

September 25, 2020

The Impacts of Climate Change on North American Defence and Security

Jill Barclay, Jayde Lavoie, Carly MacArthur, and Maria Nallim
NAADSN Research Assistant

Supervised by Dr. Wilfrid Greaves, NAADSN Coordinator

Question: What are the implications of climate change for defence and security planning and operations in Canada and the United States?

Purpose

This policy primer describes the impacts of climate change on defence and security planning and operations in North America. This includes an examination of the implications of climate change on the Canadian Armed Forces (CAF) and US Armed Forces' military preparedness. It begins by examining key institutions and policies by geographic region: first, Canada, then the USA. Given the substantial attention given to the Arctic in recent discussions of defence and security policy as they relate to climate change, the Canadian Arctic and Alaska are examined separately within this section.

This primer then undertakes a comprehensive analysis of the implications of climate change on defence and security in North America. The purpose of this assessment is to help inform policymakers and other stakeholders of important considerations regarding how climate change intersects with military operations. This is relevant both in the context of how defence operations contribute to climate change, and how the effects of climate change pose obstacles to the successful execution of defence operations.

Background

The intersection of climate change and security, commonly referred to as "climate security," has become an increasingly prominent debate among the scientific and policy community. The United Nations Security Council officially acknowledges climate change as an imminent threat to international security.¹ This is largely due to

climate change's role as a "threat multiplier" that aggravates existing defence and security issues.² As described during a Security Council debate: "The risks associated with climate-related disasters do not represent a scenario of some distant future. They are already a reality for millions of people around the globe - and they are not going away."³ North America is no exception to this reality; climate change acts as a threat multiplier in Canada and the United States in numerous ways. As conventional security threats are worsened by the consequences of global warming and more frequent extreme weather events such as heatwaves, drought, extreme snow and rainfall events, and wildfires, the continent must be better prepared. Beyond North America, climate change in conflict zones in which the United States and Canada are already involved, or may be in future, also reflect the threat multiplier effect. This may be seen through heightened conflict socio-political unrest as situations such as food and water shortages exacerbate human displacement and undermine conditions for human survival.⁴

Beyond the threat multiplying impact of climate change, more severe and frequent environmental disasters will impact defence and security in North America, creating greater demands for military response to aid in the aftermath, particularly in remote, rural and Indigenous communities. An example of this was the Fort McMurray wildfire in northern Alberta in 2016, which forced nearly 90,000 people to evacuate and caused nearly four-billion dollars in insured losses.⁵ At the height of the fire, oil production in the region was scaled back by a million barrels a day, causing substantial financial losses and reducing Canadian oil production by nearly a third.⁶ Further, natural disasters can damage military bases and other facilities that are not designed to withstand such events. In 2018, Tyndall Air Force Base in Florida was devastated by a hurricane that damaged practically every building on base and those F-22 fighter jets that were not relocated prior to the storm.⁷ In response, the US Air Force allocated \$646 million dollars for immediate repairs and recognized that more time and funding would be needed to complete the rebuilding.⁸ These are just two examples of the ways in which environmental disasters have impacted defence and security preparedness in non-traditional ways. The anticipated frequency with which these events will occur in the future indicates a need for greater military preparedness and response to climate change in North America going forward.

Despite the serious impacts of climate change, it has become a politically polarized issue, impeding effective government responses in Canada and the United States. A focus on preparation, mitigation, and adaptation to the impacts of climate change is of critical importance to the national security of both countries. The frequency and severity of climate change-related environmental disasters generates non-traditional security issues and multiplies existing threats, and demands greater attention on the North American security agenda. The next section outlines recent Canadian and US government documents and policies focused on climate change, defence, and security.

Canada

This section focuses on government policies and documents relevant to defence, security, and climate change in Canada as a whole before examining those specific to the Canadian Arctic. Since 2015, the Government of Canada has demonstrated greater awareness commitment to addressing the implications of climate change across different departments. Many of the Government's mandate letters address climate change, particularly with a focus on the Arctic as a priority.⁹ However, limited attention is paid to the implications of climate change

for defence and security. Government reports, documents and policies that specifically focus on climate defence and security remain mostly descriptive of climate impacts, rather than detailing military or government preparedness and response mechanisms. Much of the focus remains heavily focused on the Arctic, with limited attention paid to impacts for the rest of Canada. Overall, while the Government of Canada has expressed its commitment to addressing climate change across various departments, it remains largely framed as a political issue rather than a security issue. Further action could be taken to demonstrate the ways in which this commitment will be carried out in terms of increased preparedness and response, rather than repeated acknowledgement of the looming implications.

