed in-depth throughout this report. The threat profile explains the overall risk level associated with the scenario, and the threat assessment gives more detail on the specific impacts expected under those conditions.

GLOBAL CLIMATE SECURITY THREATS

NEAR-TERM SCENARIO (1-2°C WARMING): HIGH - VERY HIGH THREAT

Threat Profile: According to our analysis, climate change presents a **“high-very high”** risk level, and significant threat to both global and homeland security at 1-2°C/1.8-3.6°F of global average warming. Urgent and comprehensive prevention and preparation actions are recommended to avoid this significantly destabilizing security scenario.

Threat Assessment: At 1-2°C/1.8-3.6°F of global average warming, the world is very likely to experience more intense and frequent climate shocks that could swiftly destabilize areas already vulnerable to insecurity, conflict, and human displacement, as well as those regions whose stability is brittle due to underlying geographic and natural resource vulnerabilities. Under this scenario, all regions will experience **high levels of climate security threats** that will disrupt key security environments, institutions, and infrastructure. The resulting resource scarcity, population migration, and social and political disasters are likely to interact at the international level, alongside the creation of new areas of great power competition and potential conflict.



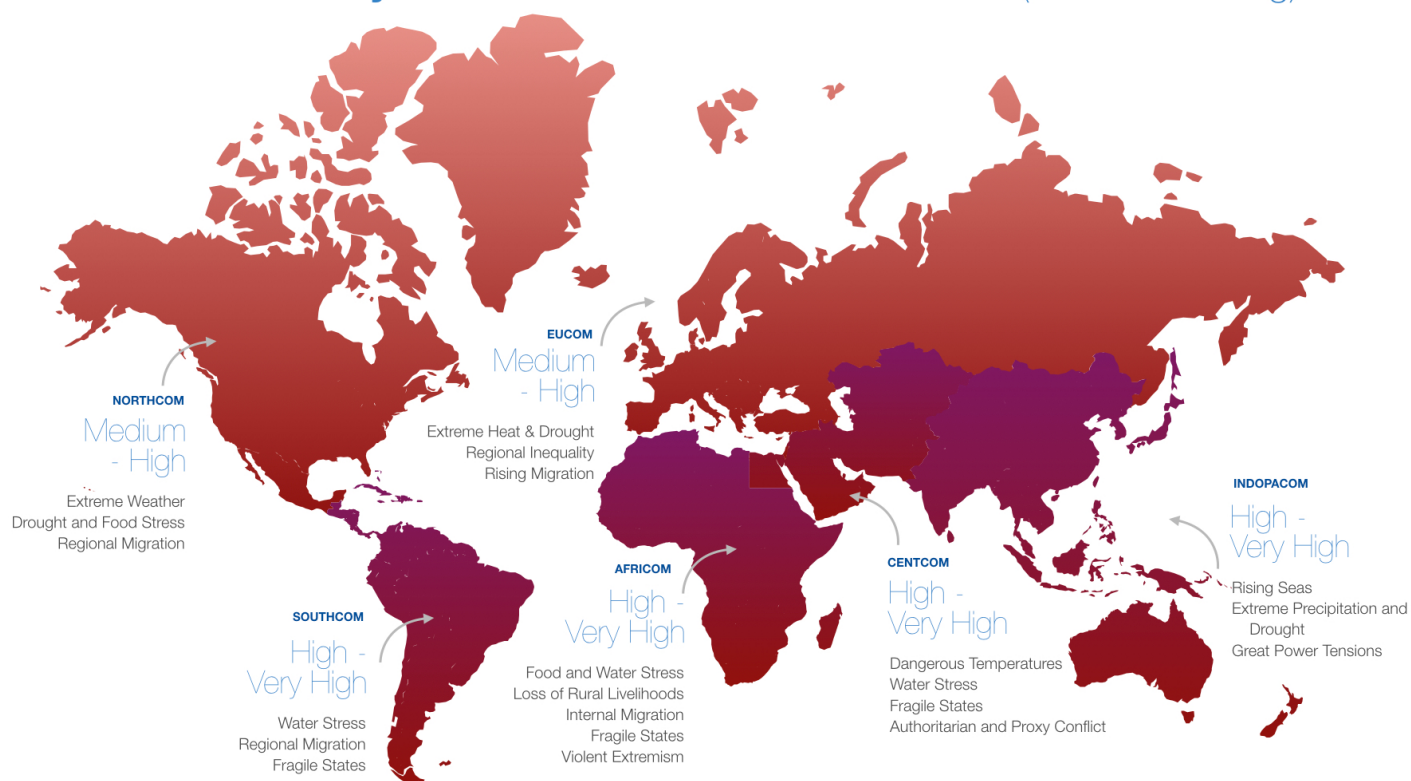
MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH - CATASTROPHIC THREAT

Threat Profile: At 2-4+°C/3.6-7.2+°F of global average warming, climate change presents a **potentially unmanageable, “very high-catastrophic” global security threat** – such that this scenario must be avoided unequivocally. Avoiding this scenario will require comprehensive and urgent global actions to reduce the scale and scope of climate change, and to adapt to unavoidable threats.

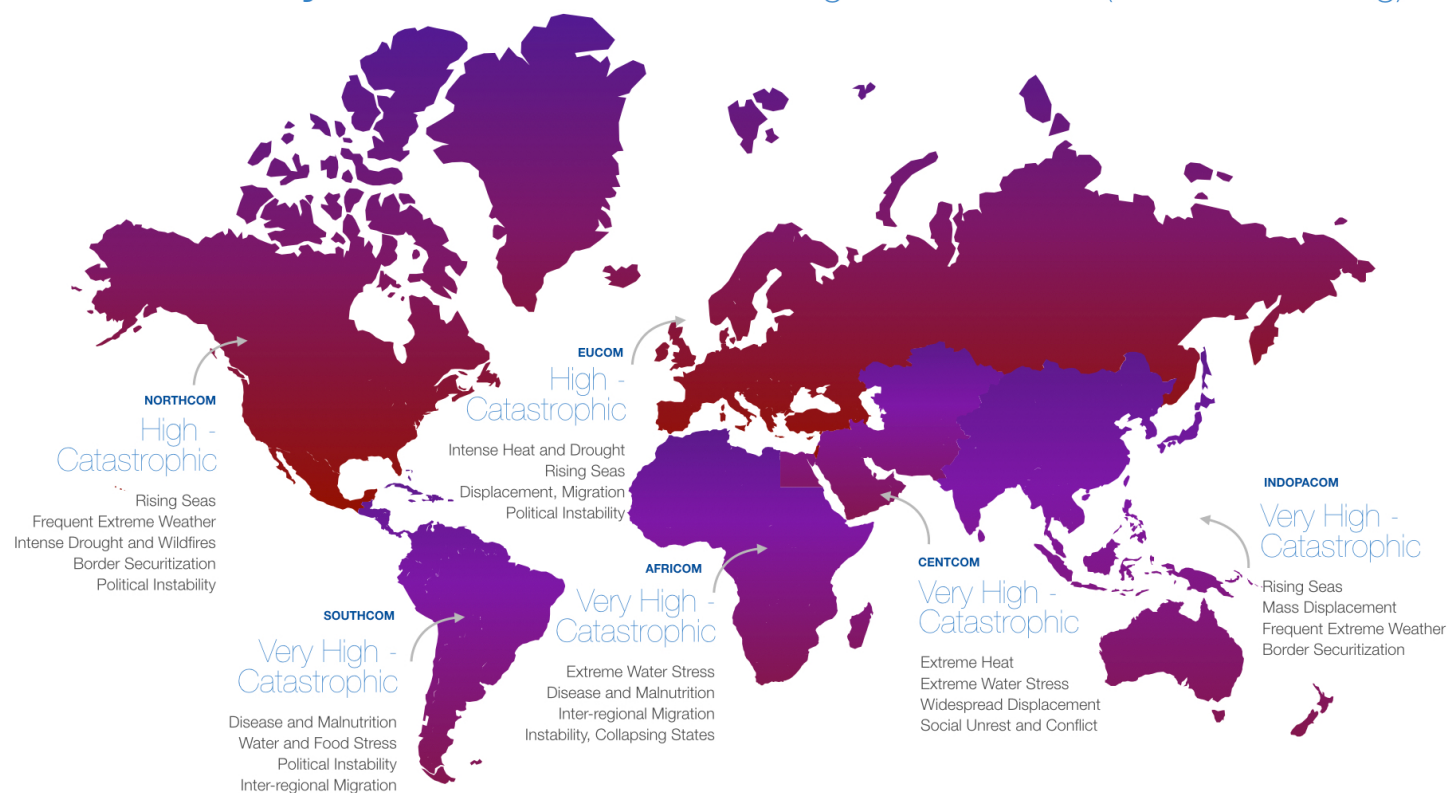
Threat Assessment: At 2-4+°C/3.6-7.2+°F of global average warming, the world is very likely to experience significant insecurity and destabilization at the local, national, regional, and international levels. All regions will be exposed to potentially **catastrophic levels of climate security threats**, the consequences of which could lead to a breakdown of security and civilian infrastructure, economic and resource stability, and political institutions at a large scale.



Climate Security Threat Profile: Near Term Scenario (1-2°C Warming)



Climate Security Threat Profile: Medium-Long Term Scenario (2-4+°C Warming)



REGIONAL AND INTERSECTING CLIMATE SECURITY THREATS

In addition to these overarching, international threat profiles, the report details threat profiles for each of six regions of the world, as well as one intersecting risk profile, under each warming scenario. For clarity, each region corresponds to the U.S. Geographic Combatant Command areas of responsibility. These threat assessments and profiles are summarized in the maps and charts on these pages.

REGION	THREAT ASSESSMENT	THREAT PROFILE
AFRICOM Africa	<p>Near Term Scenario (1-2°C Warming): High - Very High Threat</p> <p>Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat</p>	<p>At 1-2°C/1.8-3.6°F of global average warming, the AFRICOM area of responsibility will experience rapid loss of rural livelihoods, disease, resource stress, and migration. In this scenario, violent extremist groups bolster their numbers, and security threats spiral into nearby fragile areas.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the AFRICOM area of responsibility will likely experience new and renewed interstate conflict over water resources, and severe humanitarian crises resulting from migrating populations, weather disasters, and economic shocks. Security institutions may not be able to preserve stability in the region, but will increasingly attempt to do so to prevent further spread of violent chaos.</p>
CENTCOM Middle East and Central Asia	<p>Near Term Scenario (1-2°C Warming): High - Very High Threat</p> <p>Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat</p>	<p>At 1-2°C/1.8-3.6°F of global average warming, the CENTCOM area of responsibility will experience dangerous levels of temperature rise, drought, and dwindling water supplies that intensify already tense resource, political, and territorial competition. These impacts are likely to lead to increased social grievances and conflict.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the CENTCOM area of responsibility will experience warming levels that render many areas of the region uninhabitable. Competition over water resources will likely be heightened, and with large populations displaced across the region, existing cultural divisions and social unrest could lead to enduring conflicts and state failure.</p>
EUCOM Europe and Russia	<p>Near Term Scenario (1-2°C Warming): Medium - High Threat</p> <p>Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat</p>	<p>At 1-2°C/1.8-3.6°F of global average warming, the EUCOM area of responsibility will experience severe weather that threatens destabilization of its key economic sectors, rising regional inequality, and impacts on civil and military infrastructure. In this scenario, rising ethno-nationalist sentiments alongside rising migration waves pose serious threats to the alliances underlying existing security institutions.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the EUCOM area of responsibility will likely experience prolonged drought and rising seas, leading to significant internal displacement, as well as an influx of migrants from neighboring areas. In this scenario, a breakdown in regional political, institutional, and security cohesion becomes likely.</p>

INDOPACOM Indo-Asia-Pacific	<p>Near Term Scenario (1-2°C Warming): High - Very High Threat</p> <p>Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat</p>	<p>At 1-2°C/1.8-3.6°F of global average warming, the INDOPACOM area of responsibility will experience water scarcity in some areas and precipitation inundation in others. This could pose existential risks to security infrastructure and undermine social stability. Tension between regional powers will increase against a backdrop of competitive resource and territorial claims.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the INDOPACOM area of responsibility will experience devastating sea level rise threatening its megacities, infrastructure, and populations. Countries will likely securitize borders to prevent migration following severe disasters, and could undermine important military alliances and partnerships on which regional peace depends.</p>
NORTHCOM North America and Polar Regions	<p>Near Term Scenario (1-2°C Warming): Medium - High Threat</p> <p>Medium-Long Term Scenario (2-4+°C Warming): High - Catastrophic Threat</p>	<p>At 1-2°C/1.8-3.6°F of global average warming, the NORTHCOM area of responsibility will experience more intense, extreme events like storms and wildfires, with significant impacts on life and property. These effects will reduce the readiness of security infrastructure, and undermine democratic and international institutions on which major power security relations depend.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the NORTHCOM area of responsibility will experience extreme heat, sea level rise, and disaster events that severely impact infrastructure critical for protecting the homeland. Increasing divisions within society -- including rising ethno-nationalist, anti-democratic and isolationist views -- could fracture historic security agreements, and great power competition over resources in the melting Arctic may become acute.</p>
SOUTHCOM South and Central America and the Caribbean	<p>Near Term Scenario (1-2°C Warming): High - Very High Threat</p> <p>Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat</p>	<p>At 1-2°C/1.8-3.6°F of global average warming, the SOUTHCOM area of responsibility will experience shifting precipitation patterns and acute water shortages, forcing communities to migrate in search of new opportunities in an increasingly unstable environment. Transnational criminal groups, and narcotics and human traffickers will likely take advantage of this growing destabilization, further straining local security institutions.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the SOUTHCOM area of responsibility will likely experience even more acute weather instability, crop collapse, and spreading disease. Failing agricultural productivity, water insecurity and infrastructure will increase the likelihood of violent conflict, drive significant internal and cross-border migration, and increase political instability.</p>

RECOMMENDATIONS

Upon analyzing these regional, intersecting and compound global risks posed by climate change, it is clear that both warming scenarios present severe risks to human life and social stability. If allowed to reach levels that scientific models anticipate, climate change will wreak havoc on the security of our nation, and indeed all regions of the globe.

Our climate security scenarios show that even low levels of global warming will lead to dangerous and unacceptable impacts in each region of the world that will threaten domestic and international security. The threats will be severe, at minimum, and if we fail to act to mitigate the risks and rein in human-induced climate change, the results will be catastrophic. Between 2014-18, for example, the United States saw climate and weather-related disasters cause over \$400 billion in damages, and that is at the relatively low level of warming we have currently experienced.

Rather than risk the consequences laid out in this report, the world must come together to mitigate human-induced climate change and build resilience to those effects we are already experiencing. If we collectively turn our backs on these threats, we stand on the precipice of some of the greatest, multi-dimensional security threats the world has ever seen.

Mitigating these risks requires quickly reducing and phasing out global greenhouse gas emissions. As there are numerous policy options for doing so, we refrain from recommending a single course of action. Instead, **we call for the world to achieve net-zero global emissions as soon as possible in a manner that is ambitious, safe, equitable, and well-governed, in order to avoid severe and catastrophic security futures.**

The world must also “climate-proof” environments, infrastructure, institutions, and systems on which human security depends, and so we call for **rapidly building resilience to current and expected impacts of climate change.** With future-oriented investments in adaptation, disaster response, and peacebuilding efforts, we will be better able to recover from tragedies that strike and to avoid deeper instability.

It is possible to prevent the worst of the scenarios laid out in this report, but this will not happen without clear-sighted, dedicated leadership. In the United States, **we call for renewed efforts to prioritize, communicate, and respond to climate security threats, and to integrate these considerations across all security planning.**

For more specific details on achieving these goals, we direct you towards the Climate Security Advisory Group’s comprehensive policy proposals in the *Climate Security Plan for America: A Presidential Plan for Combating the Security Risks of Climate Change*.⁷

The silver lining is that despite these unprecedented future risks associated with climate change, we have unprecedented foresight as well. The climate models give us a plausible picture of the future that is very dire, but it is preventable if we choose a different course of action.

This combination of unprecedented risk and foresight underlines a “responsibility to prepare and prevent” the security risks of a changing climate. If we see it coming, we must act in a manner that is commensurate to the scale and scope of the threat.

Signed,

National Security, Military and Intelligence Panel on Climate Change (NSMIP)
The Center for Climate and Security
February 2020

INTRODUCTION

ASSESSING THREATS IN AN ERA OF CLIMATE INSECURITY

Since at least 1988, the international security community has been increasingly concerned about the global security risks of a changing climate.⁸ Recently, however, the security community is also conscious of how rapidly climate change is impacting our operational environment, and threats to our security infrastructure and institutions are increasingly clear. Based on current climatic changes, a number of climate-induced threats are already being realized (leading the U.S. Congress, for example to label climate change a direct threat to national security in 2017), with many more such threats on the horizon.⁹ These emerging risks do not happen in isolation, do not recognize national boundaries, and will only increase in strength and frequency as warming continues.

Current increases in average global temperatures from pre-industrial times are beginning to unleash dangerous new patterns of disasters across the world, and projected temperatures for the end of the 21st century would be above those ever experienced by human civilization.¹⁰ Severe heat and drought, more powerful and destructive storms, declining agriculture and rapidly spreading health risks, and multiple meters of global sea level rise will significantly threaten international security if global greenhouse gas emissions continue to grow unchecked. In high-end scenarios, entire regions of the world will be left uninhabitable due to dangerous temperatures, and crop and water resources will become increasingly strained, with severe consequences for food availability, prices, and livelihoods.¹¹ These conditions could unseat whole societies, leading to waves of migration, state fragility, and new hotspots of political instability, violence and conflict.

We have considerable certainty around the risks posed by climate change. It is a high probability, high consequence risk.¹² For some time, scientists around the world have projected expected warming and mapped how temperature increases will interact with local climates to shift weather and natural systems. To a certain extent, these risks have been incorporated into a range of security and intelligence assessments. For example, the U.S. Director of National Intelligence has included warnings about climate change threats since 2008 in National Intelligence Assessments and in eleven Worldwide Threat Assessments from 2009 – 2019. Work has also been done to mitigate these risks to the security landscape – such as investments in military resilience. However, too little work has been done to properly incorporate this information into cohesive threat assessments or to effectively communicate these risks to the public and to decision-makers.

