Arctic Climate Change

Implications for U.S. National Security

American Security Project

Perspective

-

Laura Leddy

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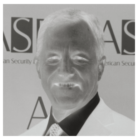

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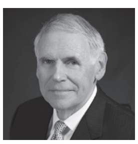

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David Wade is a consultant helping global corporations and organizations with strategic advice, public affairs and thought leadership, crisis communications, political intelligence gathering, and federal and legislative strategy.

In this Report:

Summer 2020 has seen unprecedented public engagement with the issue of Arctic climate change. The Far North has dominated international headlines by breaking record after record: hottest temperature, lowest sea ice extent, and most extreme wildfire season. Arctic climate change threatens U.S. national security by undermining American infrastructure, disrupting regional food webs, and degrading population health. A melting Arctic is also a more accessible Arctic—we are already seeing renewed great power competition in the region, as well as greater opportunities for natural resource exploration. Positive feedback mechanisms at work in the Far North further accelerate the rate of both polar and global warming. The U.S. government must respond by reducing American emissions, building climate resilience, and crafting an Arctic strategy that acknowledges climate change as the key to the region's future.

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IN BRIEF

- Due to a process known as Arctic amplification, the Far North is warming almost three times faster than the rest of the world. Arctic warming affects lower latitudes as well.
- The primary land-based effects of Arctic climate change are heatwaves, wildfires, and permafrost thaw.
- Oceans cover the majority of the Arctic region. In the oceans, the main effects of Arctic climate change are sea ice melt, sea-level rise, ocean acidification, and pollution.
- Sea ice melt is one of the most visible aspects of Arctic climate change. Experts are predicting a seasonally ice-free Arctic Ocean by 2050.
- Arctic climate change unlocks several large-scale feedback mechanisms that quicken the rate of warming even further. The region is quickly becoming a carbon source rather than a carbon sink, a transformation with catastrophic implications for global climate change.

About the Author

Laura Leddy is a graduate student at Texas A&M University's Bush School of Government and Public Service, where she is pursuing an M.A. in International Affairs. Her research focuses on the intersection between diplomacy and military power in U.S. homeland defense and foreign policy, emphasizing the Arctic region. Originally from Westchester, New York, Laura received her undergraduate degrees in History and Russian Studies from the University of Virginia in 2016.

Introduction

Seven months into the coronavirus pandemic, arguments linking COVID-19 and the climate have become ubiquitous. Like the current microbial threat, climate change is a dire emergency requiring a coordinated national and international response.[1] COVID-19 has also drawn attention to how threats converge—the pandemic exacerbates existing global inequities in everything from food security to economic stability. Climate change has acted as a threat multiplier for years: it is the ultimate converging threat.

Nowhere is this fact more apparent than in the Arctic, the region north of the Arctic Circle at 66.6° N latitude. Thanks to a natural phenomenon known as Arctic amplification, the Far North warms faster than the rest of the world.[2] Scientists have long maintained this rate is twice the global average, but today the Arctic is warming almost *three times* faster than the rest of the planet.[3]

Arctic climate change is a threat to U.S. national security. Defense officials tend to focus on the geopolitical implications of melting sea ice, but the danger is far more diffuse. On the land and in the oceans, Arctic warming threatens U.S. security interests by jeopardizing infrastructure resilience, food security, and population health.

The global climate system is tightly linked, so the rapid pace of Arctic climate change affects temperate latitudes as well. Positive feedback mechanisms at work in the Far North strengthen the relationship between the warming Arctic and a warming world. Since we face decades of baked-in climate change no matter what happens to today's emissions, the Arctic has likely already reached its climate tipping point—the point at which further environmental change becomes irreversible and self-reinforcing.[4] The question is whether we can mitigate Arctic warming enough to prevent a global tipping point.

On The Land

On the landmasses within the Arctic Circle, the most alarming effects of climate change are extreme heat, severe wildfire seasons, and permafrost melt.

Heatwaves and Wildfires

The Problem

Extreme heat in the Arctic is a story of records broken. In 2019, Alaska experienced its warmest summer to date—setting records in June, July, and August.[5] This year, Siberia observed its hottest-ever June—breaking the previous record by a significant margin.[6] The Siberian town of Verkhoyansk made international headlines on June 20 when it surpassed 100°F—a temperature unprecedented above the Arctic Circle.[7]

The current Arctic heatwave was as unexpected as it is unprecedented. Experts were not predicting these temperatures in the Far North until at least 2100.[8] Unlike most climatic events, scientists can directly link Siberia's extreme heat to greenhouse gas emissions—meaning there is no doubt human-induced climate change explains these temperature spikes.[9]

When combined with low soil moisture and precipitation levels, warmer Arctic air contributes to wildfire spread.[10] In 2019 and 2020, both Alaska and Siberia have experienced unusually active wildfire seasons.