*Strong, Secure and Engaged (2017)*¹⁰

Canada's current defence strategy anticipates that climate change will aggravate existing international vulnerabilities such as weak governance, and worsen sources of tension such as resource scarcity, describing climate change as a "security challenge that knows no borders."¹¹ It describes climate change as already generating humanitarian crises that produce greater demands for external intervention. It specifies the safety and security challenges occurring due to climate change in Northern Canada, including greater demand for search and rescue and the need to be wary of international military activities. *Strong, Secure, and Engaged* thus indicates that climate change must be considered through a security lens in order to strengthen defence preparedness within the CAF and enhance security in Canada and overseas. While the policy does address climate change, unlike Canada's previous defence policy, it still takes a more general, descriptive approach to the issue, rather than an analytical one, and lacks concrete tools for action. Moreover, domestically, it is largely focused on the Arctic, and fails to address the climate security implications for the rest of Canada.

*Emergency Management Framework for Canada (2017)*¹²

This document recognizes that "emergency management is a shared responsibility across all sectors of society" and "aims to guide and strengthen the way governments and partners assess risks and work together to prevent/mitigate, prepare for, respond to, and recover from threats and hazards that pose the greatest risk to Canadians."¹³ It lists climate and environmental change as two "accumulating risks" that require increased emergency response capacities,¹⁴ and aligns itself with key multilateral agreements focused on addressing climate change, such as the 2015 Paris Agreement and the UN Sustainable Development Goals.¹⁵ The framework notes that "risk management practices that integrate climate change projections facilitate improved decision-making by clarifying the dimensions of risk, including its causes, likelihood of occurrence and possible severity of consequences."¹⁶ While the framework does not focus specifically on a defence and security response, the CAF should fall under the "shared responsibility" approach. The CAF has vital capabilities that make it a key actor in Canada's emergency response, making this document relevant to how climate change intersects with defence and security policy.

*Canada's Changing Climate Report (2019)*¹⁷

This report was the first in a series titled *Canada in a Changing Climate: Advancing our Knowledge for Action*. It comprehensively outlines the state of climate change in Canada, detailing current and future impacts pertaining to temperature, precipitation, snow, ice, permafrost and freshwater availability. This report does not discuss the defence and security implications of climate change specifically, but by detailing the Canadian impacts of climate change it can help inform defence and security planning for extreme weather events, water shortages, and other domestic climate security threats.

*Climate Change: Its Impact and Policy Implications (2020)*¹⁸

This report states that “factors that determine the safety and security of Canadians are interconnected, and weaknesses in policy areas [...] are intensified under climate stress, and can create direct and indirect challenges for the defence and security of Canada.”¹⁹ As such, it discusses policy implications across a variety of areas, with a section dedicated to national defence and security policy. It recognizes climate change as a “non-traditional security threat that transcends borders” and a “threat multiplier” or “stressor capable of compounding pre-existing security risks.”²⁰ The report recognizes that climate change is a catalyst for increased military responsiveness as a result of necessary CAF involvement following severe environmental disasters. These findings are consistent with the findings outlined in *Strong, Secure and Engaged*, but go further to discuss the impacts of climate change on other sectors that also affect security and defence planning, acknowledging that climate-change impacts cut across different sectors.

The Canadian Arctic

*Canada's Arctic Sovereignty (2010)*²¹

The report by the House of Commons Standing Committee on National Defence concludes that security threats in the Canadian Arctic are not immediate military threats to territory, but rather the effects of climate change which are increasing shipping traffic in the region, exposing resource exploitation opportunities, and highlighting the lack of sustained political and diplomatic attention that is necessary to provide proper attention to security challenges in the region. Arctic security must be viewed on a long-term basis. Military infrastructure in the North should be developed in conjunction with infrastructure required to address the socio-economic challenges faced by people living in Northern Canada.²² That is, Canada must focus on development in the Arctic to build sustainable communities.²³

*Sovereignty and Security in Canada's Arctic: Interim Report (2011)*²⁴

This report by the Senate Committee on National Security and Defence demonstrates how security in the Arctic is principally threatened by climate change rather than conventional military threats or terrorism. Such climate threats include rising sea levels, melting permafrost, grounded vessels causing environmental damage, the

outbreak of communicable disease within small communities, and increasing need for search and rescue.²⁵ The report concludes there is no serious challenge to Canada's Arctic sovereignty or regional security. The Canadian Rangers, part of the CAF reserve that performs national security and public safety missions in Northern Canada, are identified as the frontline of security in the Arctic. The Canadian Rangers' situational awareness is adequate and growing, but it concludes that CAF capabilities in the North must be enhanced in the decade ahead to address the climate change threats to the region.²⁶

*Nation-Building at Home, Vigilance Beyond: Preparing for the Coming Decades in the Arctic (2019)*²⁷

This report by the House of Commons Standing Committee on Foreign Affairs and International Development provides a significant update to the perspective on defence and security in Northern Canada. In particular, it notes the "deteriorating" security conditions globally and in the Arctic due to the foreign policies of Russia and China, though it provides a nuanced and detailed analysis of the specific implications for Canada. Drawing on expert and institutional testimony from Northern and Indigenous organizations, the report notes that "the existent costs of climate change are outweighing the benefits for Arctic communities in Canada,"²⁸ though it stresses the economic and social consequences of climate change rather than their defence and security impacts, per se. Ultimately, of the 28 recommendations the report provides to Government, 13 focus in whole or part on defence and security issues. By contrast, only one specifically focuses on climate change, and that in the context of federal infrastructure spending, not defence and security.

