
Centre for International
Governance Innovation

Reimagining a Canadian National Security Strategy

No. 2

Climate Change Impacts on Canadian National Security

Simon Dalby and Leah Lawrence



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Table of Contents

vi	About the Project
vi	About the Authors
1	Executive Summary
1	Introduction
2	Climate Change in Context
5	Canada's Role
7	Recommendations
8	Conclusions
9	Works Cited
11	Acknowledgements

About the Project

Canada's approach to domestic and international security is at a profound moment of change. The shock wave of COVID-19 and its looming future effects highlight the urgent need for a new, coordinated and forward-looking Canadian national security strategy that identifies emerging and non-traditional threats and considers their interrelationships. Complex interactions between foreign policy, domestic innovation and intellectual property, data governance, cybersecurity and trade all have a significant impact on Canada's national security and intelligence activities.

Reimagining a Canadian National Security Strategy is an ambitious and unprecedented project undertaken by the Centre for International Governance Innovation (CIGI). It aims to generate new thinking on Canada's national security, inspire updated and innovative national security and intelligence practices, and identify ways that Canada can influence global policy and rulemaking to better protect future prosperity and enhance domestic security.

CIGI convened interdisciplinary working groups, which totalled more than 250 experts from government, industry, academia and civil society, to examine 10 thematic areas reflecting a new and broad definition of national security. Each thematic area was supported by senior officials from the Government of Canada, designated as "senior government liaisons." They provided input and ideas to the discussions of the working group and the drafting of thematic reports. Project advisers provided support and advice through specific lenses such as gender and human rights. This was critical to strengthening the project's commitment to human rights, equity, diversity and inclusion.

The project will publish 10 reports, authored independently by theme leaders chosen by the project's co-directors. The reports represent the views of their authors, are not designed as consensual documents and do not represent any official Government of Canada policy or position. The project was designed to provide latitude to the theme leaders to freely express new thinking about Canada's national security needs.

A special report by the project's co-directors, Aaron Shull and Wesley Wark, will analyze Canada's new national security outlook and propose a security strategy for Canada.

About the Authors

Simon Dalby is a CIGI senior fellow. He is professor of geography and environmental studies at Wilfrid Laurier University (WLU) in Waterloo, where he teaches courses on governance, security and environment in the Balsillie School of International Affairs.

Simon's research interests include climate discourse in contemporary geopolitics, looking at popular representations of climate change and the strategies used in a range of media, and the burgeoning debate about the Anthropocene epoch and its implications for politics and policy formulation. Simon was educated at Trinity College Dublin and the University of Victoria and holds a Ph.D. from Simon Fraser University. Prior to moving to WLU, he was professor of geography, environmental studies, and political economy at Carleton University.

Leah Lawrence is president and CEO of Sustainable Development Technology Canada, Canada's largest funder of cleantech start-ups. Since taking over the helm in 2015, she has transformed the organization, making it a champion for young companies, educating them on the importance of intellectual property, data and scale-up strategies, and helping them to navigate a globally competitive sector.

Over the years, Leah has served on many corporate and non-profit boards, including serving as president of the Ottawa chapter of the International Women's Forum, the chair of the Calgary Chamber of Commerce, and the president of the Association of Professional Engineers and Geoscientists of Alberta (APEGA). In 2018, she was honoured to receive the Centennial Leadership Award, APEGA's highest distinction for a member who has achieved exemplary achievements in their career. In 2019, Leah was listed in WXN's Top 100 list as one of the nation's most powerful women in business, recognizing her drive and passion for innovation.

Executive Summary

Like cybersecurity and the coronavirus disease 2019 (COVID-19) pandemic response, climate change and other ecological transformations are not easily dealt with using traditional approaches to the management of security, defence, development and foreign policy. For this reason, leading countries such as the United Kingdom and Australia have, in recent years, undertaken national security reviews. These reviews have reframed their approach, emphasizing the linkages between traditional security and emerging fields of human security and climate security, and collating this information into a thoughtful vision for the future. It is time for Canada to do the same.

This new vision combines international leadership, in particular putting substance behind the recent announcement that Canada will host a North Atlantic Treaty Organization (NATO)-accredited Centre of Excellence on Climate and Security. In addition, three other Canadian initiatives are recommended:

- In foreign missions and at home, Canada should embed experts in the fields of human security and climate security in its diplomatic and intelligence-gathering structures and support them with new investments in increased open-source scanning of world trends in terms of food supplies, disease outbreaks and extreme weather events.
- At home, Canada should lead an international effort on climate, environmental and security monitoring of the Arctic. Such an effort would leverage its leadership in remote sensing; artificial intelligence (AI); advanced computing; and information, communication and telecommunication technologies. Further, it would be tied to a national strategy that monitors its own key geographies, including coastlines and permafrost. These monitoring efforts should be linked to the development of next-generation climate models, potentially in partnership with the United Kingdom.
- Finally, this report urges an integrated review of the rapidly changing context of national security, emphasizing the effects of climate change and other key ecological transformations. Such a review needs to be a product of a whole-of-

government effort, with expert stakeholder and public consultations. It will be important to engage parliamentarians in their own review of the new world of national security, with climate security impacts at the fore, whether through study by standing committees of the House and Senate or through the auspices of the National Security and Intelligence Committee of Parliamentarians (NSICOP).