PROJECT OBJECTIVES

This report, produced by U.S. national security, military and intelligence professionals, synthesizes recent research linking security risks with climate change, and maps climate change trends alongside regional security scenarios. As with assessing other strategically significant security risks, we do so in order to answer four core questions:

- Which security impacts of climate change are most severe?
- Which regions are most at threat?
- What levels of warming, if any, poses a tolerable level of security risk?
- What levels of warming pose unacceptable threats to security?

To aid the security community to assess, prepare for and prevent coming global climate change threats, this report contains four parts.

1. The Climate Security Nexus: An overview of how climate change interacts with physical, social and political systems to create or intensify security threats. Hereafter, this intersection of climate change and security will be referred to as “climate security.”

2. Regional and Intersecting Climate Security Threat Assessments: A synthesis of the climate change impacts projected for each region of the globe - in both a Near Term Scenario (1-2°C/1.8-3.6°F Warming) and Medium-Long Term Scenario (2-4+°C/3.6-7.2+°F Warming) - and how they could interact with existing security dynamics to exacerbate threats, or pose new ones.

3. International Climate Security Threat Assessment: Based on the Regional, and Intersecting Climate Security Threat Assessments, we present an international threat assessment, which includes summaries of each of the threat assessments above.

4. International Climate Security Threat Profile: Based on the International Climate Security Threat Assessment, we offer a threat profile for near term and medium-long term warming scenarios.

WHAT WE KNOW: INTERNATIONAL CLIMATE CHANGE

Since the very first conception of the possibility of human-triggered warming on a global scale, the uncertainty and potentially disruptive nature of its impacts caused alarm among scientists and security professionals alike.

Writing as early as 1968, a JASON-affiliated security advisor, Gordon Macdonald, told U.S. President Lyndon Johnson that global climate change represented a complex threat that would surpass the complexity of even the catastrophic threats posed by nuclear weapons.¹³

Since then, the realities of what humanity faces due to our subsequent atmospheric modifications have steadily come into sharper focus. In June 1988, over 300 scientists and high-level political leaders from 46 different countries gathered for the “World Conference on the Changing

Atmosphere: Implications for Global Security,” and concluded that there were clear links between a changing climate and the security landscape.¹⁴ Six months later, the Intergovernmental Panel on Climate Change (IPCC) was established as an internationally-mandated scientific project, to synthesize

and communicate the most cutting-edge research on what activities cause climate change, and what impacts the phenomenon might entail.¹⁵ Since then, teams of scientists have come together to issue five comprehensive reports that summarize the latest in academic research surrounding all facets of climate change, and outline these trends in regular syntheses for use by policymaking audiences.

The most recent full synthesis report (IPCC Assessment Report 5, or AR5), issued in 2014, communicated growing alarm about the path of global climate change that humans are on. AR5 concluded that, if continuing on baseline, high-end emissions trajectories, the world would likely warm between 2.6°C to 4.8°C/4.7°F to 8.6°F by 2100.¹⁶

In 2018, the IPCC issued a Special Report on Global Warming of 1.5°C/2.7°F, giving greater clarity to the impacts associated with climate change trajectories, specifically mapping the differences that could be expected between two warming scenarios, 1.5°C/2.7°F and 2°C/3.6°F. The results of the 2018 report show that these low-warming scenarios are becoming harder to avoid, and that the impacts at even low levels of warming are more severe than previously thought. The globe has already experienced about 1°C/1.8°F of mean global temperature rise over pre-industrial levels, and under current emissions trajectories, could surpass 1.5°C/2.7°F as soon as 2030, and 2°C/3.6°F in warming by mid-century.¹⁷ And while these represent global mean temperatures, the temperatures experienced locally are often much higher than these levels.

Emissions trajectories are proceeding in exactly the wrong direction to confront the problem of global climate change – after stalling between 2014-2016, after stalling between 2014-2016, and rising from 2017-2018, annual global greenhouse gas emissions have not yet peaked.¹⁸

As they currently stand, current policies would still allow mean temperatures to increase by between 2.3 and 4.1°C/5.0 and 7.4°F by 2100, and a worst case scenario increase of 4.8/8.6°F is possible.¹⁹

This report seeks to map out what these likely future climate scenarios might look like across global regions, highlight the impacts with the greatest regional and global security consequences.

REPORT SCOPE

Anticipating possible climate futures is difficult. To do so, researchers must chart the current release of natural and human-released greenhouse gases (from transportation, power generation, buildings, and agricultural sources, among others), and extend these emission trends into the future to expected atmospheric conditions - radiative forcing - and the resulting temperature rise. U.S. Government departments and agencies have a long history of anticipating and preparing for risks, from military security to the stability of critical infrastructure across the country, and are beginning to apply these abilities to the study of climate risk.

This report synthesizes and summarizes information from across the climate and security literature into six Regional Climate Security scenarios, and one intersecting risk scenario, to illustrate how different levels of global temperature rise might impact the security dynamics of global regions. We then offer our own categorization of these threats, based upon the following risk levels.

- **Low:** some material risk to human social and security systems
- **Medium:** consequential risk to human social and security systems
- **High:** severe risk to human social and security systems
- **Very High:** severe and systemic risk to human social and security systems
- **Catastrophic:** disastrous and irreversible risk to human social and security systems

The climate change information that these scenarios are based on has predominantly been drawn from the synthesis reports of the IPCC, recent peer-reviewed literature, and reports of international bodies such as the agencies of the United Nations and the World Bank. Each scenario is grounded in the climate models put forth in the IPCC AR5 and Special Report on 1.5, and complemented with existing literature describing how climate impacts interact with human social systems (for further information on these models, please refer to this report's *Annex: Scenario Methodology*). To underpin these climate impact projections with up-to-date security information, the forecasts of the U.S. National Intelligence Council's Global Trends Reports, as well as the 2019 Worldwide Threat Assessment published by the U.S. Office of the Director of National Intelligence, form the backbone of each regional security assessment.^{20 21}

Our scenarios are necessarily built upon a number of assumptions about how the world will act in the coming decades in response to climate change. To paint the most realistic picture, we have assumed that: global-deployment of U.S. military forces will remain roughly structured as it is today; significant adaptation and disaster response improvements are not made globally; and greenhouse gas mitigation strategies are not sufficient to dramatically reshape the global energy markets. Furthermore, we focus primarily on climate change-induced security challenges, rather than the full range of human behaviors that could shape the security environment and pose risks at any given time.

We hope that this project will contribute to the rich field of national security foresight planning, which the security community uses to assess and map future threats under situations of deep uncertainty and evolving situations. Our initial categorization of threats offers a first attempt to rank these future scenarios by severity. The field of climate change and security studies is rapidly advancing as the impacts of the phenomenon set in across the globe. We intend for this report to be useful for the security community tasked with preparing for, and preventing, the anticipated threats.

THE CLIMATE SECURITY NEXUS

The low digits associated with global mean temperature increases can be misleading. Though the global average temperature increases may seem innocuous, its impacts on the natural world are not. Even at our current level of about 1°C / 1.8°F of warming from pre-industrial levels, climate change has posed severe risk to natural and human systems across the globe.²² As we cross each new frontier of global warming, humans will witness ever more abrupt changes to the historically steady climate.

Analyzed through a lens of security maintenance, the effects of climate change will affect most environmental and social systems on which safety and stability depend.

In 2018, the various U.S. government agencies protecting the country's security interests defined threats to national security as those which threaten the country's "political, economic, military, and social systems."²³ Due to the interconnected nature of these systems with those of states and peoples across the world, the U.S. intelligence, military, and diplomatic communities have taken a broad view of how climate change might impact U.S. national security interests. In 2016, the U.S. National Intelligence Council identified "pathways" through which climate change will challenge national security interests, including:

- Threats to the stability of countries
- Heightened social and political tensions
- Adverse effects on food prices and availability
- Increased risks to human health
- Negative impacts on investments and economic competitiveness
- Potential climate discontinuities and secondary surprises.²⁴

Climate change has such wide-ranging impacts on security because of its role as a "threat-multiplier." This concept, coined by the CNA Military Advisory Board in 2007, addresses the potential for changing climate conditions to accelerate existing tensions and instability, leading to "multiple chronic conditions, occurring globally within the same time frame."²⁵ As the more intense, frequent shocks resulting from rising global temperatures interact with insecure social and political systems, existing fragilities can become increasingly destabilized.

A growing, multidisciplinary field of climate security research has mapped the negative relationships between adverse environmental effects and the triggers that lead to increased conflict and violence. When these complex relationships are viewed together with the forecasted impacts of climate change, the climate's interaction with security creates two main categories of risk: destabilizing **physical shocks** and aggravated **social tensions**.

First, the sudden shifts in regional climate and weather patterns increase localized physical shocks, causing new constraints in resources and making natural disasters more frequent and intense in communities across the world. Then, as human systems are disturbed by shocks to local environments,

second-order effects creating new migration patterns and community fragility can create or exacerbate social tensions at the state and regional levels. This increased regional friction may threaten new territorial disputes, conflicts, trade and economic shocks, and harmful unilateral actions.

The following section provides a brief literature review of these risks by summarizing relevant contributions from recent scholarship and demonstrating the relationships between natural shocks, social tensions, and increased risks of instability and conflict around the world.

PHYSICAL SHOCKS

Human health and livelihoods depend directly on the stability of the natural world, from the renewable resources that we consume daily, to the habitats in which we build settlements, transport goods, and conduct increasingly interconnected economic activities. The climate impacts projected by scientists are putting these natural systems under increasing strain, and coupled with human activities, these conditions could have serious implications for our ways of life.

FOOD, WATER, AND RESOURCE STRESS

As impacts of climate change are placing increasing stress on global biodiversity and species, nearly 1 million species are already facing extinction in the next few decades.²⁶ The quantity and quality of these resources are an important component to the security and stability of human society. Competition over resources can increase alongside their scarcity, and under the right conditions can be a spark for disagreement, violence, or conflict at the community level.^{27 28 29 30}

In particular, increasing global temperatures, melting glaciers, and prolonged drought conditions will put new pressure on freshwater sources, dwindling supply at a moment of increasing human demand.³¹ These stresses will be acutely felt in arid regions with low water quantity and large populations, where water use is already heavily regulated to prevent competition.

Within transboundary basins, water-sharing agreements exist among national governments, but diminished supply can render those carefully negotiated allocations obsolete and create incentives for unilateral exploitation of the resource. While dependent on many factors, control over and access to water resources has contributed to recent transboundary tensions, including the Renaissance Dam project in the Nile Basin Region.^{32 33} National governments may move to guarantee their water access by diverting or damming the resource, or securing the basin militarily, thereby increasing diplomatic tensions among resource users, particularly in areas with recent histories of conflict and tension.^{34 35 36} Scholars like King and Burnell have also noted instances of weaponization of water resources, by extremist and militant groups.³⁷

Recent reports have shown that species cultivated through human agriculture and fishing are under severe climate threat. Diminished water resources for irrigation, higher temperatures, and decreased soil fertility already impair crop yields, particularly in the global south.³⁸ For coastal and island communities dependent on local aquaculture for their diets, rising ocean temperatures, migrating and diminishing fish stocks, and dying coral reefs put intense strain on these important natural sources of food and economic activity.³⁹

Such agricultural stressors have been linked not only to nutritional deficiencies and food insecurity among households, but an increase of local social insecurity and political tension where development is low.⁴⁰ The relationship between food insecurity and increased instances of riots or violence depends on how governments respond to the situation, and the history of inequality preceding the food shortage.⁴¹ Riots over food prices and availability can interact with political unrest, escalate into broader civil unrest and conflict, and potentially lead to situations of prolonged insecurity, as observed in the Middle East during the Arab Spring protests of 2011.^{42 43} Much like water resources, food too can be weaponized by states and militant groups, who sabotage crops or cut off access to populations they perceive as adversaries.⁴⁴

EXTREME WEATHER

Some of the most visible impacts of climate change are the increased frequency and intensity of severe weather events worldwide. Warming temperatures create the atmospheric conditions for more likely natural disasters, including heatwaves, drought, flooding, wildfires, and storms, which can upend local communities through sudden instances of mass death and devastated lives and livelihoods.⁴⁵

These disasters directly impact on the drivers of insecurity, because of the reality that underdeveloped states face increased vulnerability and instances of severe weather.⁴⁶ Major storms can exacerbate social inequality, tensions, and conflict, which may hamper immediate recovery responses. Destruction caused by severe weather can restrict access to food, water, and resources, thus creating conditions for competition described above, and the potential for both large-scale displacement and trapped, immobile populations.⁴⁷

Whether instability follows a natural hazard depends on how the local and national governments respond to care for impacted populations following a severe event. If response capabilities and funds are not deployed quickly, the likelihood of food and water insecurity, disease, immobility, and economic disturbance can build into prolonged situations of community breakdown and disaster, followed by potential political stress or conflict.⁴⁸ And, when disasters strike in quick succession or repeatedly in one place due to climate change, international response efforts might be overwhelmed, with implications for community stability or resilience in the face of future disasters.^{49 50}

SEA LEVEL RISE

Low-lying coastal areas worldwide are under severe threat as warming temperatures melt glaciers and polar ice, and sea levels rise. This poses real challenges for islands and coastal communities, as the salination of groundwater sources, increased flooding, and erosion lead to the resource and settlement insecurity of populated coastlines.⁵¹

The risks are particularly high for coastal megacities where increased flooding and storm surge impacts threaten economic and critical infrastructure serving millions of people, with potential damage particularly severe in developing countries as populations continue to grow.^{52 53} The damage to city ports and military installations, for example, will have wide-ranging effects on security, as inundation harms



FLOODS IN DIGRI DISTRICT, HYDERABD, PAKISTAN. 2011. (MUHAMMED MUHEISEN/AP PHOTO).

supply chains and military readiness, and moving infrastructure inland will be costly.⁵⁴ Meanwhile, some countries face existential challenges from even moderate sea level-rise. Low-lying island nations are likely to become submerged entirely, and currently no international agreements exist to govern the resettlement of these populations.⁵⁵

SOCIAL TENSIONS

As the pressures from food, water, and resource stress, extreme weather events, and sea level rise significantly disrupt livelihoods, new and existing tensions may deepen at the national and regional levels. Through the negative interactions of human migration and intergroup violence, existing fragile social systems may become further destabilized.

MIGRATION

Natural shocks such as drought, food and water scarcity, and extreme weather, directly and indirectly influence the drivers of human migration.⁵⁶ As local economic opportunities dwindle due to environmental changes, and habitats become unlivable, people will likely attempt to move in search of more viable alternatives.⁵⁷ The importance of climate change as a driver of global migration was recently recognized by 164 countries in the Global Compact on Migration.⁵⁸ There is increasing evidence that one pathway by which environmental stressors can increase the likelihood of conflicts is by inducing larger waves of migration by those displaced by violence and related phenomena.⁵⁹

People displaced due to the effects of climate change seek better conditions and stability in neighboring communities, and today most environmentally-caused displacement leads to internal state migration.⁶⁰ In some cases, increasing waves of migration can have a destabilizing effect on host communities, which may be experiencing their own resource constraints and begin to blame migrant communities for the added burden, as states neighboring Syria have felt in recent years.^{61 62} Migrants may not be integrated fully into society due to these tensions, particularly if they are not given rights to citizenship or if access to services is denied, and migration crises may cause increased tensions among states dealing with the inflows.⁶³ Such negative feelings toward newly immigrated communities could lead to escalating hostility and potential conflict among social groups.

Of course, for the most vulnerable communities, insecurity may arise due to their inability to migrate in the face of devastating climate changes, creating “trapped populations” that are unable to get out of harm's way.⁶⁴ Women, the poor, and the disaster-affected may not adapt to impacts through safe migration due to a lack of resources, or attempt more dangerous and exploitative movements as a result.^{65 66}

HEALTH

Climate change will pose serious challenges to human health, mainly by affecting delicate natural systems that make bodies more susceptible to stress and disease. Medical research increasingly demonstrates links between warming temperatures and increased vulnerability to heat stress, infectious diseases, extreme events, and pollution, as summarized by the now annual report on health and climate change published by the leading journal, *The Lancet*.⁶⁷

Populations will experience direct adverse health impacts from climate-induced severe weather events such as flooding, wildfires, extreme heat, and droughts, which will lead to injury and death if the impacted areas are not adequately prepared. In these disaster situations, existing health problems will be exacerbated indirectly by disruptions of health infrastructure and lack of access to care.⁶⁸ Nutritional and mental health outcomes will also be harmed by the food, water, and resources stresses detailed above, in less resilient populations, as impacts become more severe.⁶⁹

As climate change worsens, public health research anticipates that new health hazards will likely be introduced to populations not currently experiencing or adapted to them. Most severe will be the increased spread of water, food, and vector-borne diseases. Geographic and climatic shifts will make larger areas more hospitable to vectors such as mosquitoes and ticks, allowing them to spread associated diseases further. More intense precipitation events will expose more people to water-borne diseases such as cholera.⁷⁰ By mid-century, over 5 billion additional people across the world could be more vulnerable to malaria, alone.⁷¹ Together, these health risks will stress the stability of populations, care systems, infrastructure, and societies.

STATE FRAGILITY AND CONFLICT

Recent research suggests that warming temperatures and hazards linked to climate change are associated with rising levels of violence within states.^{72 73 74} In 2016, researchers conducted a global study of the intersection of climate change and conflict, and concluded that “risk of armed-conflict outbreak is enhanced by climate-related disaster occurrence in ethnically fractionalized countries.”⁷⁵

Most research in the field has focused on how climate stressors impact other conditions associated with social violence, including weak governance and low socioeconomic status.⁷⁶ In all cases, conflict is a complex, multi-faceted phenomenon that is the product of multiple stressors and grievances. When states with histories of low-burning conflict are impacted by the types of climate-related natural shocks detailed above, these stressors can be exacerbated.

For states whose abilities to govern and ensure security are already fragile, these climate-induced shocks can compound existing strife to create increasingly unstable situations. Fragile states are defined as those at high risk of experiencing state-related crises.⁷⁷ When they face mounting climate impacts, these risks can interact to create worsened environments for humanitarian response and governance. Thus, the majority of highly fragile states in the world today also face high climate risks, predominantly in Asia, Africa, and the Middle East.⁷⁸

If fragile and resource-strained states are unable to respond to mounting water and food, weather, or migration crises, or do so unfairly and unevenly, government legitimacy can erode, citizen mistrust increase, social cohesion diminish, and conflict potentials rise.^{79 80 81} Violence can also spread across regions with low governance, creating risks among fragile states who neighbor each other and may be experiencing similar climate impacts.