*Canada's Arctic and Northern Policy Framework (2019)*²⁹

This is the primary policy governing the Canadian Arctic and aims to address gaps experienced by populations in Northern Canada, and direct support to Northern and Indigenous governments and organizations through to 2030.³⁰ The role of the Canadian Armed Forces is outlined as key to demonstrating Canada's sovereignty over its Arctic territory.³¹ The Framework works in tandem with *Strong, Secure, and Engaged* to enhance the CAF's presence in the region over time and invest in the capacities to increase situational awareness and response to emergencies or military threats when they occur. The CAF's intention to consult with Indigenous governments, organizations, and Northern communities is a key component of its Arctic operations.³² Further, the Framework outlines the collaboration between Inuit organizations, Northern communities, federal and provincial agencies, and the private sector to understand and address the effects of climate change on communities and biodiversity. By engaging a range of Northern stakeholders, the CAF seeks to be better prepared to address the implication of climate change in the region.³³

The United States

The following section highlights key policies and government documents in the United States for the discussion of climate change, defence, and security. While DoD recognizes climate change as a threat to military operations, its approach consists of preparing for the effects of climate change without substantially altering its operations. Where climate change is discussed in recent U.S. defence and security policies, it is in relation to its expected effects on operations and infrastructure; there is little consideration of the broader societal or strategic

implications of climate change for defence and security in the United States or beyond. Recent documents demonstrate the decline in prioritization and understanding of both climate change and the Arctic as issues relevant for U.S. defence and security, culminating in the total omission of both from recent national defence and security strategies by the current Administration. This reflects a trend in U.S. defence policy, wherein climate change is sometimes recognized for its impacts on military objectives but not understood as a security threat more broadly.

*Climate Change Adaptation Roadmap (2014)*³⁴

This document details the U.S. Department of Defense's climate change adaptation activities. Noting the potential for climate change to pose risks to national security, it suggests responding to climate change both through adaptation and mitigation measures. This includes the establishment of three broad goals: to identify and assess the effects of climate change on the Department; to integrate climate change considerations across the Department and manage associated risks; and to collaborate with internal and external stakeholders on climate change challenges. This document is accompanied by the *Strategic Sustainability Performance Plan*, which articulates the Department's sustainability vision, and its plan to "mitigate the effects of climate change on military operations and national security."

*U.S. National Security Strategy (2017)*³⁵

The first major national security document released under the Trump Administration, this document is a paean to the president that reverses the focus of the previous two national security strategies. It reframes America's place in the world and characterizes the international system as one of conflict and geopolitical rivalry, while omitting an mention of climate change or the Arctic region.

*U.S. National Defense Strategy (2018)*³⁶

The current national defence document acknowledges the increasing complexity of the global security environment, as characterized by the changing nature of warfare and the re-emergence of long-term, strategic competition, citing Russia and China's intentions to re-shape the rules-based international order. Reversing previous national security strategies and replacing the former Quadrennial Defense Review, climate change again goes unmentioned, clearly indicating the current Administration's perspective on the relevance of climate change for American defence and security.

*Report on the Effects of Climate Change on the Department of Defense (2019)*³⁷

This report was released in response to the 2018 *National Defense Authorization Act*, in which Congress asked DoD to provide a report on "vulnerabilities to military installations and combatant commander requirements resulting from climate change over the next 20 years."³⁸ The *Act* outlined that DoD should take action to prepare for the effects of climate change by identifying the risks to military infrastructure and "increase the resiliency of the identified vulnerable military installations."³⁹ In the report, DoD recognizes climate change impacts on

military operations and readiness, in contrast to the absence of such recognition in prior, recent policy documents. Furthermore, the report notes there will likely be increased demand for search and rescue operations, monitoring of shipping and other activities in the Arctic, and better capabilities to respond to regional crises. The changing environment is noted as increasing security requirements, capabilities, and costs.