In Siberia, scientists believe "zombie fires" are partly to blame. These fires retreat underground for the winter and often reappear in the same place summer after summer, scorching the same ground repeatedly.[11]

Aerial view of the 2019 Siberian wildfires. European Space Agency photo.

Security Implications

Arctic heatwaves do not remain confined to the region. Polar warming lessens the temperature and pressure differences between the Arctic and lower latitudes, bringing southward more extreme temperatures—both hot and cold.[12] Arctic climate change thus contributed to both the 2013-2014 polar vortex over North America and the July 2019 heatwave across Europe. Extreme heat and cold are security threats because they adversely affect human health, sometimes fatally. According to the Centers for Disease Control and Prevention, severe heatwaves are among the leading causes of weather-related deaths in the U.S.[13] Extreme weather also affects U.S. national security in a more traditional sense. The Department of Defense (DOD) has acknowledged climate change as a threat to its mission, operations, and installations since 2010.[14]

Wildfires do not respect borders either. Pollution from Arctic fires spreads quickly, threatening air quality across the U.S. For example, smoke from the Siberian fires has spread across the northern Pacific, bringing a lingering haze to the Pacific Northwest and south-central Alaska.[15][16] This smoke pollution is a health security threat.

Feedback Mechanisms

Arctic climate change unlocks several large-scale feedback mechanisms that quicken the rate of warming even further.[17] Arctic peatlands—a type of wetland—have historically acted as a fire break in the Far North. Now, higher temperatures dry out peatland soils more quickly, turning them into fire propagators instead.[18] Wildfires are both a product of and a catalyst for climate change.[19] This June alone, fires in the Arctic contributed almost 60 million metric tons of carbon dioxide to global emissions.[20]

Arctic heatwaves and wildfires also contribute to one of the most serious climatic threats to U.S. national security: permafrost melt.

Permafrost Melt

The Problem

As Russia's Norilsk Nickel oil spill demonstrates, permafrost melt is among the most acute effects of Arctic climate change. In late May, thawing permafrost undermined the foundation of a fuel reservoir at the Norilsk Nickel metallurgy plant in northern Siberia. The reservoir then collapsed, releasing 21,000 tons of diesel into Arctic waterways.[21]

Permafrost is permanently frozen ground, whether on or below the Earth's surface. It covers about 25% of all ice-free land in the Northern Hemisphere.[22] As the Arctic warms, permafrost begins to melt, and the once-solid ground becomes unstable. Complicating this problem is the unpredictable nature of future permafrost thaw. Under our current warming trajectory, we can expect the near-elimination of all Arctic permafrost. If countries limit global warming to the Paris Agreement's maximum of 2°C, we could preserve 55%-75% of this land area.[23]

Security Implications

Permafrost threatens U.S. security by destabilizing U.S. infrastructure. Americans have built entire communities, military bases, and industrial plants on permafrost.[24] Before the 1960s, no one built Arctic infrastructure with permafrost in mind. Once architects started taking it into account, they built with steady-state conditions in mind. As thaw accelerates and becomes unpredictable, these conditions no longer hold.[25] Over the next century, permafrost melt in Alaska alone could cause upwards of $2 billion in infrastructure damage.[26]

In the long-term, melting permafrost also threatens to uncover substances better left buried. These substances include prehistoric pathogens to which humans have no immunity, and Cold War-era hazardous waste. American and Soviet military projects in the Arctic left behind sewage, radioactive coolant, carcinogenic industrial chemicals, and diesel fuel—all of which will adversely affect human health if they resurface.[27]

Feedback Mechanisms

Soils are the largest carbon reservoir on land worldwide, and permafrost contains as much as 50% of this carbon.[28] Melting permafrost releases trapped carbon—and methane, a more potent greenhouse gas—back into the atmosphere, contributing to global climate change.[29] In Alaska, recent observations of permafrost carbon flows found the soil releasing more carbon than it is absorbing.[30] Carbon outflows mean the Arctic is on its way to becoming a carbon source rather than a carbon sink, a transformation with catastrophic consequences for global climate change. The exact rate at which thawing Arctic permafrost emits carbon is still uncertain. It depends on the rate of worldwide temperature increase, demonstrating just how interlinked Arctic warming and global warming are.[31]

In the Oceans

Most of the Arctic region consists of oceans, not land. In polar waters, the most critical consequences of climate change are sea ice melt, sea-level rise, ocean acidification, and pollution.