Climate change can also open up new areas for state interaction, including the melting Arctic; upset existing treaties and cooperation, such as migration or resource agreements; or rapidly change conditions in disputed areas, like the South China Sea. If states respond to climate changes in these areas in a competitive rather than cooperative way, or further militarize their presence, new or existing tensions could have the potential to flare into conflict that has international-level impacts.⁸²

MIGRANTS IN LESBOS, GREECE. 2015. (TYLER HICKS/NY TIMES).



REGIONAL CLIMATE SECURITY THREAT ASSESSMENTS

In order to obtain a clear look at the security risks posed by global climate change, it is helpful to examine impacts through a regional scenario-based approach. Future scenarios detail not what *will* happen in the future but what *could*, allowing for a visualization of multiple events across geographies and risk levels. As Michael Fitzsimmons of the U.S. Army War College writes, “Scenario planning should be one of the Department of Defense’s (DoD) most important tools for developing strategy under uncertainty,” due to the approach’s ability to explore a wide range of potential future challenges and their interactions, which otherwise would be restrained by the unpredictability of each individual event.⁸³ The U.S. intelligence community has been producing future scenario-based research in its regular Global Trends Reports since 1997.

Current emissions trajectories project that without employing rapid sectoral mitigation or carbon-removal strategies (by continuing to burn fossil fuels throughout the remainder of the 21st century), the world is on track to warm 4.1-4.8°C/7.4-8.6°F from pre-industrial baselines by 2100. If all mitigation policies currently in place are consistently deployed, warming would reach 2.8-3.2°C/5.0-5.8°F by the end of the century.

Even fulfilling the current pledges and targets made under the 2015 Paris Climate Agreement, the world would still see 2.5-2.8°C/4.5-5.0°F of average warming by 2100.⁸⁴ By continuing current actions, the world will continue to warm rapidly across the next few decades, surpassing 1.5°C/2.7°F as soon as 2030 and 2°C/3.6°F as soon as 2052 (see Figure 1 below).⁸⁵

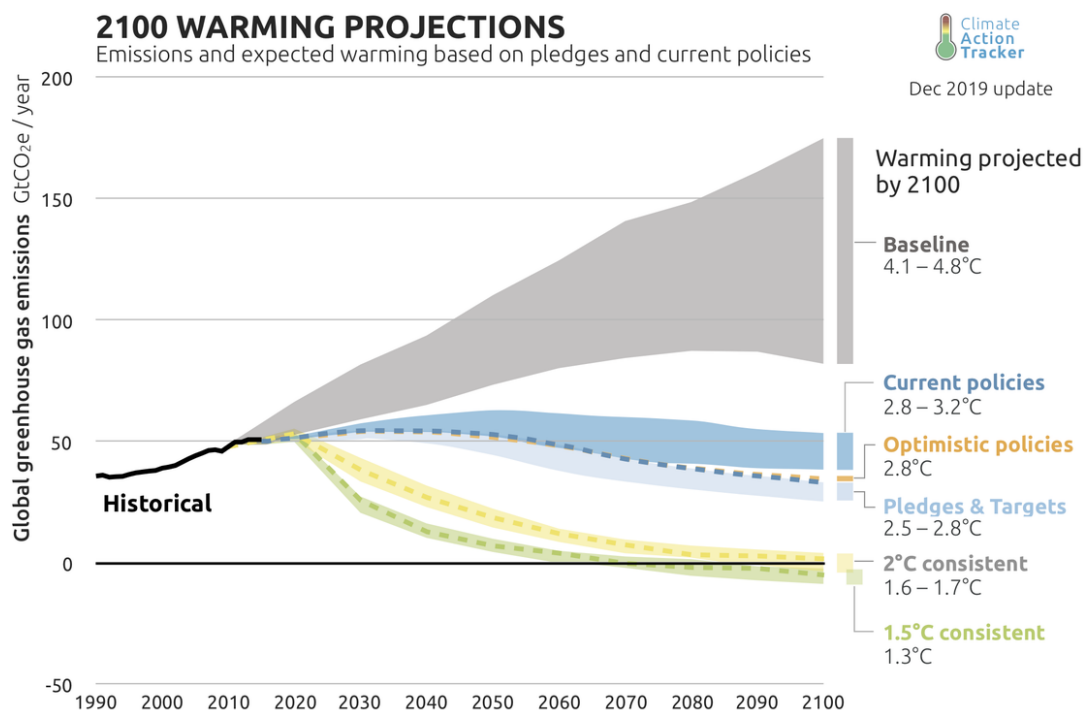


Figure 1: Climate Action Tracker: Addressing Global Warming. Updated December 2019

CLIMATE SECURITY SCENARIOS

Building from these future warming projections, this report summarizes projected climate impacts and corresponding security risks under two future scenarios.

NEAR TERM SCENARIO (1-2°C WARMING)	MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)
Temperature: Global average temperature rises between 1 - 2°C / 1.8 - 3.6°F.	Temperature: Global average temperature rises between 2 - 4°C / 3.6 - 7.2°F, or higher.
Timeframe: Between now and 2050; reaching high-end of spectrum as soon as mid-century.	Timeframe: Between 2050-2100, reaching high-end of spectrum as soon as end of century.

We have based our two scenarios on the global average warming that is possible on this high-emissions trajectory, in which the planet warms an average of 2°C/3.6°F by mid-century, and 4°C/7.2°F or higher by the end of the century. This allows us to look at the worst-case scenario impacts possible in each region of the world. However, it is important to note that the world is already within the bounds of the Near Term Scenario, having experienced approximately 1°C/1.8°F of mean global temperature rise over pre-industrial levels.

From harsh weather events, to severe heat and drought, to sea level rise, and negative consequences for water and agricultural resources, neither of these scenarios are compatible with healthy human societies. The impacts in both scenarios have the potential to cause death and destruction without robust mitigation and adaptation strategies.

Projections of climate impacts are complicated by the fact that global warming futures differ depending upon what course of mitigation and adaptation the world chooses to take, as well as by how planetary systems interact with atmospheric greenhouse gas concentrations. Some climate impacts are projected to be more likely than others at various levels of warming, but all reflect statistical bounds of uncertainty that are highly dynamic given the multitude of variables.

REGIONAL ANALYSIS

For this report, we have compiled climate impact scenarios covering six regions of the world, corresponding to the global division of U.S. Geographic Combatant Commands (see Figure 2 below). These regional analyses are based largely on the research communicated in the Regional Climate Projection chapters of the IPCC AR5 *Impacts, Adaptation, and Vulnerability* section, as well as peer-reviewed and gray literature describing recent findings in natural and social climate systems.⁸⁶ For more information on the climate science used as a foundation for our scenarios, see the last section of this report, *Annex: Scenario Methodology*.

A regional perspective allows for an integrated look at how various climate impacts, warming patterns, demographic shifts, and political and economic dynamics are expected to interact under shifting conditions in the future. However, climate-induced shifts in weather and ecosystems do not adhere to strict boundaries, and it is difficult for scientists to project exactly how a model of global temperature increases will shift the conditions of a specific localized area. Large discrepancies in historical and current data across the world also complicate this endeavor.

Where possible, specific conditions and impacts projected for sub-regions are detailed, and hotspot areas for potential security or human risks are described. Likewise, when climate impacts for a given region may have cascading geopolitical impacts, those possibilities are described.

The six regions are geographically paired to the U.S. military's Geographic Combatant Command (GCC) Areas of Responsibility (AOR). The U.S. GCCs shape the global security environment, particularly as it relates to regional and international security institutions that are responsible for maintaining security. In this context, the GCC regional organization will help security practitioners, policy-makers and public officials, the primary audience of this report, more easily absorb the ways in which climate security risks will shape the global security landscape. The six regions are as follows:

- **U.S. African Command** (AFRICOM): Africa
- **U.S. Central Command** (CENTCOM): Middle East and Central Asia
- **U.S. European Command** (EUCOM): Europe and Russia
- **U.S. Indo-Pacific Command** (INDOPACOM): Indo-Asia-Pacific
- **U.S. Northern Command** (NORTHCOM): North American and the Polar Regions
- **U.S. Southern Command** (SOUTHCOM): South and Central America and Caribbean



Figure 2: US Geographic Combatant Commands, adapted from U.S. Transportation Command⁸⁷

THREAT ASSESSMENT STRUCTURE

Climate change will impact regional security in a number of ways, and threats will also spill over across regions. We break down each of the regional and interregional risk pictures into a threat profile, explaining the overall risk level associated with the scenario, and a threat assessment, assessing and providing detail on the specific impacts expected under those conditions. Each regional chapter of this report is organized according to this structure:

THREAT PROFILE: A profile of climate security risks under each warming scenario, and a summary of the scale and scope of the threats. These regional threat profiles are based on an aggregate of the three categories of risk evaluated in the threat assessment (described below).

THREAT ASSESSMENT: A comprehensive assessment and description of the threat climate change poses to the regional security landscape, evaluating three categories of risk:

Risks to the Security Environment: Description of climate change-related risks to natural and social systems, including the availability of natural resources and severe weather, that may scale up to higher-order security risks such as state instability, state failure, interstate tensions, conflict, and military interventions.

Risks to Security Institutions: Description of climate change-related risks to the missions, capabilities, legitimacy and viability of national and regional security and military institutions, as well as peace and security agreements.

Risks to Security Infrastructure: Description of climate change-related risks to physical and network infrastructure whose incapacitation or destruction could disrupt or debilitate regional security.

Each chapter's Threat Assessment contains "climate security risk level" categorizations, which judge the level of risk to the region's security environment, institutions, and infrastructure under each scenario. These determinations are based on the report investigators' expert judgements of each climate security scenario description. The expert judgements take the following criteria into account: magnitude of impacts; reversibility of impacts; and vulnerability and adaptation potential of effected social and security systems. Our five risk levels build from IPCC evaluation of regional risk levels of natural threats, but are adapted for these security assessments.⁸⁸

The Threat Profile for each region is determined by aggregating the three Threat Assessment levels in each scenario (risks to the security environment, risks to security infrastructure, risks to security institutions). The overall Global Threat Assessment and Threat Profile are determined by aggregating the risk levels of the six regions and incorporating intersecting risks. Ultimately, these security risk levels are based on the judgments of the Panel investigators alone. See below for a description of each risk level.

CLIMATE SECURITY RISK LEVEL CATEGORIZATIONS

- **Low:** some material risk to human social and security systems
- **Medium:** consequential risk to human social and security systems
- **High:** severe risk to human social and security systems
- **Very High:** severe and systemic risk to human social and security systems
- **Catastrophic:** catastrophic risk to human social and security systems

To underscore, each regional climate security scenario is meant to be an illustrative look at the climate impacts projected for that region, paired with current understandings of the security conflicts, vulnerabilities, and risks that define the region today and could be exacerbated by those impacts into the future. It is possible that the risks illustrated in these scenarios are conservative, may happen sooner, or could interact in unpredictable ways. However, these projections can be avoided through sufficient mitigation and adaptation efforts to minimize the worst of climate change's damage to global security.

Each of these regional and intersecting threat assessments, and their corresponding risk scenarios, are not specifying what *will* happen, but what plausibly *could* happen. They are drafted to be comprehensive, but brief, and to communicate the most severe risks currently identified by the scientific community that could have serious implications for national and global security. Each assessment can be read on its own, or in compilation with others, for a snapshot of potential scenarios facing human populations.

AFRICOM: AFRICA

THREAT PROFILE

Based on the regional threat assessment for the two warming scenarios below, we have determined the following regional threat profile of climate change for the AFRICOM area of responsibility.

AFRICOM Climate Security Threat Profile

Near Term Scenario (1-2°C Warming)



Medium-Long Term Scenario (2-4+°C Warming)



NEAR-TERM SCENARIO (1-2°C WARMING): HIGH - VERY HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the AFRICOM area of responsibility will experience rapid loss of rural livelihoods, disease, resource stress, and migration. In this scenario, violent extremist groups bolster their numbers, and security threats spiral into nearby fragile areas.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH - CATASTROPHIC THREAT

At 2-4+°C/3.6-7.2+°F of global average warming, the AFRICOM area of responsibility will likely experience new and renewed interstate conflict over water resources, and severe humanitarian crises resulting from migrating populations, weather disasters, and economic shocks. Security institutions may not be able to preserve stability in the region, but will increasingly attempt to do so to prevent further spread of violent chaos.

THREAT ASSESSMENT

The threat profile of climate change for the AFRICOM area is determined by an assessment of how climate change will affect the regional security landscape at both warming scenarios.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Catastrophic Threat

BASELINE

The African continent is particularly vulnerable to climate change and is experiencing warming above the global average. Current trends show worrying patterns of droughts and floods alternating seasonally, the desertification and unpredictable precipitation in the Sahel region, and an increase in extreme heat waves, particularly in equatorial and southern regions.⁸⁹

RISKS TO SECURITY ENVIRONMENT

As the continent perhaps most wholly vulnerable to climate change, and characterized by a history of underdevelopment, conflict, and insecurity, Africa provides a severe example of the potential for climate impacts to compound with existing tensions.⁹⁰ The IPCC identifies the continent as at particular risk from water and food stress, flooding, migration, and disease.⁹¹

Across various scenarios, Africa will experience more warming than the global average, causing increasing drought, disease, and poverty across its regions. Its diverse climates and sub-regions will face differing effects, but almost all will face a high risk of water and food stress, resource scarcity, and regional migration. These effects will occur against a backdrop of weak and fragile governments, already struggling to provide for their rapidly growing populations, overcome humanitarian crises, and control extremist threats.

NEAR TERM SCENARIO (1-2°C WARMING)

Projections show that the African continent will rapidly reach 2°C/3.6°F of average warming, perhaps as early as the middle of the century.⁹² This will have particularly high consequences across the arid Northern and Southern regions, where warming is likely to accelerate and precipitation decrease faster than in other

areas of the continent. Reaching a threshold of “unprecedented climates,” fully distinguishable from current conditions, could happen within the next few decades in West Africa and the Sahel.⁹³

These weather shifts will have negative impacts on agriculture and food production, particularly in their interaction with existing stressors across the continent. Africa’s semi-arid regions will bear the brunt of this dwindling agricultural output, as soil moisture is reduced, arable land is lost, and areas of productivity become scarce. These changes will have severe consequences for African livelihoods, with almost 20% of all Africans already undernourished and highly reliant on agriculture today, particularly in Sub-Saharan and Eastern Africa.⁹⁴ Near term climate change will deepen these trends, as warming is expected to threaten food availability and access through direct impacts on crops and livestock, markets, and prices.⁹⁵

As pastoralists see their livelihoods erased, many will migrate further in search of arable land or economic opportunities, including across insecure borders or areas already occupied by farmers or militias. This may lead to increased small-scale conflicts over limited resources, as have escalated recently between herders and farmers in the increasingly arid pastoral regions of Nigeria.⁹⁶ Many farmers, however, will instead head to already overburdened cities in search of new livelihoods. In Kenya and Niger, for example, migration from rural areas into urban settlements has increased in response to recent drought conditions.⁹⁷

The security ramifications of these movements across Africa’s regions and into rapidly growing cities can be pronounced. Governments already cannot provide services for their citizens, and face increased discord and instability from populations whose health, food, employment, water, and sanitation needs remain unmet. Such conditions have led to the empowerment of extremist groups seeking to wrest power away from the government, inflamed ethnic tensions, electoral contention and violence, and dwindling security, particularly in places with histories of violent conflict.⁹⁸ As climate effects push more populations into the increasingly dense cities of already fragile states, the potential for radicalization and conflict may escalate.

Aggravating these existing tensions will also be the escalating risk of disease that climate change will generate across the continent. As climates warm, and, in some areas, precipitation and flood conditions increase, these conditions could interact with weak nutrition and health systems to rapidly spread diseases that are currently in slow decline. In East Africa, incidences of malaria and other vector-borne diseases will increase as mosquitos and transmitting insects move into warming areas that were previously uninhabitable.⁹⁹ Cholera outbreaks have increased following high temperatures and heavy rainfalls, especially in countries with weak sanitation infrastructure to limit its spread, and these conditions will become more frequent with increased warming.¹⁰⁰ In the case of health, climate conditions will likely combine with poverty, underdevelopment, food and water insecurity, and conflict to spread diseases that will be difficult for governments to contain.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

If mean global temperatures increase past 2°C, the effects will likely be disastrous for much of Africa, which itself would experience an average of 3-6°C of continental warming at high-end scenarios by the end of the century. Northern and Southern Africa would see extreme temperatures and heatwave conditions, some likely unbearable for humans to experience for prolonged periods.¹⁰¹

Water scarcity across the continent, already a reality today, will become more prevalent with severe droughts striking and persisting in northern and southern regions.¹⁰² River basins and freshwater lakes will be particularly strained, due to climate change and to increasing demands from agriculture and booming urban populations. Such water basins are often transboundary by nature, and under severe drought conditions they are likely to be venues for increasing interstate tensions. The West African river basins and the Lake Chad region are of particular concern, as lowering water levels could provoke tensions between states with histories of recent conflict.^{103 104} Increased demand could also provoke tensions in the Nile River Basin, as Egypt has already threatened to take military action against Ethiopia if its Grand Renaissance Dam lowers water supplies.¹⁰⁵

Just as some parts of the continent face extreme water scarcity, other regions will be inundated. Sea level rise threatens coastal nations, where populations are rapidly growing in vulnerable areas at risk of exposure and floods.¹⁰⁶ East Africa will likely face increased threats from typhoons developing over a warming Indian Ocean, and storm surges would be particularly devastating in underdeveloped regions where little adaptive infrastructure exist to hold back the tides, creating historic destruction as happened recently in Mozambique.^{107 108} Any forced relocation from low-lying areas may have unintended security consequences, destabilizing populations and leaving them more dependent on governments who are unable to support their needs.

Rising sea levels will also further complicate river basin tensions, as deltas become salinized and freshwater resources threatened. Some such areas are already hotspots for conflict, such as the Niger Delta, where attacks by extremist groups have threatened the local region and seized control of dwindling freshwater resources.¹⁰⁹

These conditions of extreme weather and competition over resources at the local, national, and regional levels, threaten to push existing fragile states into spirals of conflict, as armed militias recruit from increasingly desperate and mobile populations to secure access to water, food, or economic resources. In the recent histories of Darfur, Kenya, Mali, and increasingly across the Sahel, religious extremist groups have exploited and deepened humanitarian crises as they attempt to control rural territories.¹¹⁰ Regional refugees may escape to the relatively strong economic nations of Northern or Southern Africa, which will themselves be experiencing climate shocks, scarcity, and destabilization.