Alaska

*Arctic Roadmap 2014-2030 (2014)*⁴⁰

The publication provides direction to the U.S. Navy for the near-term (2014-2020), mid-term (2020-2030), and far-term (beyond 2030). Throughout each timeframe, the Navy has determined that it must regularly anticipate the impacts of climate change and re-evaluate its preparedness, based on the findings of a dedicated Task Force on climate change struck for this report. As a part of these preparations, the Navy outlined targeted investments in Arctic capabilities to safeguard against uncertainty.⁴¹

*National Security Implications of Climate-Related Risks and Changing Climate (2015)*⁴²

This report outlines “the most serious and likely climate-related security risks for each Combatant Command, the ways in which the Combatant Commands are integrating mitigation of these risks into their planning processes, and a description of the resources required for an effective response.” It describes climate change impacts on worsening human security and undermining governance in already fragile regions of the world, and obliquely acknowledges that climate change will also pose related challenges in the United States itself, particularly due to extreme weather events.⁴³ The report also notes that diminishing sea ice in the Arctic will require increased military capabilities and activities, and outlines operations in the Arctic to monitor and evaluate the changing geological environment for better preparedness of military operations in the region.⁴⁴

*Arctic Strategy Report (2019)*⁴⁵

This report from DoD to Congress identifies competition with China and Russia as the principal challenge to long-term U.S. security in the Arctic. Without offering many details on the threat, the report notes that China and Russia “pose discrete and different challenges in their respective theaters, but both are pursuing activities and capabilities in the Arctic that may present risks to the homeland.”⁴⁶ DoD’s stated goal for the Arctic is “a secure and stable region where U.S. national interests are safeguarded, the U.S. homeland is defended, and nations work cooperatively to address challenges.”⁴⁷ DoD’s approach to Arctic security is through building Arctic awareness, enhancing Arctic operations, and strengthening the rules-based order in the Arctic.⁴⁸ The changing physical environment is noted as having adverse effects on infrastructure, including military installations, but climate change is not directly noted as being the cause nor is it understood to have defence and security implications beyond requiring “DoD to make time-sensitive, risk-informed investments to build awareness of the region.”⁴⁹

Climate Change Impacts on Military Operations in North America

The remainder of this brief examines how climate change affects defence and security in North America. Rather than focusing geographically, this section is organized around specific defence and security issues related to or affected by climate change, and takes a more holistic approach that demonstrates their overarching effects, with geographical examples within each subsection.

Environmental Disasters

Between 2008 and 2018, the Canadian Disaster Database documented almost 200 major disasters in Canada that “resulted in billions of dollars in damages, as well as the displacement of hundreds of thousands of Canadians.”⁵⁰ Though that not all of these events were extreme weather-related, it is an indicator of the current frequency of disasters that is expected to increase as a result of climate change. Such disasters are increasingly straining CAF operations.⁵¹ For instance, the CAF deployed in response to environmental disasters at least 23 times between 2010-2018, with increasing frequency: one deployment in 2010, compared to six in 2018.⁵² As a result, the CAF is being pushed to the limit as a result of increased climate-related events it is required to respond to; General Jonathan Vance has stated that “these calls for assistance are stretching the military beyond what it was originally designed to handle,” and the current CAF structure is “probably too small to be able to deal with all of the tasks.”⁵³ Increasingly frequent military response will be required as environmental disasters become increasingly common and severe across Canada.

The United States faces similar concerns pertaining to the need for increased military capacity to respond to natural disasters. In 2014, the Center for Naval Analyses Military Advisory Board noted that the National Guard, reserve forces and the Army Corps of Engineers are “being called on more frequently to battle wildfires, respond to flooding and major snow events, and move water to drought-stricken areas, at home and abroad.”⁵⁴ For instance, DoD previously reported that “Super Storm Sandy in New York and New Jersey in 2012 resulted in over 14,000 DoD personnel mobilized to provide direct support, and at least an additional 10,000 who supported the operation in various capacities in the areas of power restoration, fuel resupply, transportation infrastructure repair, water and meal distribution, temporary housing and sheltering, and debris removal.”⁵⁵ Climate change will only exacerbate this issue, further straining these organizations’ capacities to support federal, state, and local authorities in times of crisis.

Military Installations and Greener Defence Operations

Damage to military installations is another concern as a result of climate change. A report from the Under Secretary of Defense for Acquisition, Technology and Logistics indicates that as much as two thirds of U.S. military infrastructure could be at risk of climate-related impacts.⁵⁶ Extreme weather events such as hurricanes, wildfires and droughts resulting from increasing temperatures, and flooding as a result of the rising sea levels could greatly affect U.S. military installations, as exemplified by the 2018 destruction of Tyndall Air Force Base

in Florida by Hurricane Michael. With reconstruction costs estimated at more than USD\$4 billion,⁵⁷ maintaining US military readiness in the face of climate impacts is an expensive and multi-year prospect.

By contrast, while damage to military installations also confronts defence planners in Canada, the CAF places greater importance on making future infrastructure more environmentally friendly. *Strong, Secure and Engaged* identifies the need for the Department of National Defence (DND) to help mitigate its contribution to greenhouse gas emissions that are principally responsible for climate change. DND and CAF operations represent more than 50% of the Government of Canada's total greenhouse gas emissions, and therefore have a crucial role to play in assisting the federal government to meet its climate targets.⁵⁸ Some examples of positive changes to Canadian military infrastructure in 2019 include: 100% of new and upgraded defence buildings were built to meet the latest industry standards for excellence in green building design, construction, and maintenance; 75% of all electricity used at bases and wings in provinces with carbon-intensive electrical grids came from clean sources; and 27% of light-duty vehicle fleet now runs on hybrid, plug-in hybrid and/or electric technology.⁵⁹