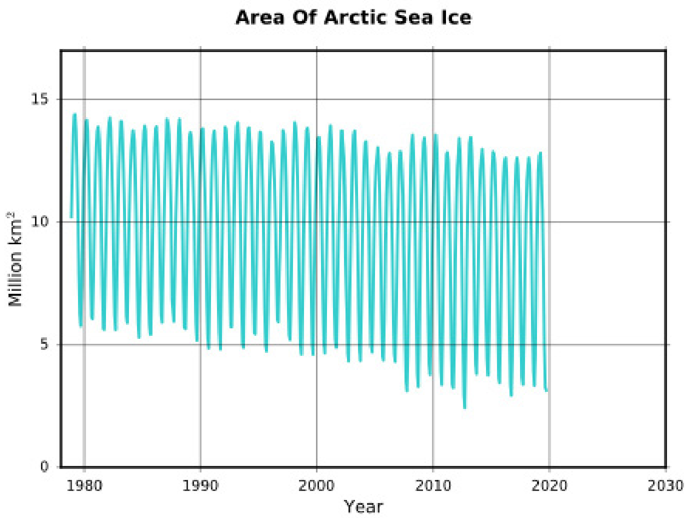
Sea Ice Melt

The Problem

Declining sea ice is one of the most visible aspects of Arctic climate change. In 2020, warmer air and ocean temperatures have contributed to record-low levels of Arctic sea ice.[32] Satellites first started recording Arctic sea ice data in 1979; since then, scientists have observed a stark decline in both the seasonal extent and physical thickness of that ice.[33] By 2050, the Arctic Ocean will likely be ice-free each summer.

Security Implications

The rapid melting of Arctic sea ice facilitates great power competition in the region. A more accessible Arctic is a more crowded Arctic, and both Russia and China have made significant inroads in the region over the last decade. Air Force General and USNORTHCOM Commander Terrence O'Shaughnessy noted as much to Congress in February 2020, calling a rapidly warming Arctic the "new frontline to our homeland defense."[34] Although there is currently a low probability of armed conflict in the Arctic, one potential flashpoint is the Barents Sea between Norway and Russia. A rapid decline in ice cover above the Barents Sea in recent decades, combined with the uneasy security situation between NATO and Russia, makes for a potentially combustible situation.[35][36]



Monthly mean values of Arctic sea ice extent, 1979-2015. Image Credit: Dominiklenne / Wikimedia Commons.

Arctic ice melt also affects U.S. food and energy security. A loss in sea ice cover has cascading effects on the regional food web, threatening keystone Alaskan species like salmon and Pacific cod.[37] As the Arctic Ocean warms and comes to look more and more like the Atlantic and Pacific Oceans, other fish species will move northward into the waters off Alaska—presenting opportunities for new fisheries.[38]

Similarly, receding Arctic sea ice makes natural resources such as oil, natural gas, and minerals increasingly accessible. The Arctic region contains approximately 90 billion barrels of undiscovered oil, making increased natural resource exploration an attractive proposition.[39] However, newly available fishing grounds and natural resources could well spark competition between Arctic powers unless there are clear rules of the road. With economic opportunity comes a challenge: ensuring Arctic development proceeds sustainably and peacefully.

Feedback Mechanisms

Since 1979, the decline in Arctic sea ice cover has made the region increasingly susceptible to further warming. Less ice in the Far North means a lower albedo—the proportion of light reflected by a surface.[40] Due to its color, ice is highly reflective. As Arctic sea ice melts, it exposes dark ocean surfaces to the sun's rays. Dark water absorbs a greater proportion of the sun's heat, leading to warmer ocean temperatures that, in turn, promote increased ice melt.[41] This heat-melt cycle is one of the main contributors to the phenomenon of Arctic amplification.

Sea-Level Rise

The Problem

The polar regions contain two of the world's hotspots for rising sea levels: the Greenland ice sheet and the Thwaites Glacier. Meltwater from the Greenland ice sheet accounts for about 30% of 20th-century sea-level rise (20cm since 1900). The International Governmental Panel on Climate Change predicts the entire Greenland ice sheet will be melting annually by 2100, contributing to an additional 30-100cm in global sea-level rise over that period.[42]

The Thwaites Glacier is located in Antarctica, highlighting that polar climate change affects the South Pole as well as the Far North. The Antarctic continent is also experiencing amplified warming, with air temperatures at the South Pole rising three times faster than the global average.[43] If the Thwaites Glacier melts entirely, it could alone raise sea levels by as much as 65cm by the end of the century.[44]

Calving front of the Thwaites Glacier. NASA photo.