Such conditions will no doubt be compounded by the implications of a warmed world, as other regions face increasingly severe conditions in tandem. Rising global food prices were destabilizing for Africa following the price shock of 2008, further aggravating food insecurity as prices rose, and contributing to land grabs of arable geographies by foreign nations seeking to stabilize their own food interests.¹¹¹

These conditions are likely to be repeated with harsh agricultural impacts striking more frequently and intensely across the globe. Those Africans with resources or access to do so will attempt to migrate off the continent to comparatively stable climates of Europe or North America, likely against a backdrop of increasing hostility to immigrants in those regions. Western military involvement in the region may become more violent, as rising terrorist movements place blame for the crumbling conditions on African livelihoods on Northern nations.



DADAAB, KENYA. JULY 2011. (ANDY HALL/OXFAM).

RISKS TO SECURITY INFRASTRUCTURE

Already, U.S. AFRICOM operations and missions are experiencing the destabilization brought about by rapid environmental change.¹¹² The thousands of military forces and front-line civilians working to address future security challenges of the continent, through local, African Union, U.S., and European military partnerships, will see deterioration of their capabilities due to climate change effects, and potential increased security interest from states like Russia and China.

Various military logistics hubs and joint task forces operate in regions facing extreme water and agricultural stress, including in West Africa, the Lake Chad region, and the Horn of Africa. This stress severely impacts their ability to provision operations across the continent. Likewise, coastal military infrastructure, like the Combined Joint Task Force - Horn of Africa in Djibouti, is threatened by rising sea levels, high temperatures, and extreme weather disasters.¹¹³ As partner military and civilian infrastructure is weakened by climate impacts, or seized by empowered extremist groups, U.S. and European forces will likely need to engage further in the region to maintain the access to key resources. The introduction of nuclear energy capabilities to countries like Nigeria may also create new strategic targets for extremist groups.¹¹⁴

RISKS TO SECURITY INSTITUTIONS

State fragility is already perilously high across Africa, and climate change will harm existing institutions critical to maintaining security. Water-sharing agreements, like those preventing conflict between Nile basin states, are fragile in the face of dwindling water supply that may spark renewed resource conflicts. Weak government forces will be unable to contain the power of growing extremist groups, who recruit from displaced pastoralist and unserved populations.¹¹⁵

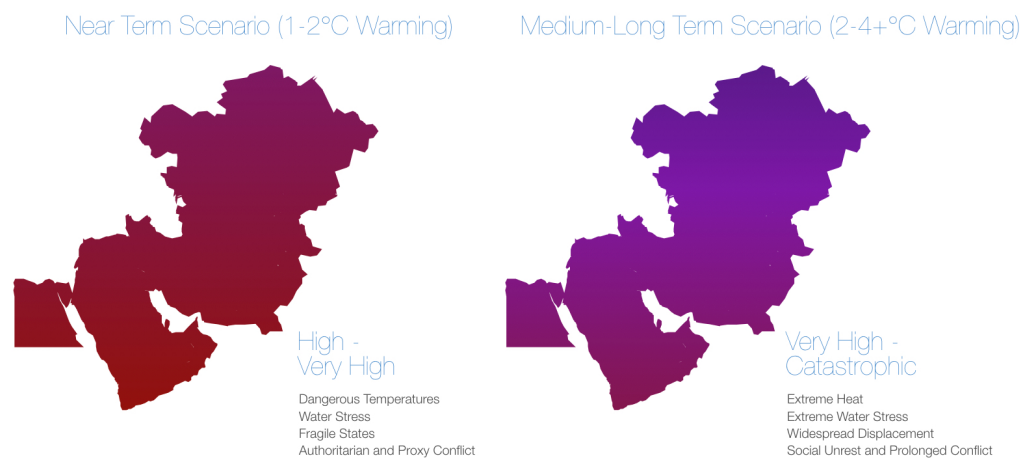
Peacekeeping missions conducted jointly by the United Nations and the African Union will be stretched thin by the sheer number of crises and conflicts requiring response. The willingness of these institutions to operate in the area may collapse completely, as dangerous situations and terrorist activity spirals, and partner governments withdraw troops, humanitarian workers, and diplomats from the region. As refugees and conflicts spill across borders, democratic governments unable to provide resources to their populations may collapse in the face of authoritarian leaders.¹¹⁶

CENTCOM: MIDDLE EAST AND CENTRAL ASIA

THREAT PROFILE

Based on the regional threat assessment for the two warming scenarios below, we have determined the following regional threat profile of climate change for the CENTCOM area of responsibility.

CENTCOM Climate Security Threat Profile



NEAR-TERM SCENARIO (1-2°C WARMING): HIGH - VERY HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the CENTCOM area of responsibility will experience dangerous levels of temperature rise, drought, and dwindling water supplies that intensify already tense resource, political, and territorial competition. These impacts are likely to lead to increased social grievances and conflict.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH - CATASTROPHIC THREAT

At 2-4+°C/3.6-7.2+°F of global average warming, the CENTCOM area of responsibility will experience warming levels that render many areas of the region uninhabitable. Competition over water resources will likely be heightened, and with large populations displaced across the region, existing cultural divisions and social unrest could lead to enduring conflicts and state failure.

THREAT ASSESSMENT

The threat profile of climate change for the CENTCOM area is determined by an assessment of how climate change will affect the regional security landscape at both warming scenarios.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Catastrophic Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High Threat

BASELINE

Warming is higher in the Middle East region than the global average, with temperature records surpassing 50°C/122°F in recent years.¹¹⁷ The region is already experiencing high water stress, and the warming temperatures and diminishing precipitation caused by climate change will worsen these conditions severely.

RISKS TO SECURITY ENVIRONMENT

CENTCOM's area of responsibility encompasses southwest and central Asia, which has experienced the most military investment and legacies of conflict in the contemporary world. Extreme heat and drought already define the climate of much of the region, and these conditions will become more extreme under both climate scenarios. While parts of the region may become unlivable by century's end, other areas will experience a cascade of new conditions that could set off decades of social unrest, extremism, and conflict. The IPCC identifies this region as under particular risk from extreme heat, water stress, and severe storms.¹¹⁸

NEAR TERM SCENARIO (1-2°C WARMING)

Under even near-term projections of climate change, the heat and drought conditions prevailing over this region are expected to become more intense. Mean regional temperature increases could exceed 3°C throughout much of the region, even under low-emissions scenarios, and each summer could see heat extremes lasting for as long as one month. Precipitation trends will be mixed at this level of warming, with small areas to the south experiencing some increases in precipitation but most Mediterranean countries seeing much drier conditions.¹¹⁹

Many states in the region lack adequate freshwater sources and depend on water originating from outside their borders, namely from the Tigris and Euphrates Rivers crossing Turkey, Syria, Iran, and Iraq, and the Jordan River along Jordan, the Golan Heights, Israel, and the West Bank.¹²⁰ These freshwater resources, and the populations singularly dependent on them, are at the center of regional conflict hotspots and will experience new strain as water levels decline.

The fight for control over water resources has been an important factor in recent and existing Middle East conflicts.¹²¹ In the persisting Palestinian/Israeli conflict, Israel's access to water has long been a central concern of negotiations. Near-term climate dynamics may lead the two parties to further securitize water access and increase tensions with neighboring Jordan and Egypt.¹²² While desalination projects and water-sharing agreements may hold promise for freshwater availability in these countries, these efforts have so far struggled alongside leadership changes and conflict in the region and are yet to materialize.

Dwindling freshwater supplies impact the food security of the region, with recent droughts serving as one source of social unrest over food availability and prices, including in Syria.¹²³ Droughts compound ongoing conditions of high dependence on agricultural imports, fragile government service provision, loss of economic livelihoods, and urban migration leading to situations of political instability. In countries like Jordan that have taken in hundreds of thousands of refugees from neighboring conflicts, water, food and environmental resources become further strained under the additional population demands.¹²⁴

Sea level rise will also impact low-lying countries in the region, including Egypt, Kuwait, Qatar, Bahrain, and the United Arab Emirates, where many settlements are coastal and port cities are critical to economic productivity.¹²⁵ The inundation of low-lying cities like Alexandria, Egypt has already begun, and if left unchecked could see millions displaced and city aquifers salinized.¹²⁶ Coupled with these trends, the Persian Gulf may become exposed to new risks of cyclones, not historically experienced in the region, due to warming Indian Ocean temperatures. Storm surges as high as 4 meters could hit coastal cities like Dubai and destroy coastal infrastructure not designed to withstand such events.¹²⁷ Coastal military bases and infrastructure across the region, such as that along the heavily securitized Strait of Hormuz, face similar threats.

In Central Asia, warming temperatures could benefit agricultural outputs, though flooding from accelerated glacial melting poses a significant threat in near term scenarios.¹²⁸ Historic floods, like those that rocked Pakistan in 2010 killing around 2,000 people and affecting nearly 20 million, are likely to become more common in the Western Himalayan region.¹²⁹ Such destructive events may create conditions for growing extremist movements in these countries to take advantage of the destruction caused by severe weather conditions to challenge government authority.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

The extreme heat already experienced by the Middle East region could reach intense proportions under long-term scenarios. Under the 2-4+°C/3.6-7.2+°F warming trajectories, the climate of the region could exceed the limits of human habitability. The states surrounding the Persian Gulf could see daily maximum temperatures of well over 50°C (122°F), with some areas experiencing maximums over 60°C (140°F). Such temperatures and humidity levels would render regional centers like Abu Dhabi, Dubai, Doha, Dhahran and Bandar Abbas, and the Mecca too hot for people to survive for more than six hours outdoors.¹³⁰

Access to water could become a life-or-death situation for many in the region by the end of the century in high-end scenarios. Water stress projections for high-warming scenarios are extreme, with annual precipitation discharges decreasing by as much as an additional 75% in a 4°C world.¹³¹ Nevertheless, populations will continue to grow by hundreds of millions of people in some of the areas that are the most water stressed, and increasing water demand will be a feature for decades to come.¹³² These conditions could lead tense cross-regional water cooperation to turn into conflict, particularly if countries controlling river headwaters move to dam, further deplete, or otherwise constrain these limited resources on which much of the region depends.

The Middle East and Central Asia are at the center of some of the globe's most troubling security threats, from oppressive regimes hedging towards nuclear capabilities, to growing extremist and terrorist activity. For those nations dependent on revenues from energy resources, any continued patterns of low prices (including from decreased consumption, uncertain market effects of climate mitigation, or supply chain impacts around the world) could bankrupt the public budgets when they may already be strained to provide for their suffering populations.¹³³ These trends could combine with the destabilizing effects of severe climate change to transform already fragile states into failed states, or invite even more authoritarian and violent state control of unrest within populations.

The region is a theater for great power interaction, as well, as China and Russia seek to project power in the conflicts of their neighboring states and entrench themselves militarily and economically in the region alongside the United States.¹³⁴ Whether the governments of the region can turn these great power investments into adequate adaptation measures to help them withstand the climate shocks to come, or whether most investment continues to be in military support and weaponization, will determine the future climate security landscape.

RAQQA PROVINCE IN EASTERN SYRIA, NOVEMBER 2010. (PHOTO BY KHALED AL-HARIRI/REUTERS)



RISKS TO SECURITY INFRASTRUCTURE

The CENTCOM theater is defined by active security and combat operations, with over 90,000 American forces and front-line civilians operating in the region as of 2018.¹³⁵ Regional infrastructure is critical to mission success, and operating bases have already been adversely affected by water scarcity and extreme heat trends, with detrimental effects on force readiness and health.

Critical infrastructure is often at the center of security conflicts in the region. Energy grids, transportation systems and waterways, as well as water infrastructure, including desalination plans, risk weaponization by violent groups seeking to use them as leverage. As the conditions around these resources change, so too will the competition over them, with groups becoming potentially more desperate for control, as has been observed in the recent drought and conflict in Yemen.¹³⁶

Port infrastructure is particularly vulnerable to sea level rise and newly severe weather events in the region, and U.S. naval operators are concerned with maintaining access to critical ports.¹³⁷ Flooding and disasters could have dramatic impacts in highly contested waterways, by rendering some security and commercial ports inoperable for significant periods of time.

RISKS TO SECURITY INSTITUTIONS

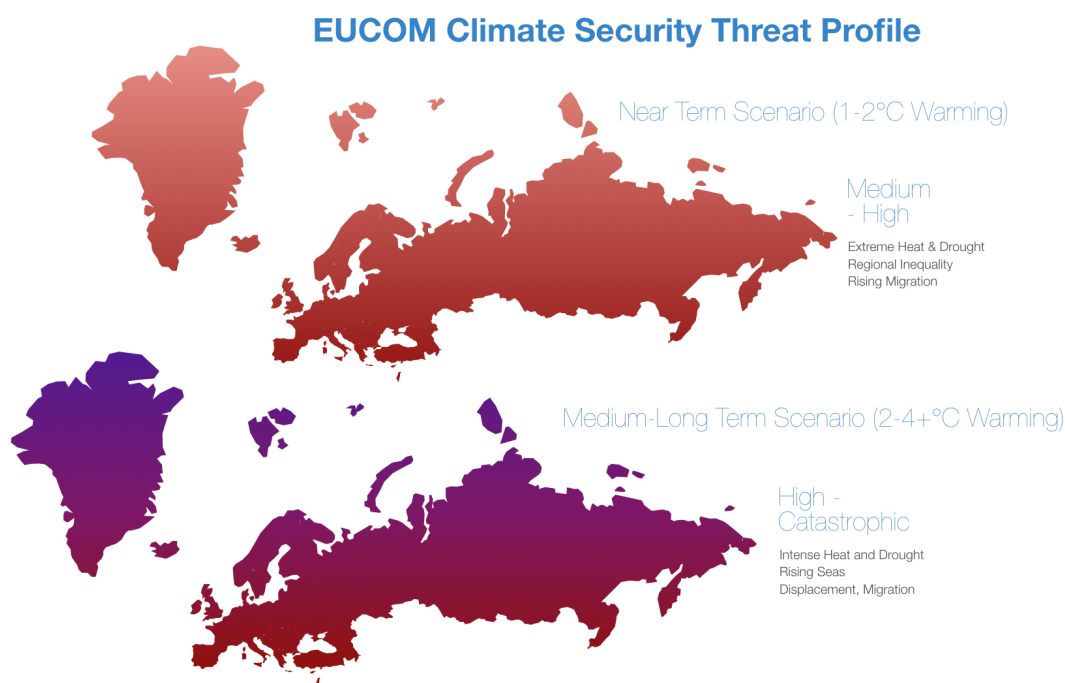
Even with large-scale, global security presence and peace agreements governing territorial borders, old conflicts risk reigniting under changing climates in the CENTCOM region. Water sharing arrangements are weak and increasingly contentious as growing populations and heat stress drain supplies on which multiple states depend.

Populations living under undemocratic authorities may use large-scale social strife to revolt against governments. However, as was seen in a number of countries following the Arab Spring revolutions of 2011 (with exceptions such as Tunisia), these revolts will not necessarily lead to stronger democratic institutions, but rather instances of prolonged conflict.¹³⁸ Refugees displaced by such unrest can, in some circumstances, represent new resource burdens on states, increasing tensions among diverse religious and cultural populations that could engender even more fragility and conflict.

EUCOM: EUROPE AND RUSSIA

THREAT PROFILE

Based on the regional threat assessment for the two warming scenarios below, we have determined the following regional threat profile of climate change for the EUCOM area of responsibility.



NEAR-TERM SCENARIO (1-2°C WARMING): MEDIUM - HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the EUCOM area of responsibility will experience severe weather that threatens destabilization of its key economic sectors, rising regional inequality, and impacts on civil and military infrastructure. In this scenario, rising ethno-nationalist sentiments alongside rising migration waves pose serious threats to the alliances underlying existing security institutions.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH THREAT

At 2-4+°C/3.6-7.2+°F of global average warming, the EUCOM area of responsibility will likely experience prolonged drought and rising seas, leading to significant internal displacement, as well as an influx of migrants from neighboring areas. In this scenario, a breakdown in regional political, institutional, and security cohesion becomes likely.

THREAT ASSESSMENT

The threat profile of climate change for the EUCOM area is determined by an assessment of how climate change will affect the regional security landscape at both warming scenarios.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): Medium - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): High Threat Medium-Long Term Scenario (2-4+°C Warming): High - Very High Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat

BASELINE

The European region has already experienced dramatic increases of temperatures, particularly in the past decade, when average annual temperatures were over 1.6 °C above pre-industrial levels.¹³⁹ As global temperatures rise, Europe is undergoing more instances of climate extremes, and in the near-term, this could cause a dramatic departure from the climate and weather conditions of today.^{140 141}

RISKS TO SECURITY ENVIRONMENT

Climate change will impact the European continent unevenly as varied effects strike regions with different adaptation levels and capabilities, but no region will be left unaffected. Warming rates will be most severe across the cold climates of Northern Europe. The IPCC identifies the region to be at particular risk from water stress, flooding, and extreme heat.¹⁴²

The Southern Europe and the Mediterranean sub-regions will see rising temperatures bringing extended drought conditions, hampering economic productivity and leading to increasing emigration to other regions of Europe. The security impacts of severely threatened regions neighboring Europe, including the Middle East and North and Sub-Saharan Africa, will increasingly spill into the region through humanitarian demands and population movements. With political and demographic stressors increasingly dividing the citizens of Europe today, often aided by Russian influence campaigns, the future stability of the region may indeed rest on its ability to withstand growing climate shocks and outside intervention.