Within the United States, the DoD has increasingly emphasized what it labels "energy security" – namely resilient energy systems and fuel conservation – within its operations. Yet, still, in 2017 alone the Pentagon recorded greater emissions than the entire countries of Sweden or Denmark.⁶⁰ The U.S. military has a massive opportunity to reduce emissions from its operations, but while it acknowledges the adverse impacts of climate change on U.S. and global security, it's done little to address how these operations contribute significantly to global greenhouse gas emissions. Overall, while both countries are adapting to the effects of climate change on military infrastructure, the American approach focuses on mitigating the consequences of infrastructure damage, while Canada's seeks to address the underlying contributions of the military to its national emissions.

Climate Change and International Security

Some traditional defence and security threats relate to the effects of climate change, such as new possibilities for international conflict and great power competition. Conflicts in climate-stressed countries and regions are already producing socio-political instability and undermining state capacity in ways that produce significant human and inter-state insecurity. Recent examples include the civil wars in Syria and Mali, both of which were partly catalyzed by climate-related social unrest, and to which both Canada and the United States participated in multilateral military interventions.⁶¹ Other climate impacts, such as rising sea levels leading to mass displacement along coastal regions, will likely contribute to greater conflict around much of the world.⁶² Already, the world has experienced a new record number of displaced people, estimated at more than 250 million; as many as 200 million more are predicted to be displaced by climate change by 2050.⁶³ Another concern is the effect that climate change may have on global food and water security, with increasingly frequent and severe droughts as well as extreme temperatures, increasing the probability of violent conflicts in countries that already experience resource scarcity.⁶⁴ These conventional security concerns exemplify the threat multiplier effect of climate change on already vulnerable or fragile regions of the world.

The Arctic: Preparing for the Threats of Climate Change

The Arctic is warming faster than the rest of the globe as a result of the natural phenomenon of Arctic amplification, whereby the effects of climate change are aggravated in the circumpolar north due to climate feedback loops.⁶⁵ Consequently, military operations in Northern Canada and Alaska will have to be resilient and versatile in order to manage the fast-changing Arctic environment. This section explores the main factors to consider when preparing military operations for climate change in the Arctic.

Climate monitoring technologies

Planning for the future of the military in the Arctic requires a higher level of adaptability than in southern environments, and one of the best ways to increase military preparedness in the Arctic is through increased climate modelling and monitoring to track current and future changes in climate and their subsequent impacts. Efforts are needed to increase the geographic coverage of these observations in order to reduce scientific uncertainty.⁶⁶ Previous environmental modelling has proven too modest as the decline in Arctic sea ice and other environmental changes are occurring more rapidly than predicted.⁶⁷ There are unavoidable uncertainties about the Arctic environment that must be accepted for Arctic military preparedness, but reducing these uncertainties requires more and better climate modelling and surveillance technologies. This may include increased cooperation with other Arctic states to close the knowledge gap and avoid duplicated efforts.

Infrastructure

Existing infrastructure in the Arctic is largely built on permafrost, but with the top layer beginning to thaw in the summer months, this has led to the instability of critical infrastructure.⁶⁸ Declining snow, ice, and permafrost will continue as a result of climate change, with estimates suggesting the area of near-surface permafrost will decrease as much as 35% from current levels.⁶⁹ This suggests that current Arctic infrastructure will need to be either rebuilt or reinforced against permafrost thawing. Any new infrastructure will also have to consider the potential instability of the natural environment on which it is built. Overall, the climate-related challenges to Arctic infrastructure pose a considerable threat to state capacity and human security in the region.

Increased Surveillance

Climate change has greatly diminished Arctic sea ice, creating new commercial transit routes that have become a point of concern for the U.S. and Canada and others as non-Arctic states express their interest in using these passages.⁷⁰ Given that the Arctic Ocean could experience ice-free summers as early as the 2030s,⁷¹ the opening of Arctic sea lanes will likely result in more maritime activity in the region. Consequently, there will be need for increased monitoring of shipping lanes and maritime transportation to ensure compliance with domestic and international law and ensure regional stability.⁷² While satellites and nautical vessels will likely play a greater role, there may be an increased reliance on Arctic surveillance by air. Unmanned aerial vehicles such as drones

and remotely controlled aircraft, which can fly for longer periods of time and travel further distances, may allow for improved surveillance of large areas often inaccessible by other means.⁷³

Human Security

Climate change also has particularly significant impacts on human security in the Arctic.⁷⁴ Issues include threats to human health, such as increased rates of accidents and fatalities due to unpredictable ice and weather, new vectors for communicable disease, changes to food- and water-borne pathogens, increased exposure to environmental contaminants, and ozone depletion causing increased exposure to ultraviolet radiation.⁷⁵ Climate change also worsens existing transboundary pollution such as persistent organic pollutants (POPs), which increase rate of cancer and cause neurological damage in children, and are aggravated by black carbon from shipping and power generation, and older contamination from Cold War era military and industrial activity.⁷⁶ The effects on traditional food systems and local economies are considerable, and combined with climate-related threats to critical infrastructure pose considerable policy challenges to ensure the continued viability of current patterns of Arctic life.