Security Implications

Over the long-term, rising sea levels represent the greatest climate-induced threat to U.S. national security. The economic cost of higher seas will be devastating: as much as 4% of global GDP by the end of the century. Elevated sea levels mean more coastal flooding, more infrastructure damage, and more catastrophic storm surges—especially along America's vulnerable Eastern Seaboard. Domestic food security is also at risk since salty seawater will more frequently inundate low-lying agricultural lands.[45]

Even conservative estimates of sea-level rise represent a dangerous increase for global security. For example, the low-end estimate of 30cm by 2100 will prove devastating to islands already just above sea-level, forcing entire populations to relocate. A new stream of climate refugees will exacerbate the climate-induced migration flows already underway.[46]

Feedback Mechanisms

Antarctica holds about 90% of all ice on Earth, meaning the polar south holds the key for understanding future sea-level rise. Within the West Antarctic ice sheet, the Thwaites Glacier plays a pivotal role: it acts as a "stopper" holding back other glaciers. If Thwaites disappears, the rest of the ice sheet could follow—contributing a catastrophic 2-3m of additional sea-level rise.[47] The loss in ice cover will also allow more methane to escape from the sea floor, contributing to global greenhouse gas emissions.[48]

Ocean Acidification

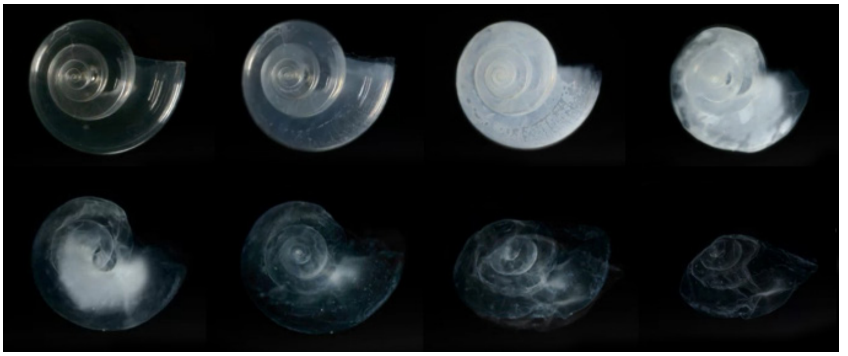
The Problem

Soils are the largest *land-based* carbon reservoirs, but the oceans absorb the majority of all human-emitted carbon dioxide. This carbon dissolves in the seawater, producing a chemical solution called carbonic acid. Rising acidity levels rapidly shift the chemistry of the ocean, especially as we produce more carbon dioxide. The Arctic's cold waters are especially susceptible to increased acidification, which destroys the minerals vital to oceanic shell-building creatures.[49]

Security Implications

By degrading marine ecosystems, ocean acidification threatens both global and domestic food security. Shell-building creatures play a pivotal role in aquatic food webs: coral, for example, provides the foundation for critical marine habitats. Other shell-dependent organisms include crabs, lobsters, and oysters—all integral to global seafood industries.[50]

The effects of ocean acidification do not remain in the Far North. Highly acidic Arctic waters spill into neighboring oceans like the North Pacific, impacting food webs and fisheries. High acidification levels have already caused oyster die-offs in the Pacific Northwest. The waters off Alaska are also experiencing unusually fast rates of ocean acidification, threatening the commercial and subsistence fisheries on which Alaskan livelihoods depend.[51]



Dissolving of mollusk shell in seawater adjusted to acidity levels projected for the year 2100. NOAA photo.

Feedback Mechanisms

Over the past century, the oceans have absorbed 93% of all emissions-induced heat. Oceanic absorption of greenhouse gases saved us from experiencing "Death Valley conditions" in 2020.[52] As the oceans grow more saturated with dissolved carbon, rising acidity levels and higher water temperatures kill sea life and induce ice melt, leading to even greater oceanic heat intake. Thawing underwater permafrost off the coast of Siberia is also of great concern to those watching acidification levels, since this permafrost melt injects still more carbon into the oceans.[53]

Pollution

The Problem

Although pollution is a global issue, oceanic and atmospheric circulation patterns cause waste to concentrate and accumulate in the Arctic. The most common polar pollutants are persistent organic pollutants (including many pesticides), mercury, and plastics. Above the oceans, anthropogenic air pollution creates Arctic haze: a seasonal reddish-brown smog consisting mainly of sulfate aerosols and microscopic particulate matter.[54] Winds transport these substances from industrialized countries to the Far North.