NEAR TERM SCENARIO (1-2°C WARMING)

Under a global warming scenario of up to 2°C/3.6°F, Europe will experience higher warming than the global average.¹⁴³ These effects will be most felt through increasing dryness in the Southern latitudes and wetness across the Northern latitudes, along with more frequent extreme heatwave events striking each summer. Extreme sea level rise has already increased across the continent, and could increase over half a meter on average under this warming scenario.¹⁴⁴

These climate extremes, particularly in heat and precipitation patterns, can have devastating consequences for the agricultural sector. More severe drought conditions are expected to lower agricultural productivity in Southern Europe, while Northern Europe may see an increase in agricultural yields as growing seasons extend, though unpredictable heatwaves or rainfall patterns can be devastating to harvests in any year.¹⁴⁵ The forested regions of Southern and Eastern Europe will see more frequent wildfires and droughts, with implications for the forestry sector. Russia can expect future patterns of poor grain harvests, in particular, with economic losses totaling over \$3 billion annually by 2050.¹⁴⁶

Against a backdrop of growing security concerns and political divisions, these near-term climate impacts are worrying. Economic inequality is already widespread across the continent, with conditions of high youth unemployment, aging populations, and stalled economic growth increasingly acute in the Mediterranean and Eastern Europe.¹⁴⁷ Intra-regional migration is often one directional, with residents from Eastern states like Croatia and Romania emigrating west and north in large numbers. This is alongside an influx of refugees from climate and conflict-impacted countries of Africa and the Middle East, as European and non-European citizens alike search for reliable economic opportunities and social safety nets in the regions' wealthy urban centers.¹⁴⁸ Even under a scenario of limiting warming to a global average of 2°C/3.6°F, Europe could expect to see sectoral costs of over €100 billion annually by the 2050s, with these losses doubling under higher-emission scenarios.¹⁴⁹

The negative consequences of such inequality have begun to tear at the fabric of formerly stable European societies. In particular, the radicalization of restless youth populations, both citizen and immigrant, is of growing concern for European governments. Further, with terrorist activity remaining high in recent years and requiring concerted counter-terrorism efforts across the continent, this becomes a significant stressor.¹⁵⁰ Nationalist, ethno-nationalist and nativist sentiments are becoming more popular, often through the rhetoric of extreme right and left groups, whose polarization leads to political gridlock and volatility. Antidemocratic responses to economic and security distress are also more common, with Hungarian, Polish, and Turkish leaders cracking down on dissent, limiting democratic freedoms, and pointing the blame on immigrant and Western entities.¹⁵¹ The expected agricultural, economic, and migration impacts of near-term climate change do not bode well for societies already under existing strains.

The geopolitical relationships among great European powers are becoming increasingly tense and are likely to grow more confrontational under increased warming. The European Union faced a severe political and security issue during the 2015 migrant crisis, and that incident could pale in comparison to the mobile populations in a 2°C/3.6°F world. Such crises have led to anti-immigrant sentiments at the root of the United Kingdom voting to leave the E.U., stripping the bloc of a member with important security capabilities.

Russia, suffering economically from low oil prices, sanctions, and a recent historic drought, became more belligerent towards its neighbors, including by limiting agricultural trade.^{152 153} Its 2014 invasion of Ukraine, exploitation of Balkan tensions, and growing interference in European elections at all levels show the steps Russia will take to undermine European stability, and extend its own regional power. As Russian agricultural sectors suffer under near-term warming scenarios, and energy sectors become threatened by proposed climate mitigation, security experts expect its aggression to become more blatant, rather than dwindle, as its position as a global superpower becomes more insecure.¹⁵⁴ Melting Arctic regions may also allow increased Russian exploitation of natural resources for commercial shipment around the globe.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

Under higher warming scenarios, the impacts facing Europe will become even more extreme, dramatically altering the climates of much of the continent. Temperatures over European lands would likely continue to rise faster than the global average, and could reach a 4.5°C increase by the end of the century.¹⁵⁵ At these temperatures, Northern latitudes can expect to face many more frequent and devastating heavy precipitation events, including floods and storms, and Southern latitudes face a dramatic increase in drought and heatwave events.¹⁵⁶

The agricultural and economic impacts already painful in near term scenarios, will become more severe above those levels of warming. Whole agricultural zones will move further and further north, as the Southern European climate becomes increasingly drought-prone with acute water shortages. Studies point to a Mediterranean region that could dry out and heat up intensely, with current ecosystems no longer able to survive projected annual extreme heat events lasting upwards of three months.¹⁵⁷ The increasingly warm summers will affect the all-important economic sector of European tourism, with crowds opting to avoid the Mediterranean region during the summer because of heat, and alpine regions during the winter, due to diminishing snowpack for skiing. Studies have calculated that high-level scenarios of warming could cost the European economy over €700 billion annually by the 2080s.¹⁵⁸

Projected sea level rise under this severe scenario threatens every significant European port city, with low-lying states like the Netherlands threatened with over a meter of sea level rise under high-impact estimates.¹⁵⁹ High-end emissions scenarios suggest .52-.98m of sea-level rise by the end of the century, and this could affect as many as three-quarters of all European cities.¹⁶⁰ With these potential levels of coastal inundation, dike or wall building may become untenable, requiring infrastructure and entire settlements to be moved further inland.

At these extreme levels of impact, many European states may be unable to adapt to the changes facing them. The IPCC identifies the Southern European and Mediterranean regions as having a lower capacity to adapt than their Northern neighbors, but more vulnerable to climate impacts including sea level rise, heatwaves and droughts, water stress, and systemic failure.¹⁶¹ Less-developed Eastern and Southern European states, for example in the Balkans, possess weak government institutions and histories of ethnic conflict, and may not be able to support their populations through such extreme changes.

Such conditions would lead to even more robust waves of intra-regional migration throughout the century, as populations turn North to escape the increasingly hostile conditions of Southern Europe. The ability of European countries to handle these movements, alongside dramatic numbers of immigrants from nearby regions facing their own extreme effects, will fundamentally test the region's liberal values of open borders and individual legal rights. If anti-immigrant sentiments continue to rise alongside these migration patterns, European state reactions are likely to become increasingly militarized and nationalist, threatening the cohesion of the European Union and NATO alliances, and regional political stability. Coastal countries will likely deploy naval forces to stem influxes of migrants from the sea, following current trends of securitized responses to migration, and European borders may become newly securitized with increasing tensions around freedom of movement.¹⁶²

Russian aggression towards the West may increase alongside severe warming, as it seeks to claim Arctic territories or productive agricultural lands outside its existing borders. Facing an intense threat of permafrost melt in its most northern latitudes, Russia will also face irreversible and costly impacts on its lands and infrastructure, with serious repercussions for the state of global emissions.¹⁶³ Its current efforts to prop-up authoritarian governments, challenge political borders, and invade militarily in the European and nearby regions give us some indication of how Russia could exploit the political chaos arising from severe climate change.

Whether the modern political project of Europe, and its hard-won, historic regional peace, could withstand these vast shifts in regional economic output, resource availability, human movement, and external threats is in doubt. But it is clear from the climate changes projected at such a severe level of warming is that the current volatility and tensions rising across the continent will seem exceedingly stable in light of the turbulence to come.

WILDFIRE DAMAGE IN MATI, NEAR ATHENS, GREECE. JULY 2018. (Savas Karmanioli/AFP)



RISKS TO SECURITY INFRASTRUCTURE

The European subcontinent is home to civilian and military infrastructure that is essential for the maintenance of both regional and global security. U.S. and NATO member state military bases and strategic listening posts exist in vital places across both Western and Eastern Europe facing rapid climate changes.

Military installations along the Mediterranean and Atlantic will see rapid sea level rise and increasing flooding incidents, impacting systems, personnel, and force readiness.¹⁶⁴ An increase in extreme heat and precipitation events requiring response will also strain emergency capabilities of NATO, including the Euro-Atlantic Disaster Response Coordination Center, NATO Response Force, and Crisis Management and Disaster Response Centre of Excellence (CMDR COE), and the capabilities of European militaries operating within their territories.¹⁶⁵

Critical European civilian infrastructure will face equally detrimental impacts from flooding, heat, and water stress. Infrastructure serving European shipping ports are likely to become inundated in high-precipitation events, and electricity grids overwhelmed in extreme heatwaves. Southern and Eastern European countries reliant on hydropower will similarly see energy capacities dwindle in drought conditions.¹⁶⁶

RISKS TO SECURITY INSTITUTIONS

Climate stresses to Europe and its neighboring regions – particularly North Africa and the Middle East – are likely to increase the scale, scope, and tempo of migration to Europe, which may contribute to ongoing political fragmentation. Perhaps the biggest implication of increasing migration could be rising ethno-nationalist political rhetoric and party representation, and militarized responses to migrants, as seen in recent crises.¹⁶⁷

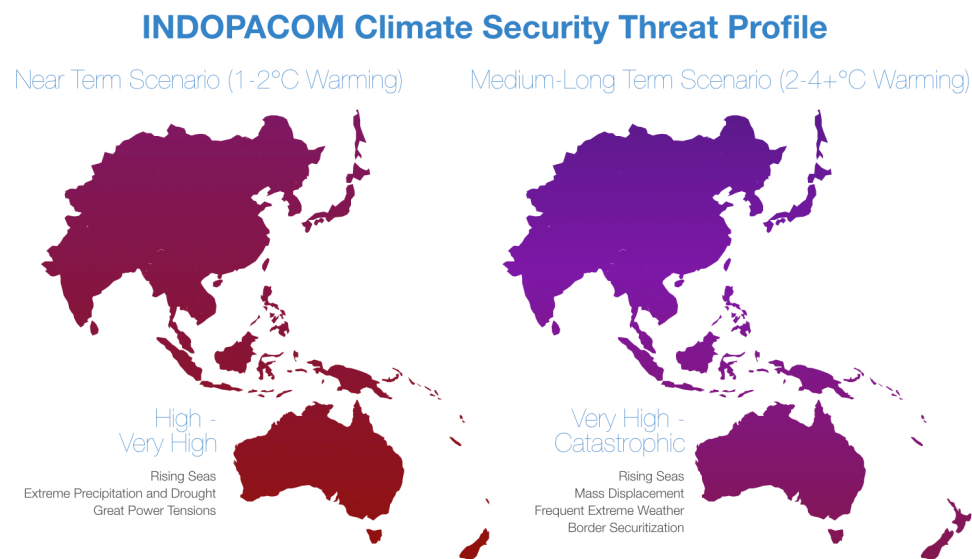
Nationalist-driven divisions within Europe could change the nature of the NATO mission, and potentially strain its ability to operate outside of the subcontinent. If populations call for strengthening borders and limiting internal migration, the movements and trade agreements on which the European Union rests could fracture.

Even without growing political backlash, NATO and the EU institutions will experience budgetary strains due to the high costs of response operations, adaptation investments, and large-scale infrastructure projects in response to address new climate threats. These increasing demands threaten the capacity and capabilities of security operations and civilian service provision alike.¹⁶⁸ Likewise, if stability and basic services are not restored quickly following frequent extreme events, swift public reaction could undermine democratically elected governments and foster deep divisions for exploitation by adversaries.

INDOPACOM: INDO-ASIA-PACIFIC

THREAT PROFILE

Based on the regional threat assessment for the two warming scenarios below, we have determined the following regional threat profile of climate change for the INDOPACOM area of responsibility.



NEAR-TERM SCENARIO (1-2°C WARMING): HIGH - VERY HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the INDOPACOM area of responsibility will experience water scarcity in some areas and precipitation inundation in others. This could pose existential risks to security infrastructure and undermine social stability. Tension between regional powers will increase against a backdrop of competitive resource and territorial claims.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH - CATASTROPHIC THREAT

At 2-4+°C/3.6-7.2+°F of global average warming, the INDOPACOM area of responsibility will experience devastating sea level rise threatening its megacities, infrastructure, and populations. Countries will likely securitize borders to prevent migration following severe disasters, and could undermine important military alliances and partnerships on which regional peace depends.

THREAT ASSESSMENT

The threat profile of climate change for the INDOPACOM area is determined by an assessment of how climate change will affect the regional security landscape at both warming scenarios.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Catastrophic Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High Threat

BASELINE

The Indo-Asia-Pacific Region includes the nations of East, South and Southeast Asia; the Pacific Islands; Australia; and New Zealand, who have experienced current warming levels in different ways. The great diversity of this region, its rising powers and their strategic importance for global economic trade and activity, make ensuring its stability key to global security. Regional geography and weather patterns, however, make the area uniquely vulnerable to climate change, with many countries facing high or existential risks at current warming levels. The IPCC identifies this region as under particular risk from water and agricultural stress, flooding, storms, and disease.¹⁶⁹

RISKS TO SECURITY ENVIRONMENT

NEAR TERM SCENARIO (1-2°C WARMING)

Asian populations are rapidly growing, urbanizing, and industrializing, putting new demands on the water and agricultural potential of the region. At the same time, however, near-term scenarios of climate change put the continent at even greater risk for water scarcity and extreme weather events, particularly in coastal regions with booming resource demands.¹⁷⁰

The mountain glaciers of Asia, all important for their supply of freshwater to the continent's growing populations, have already experienced rapid melting under current patterns of regional warming. The Hindu Kush-Himalayan region's glaciers are of particular concern, having experienced accelerated melting in recent decades, and under threat of losing as much as one-third of their mass in even low emission projections.¹⁷¹ These melting levels would have devastating downstream effects in coming decades. As glaciers melt rapidly, severe flooding, landslide, and avalanche events become more frequent, putting as many as one billion people in the Western Himalayas at risk of inundation.¹⁷²

An increased intensity of precipitation events will also wreak havoc, as warmer temperatures cause monsoon seasons to become more variable and cyclones more frequent in the tropics. The East Asian and Indian monsoons are projected to contain greater rainfalls and more extreme high precipitation events.¹⁷³ This increased variability, particularly when delayed monsoons are followed by extreme precipitation within the same season, can devastate agricultural harvests. The region is also at risk of intensified cyclone events, which are moving further north as climate change escalates.¹⁷⁴

But as some Asian regions face catastrophic floods, storms, and monsoons, others will see rivers dry up, with warming temperatures and increased freshwater demand compounding increasing conditions of water scarcity. The Northern regions of China face severe and growing water insecurity, as demand from industrial cities expand and run-off from the Yellow, Yangtze, and Mekong rivers decline. These conditions are expected to become more acute in near-term climate scenarios, with Yellow River Basin freshwater resources potentially declining by as much as 30%.¹⁷⁵ China has created dams, diversion infrastructure, and protected areas to cope with the scarcity, but may force growing pressure on downstream areas in the process.¹⁷⁶

These precipitation stressors can overwhelm regional agriculture, on which 81% of Asian livelihoods depend.¹⁷⁷ Near-term projections show erratic climate change effects on overall crop production, with diminished yields in South and Central Asia coupled with some improved yields in East Asia. Rice is at risk from higher temperatures, precipitation events, and subsequent price shocks, particularly threatening for Southeast Asian countries economically dependent on this staple crop.¹⁷⁸

Perhaps even more devastating to the food security of Asia-Pacific populations will be the impact of warming on ocean fisheries and coral reefs. Even low emission scenarios, and the resulting ocean acidification and temperature spikes, lead to collapsed reefs and fish stocks. East Asian waters have already seen a 15-35% warming-driven decline in productivity.¹⁷⁹ Pacific and Asian populations depend on fishing for the bulk of their diet and income, and are likely to experience increased vulnerability as warming increases.¹⁸⁰ Highly developed nations like Japan and New Zealand will also see harsh economic repercussions as reefs collapse and fish stocks move to colder waters in northern latitudes, and the potential collapse of the Great Barrier Reef off of Australia will have economic impacts across sectors.¹⁸¹

Even in low warming scenarios, the low-lying regions of this region will see existential threats posed to their populations and territories due to sea level rise. Sea levels and floods in high-emission scenarios could create as many as 20 million climate migrants in Bangladesh by 2050, with these populations expected to move internally or into nearby India.¹⁸² For low-lying countries like the islands of the Pacific and Indian Oceans, where some populations are only a few feet above sea level, millions of people and whole nations will have no choice but to abandon their ancestral homes as waters rise permanently. Countries in this region will see high climate risks both in terms of shares of population affected (The Maldives, Marshall Islands, Kiribati, and Vietnam each have over 40% of their populations at risk) and in total number (climate risk threatens 107 million people in China, 53 million in Bangladesh, 44 million in India, 38 million in Vietnam, and 26 million in Indonesia).¹⁸³

These climate effects will take place against a backdrop of rapidly changing Asian security dynamics as power and governance systems shift throughout the region. Through its Belt and Road Initiative, China is building its investment, presence, and power across the continent and world, while securing access to critical resources and agricultural lands to bolster its own.¹⁸⁴ Meanwhile, it is growing its military footprint

throughout the region under the banner of national and regional security, constructing new military bases and partnerships with vulnerable countries throughout the Pacific.¹⁸⁵ As the impacts of extreme weather, water scarcity, and diminished agricultural and fishery production become more acute, China could increase its regional investments in response, hoping to guarantee further stability and resource access.

Power relations are also becoming more strained within nation states, as antidemocratic trends are rising throughout the region. China's use of censorship and sophisticated tracking technologies may increasingly target minority populations inhabiting valuable arable land, such as those inhabited by Uyghur Muslim populations.¹⁸⁶ Similarly repressive tactics are being deployed by Cambodia, Thailand, and Myanmar.¹⁸⁷ Harsh inequalities exacerbated by climate change and worsened by oppressive government responses could lead to new bouts of internal strife. In Thailand, for example, recent legacies of conflict and ethnic violence have been cleavages along which new tensions break out in the face of natural disasters.¹⁸⁸ Dwindling and migrating fish stocks in the heavily-disputed South China Sea are altering conditions that could lead to great power conflict between the U.S., China, and states with competing claims in these waters.^{189 190}

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

Over long-term projections of severe warming, sea level rise is the most devastating climate threat to the Asia-Pacific region. A one meter rise in sea levels would displace 37 million people in the East Asian and Pacific, and that number would nearly double with a two meter rise.¹⁹¹ Heavily populated cities along the coast will see huge economic and livelihood losses due to rising seas, including Mumbai, Bangkok, Jakarta, Ho Chi Minh City, and Guangzhou.¹⁹²

To avoid the rising sea and extreme weather threats, these cities may need to move millions of people and billions of dollars worth of infrastructure further inland. Fertile agricultural lands along the coasts will be lost to salinization of land and aquifers which reduce potential to grow staple crops.

As with other regions of the world, such massive waves of migration will overwhelm local governments, strain already scarce resources, and provoke existing social tensions. Religious extremism in South and Southeast Asian countries like Bangladesh, Indonesia, Malaysia, and India has increased as populations blame governments for protracted poverty, unemployment, and lack of services.¹⁹³ These conditions could become more acute with increasingly harsh climate impacts.