Conclusion

This policy primer analyzes the impacts of climate change on North American defence and security. Although climate change has been incorporated into Canadian and American defence and security planning and strategy documents only to a limited extent – and in the United States has regressed under the current Administration – climate change clearly affects military preparedness and national security in myriad ways. It acts as a multiplier that worsens conventional security threats, straining defence capabilities through increased demand in response to environmental disasters and other climate related emergencies domestically and abroad. Extreme weather events have already proven devastating to operational readiness when they strike military bases, and such events are certain to worsen. Acute climate-related impacts in Arctic North America, in particular, require greater investments in climate monitoring technologies, infrastructure adaptation, and tools for regional monitoring and surveillance, and to support human security. The impacts of climate change, and their implications for North American defence operations, will increase in the future. As such, it is vital that North American governments prioritize preparation, mitigation, and adaptation to the impacts of climate change in order to best defend the security and vital interests of their citizens.

Notes

¹ Jones Parry, E. “The Greatest Threat to Global Security: Climate change Is Not Merely An Environmental Problem.” *UN Chronicle*. <https://www.un.org/en/chronicle/article/greatest-threat-global-security-climate-change-not-merely-environmental-problem>

² P. Huntjens. “Climate Change as a Threat Multiplier for Human Disaster and Conflict.” *The Hague Institute for Global Justice*, Working Paper, No.9. <https://www.thehagueinstituteforglobaljustice.org/wp-content/uploads/2015/10/working-Paper-9-climate-change-threat-multiplier.pdf>

³ United Nations. "Climate change recognized as a 'threat multiplier', UN Security Council debates its impact on peace." *UN News*. January 25, 2019. <https://news.un.org/en/story/2019/01/1031322>

⁴ *Ibid*.

⁵ C. Ramsay. "3 years after Fort McMurray wildfire, rebuild continues: 'We just want out home back'." *Global News*. May 3, 2019. <https://globalnews.ca/news/5234350/fort-mcmurray-wildfire-3-years-later/>

⁶ "Fort McMurray wildfire cuts Canada's oil output by a third." *The Guardian*. May 11, 2016. <https://www.theguardian.com/world/2016/may/11/fort-mcmurray-wildfire-cuts-canadas-oil-output-by-a-third>

⁷ M. Reeves. "Tyndall one year after Hurricane Michael." *Tyndall Air Force Base, News*. October 10, 2019.

<https://www.tyndall.af.mil/News/Article-Display/Article/1985607/tyndall-one-year-after-hurricane-michael/>

⁸ *Ibid*.

⁹ See Justin Trudeau, Prime Minister of Canada. *Mandate Letters*. 2019. <https://pm.gc.ca/en/mandate-letters>.

¹⁰ Department of National Defence. *Strong Secure and Engaged*. (Ottawa: Government of Canada, 2017).

<http://dgpapp.forces.gc.ca/en/canada-defence-policy/docs/canada-defence-policy-report.pdf>

¹¹ *Ibid*, 52.

¹² Public Safety Canada. *An Emergency Management Framework for Canada*, 3rd ed. (Ottawa: Government of Canada, 2017).

<https://www.publicsafety.gc.ca/cnt/rsrccs/pblctns/2017-mrgnc-mngmnt-frmwrk/index-en.aspx>

¹³ *Ibid*, 6.

¹⁴ *Ibid*, 4.

¹⁵ *Ibid*, 5.

¹⁶ *Ibid*, 11.

¹⁷ Environment and Climate Change Canada. *Canada's Changing Climate Report*. (Ottawa: Government of Canada, 2019).

https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR_FULLREPORT-EN-FINAL.pdf

¹⁸ Parliamentary Information and Research Services. *Climate change: Its Impact and Policy Implications*. (Ottawa: Library of Parliament, Government of Canada, 2020).

<https://lop.parl.ca/staticfiles/PublicWebsite/Home/ResearchPublications/BackgroundPapers/PDF/2019-46-e.pdf>

¹⁹ *Ibid*, 22.

²⁰ *Ibid*, 21.

²¹ M. Bernier. "Canada's Arctic Sovereignty: Report of the Standing Committee on National Defence." *House of Commons* (June 2010): 5. <https://www.ourcommons.ca/Content/Committee/403/NDDN/Reports/RP4486644/nddnrp03/nddnrp03-e.pdf>

²² Bernier, *Canada's Arctic Sovereignty*, 14.

²³ *Ibid*, 15.