Security Implications

As elsewhere, air and water pollution adversely affect food and health security in the Arctic. Chemical pollutants and poor air quality degrade Arctic ecosystems and make life harder for indigenous communities. Of particular concern is the impact of plastic pollution on regional food webs. Small creatures at the bottom of the marine food chain often ingest microplastics in the water; these microplastics then "biomagnify" up the chain, eventually working their way into humans.[55]

Feedback Mechanisms

According to the World Wildlife Fund, the Arctic is the "chemical sink of the globe."[56] Air and water pollution further degrade an Arctic environment already in the throes of rapid climate change. Polar pollution also reveals how interconnected the Arctic is with the wider world: just as industrial activities hundreds of miles away contribute to polar pollution, so the warming Arctic contributes to a warming world.

Policy Recommendations

Arctic climate change is a multifaceted phenomenon requiring a nuanced American response. U.S. policymakers have thus far zeroed in on the geopolitical implications of sea ice melt, which is already facilitating renewed great power competition in the Far North. Homeland defense is certainly a major security concern, but a warming Arctic poses far more severe threats to U.S. interests. By taking the following steps, the U.S. can both prepare for and help mitigate these threats.

1. **The U.S. must drastically reduce its greenhouse gas emissions over the next decade.**

   Anthropogenic climate change causes the Arctic to heat up disproportionately faster than the rest of the world—this means we can only mitigate Arctic warming by reducing global carbon and methane emissions. By pivoting to zero-carbon energy sources like wind, solar, and hydropower, the U.S. can regain climate leadership through the power of its example. U.S. leadership on clean energy will encourage other countries—especially China—to reduce emissions as well. The time to do so is now, while we are seeing record low prices for building renewable energy infrastructure.[57]

2. **The next administration must commit to a "green" post-COVID economic recovery**.

   In designing a post-COVID recovery plan, the U.S. should draw lessons from the E.U., which passed a €750 billion coronavirus package on July 21. 30% of this package will go toward climate action, creating a vast green stimulus.[58] Although the U.S. Congress is not the European Council, there is still hope for a bipartisan consensus on America's post-COVID recovery. The Senate's American Energy Innovation Act (AEIA) could provide a starting point for broader economic stimulus. The AEIA includes dozens of energy bills that have passed the Senate Committee on Energy and Natural Resources, most with bipartisan support. Although not a comprehensive clean energy bill, the AEIA's passage would mark the first major U.S. energy bill in over a decade.[59]

3. **U.S. policymakers must focus on building domestic climate resilience**.

   Emissions reductions will mitigate climate change over the long term, but we still face decades of baked-in warming. Inevitable warming means we must prepare for the new normal: hotter Arctic summers, thawing Alaskan permafrost, and sea-level rise threatening America's coastal cities. Adaptation to the warming beyond our control means building climate-resilient infrastructure, power systems, and food chains.[60]

4. **The U.S. must embrace an updated Arctic strategy that acknowledges polar climate change.**

   Arctic climate change is real, it is a threat, and it will define the Far North's future. To be successful, any U.S. strategy for the Arctic must incorporate these fundamental truths. At his first public event on July 31, 2020, the new U.S. coordinator for the Arctic region, James DeHart, suggested future generations would look back at this summer as a pivot point in America's approach to the Arctic.[61] The U.S. has been especially active in the region of late: calling for a new fleet of icebreakers, reopening its consulate in Nuuk, Greenland, and reinstating the position of U.S. Arctic coordinator. None of this will matter, however, if Arctic climate change goes unchecked.

Conclusion

Arctic climate change and global climate change are inextricably linked. To mitigate the devastating effects of a warming Arctic, industrialized nations must commit to drastic reductions in greenhouse gas emissions. The U.S. needs to play a leadership role in promoting emissions reductions. If it does not, Arctic climate change may soon drive the globe to its climate tipping point.

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We believe that America must lead in the pursuit of our common goals and shared security. We must confront international challenges with our partners and with all the tools at our disposal and address emerging problems before they become security crises. And to do this we must forge a bipartisan consensus here at home.

ASP brings together prominent American business leaders, former members of Congress, retired military flag officers, and prominent former government officials. ASP conducts research on a broad range of issues and engages and empowers the American public by taking its findings directly to them via events, traditional & new media, meetings, and publications.

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ASP exists to promote that dialogue, to forge that consensus, and to spur constructive action so that America meets the challenges to its security while seizing the opportunities that abound.

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