We already observe the use of military forces along borders to secure resources or prevent migrant crossings, and areas could become increasingly securitized. Wealthy countries like Australia, experiencing waves of refugees making dangerous ocean journeys to their shores, have recently used their security forces to intercept and relocate migrants to out-of-country detention centers.¹⁹⁴

Militarized borders across the region may unravel into dangerous security hotspots as existing peace agreements no longer cover changing and extreme climate security consequences. With glaciers at risk of disappearing at high warming scenarios, water stress along the Pakistani-Indian border may overcome the 1960 Indus Waters Treaty. This is particularly worrying for Pakistan, who relies on the Indus River basin for 90% of its agriculture and could resort to desperate means if its supply is cut off.¹⁹⁵ Growing tensions over resources along the Indian-Chinese and North-South Korean borders may face similar stressors.

With U.S. forces operating in all of these areas, and reliant on coastal and island bases for their presence, climate change in the Asia-Pacific region will have direct U.S. national security implications. From sea level rise threatening regional naval bases and allies, to demands for humanitarian responses in the region and increasing tensions among military powers, the climate vulnerability of the region threatens to pull nations into a dangerous new security reality, at all warming scenarios.

RISKS TO SECURITY INFRASTRUCTURE

The Indo-Asia-Pacific area contains some of the most strategic infrastructure for ensuring both global economic and military stability. This coastal infrastructure faces existential risk from climate impacts such as flooding, erosion, and disasters, which may leave entire facilities inoperable in the near future.¹⁹⁶

KORALI IN DHAKA, BANGLADESH. 2019. (Ignacio Marin/ Institute).



U.S. naval bases on small islands like Diego Garcia, Guam, and the Marshall Islands are facing serious impacts of rising seas, in some cases forcing a complete removal of existing operations.¹⁹⁷ In the face of extreme cyclones, other bases will be strained by response demands while potentially trying to recover their own capabilities.¹⁹⁸ Disaster response is a critical component of security cooperation in the region, but more frequent and intense events may make it increasingly difficult to restore stability to entire areas, allowing extremist groups or adversarial states to gain deeper control in the region. Furthermore, as disaster response missions affect the readiness and preparation of forces to confront adversaries or non-related threats, decision-makers may find it hard to justify the cost of response.

The risks to civilian infrastructure, too, will have lasting security consequences. If ports and industrial centers of coastal megacities close due to extreme flooding or storm surges, the entire world will face the economic repercussions. Collapsed electric grids, transport infrastructure, and agricultural sectors in this productive region would impact the stability of global markets, and communities reliant on trade-related production.

RISKS TO SECURITY INSTITUTIONS

The security alliances shaping the INDOPACOM area are necessary for maintaining peace against an increasingly aggressive China. But tensions around trade, territorial claims, and migration could undermine even the most historic military partnerships.

Rising ethnonationalist response to waves of migration from small-island states and low-lying coastal areas will strain government institutions, potentially causing countries like Australia and India to unilaterally close their borders.¹⁹⁹ The injustice felt by these climate refugees could turn into blame against Western states by civil society and populations, further perpetuated by extremist groups and adversarial propaganda.

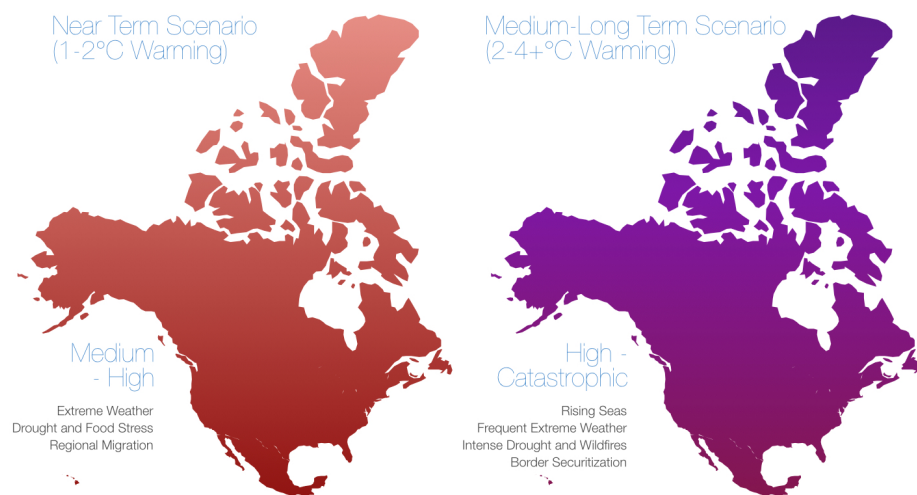
Existing diplomatic institutions, like the UN Convention on the Law of the Sea (UNCLOS) and the Asia-Pacific Economic Cooperation (APEC), may become increasingly tense and competitive over competing ocean resource claims. Migrating fish stocks or deep-sea oil exploration may set off new conflict among Southeast Asian countries, or major powers like the U.S., Russia, and China, as states attempt to defend their rights to navigation in an increasingly changed Pacific context.²⁰⁰

NORTHCOM: NORTH AMERICA AND POLAR REGIONS

THREAT PROFILE

Based on the regional threat assessment for the two warming scenarios below, we have determined the following regional threat profile of climate change for the NORTHCOM area of responsibility.

NORTHCOM Climate Security Threat Profile



NEAR-TERM SCENARIO (1-2°C WARMING): MEDIUM - HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the NORTHCOM area of responsibility will experience more intense, extreme events like storms and wildfires, with significant impacts on life and property. These effects will reduce the readiness of security infrastructure, and undermine democratic and international institutions on which major power security relations depend.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH THREAT - CATASTROPHIC

At 2-4+°C/3.6-7.2+°F of global average warming, the NORTHCOM area of responsibility will experience extreme heat, sea level rise, and disaster events that severely impact infrastructure critical for protecting the homeland. Increasing divisions within society -- including rising ethno-nationalist, anti-democratic and isolationist views -- could fracture historic security agreements, and great power competition over resources in the melting Arctic may become acute.

THREAT ASSESSMENT

The threat profile of climate change for the NORTHCOM area is determined by an assessment of how climate change will affect the regional security landscape at both warming scenarios.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): Medium - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): Medium - High Threat Medium-Long Term Scenario (2-4+°C Warming): High - Very High Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): Medium - High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High Threat

BASELINE

For the U.S., Canada, and Mexico, climate change is contributing to risks of rising extremes across the continent, in heat, precipitation, drought, sea levels, wildfires, and storms. Few areas of the region are unaffected, even at low levels of warming, and all experience rising economic and social costs from intensified disasters. Melting Arctic conditions also newly define the region, as summers become ice free and tensions brew in the region over competing commercial interests.

RISKS TO SECURITY ENVIRONMENT

Warming across the North American region is projected to be swift, particularly for more Northern latitudes. On high end trajectories, temperature rise could exceed a regional average of 2°C by the middle of the century.²⁰¹ This warming will bring with it more frequent extreme heat and precipitation events, droughts, and earlier winter melting, as well as a host of localized impacts likely to stress the foundations of communities across the continent. The IPCC identifies this region as under particular risk from wildfires, extreme heat, and storms.²⁰²

NEAR TERM SCENARIO (1-2°C WARMING)

An increased intensity of tropical storms will inundate the Eastern coasts of the North American continent, bringing with them extreme economic and health impacts for communities affected. Recent research suggests that hurricanes will be both more intense and have higher rainfall rates as a result of coming climate change.²⁰³ Together with increasingly high storm surges, flooding, and high wind effects, these hurricanes will threaten important coastal infrastructure and could lead to higher damages for those not able to escape a storm's path, particularly vulnerable and elderly communities.²⁰⁴

As the East is hit by historic storms off the Atlantic, the Western areas of the continent will experience new patterns of severe wildfires that will increase under near to mid-term warming scenarios. Fires are burning hotter, larger, and for longer periods throughout the year, and lead to loss of homes, infrastructure, agriculture, and lives. Areas along the dry Western coast of the continent are at particular risk, but wildfires will increasingly threaten the Northern Plains, Rocky Mountains, and Southeast Pacific coast in summer and fall months.²⁰⁵ These dangerous conditions have health impacts for nearby communities even if not directly impacted by fires, as smoke and air conditions can cause injury and respiratory impacts.²⁰⁶

The United States has seen mounting costs of such events, with climate and weather-related disasters costing over \$400 billion in just 2014-18, and trends towards increased exposure and intensity of events are worrisome.²⁰⁷ There are also direct security implications of more frequent storm and disaster events, as military bases, ships, aircraft, equipment, and troops must be moved out of harm's way, at great expense, or face significant and expensive damage.^{208 209}

Southwestern North America already faces conditions of water scarcity, through a combination of warming temperatures, drying, and decreased precipitation. In near-term projections, these conditions will deteriorate as water stress and drought become more acute in the arid regions of Western U.S., Canada, and Mexico, with negative implications for crop irrigation in these regions.^{210 211} The communities along the U.S.-Mexico border face particularly dire drought conditions, reported as the most extreme the region has experienced in the past century, along with consistently high temperatures.²¹²

Water availability is not the only growing tension across the dry border regions. As record numbers of migrants from Central and South America attempt to cross the southern Mexican and U.S. borders, tensions have risen as political leaders have grown increasingly polarized on how to manage the situation. In both countries, military forces have been called on to respond to the migration flows, enforcement and vetting has increased, and asylum policies have become more restrictive.²¹³ Efforts to more strictly limit immigration could have labor implications for border economies, particularly in the agriculture and industrial sectors. With climate impacts including heat and drought diminishing crop yields across the region, migrants are citing lack of food as their primary impetus for migration to Northern latitudes.²¹⁴

In the Arctic region, warming is being experienced nearly twice as fast as the rest of the planet, with record-breaking temperatures every year since 2014 exceeding all previous records.²¹⁵ This fast-paced warming is expected to continue, with new light being shed on how warmer polar temperatures impact extreme weather conditions at midlatitudes, amplifying dryness and heat along the west coast of North America, and cold, wet weather along the East.²¹⁶

The Arctic region is likely to begin experiencing ice-free summers within the next decade, with summers likely to be completely free of sea ice by mid-century, opening up valuable new territory for shipping lanes and resource extraction.²¹⁷ Such commercial activities are not without serious security implications for the variable and harsh conditions of the region, and lack of many permanent infrastructures, will require continual high-capability Navy and Coast Guard presence for search-and-rescue and ice breaking purposes. With the warming Arctic comes a rush of interest from other countries and commercial actors to the region, seeking these opportunities and drastically lowered shipping times. Currently addressed by the Arctic Council institution, as the region becomes more navigable relations

among Arctic Council and official “Arctic Council Observer” states may be fraying.²¹⁸ While the Arctic Council currently has purview only over non-security issues, this may evolve in future years as security issues come to the fore.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

Over a long-term, high-warming scenario, North America is projected to see large increases in extreme heat, with Southern latitudes experiencing decreases in annual precipitation and Northern latitudes experiencing an increase. Warming will be most pronounced in the North, with a 4°C temperature increase by the end-of-century translating to 6°C and greater in Northern Canada and Alaska.²¹⁹

Rising sea levels under this scenario could be extreme and will threaten inundation of much of the heavily populated coastal regions, intense floods, storm surges, and groundwater disruptions. At the higher end emissions scenarios, 1.2 meters (4 feet) of sea level rise by end of century is likely, and high as 1.8-2.4m (6-8 feet) is possible, which could sink as much as \$507 billion in coastal infrastructure and force large scale coastal resettlements.²²⁰ While many North American cities have high adaptive capacity to such extremes, the density of population and infrastructure make damages and evacuations more costly. Critical coastal infrastructure, such as electricity grids, transportation lines, ports, and military bases, will be further threatened by sea levels, floods, and extreme events, and would likely need to be expensively retrofitted or relocated by the century’s end.²²¹

Extreme heat projections are increasingly dangerous in high-end, long term scenarios, in which the increased intensity and duration of heat waves will pose severe risks to human health. By mid-to-late 21st century, half of all North American summers are projected to be hotter than the maximum summer temperatures experienced at the end of the 20th century.²²² These extreme temperatures will put populations at risk of heat stresses across the continent, with particular risks in under-adapted northern areas. Across Mexico and the Western and Southeastern United States, extreme heat will define the majority of all summers and drought conditions will severely decrease water availability.²²³

While moderate levels of climate change could benefit some agricultural products, increased warming will have severe impacts on key staple crops including corn, soy, and cotton as temperature thresholds for growing conditions are surpassed. This could have drastic consequences for regional agriculture by the end of the century, with crop yields affected by as much as 63-82% by 2099 in high-emissions scenarios.²²⁴ Livestock will also face heat-induced stressors, with implications for those agricultural sectors. Without reliable water sources and damaged by extreme summer temperatures, the agricultural regions of the American Great Plains will see good growing conditions move further and further north.

In the polar regions, severe scenarios will likely bring about wholly unprecedented climates, with fall seasonal temperatures as high as 13°C above pre-industrial levels projected by 2100.²²⁵ These temperatures in high-emissions scenarios mean that the Arctic region could be free of ice well into September by the end of the century.²²⁶ Changing conditions will make regions like the Arctic increasingly viable for commercial activity, leading to increased competition for the sea routes and resources available. As countries like Russia bolster their military presence in the Arctic, ice-free routes could push belligerent governments to act outside of cooperative institutions on both poles

to unilaterally stake and protect their claims. Tensions among North American countries could also strain, as Canada pushes its existing claims on the Northwest Passage, and indigenous settlements face harsh impacts on ecosystems and fish stocks in the Northern Atlantic.

As these harsh climate effects overwhelm communities reliant on stable weather and resources, the governments of North America may be increasingly unable to respond to mounting disasters and help communities rebuild. As the United States has experienced following the weather events of 2017, damage costs compound quickly and legislative delays can hold resources from communities in need of aid and response.²²⁷ With extremes increasing across all regions, even wealthy governments and trained security services of the U.S. and Canada will find it difficult to provide overlapping responses, and unstable local governance institutions across the continent could collapse under the strain.

Recent cases suggest that citizens with unmet needs following natural disasters resent unresponsive government institutions going forward, and these negative sentiments could shape public life over the next century.^{228 229} If Northern American countries are to manage severe climate change, alongside expected increases in migration flows, food price increases, trade shocks, and health impacts influenced by climate events across the world, public policy and funding on levels never seen before would be required to prepare this relatively wealthy continent to adapt to the extremes in store.

CALIFORNIA, USA. 2019. (Mark Ralston/AFP)



RISKS TO SECURITY INFRASTRUCTURE

The U.S. military has undertaken several extensive reviews of its homeland military installations and infrastructure, identifying the destructive risks that climate change will pose to mission readiness. On its bases, the Department of Defense sees sea level rise, drought, dust, fire, and heat negatively impacting its infrastructure and training ranges.²³⁰ The most evident example is the infrastructure at Hampton Roads which, low-lying along the Atlantic Ocean, faces serious risks to military operations, readiness, and strategy.²³¹

Military aircraft utility itself is negatively impacted, with decreased performance on hot and humid days.²³² In the complicated environment of the Arctic, new ice-breaking and search-and-rescue infrastructure is required to protect security and commercial interests from dangerous events.²³³

Civilian infrastructure, on which security operations also depend, is increasingly insecure. Electric grids and transportation lines are vulnerable to high winds, storms, fires, floods, and heat, causing new inefficiencies in logistical chains that impede the military's ability to respond.²³⁴ Military forces are also being called on more than ever to perform rescue and humanitarian response to climate-induced disasters on their own soil, depleting budgets, readiness, and training time. When domestic critical infrastructure like agricultural and water systems are increasingly stressed, both the civilian and military communities dependent on them are weakened in turn.

RISKS TO SECURITY INSTITUTIONS

The stability of U.S. security institutions rests not only on the readiness of its military, but also on the stability of its communities and political institutions. As climate risks increase across the North American continent, this strength and safety becomes more difficult to uphold.

Climate threats in neighboring regions such as SOUTHCOM will drive migrants further north, potentially sparking increased political tensions over U.S. borders. Impacts of weakened social support systems and strengthened transnational crime networks in Central America and the Caribbean also can harm the U.S. homeland.²³⁵ These risks communicated through incendiary political rhetoric, to an increasingly concerned public, can engender nationalist, isolationist, anti-democratic and authoritarian responses. These could limit future American responses to contain crises outside its border, just as those insecurities increasingly threaten to spill over into U.S. territory.

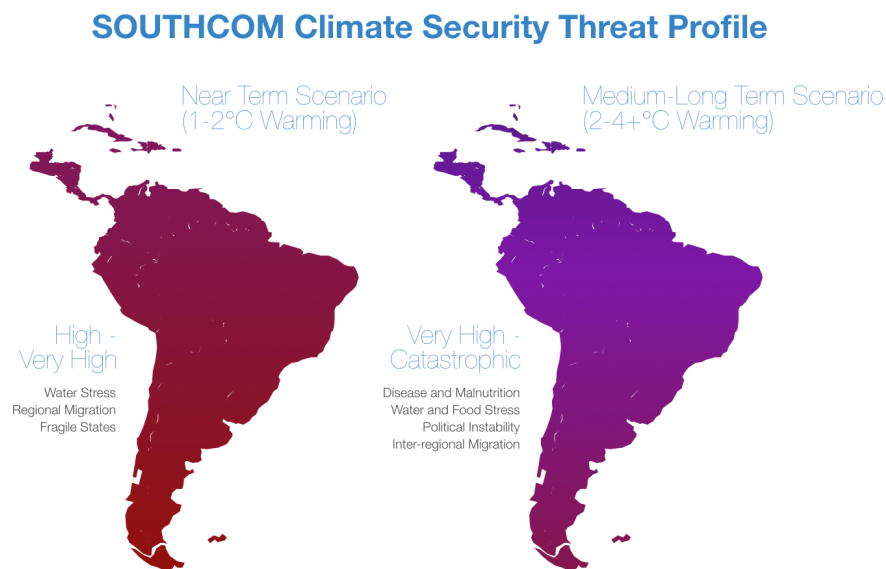
Relationships with historic allies are newly tested in the face of climate impacts. Within institutions from the Arctic Council and to the U.S.-Mexico-Canada Agreement (USMCA), climate stressors are creating new tensions among formerly friendly neighbors.²³⁶ Undermining security agreements across the Atlantic and Pacific with negative rhetoric or decreasing financial commitments could also weaken the posture of institutions against great power adversaries.

With homeland populations living in more vulnerable conditions, threatened by floods, storms, fires, and droughts, the American public is less secure financially and physically.²³⁷ Increasing political divisions across parties and locations, including a widening rural-urban divide, make policymaking across these communities more difficult, and crisis response slower and weaker. Widening economic and health inequalities across social spheres encourage populist rhetoric and mistrust in existing government institutions, further undermining their ability to address the climate situation in a concerted manner.