²⁴ P. Wallin, and R. Dallaire. "Sovereignty & Security in Canada's Arctic: Interim Report." *Standing Senate Committee on National Security and Defence* (2011): 28. <https://sencanada.ca/Content/SEN/Committee/403/defe/rep/rep07mar11-e.pdf>

²⁵ Wallin & Dallaire. *Sovereignty & Security in Canada's Arctic*, 28.

²⁶ *Ibid*, 39.

²⁷ *Nation-Building at Home, Vigilance Beyond: Preparing for the Coming Decades in the Arctic*. Report of the Standing Committee on Foreign Affairs and International Development (2019).

<https://www.ourcommons.ca/Content/Committee/421/FAAE/Reports/RP10411277/faaerp24/faaerp24-e.pdf>

²⁸ *Ibid*, 21.

²⁹ Northern Affairs Canada. *Canada's Arctic and Northern Policy Framework*. Government of Canada. November 18, 2019.

<https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/156052330587>

³⁰ Northern Affairs Canada. "Forward." In *Canada's Arctic and Northern Policy Framework*. Government of Canada.

³¹ Northern Affairs Canada. "Our present." In *Canada's Arctic and Northern Policy Framework*.

³² Northern Affairs Canada. "A safe and secure Arctic and North, now and into the future." In *Canada's Arctic and Northern Policy Framework*.

³³ Northern Affairs Canada. "Goal 5: Canadian Arctic and northern ecosystems are healthy and resilient." In *Canada's Arctic and Northern Policy Framework*.

³⁴ U.S. Department of Defense. *2014 Climate Change Adaptation Roadmap* (Washington, DC: 2014),

https://www.acq.osd.mil/eie/Downloads/CCARprint_wForward_e.pdf

- ³⁵ The White House, *National Security Strategy of the United States of America* (Washington, DC: 2017). <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>
- ³⁶ U.S. Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America* (Washington, DC: 2018), <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>
- ³⁷ Office of the Under Secretary of Defense for Acquisition and Sustainment, *Report on Effects of a Changing Climate to the Department of Defense* (U.S. Department of Defense: Washington DC, 2019). https://climateandsecurity.org/wp-content/uploads/2019/01/sec_335_ndaa-report_effects_of_a_changing_climate_to_dod.pdf
- ³⁸ J. Conger. "New Pentagon Report: "The Effects of a Changing Climate Are a National Security Issue"." The Center for Climate & Security. January 24, 2019. Accessed August 27, 2020. <https://climateandsecurity.org/2019/01/new-pentagon-report-the-effects-of-a-changing-climate-are-a-national-security-issue/>
- ³⁹ U.S. Congress, House, Armed Services Committee, *National Defense Authorization Act for Fiscal Year 2018*, HR 2810, 115th Cong., introduced in House June 7, 2017. 131. <https://www.congress.gov/bill/115th-congress/house-bill/2810/text>
- ⁴⁰ U.S. Navy Task Force on Climate Change. "Arctic Roadmap 2014-2030." *U.S. Navy* (February 2014): 8. <https://info.publicintelligence.net/USNavy-ArcticRoadmap.pdf>
- ⁴¹ U.S. Navy Task Force on Climate Change, *Arctic Roadmap 2014-2030*, 8.
- ⁴² Department of Defense. "National Security Implications of Climate-Related Risks and a Changing Climate." *United States Government* (July 2015): 5. <https://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf>
- ⁴³ *Ibid*, 4.
- ⁴⁴ Department of Defense, *National Security Implications of Climate-Related Risks and a Changing Climate*, 5.
- ⁴⁵ Department of Defense. "Department of Defense Arctic Strategy." *Office of the Under Secretary of Defense for Policy* (2019): 6. <https://media.defense.gov/2019/Jun/06/2002141657/-1/-1/1/2019-DOD-ARCTIC-STRATEGY.PDF>
- ⁴⁶ Department of Defense, *Department of Defense Arctic Strategy*, 6.
- ⁴⁷ *Ibid*, 2.
- ⁴⁸ *Ibid*, 3.
- ⁴⁹ *Ibid*, 9.
- ⁵⁰ Parliamentary Information and Research Services. *Climate change: Its Impact and Policy Implications*. 24.
- ⁵¹ D. Major and S. Shivji. "Canada's military feeling the strain responding to climate change." *CBC*. June 24, 2019. <https://www.cbc.ca/news/politics/canada-s-military-adopting-climate-change-1.5186337>
- ⁵² DND, "Operation LENTUS." Ottawa: Department of National Defence. <https://www.canada.ca/en/department-national-defence/services/operations/military-operations/current-operations/operation-lentus.html>
- ⁵³ D. Major, and S. Shivji. "Canada's military feeling the strain responding to climate change."
- ⁵⁴ Library of Parliament. "Climate Change: Its Impact and Policy Implications", Publication No. 2019-46-E. 24.
- ⁵⁵ Department of Defense, *National Security Implications of Climate-Related Risks and a Changing Climate*, 4.
- ⁵⁶ Office of the Under Secretary of Defense for Acquisition and Sustainment, *Report on Effects of a Changing Climate to the Department of Defense*, 16.
- ⁵⁷ Magen M. Reeves, "Tyndall One Year After Hurricane Michael," Tyndall Air Force Base, October 10, 2019, <https://www.tyndall.af.mil/News/Article-Display/Article/1985607/tyndall-one-year-after-hurricane-michael/>; Steve Brock et al., *The World Climate and Security Report 2020* (Washington, DC: The Center for Climate and Security, February 2020), 77, https://climateandsecurity.files.wordpress.com/2020/02/world-climate-security-report-2020_2_13.pdf
- ⁵⁸ Department of National Defence. *Strong Secure and Engaged*. 75.
- ⁵⁹ Department of National Defence. "Strong, Secure, Engaged: Moving to Sustainable Defence Operations." Canada.ca. February 13, 2020. Accessed August 27, 2020. <https://www.canada.ca/en/department-national-defence/maple-leaf/defence/2020/02/strong-secure-engaged-moving-to-sustainable-defence-operations.html>
- ⁶⁰ Neta C. Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War." Watson Institute of Public and International Affairs, Boston University, 2019, 2.
- ⁶¹ Peter Gleick. 2014. "Water, Drought, Climate Change, and Conflict in Syria." *Weather, Climate, and Society* 6, no. 3: 331-340; Mitra, Shreya. 2017. *Mali's Fertile Grounds for Conflict: Climate Change and Resource Stress*. Policy Brief: Planetary Security Initiative. Accessed at https://www.clingendael.org/sites/default/files/2017-12/PB_Malis_Fertile_Grounds_for_Conflict.pdf; ICRC¹³