SOUTHCOM: SOUTH AND CENTRAL AMERICA AND THE CARIBBEAN

THREAT PROFILE

Based on the regional threat assessment for the two warming scenarios below, we have determined the following regional threat profile of climate change for the SOUTHCOM area of responsibility.



NEAR-TERM SCENARIO (1-2°C WARMING): HIGH - VERY HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the SOUTHCOM area of responsibility will experience shifting precipitation patterns and acute water shortages, forcing communities to migrate in search of new opportunities in an increasingly unstable environment. Transnational criminal groups, and narcotics and human traffickers will likely take advantage of this growing destabilization, further straining local security institutions.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH - CATASTROPHIC THREAT

At 2-4+°C/3.6-7.2+°F of global average warming, the SOUTHCOM area of responsibility will likely experience even more acute weather instability, crop collapse, and spreading disease. Failing agricultural productivity, water insecurity and infrastructure will increase the likelihood of violent conflict, drive significant internal and cross-border migration, and increase political instability.

THREAT ASSESSMENT

The threat profile of climate change for the SOUTHCOM area is determined by an assessment of how climate change will affect the regional security landscape at both warming scenarios.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat

BASELINE

Rising temperatures have impacted the SOUTHCOM regions variably, as countries experience a wide range of impacts across its latitudes. Central America and the Caribbean have been identified as the most responsive tropical region in the world to current observations of warming, with extreme events hitting repeatedly and with force in the past two decades, and these trends are expected to continue over the near term.²³⁸ Its populations, however, are vulnerable to the compounding security multipliers of climate change, as they are already plagued by extensive violence and organized crime.

RISKS TO SECURITY ENVIRONMENT

Central and South America have a wide range of varying climates, from the tropical rainforest of the Amazon, to the semi-arid deserts of the Andes mountains, and the island archipelagos of the Caribbean. More extreme weather will strike the region as temperatures increase, destabilizing agriculturally dependent economies and forcing whole communities from their homes. The IPCC identifies this region to be under particular risk of water and agricultural stress, and disease.²³⁹

NEAR TERM SCENARIO (1-2°C WARMING)

Water across the region will become increasingly irregular due to uneven precipitation patterns and glacial melt. Andean glaciers rapidly melting include those providing water to Venezuela, Colombia, Ecuador, Bolivia, and Peru. Bolivian and Peruvian glaciers have already lost more than half their mass, and Andean glaciers could disappear entirely in the coming decades.²⁴⁰ Their melt will initially cause an increase in stream water, and perhaps spring flood conditions, as they retreat, but decreased runoff

as the glaciers disappear altogether. Away from the coasts and along the arid regions of South America, drought conditions may become protracted, specifically in Peru and northeastern Brazil.²⁴¹

As oceans warm, they will also devastate the livelihoods of dependent coastal populations, even at relatively low levels of warming. The region's coastal and Caribbean populations are highly dependent on local fish stocks for income and health; ocean warming and acidification may devastate these sources. The complex reef ecosystems which support these coastal communities are particularly vulnerable to collapse due to warming and human activity, with projections estimating that Brazilian and Mesoamerican coral reef systems will decline and likely collapse completely by mid-to-late century in high-emissions scenarios.²⁴²

Floods, droughts, and storms have already cost the region billions of dollars and thousands of lives, and these trends are expected to intensify alongside warming. In scenarios up to 2°C of warming, extreme weather will become even more erratic and devastating in the Eastern coastal regions as sea temperatures rise. Such storms have extended negative effects, as related flooding can taint groundwater supply, overwhelm local infrastructure, and spread dangerous water-borne diseases.²⁴³ As some of the most vulnerable in the world to risks of extreme weather events, Central American countries may be hit by climate impacts that cost as much as 14.2% of GDP annually by 2030.²⁴⁴

The breakdown of governance, economic productivity, and security following extreme events becomes more likely as their strength and repetition cause more devastating conditions. Recent storms in the Caribbean have left regions without electricity or services for extended periods, and they have struggled to rebuild economically in the years following, particularly in the tourism sector.²⁴⁵ Violence and looting have followed such events, and institutional breakdown made it more difficult for governments to regain control.²⁴⁶ As the largest military and naval presence in the region, U.S. joint task forces are often called upon to aid in humanitarian response to extreme events, as was observed in the 2017 hurricane season when hundreds of personnel and multiple aircraft and ships were dedicated to responding to two severe storms.²⁴⁷

The combination of rising temperatures and inundation from extreme weather and floods will bring new and more pervasive health risks to populations, particularly from vector and water-borne diseases. Diseases such as malaria, Zika, dengue, and yellow fever will spread more rapidly as their vectors are able to survive wider climate ranges.²⁴⁸ High latitude areas of the Amazon, and northwestern regions experiencing more intense El Niño warming could be particularly threatened.²⁴⁹ In warm, water-logged conditions following extreme floods, storms, and hurricanes, water-borne diseases like cholera will spread rapidly throughout damaged sanitation systems, as they have in Peru, Ecuador, Colombia, Venezuela, Haiti, and the Dominican Republic.

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

Rising sea levels projected for long-term warming scenarios will harm this region by threatening the non-adaptive infrastructure of populous coastal communities, particularly through storm surges accompanying tropical storms and hurricanes. The low-lying regions of the Caribbean islands, where one million people live within 1m of high tides, are likely to be devastated by floods, storm surges, and

sea level rise projected to be as high as 1.5m by the end of the century, under high-end scenarios.²⁵⁰ Communities along the coasts of Central and South America will be hard hit by rising seas, including the megacities of Buenos Aires, Rio de Janeiro, Panama City, Lima, Cartagena, and Caracas.²⁵¹

If glaciers in the Andes mountains begin to disappear completely, which high-emissions models project they may do by the end of the century, many dependent streams will dry up, putting strain on and introducing tension between societies that have been built up around them for irrigation, tourism, and energy provision.²⁵² Warming temperatures also interact with regional resource depletion to produce potential climate “tipping points.” For example, in the rainforests of the Amazon, continued deforestation and rising temperatures could shift local weather patterns to resemble dry, savanna ecosystems, and threaten the water supply of dependent population centers, like São Paulo, Brazil.²⁵³

Alongside extreme weather and glacial melt, however, this region will be hardest hit economically by the impacts of extreme climate change on its agricultural production. For many sub-regions, it is difficult to predict whether warming and increased atmospheric carbon will negatively or positively affect crop yields. However, under higher scenarios of warming, the picture is increasingly bleak for the important regional crops of coffee and soybeans, whose yields suffer from increased and extreme air temperatures, and sugar, which may be impacted by high precipitation events.²⁵⁴

Much of the agricultural losses will result from the increased incidence of pests and disease, spread more easily in warmer, wetter temperatures.²⁵⁵ Already extreme weather has had severe impacts on agricultural communities; the coffee leaf rust outbreak in Central America was responsible for economic losses of up to \$5 billion between 2011-14, causing the declaration of national states of emergency, and increased regional migration.²⁵⁶

With this potentially devastating loss of livelihoods and growing food insecurity projected across the region, already troubled security situations could spin further out of control. As crop yields decline in South America, for example, farmers may shift to growing coca and other illicit crops, becoming involved in other aspects of the drug trade or widespread gang activity to supplement their incomes.^{257,258} Food, economic, and community insecurity will also push populations to migrate to nearby areas in greater numbers.²⁵⁹ Alongside these climate trends, overtaxed governments, high crime rates, and the reopening of past conflicts could shape the increasingly unstable futures of Central and South American countries.²⁶⁰

As regional populations become more mobile, recent experiences of waves of Central Americans migrating north to Mexico and the United States show that intercepting and processing these migrants will become an additional burden to the taxed security services.²⁶¹ More heavily militarized borders, restrictive asylum laws, and poor conditions in migrant holding centers on the border will become the norm as extreme climate impacts push the population of this region from their homes.

RISKS TO SECURITY INFRASTRUCTURE

Most military infrastructure in the South and Central America and the Caribbean is located along coastlines, but their exposure to rising seas and extreme weather risks receives little attention.²⁶² In the future, the region will be more dependent on U.S. and European military capabilities to perform humanitarian assistance and disaster relief operations following devastating hurricanes and disasters.

Rising risks in the SOUTHCOM security environment may even drive the broadening of U.S. military infrastructure and presence in the region. At present, the U.S. supports partner countries with rotations of small teams of troops working alongside local security forces;²⁶³ but this small presence will be inadequate to contain the destabilization, social breakdown, or increased criminal activity that follow climate shocks.

The convergence of multiple impacts - extreme precipitation, drought, storms, and fires - will increase instability in an area that already possesses some of the highest levels violence in the world.²⁶⁴ Operational success against narcotic and human trafficking will become even more difficult as criminal networks spread after agricultural or weather disasters.

We already can observe how regional water stress can put severe strains on electricity, leading to black-outs, water rationing, and energy crises that resulted in full-scale political destabilization in Venezuela.²⁶⁵ These civilian infrastructural insecurities will become more frequent, driving people from their homes in search of more dependable services in other countries.

THE DRY CORRIDOR OF GUATEMALA, HONDURAS, AND EL SALVADOR (FAO)



RISKS TO SECURITY INSTITUTIONS

The governance institutions of the SOUTHCOM region are likely to be undermined by the destabilizing effects that climate shocks will have on local livelihoods. Populations forced from agricultural areas must increasingly turn to local gangs, trafficking, or transnational crime opportunities to survive. This causes further corruption in of local and national governments.²⁶⁶

Much of the resulting destabilization will come in response to increased migration. Central Americans will be followed by others from newly fragile states in South America and the Caribbean moving north to escape water, heat, and food stress, and increasing conflict. The Department of Homeland Security's newly negotiated "Regional Multilateral Compact"²⁶⁷ attempts to bolster gang and violence prevention efforts, but this may quickly lead to coordinated border shut-downs to prevent this migration people.

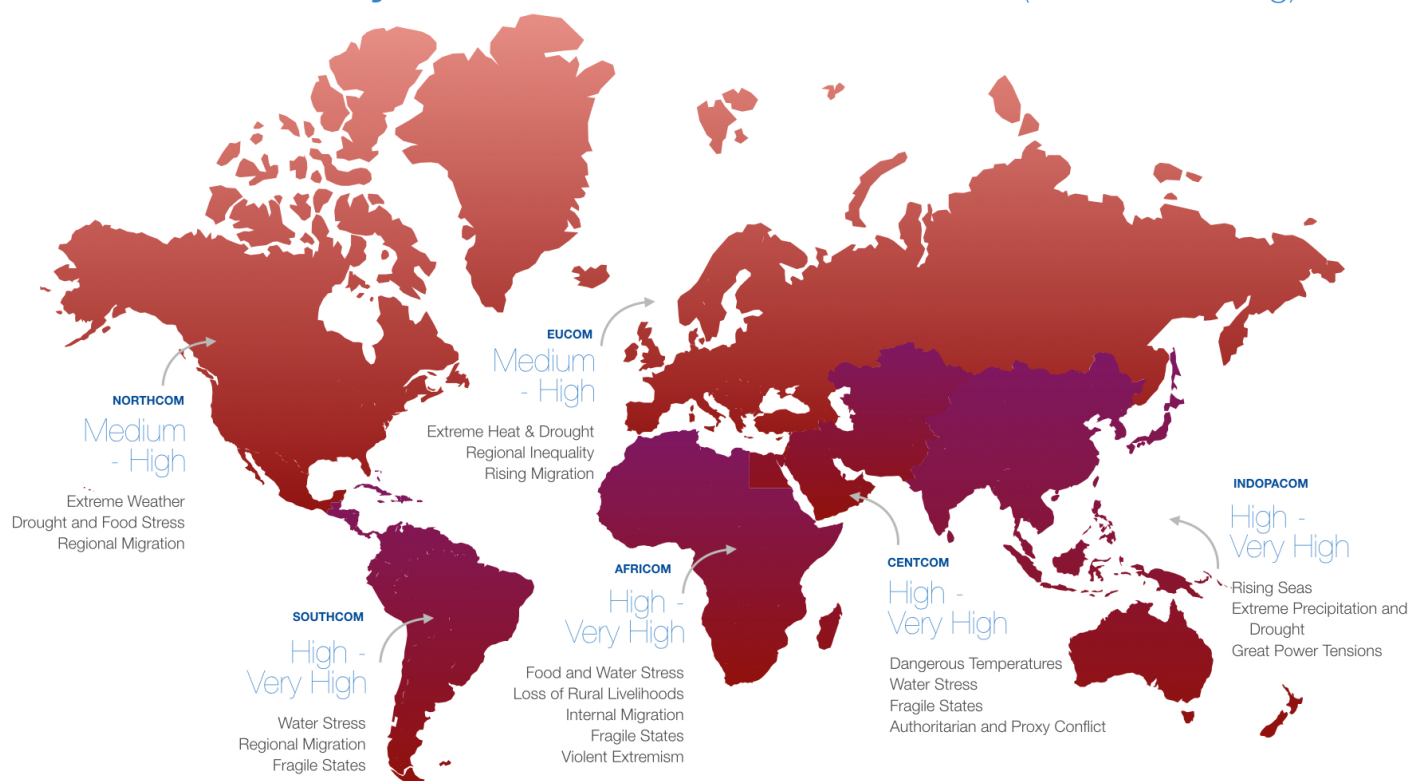
The financial institutions of the region may also falter following devastating climate events. The already high-debt nations of SOUTHCOM could see their newfound middle-income country statuses quickly reversed due to food and energy price spikes, caused by powerful storms. Whether regional institutions, like the Organization of American States (OAS) can assist the SOUTHCOM region through these changes remains to be seen. However, if the U.S continues its current isolationist tack, we may witness the crumbling of regional alliances and support.

GLOBAL CLIMATE SECURITY THREAT ASSESSMENT

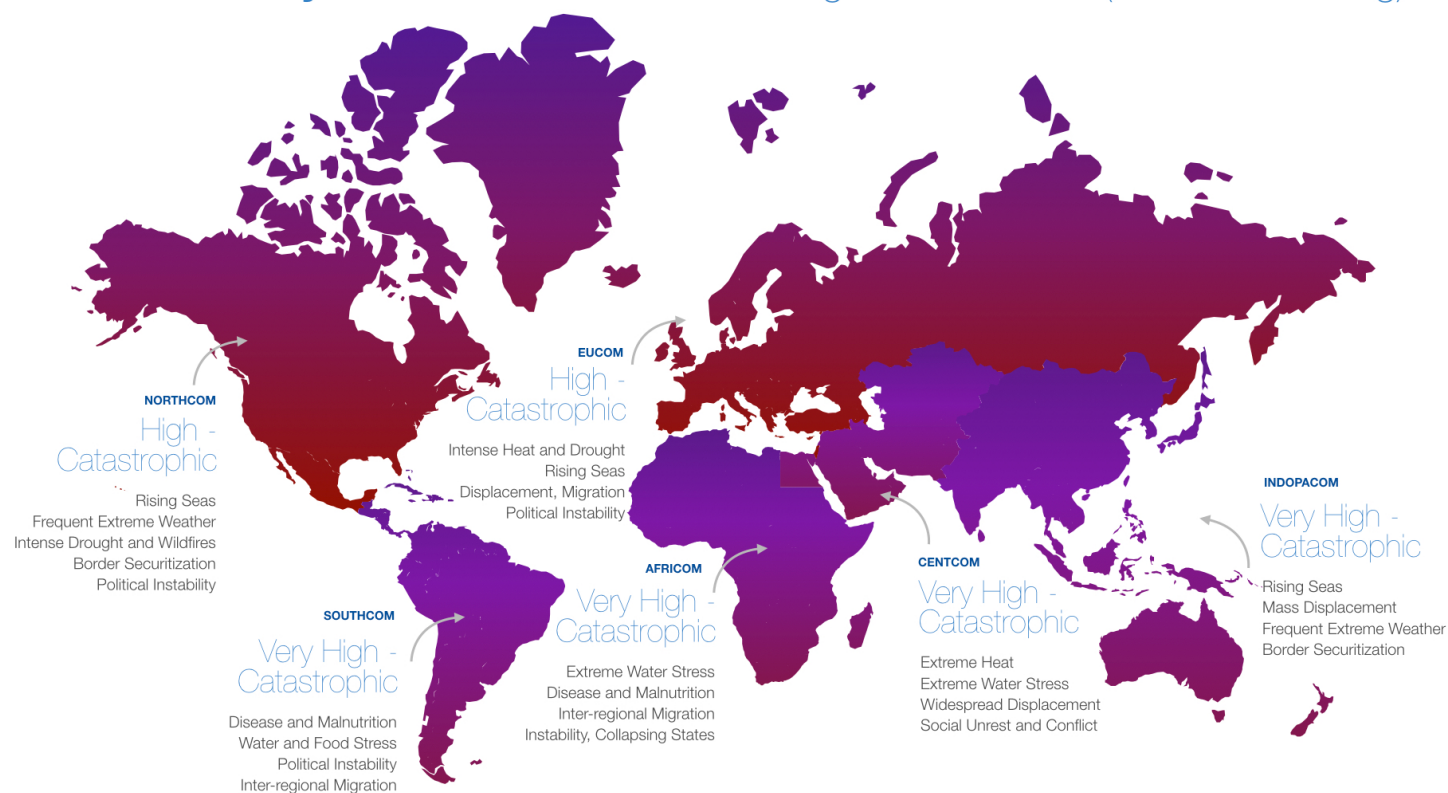
This global threat assessment is based on an aggregate assessment of both the “Regional Threat Profiles and Assessments” in this report, and an analysis of “Intersecting Risks” across these regions, summarized below. The combination of regional and intersecting risks is important, as climate change knows no political boundaries, and risks can compound across those boundaries, particularly in the context of global disaster trends. As the risks described in the regional assessments materialize, sometimes simultaneously, they interact to create compound risks.

CLIMATE IMPACT ON REGIONAL SECURITY	THREAT ASSESSMENT
Risks to Security Environment	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Infrastructure	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat
Risks to Security Institutions	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat

Climate Security Threat Profile: Near Term Scenario (1-2°C Warming)



Climate Security Threat Profile: Medium-Long Term Scenario (2-4+°C Warming)



INTERSECTING RISKS TO SECURITY ENVIRONMENTS

NEAR TERM SCENARIO (1-2°C WARMING)

We are already seeing the intersecting security consequences of warming, and those states already facing fragility and instability will be the hardest hit in near-term climate scenarios. Least-developed countries, small island states, and the arid states of the Middle East and North Africa will see harsh warming impacts set in before other regions due to their unique climate and geographies. They are also vulnerable to climate shocks to agricultural yields thousands of miles away due to their dependence on a vulnerable global food market.²⁶⁸ Unfortunately, these nations are already the most prone to weak governance, insecurity, and legacies of conflict.²⁶⁹

The U.N Security Council (UNSC) has recognized the climate change-induced nature of conflicts in the Lake Chad Basin and Somalia, and expects more climate issues rise to its agenda of international peace and security in coming years.²⁷⁰ Particularly pressing will be the resettlement of populations displaced due to rising sea levels, and the thorny questions of statehood and sovereignty that will need to be considered when a low-lying island state loses all of its territory to the sea.

New areas for potential great power conflict will also open up in near term scenarios. Competing claims over the melting Arctic's resources and shipping routes have led states to competitive posturing in the polar region, and geopolitical tension among Russia, China, the U.S., Canada, and other nations, and such claims in the region could migrate into other areas of global conflict or proxy war.²⁷¹

Newly volatile precipitation patterns will also have serious ramification for global crop yields, prices, and markets in the coming decades. Access to stable, fertile agricultural lands will create competing claims between local groups and states, and could trigger aggressive land grabs and resource weaponization, and exacerbate vulnerabilities across Africa, Central and South America, and European regions.²⁷² Similarly, fish stocks will quickly begin migrating north to colder waters, and those populations reliant on fishing them will likely do the same. Movement of peoples into "internationally-contested waters" could create new threats to ocean borders, and lead to naval interaction if changing conditions are not properly governed.²⁷³

MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING)

As the world moves along the curve of even more serious climate change scenarios, the prospects for new and unforeseen security risks increase. Tempted by geoengineering solutions to maintain some degree of climate stability - either at a local, regional, or global scale - actors may unilaterally deploy untested technologies or chemicals with hope of synthetically mitigating rising temperatures.²⁷⁴ If not carefully studied, governed, and deployed with deep international buy-in, unintended consequences of geoengineering technology could blow back on its deployers and create tense situations of evolving population victimization and blame.

If we cannot stop the rise of global temperatures in this longer term trajectory, regions may be exposed to summer heat levels dangerous for human exposure, catastrophic storm surges and flooding, and more powerful disaster events that can destabilize multiple regions at the same time. A state or region may well face overlapping disasters, or cascading ones, in which several dimensions of vulnerability interact to create new situations of widespread famine, displacement, or conflict.²⁷⁵

In these scenarios, populations across multiple regions may be uprooted from their homes by disaster at the same time, and attempt to move into the same comparatively stable Northern environments in search of safety. These states are likely to become hostile to the rush of climate refugees from diverse backgrounds and cultures, and could resort to militarized responses to quell the migration stream.

INTERSECTING RISKS TO SECURITY INFRASTRUCTURE

As climate change escalates globally, international military infrastructure will be simultaneously newly vulnerable and increasingly vital for response purposes. Adversarial state naval and ground forces may be able to put past disagreements aside in favor of cooperation to deal with cross-border disaster and catastrophe. Alternatively, militaries may become more competitive against the climate backdrop, seizing relative gains from the misfortunes experienced by their adversaries. For example, consider the territorial wars being waged by several regional and world powers throughout the Syrian civil war, or the Russian cyber-disinformation efforts to further destabilize its European neighbors as Syrian refugees migrated north.²⁷⁶

States may rush to build new military infrastructure in areas of increasing resource competition, like the Arctic or in contested waters, which could lead to rapid securitization of areas highly vulnerable to climate risks. International peacekeeping forces expect to see their own operations intensify alongside the threat-multiplying effects of climate change.²⁷⁷

Finally, there is the potential for emerging international nuclear emergencies intersecting with coming climate realities. Even today, states facing extreme climate risks, like Egypt, are pursuing the creation of nuclear energy infrastructure without accounting for future climate security scenarios.²⁷⁸ Through mounting challenges of keeping nuclear materials secure and out of extremist hands, severe weather and floods threatening nuclear infrastructure, or sea level rise leading to the erosion of previously “cleaned-up” nuclear waste sites, the climate’s effects on nuclear infrastructure could have lasting consequences for world health and security.

INTERSECTING RISKS TO SECURITY INSTITUTIONS

With dispersed climate chaos quickly overtaking the global security reality, in either near or long-term warming scenarios, global institutions will lack the power to support or stabilize all climate-induced crises. Fragile, brittle, and disappearing states may collapse following repeated climate shocks, testing an international order crafted to uphold traditional notions of state sovereignty.²⁷⁹

Ill will may pervade global institutions reliant on mutual trust for cooperation, as global inequalities grow between rich and poor, North and South, adapted and un-adapted. While some states call for security institutions like the U.N. Security Council or NATO to include climate change in their scope of affairs, others may regard these moves as attempts to use climate tragedies as excuses for military expansion.

Central banks are already drawing attention to the economic impacts of climate-related risks, stating that they will affect all agents and assets within the global economy, with serious implications for future financial stability.²⁸⁰ International financial institutions, rocked by repeated economic blows and price shocks, could be unable to prevent states from deploying protectionist or opportunistic trade policies following climate-induced disasters.

Institutions dedicated to managing specific collective action problems in promotion of peace and prosperity, such as the World Health Organization, UN High Commissioner for Refugees, or the World Bank, may see their outdated institutional designs and meager budgets unable to match the pace of change and challenges. And the web of global development assistance and alliances which underpin state cooperation and defense could likely shift under new pressures, threats, and movement of peoples.

At the heart of many of these growing fissures in security institutions will be the social and political blowback from populations experiencing a whiplash of global climate changes. Citizens may grow weary of financially supporting a liberal international order that cannot protect them from severe climate risks. Growing nationalism and isolationist policies, or authoritarian means of political control, may look increasingly attractive in the face of global uncertainty and instability, leaving those socially marginalized even more vulnerable. What mutual interests will organizations like the European Union or NATO alliances rest on, if each state is increasingly focused on fulfilling its own needs at the expense of others? The security repercussions of such institutional breakdown could be profound. Leaders may find themselves unable to make the sacrifices necessary for international cooperation, and instead blame others for local suffering.

REGIONAL THREAT PROFILES AND ASSESSMENTS

REGION	THREAT ASSESSMENT	THREAT PROFILE
AFRICOM Africa	Near Term Scenario (1-2°C Warming): High - Very High Threat	At 1-2°C/1.8-3.6°F of global average warming, the AFRICOM area of responsibility will experience rapid loss of rural livelihoods, disease, resource stress, and migration. In this scenario, violent extremist groups bolster their numbers, and security threats spiral into nearby fragile areas.
	Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat	At 2-4+°C/3.6-7.2+°F of global average warming, the AFRICOM area of responsibility will likely experience new and renewed interstate conflict over water resources, and severe humanitarian crises resulting from migrating populations, weather disasters, and economic shocks. Security institutions may not be able to preserve stability in the region, but will increasingly attempt to do so to prevent further spread of violent chaos.
CENTCOM Middle East and Central Asia	Near Term Scenario (1-2°C Warming): High - Very High Threat	At 1-2°C/1.8-3.6°F of global average warming, the CENTCOM area of responsibility will experience dangerous levels of temperature rise, drought, and dwindling water supplies that intensify already tense resource, political, and territorial competition. These impacts are likely to lead to increased social grievances and conflict.
	Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat	At 2-4+°C/3.6-7.2+°F of global average warming, the CENTCOM area of responsibility will experience warming levels that render many areas of the region uninhabitable. Competition over water resources will likely be heightened, and with large populations displaced across the region, existing cultural divisions and social unrest could lead to enduring conflicts and state failure.
EUCOM Europe and Russia	Near Term Scenario (1-2°C Warming): Medium - High Threat	At 1-2°C/1.8-3.6°F of global average warming, the EUCOM area of responsibility will experience severe weather that threatens destabilization of its key economic sectors, rising regional inequality, and impacts on civil and military infrastructure. In this scenario, rising ethno-nationalist sentiments alongside rising migration waves pose serious threats to the alliances underlying existing security institutions.
	Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat	At 2-4+°C/3.6-7.2+°F of global average warming, the EUCOM area of responsibility will likely experience prolonged drought and rising seas, leading to significant internal displacement, as well as an influx of migrants from neighboring areas. In this scenario, a breakdown in regional political, institutional, and security cohesion becomes likely.
INDOPACOM Indo-Asia-Pacific	Near Term Scenario (1-2°C Warming): High - Very High Threat	At 1-2°C/1.8-3.6°F of global average warming, the INDOPACOM area of responsibility will experience water scarcity in some areas and precipitation inundation in others. This could pose existential risks to security infrastructure and undermine social stability. Tension between regional powers will increase against a backdrop of competitive resource and territorial claims.
	Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat	At 2-4+°C/3.6-7.2+°F of global average warming, the INDOPACOM area of responsibility will experience devastating sea level rise threatening its megacities, infrastructure, and populations. Countries will likely securitize borders to prevent migration following severe disasters, and could undermine important military alliances and partnerships on which regional peace depends.

NORTHCOM North America and Polar Regions	Near Term Scenario (1-2°C Warming): Medium - High Threat Medium-Long Term Scenario (2-4+°C Warming): High - Catastrophic Threat	<p>At 1-2°C/1.8-3.6°F of global average warming, the NORTHCOM area of responsibility will experience more intense, extreme events like storms and wildfires, with significant impacts on life and property. These effects will reduce the readiness of security infrastructure, and undermine democratic and international institutions on which major power security relations depend.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the NORTHCOM area of responsibility will experience extreme heat, sea level rise, and disaster events that severely impact infrastructure critical for protecting the homeland. Increasing divisions within society -- including rising ethno-nationalist, anti-democratic and isolationist views -- could fracture historic security agreements, and great power competition over resources in the melting Arctic may become acute.</p>
SOUTHCOM South and Central America and the Caribbean	Near Term Scenario (1-2°C Warming): High - Very High Threat Medium-Long Term Scenario (2-4+°C Warming): Very High - Catastrophic Threat	<p>At 1-2°C/1.8-3.6°F of global average warming, the SOUTHCOM area of responsibility will experience shifting precipitation patterns and acute water shortages, forcing communities to migrate in search of new opportunities in an increasingly unstable environment. Transnational criminal groups, and narcotics and human traffickers will likely take advantage of this growing destabilization, further straining local security institutions.</p> <p>At 2-4+°C/3.6-7.2+°F of global average warming, the SOUTHCOM area of responsibility will likely experience even more acute weather instability, crop collapse, and spreading disease. Failing agricultural productivity, water insecurity and infrastructure will increase the likelihood of violent conflict, drive significant internal and cross-border migration, and increase political instability.</p>

This chart summarizes the core components of the International Climate Security Threat Assessment, which is derived from an aggregate assessment of the 6 regional threat profiles, and the threat profile of the intersecting risks. This assessment will be used to determine the International Climate Security Threat Profile.

GLOBAL CLIMATE SECURITY THREAT PROFILE

In the security community, analysts use threat-based scenarios like those detailed above to determine “threat assessments” that describe the scale and scope of a particular threat. From there, one can craft a specific “threat profile” of any given event or variable to understand the risks to security outcomes. With careful assessments in hand, one is better able to weigh policy options and threats against each other to determine what risks might be tolerable for society to confront without mitigation. As covered in the Global Climate Security Threat Assessment above, this threat profile is built on aggregate assessment of the regional threat profiles, and an assessment of the intersection of these regional threats at the inter-regional level.

NEAR-TERM SCENARIO (1-2°C WARMING): HIGH - VERY HIGH THREAT

At 1-2°C/1.8-3.6°F of global average warming, the world is very likely to experience more intense and frequent climate shocks that could swiftly destabilize areas already vulnerable to insecurity, conflict, and human displacement, as well as those regions whose stability is brittle due to underlying geographic and natural resource vulnerabilities. Under this scenario, all regions will experience high levels of climate security threats that will disrupt key security environments, institutions, and infrastructure. The resulting resource scarcity, population migration, and social and political disasters are likely to interact at the international level, alongside the creation of new areas of great power competition and potential conflict.



MEDIUM-LONG TERM SCENARIO (2-4+°C WARMING): VERY HIGH - CATASTROPHIC THREAT

At 2-4+°C/3.6-7.2+°F of global average warming, the world is very likely to experience significant insecurity and destabilization at the local, national, regional, and international levels. All regions will be exposed to potentially catastrophic levels of climate security threats, the consequences of which could lead to a breakdown of security and civilian infrastructure, economic and resource stability, and political institutions at a large scale.



CONCLUSION

These analyses show that at even the lowest levels of warming, each global region will face severe risks from climate change that threaten to destabilize security environments, institutions, and infrastructure. Higher levels of warming pose catastrophic, and likely irreversible, security risks across the entire world. This is a sobering picture of the future of global security under climate change. We hope that these scenarios will energize the security community to immediately confront and prevent these risks, and to advocate for policies that lower global emissions as fast as possible.

Of course, there are numerous factors left out of these scenarios that could increase their threat potential and should give decision-makers additional reason to be even more cautious. First, more extreme or more rapid warming scenarios than those used by the IPCC-affiliated scientists whose work is summarized in this report are possible. As recently imagined in so-called “Hothouse Earth” scenarios, warming patterns could unlock sources of emissions in global permafrost stores that have the potential to trigger feedback loops of increasing emissions.²⁸¹

Other cascading, uncertain interactions between warming and natural systems could be activated at higher levels of warming and result in dangerous new weather patterns or rates of sea level rise. These low-probability, high-impact events could pose catastrophic or potentially existential threats to human society, and as such would raise the risk profile of climate change scenarios to levels now difficult for the security community to truly comprehend.

In part due to the foresight endeavors of contemporary climate scientists, we can develop this scenario-based look at how the impacts of climate change might interact with human systems to create new security risks in societies across the globe. Now, armed with this information and these pictures of our potential global futures, it is our responsibility as the security community to prepare and respond. As professionals uniquely tasked with predicting and preventing the worst events that could strike our societies, we must heed the warnings present in these climate scenarios.

Mitigating these risks requires quickly reducing and phasing out global greenhouse gas emissions. As there are numerous policy options for doing so, we refrain from recommending a single course of action. Instead, **we call for the world to achieve net-zero global emissions in a manner that is ambitious, safe, equitable, and well-governed.**

The world must also **rapidly build resilience to the impacts of climate change that we are already experiencing**, by “climate-proofing” infrastructure, institutions, and systems on which human security depends. With future-oriented investments in adaptation, disaster response, and peacebuilding efforts, we will be better able to recover from tragedies that strike and to contain effects from spiraling downward into deeper instability.

It is possible to prevent the worst of the scenarios laid out in this report, but this will not happen without clear-sighted, dedicated leadership. In the United States, **we call for renewed efforts to prioritize, communicate, and respond to climate security threats, and to integrate these considerations across all security considerations.**

For more specific details on achieving these goals, we direct you towards the Climate Security Advisory Group’s comprehensive policy proposals in the *Climate Security Plan for America: A Presidential Plan for Combating the Security Risks of Climate Change*.²⁸²

Only by responding swiftly to mitigate the climate problem and adapting to those changes that are coming, will we be able to meet these challenges head-on. If not, and if we instead shrink from the threat, we stand on the precipice of some of the greatest, multi-dimensional, security outcomes the world has ever seen.

ANNEX: SCENARIO METHODOLOGY

Scientists link atmospheric greenhouse gas concentrations with the complex relationships existing among global temperature and local climates, to anticipate how warming might affect regional habitats and weather patterns across the earth. This requires a constant compilation of global temperature and weather data into models of emissions-warming-climate scenarios, and the careful calibration of scientific uncertainty about the resulting forecasts.

Despite this complex task, climate scientists have produced increasingly sophisticated and granular projections of global warming trends and their impacts on regional geographies. No single model on its own can predict exactly how global temperature changes will translate into altered weather patterns, but through regional compilation models, climate scientists can now predict with increasing precision how much *more likely* some weather patterns are than others, due to warmer conditions.

To more accurately chart future emissions trends, socioeconomic conditions such as population growth, economic activity, energy demand, and the use of mitigation technologies must be incorporated into model projections. The past IPCC reports have used four different projection models, known as “Representative Concentration Pathways” (RCPs), which are built from differing assumptions of human activity and based on different scenarios of radiative forcing, to project potential emissions and related temperature rise through the end of the century.

These scenarios underpinning these RCPs are as follows (IPCC Data Distribution Center 2019):

- **RCP 2.6** - anticipates significant mitigation activities to reduce emissions and corresponds to about 1.5°C in total temperature rise by 2100.
- **RCP 4.5** – projects sufficient mitigation activities to stabilize climate levels by the end of the century, corresponding about 2.4°C temperature rise by 2100.
- **RCP 6.0** – projects sufficient mitigation activities to stabilize warming to about 3°C degree temperature rises by 2100.
- **RCP 8.5** – anticipates no further mitigation activities corresponding to about 4.9°C temperature rise by the end of the century.

Scientists used these differing RCP scenarios with regional climate and weather models to project how different emissions pathways and scenarios of temperature rise will lead to varied climate impacts across the world. From a security perspective, the resulting impacts and adaptation projections matter foremost for planning, policymaking, and building systemic resilience to anticipated changes. Not all areas of the globe will see the same levels of temperature rise or the same shifts in climate, and ecosystems and human settlements may be more sensitive to shocks that are more or less likely to impact their region.

The RCP models form the foundation of the 2014 IPCC AR5 report and are used in the majority of research that this synthesis report is based on. As the basis of the most comprehensive forecasts we currently possess of how temperature rise will impact geographic regions, this report adopts their projections for our security scenarios.

It should be noted that there is increased discussion about whether a RCP8.5 scenario is increasingly unlikely, given the fact world has implemented some mitigation efforts that the model assumes it would not.²⁸³ Given current greenhouse gas emission levels, this high-end emissions scenario should not be interpreted as a ‘business as usual’ pathway.

However, much of the research into high-end warming scenarios available at present is based on the RCP8.5 scenario, and these represent our current best look at the impacts that can be expected in a world with over 4°C in temperature rise. Future IPCC Assessment Reports will be based around new scenarios known as Shared Socioeconomic Pathways (SSPs), rather than the RCPs, and will likely offer a more detailed look at how global mitigation efforts will interact with emissions, temperature rise, and climate impacts.²⁸⁴

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