2019. “Mali-Niger: Climate change and conflict make an explosive mix in the Sahel.” International Committee of the Red Cross. January 19. <https://www.icrc.org/en/document/mali-niger-climate-change-and-conflict-make-explosive-mix-sahel>.
- ⁶² Canadian Parliament, House of Commons. Evidence – NDDN (41 – 1) – No. 25. <https://www.ourcommons.ca/content/Committee/421/NDDN/Evidence/EV8565937/NDDNEV25-E.PDF>
- ⁶³ Oli Brown. 2008. *Migration and Climate Change*. IOM Migration Research Series No. 31. Geneva: International Organization for Migration, 11.
- ⁶⁴ U.S. Department of Defense, *Quadrennial Defense Review 2014* (Washington, DC: 2014), 8, https://archive.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf
- ⁶⁵ Arctic Monitoring and Assessment Programme (AMAP). “Snow, Water, Ice, and Permafrost in the Arctic: Summary for Policy-makers.” *Arctic Council* (2017), 2. <https://oaarchive.arctic-council.org/bitstream/handle/11374/1931/swipa-spm.pdf.pdf?sequence=1&isAllowed=y>
- ⁶⁶ AMAP, *Snow, Water, Ice, and Permafrost in the Arctic*, 6.
- ⁶⁷ Arctic Council. “Arctic Resilience Interim Report 2013: Summary for Policy-Makers.” *Arctic Council* (2013), 3. <http://hdl.handle.net/11374/1629>
- ⁶⁸ AMAP, *Snow, Water, Ice, and Permafrost in the Arctic*, 3.
- ⁶⁹ *Ibid*, 4.
- ⁷⁰ Francesco Femia and Caitlin Werrell, “UPDATE: Chronology of U.S. Military Statements and Actions on Climate Change and Security: Jan 2017-August 2019,” Center for Climate and Security, last modified August 22, 2019, <https://climateandsecurity.org/2019/08/22/update-chronology-of-u-s-military-statements-and-actions-on-climate-change-and-security-jan-2017-august-2019/>
- ⁷¹ AMAP, *Snow, Water, Ice and Permafrost in the Arctic*, 3.
- ⁷² U.S. Navy Task Force on Climate Change, *Arctic Roadmap 2014-2030*, 4.
- ⁷³ Transport Canada. “Drones in the Arctic.” *Government of Canada* (2020). <https://tc.canada.ca/en/programs/national-aerial-surveillance-program/drones-canadian-arctic>
- ⁷⁴ Hoogensen Gjörv, Gunhild, Dawn R. Bazely, Maria Goloviznina, and Andrew J. Tanentzap, eds. 2014. *Environmental and Human Security in the Arctic*. New York: Routledge.
- ⁷⁵ Jacinthe Séguin, ed. *Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity* (Ottawa: Health Canada, 2008), 324-327; Carl M. Hild and Vigdis Stordahl, “Human Health and Well-being,” in *AHDR, Arctic Human Development Report* (Akureyri: Steffanson Arctic Institute, 2004), 155-168.
- ⁷⁶ David Leonard Downie and Terry Fenge, eds. *Northern Lights Against POPs: Combatting Toxic Threats in the Arctic* (Montréal-Kingston: McGill-Queen’s University Press, 2003).