Introduction

Climate change has been recognized as a security threat for more than three decades, as have, more broadly, the impact that human activities are having on our planetary ecological boundaries (Purdy and Smythe 2010; Rockstrom and Gaffney 2021). Like the rapidly changing context of cybersecurity and pandemic preparation, climate change and other ecological transformations necessitate a new approach to how we frame, interpret and define national and international peace and security — “rethinking what security itself entails” (Youngs 2021).

The UK government recently embarked on an integrated review of this problem, looking beyond the traditional boundaries of existing diplomatic, military, and security and intelligence organizations. In its examination of the landscape of emerging risks, the government requested the gathering of new data and research from a wide and diverse group of stakeholders, looking at the linkages between traditional security and emerging fields of human security and climate security, and collating this information into a thoughtful vision for the future (UK Government 2021). An integrated approach such as this is needed in Canada.

With one past exception (McBean et al. 2012) and a recent study commissioned by the Department of National Defence (Conger and Fetzek 2021), Canadian policy discussions on the threats of climate change and national security have been few and far between. In a perverse way, the recent COVID-19 pandemic, and the national and global response to it, has underlined the importance of such an effort. The International Federation of Red Cross and Red Crescent Societies (IFRC) reported that in the six months following the World Health

Organization’s declaration of the pandemic, more than 100 disasters, most of them climate- and weather-related, affected more than 50 million people (Aljazeera 2020). “Of course, the COVID is there, it’s in front of us, it is affecting our families, our friends, our relatives,” IFRC Secretary General Jagan Chapagain told a virtual press conference, but he warned that the IFRC expects “climate change will have a more significant medium- and long-term impact on the human life and on Earth” (quoted in Aljazeera 2020). The most recent report of the Intergovernmental Panel on Climate Change (IPCC) underlined that the impacts of weather and climate extremes, including heat waves, heavy precipitation and droughts, are being experienced in every region of the globe (IPCC 2021).

In addition to the need for a reframing of the policy approach to climate change and national security, the roles of responders must also be reassessed. Images of the Canadian Armed Forces being deployed to fight extreme weather events (and now also a pandemic) have become common. Responding to these events seems to be an expected duty of military and public safety personnel both domestically and abroad, but whether it should be is open to debate (Regehr and Bercuson 2020; Dhanasree and Brisbois 2021). It may also be the case, as the recent advisory committee to NATO on climate security suggested, that aid and disaster recovery missions might be better accomplished by civilian agencies, which would not cause security alarms in other states worried about the presence of foreign military forces in their regions (North Atlantic Civil Society Working Group on Environment and Security 2021). Regardless, when a nation’s armed forces are called in to respond to an international or domestic crisis, it requires diversion of personnel and other resources from their military commitments, including NATO training commitments (*The Economist* 2020), potentially reducing their ability to respond effectively to other security crises that more directly fall within their mandates. It also raises questions about the role for the federal government in areas that are primarily provincial jurisdiction (Leuprecht and Kasurak 2021).

Climate Change in Context

We no longer live in the relatively stable climate conditions of the twentieth century. Rapid climate and ecological change is now the context for all security and intelligence planning and preparation, as the rising toll of disasters worldwide shows. Research on disaster security clearly indicates that these changing circumstances often involve unanticipated vulnerabilities to existing emergency systems (Matejova and Briggs 2021). Crucially, new and better approaches to threat assessment are required. New infrastructure for intelligence gathering and stronger and wider partnerships for communication and coordination across intelligence, security and diplomatic organizations are also needed, so that, working together, they can quickly come to clear understandings of vulnerabilities and respond appropriately.

Climate Change and Second-Order Effects

The risks go far beyond those that may result from disaster response. Resource competition, habitat and livelihood losses, population displacements (including of species other than human), societal disruptions and political tensions — all can lead to human insecurity and conflict (Werrell and Femia 2017). As we have seen with the COVID-19 pandemic, poor and marginalized communities are especially vulnerable.

An oft-cited example of second-order effects of climate and ecological change is large-scale migration. The more likely concern is displacement and migration within nations or between neighbouring ones. While in the long run this may matter to Canadian immigration policy, there are few indications that climate migrations will have direct impacts on Canada in the short run. The more likely consideration will be providing humanitarian assistance to other nations and populations (Internal Displacement Monitoring Centre 2021; Selby and Daoust 2021). Intelligence gathering should, therefore, monitor policies that harden borders, which, research shows, simply make matters worse for those forced to flee (McLeman 2019).

Another example of a second-order effect could relate to livelihood losses and societal disruptions that result from drought and/or water insecurity (which often leads to food insecurity). However, there is again a need for caution. One of the high-profile cases sometimes used to justify the formulation of climate as a threat multiplier was the Syrian civil war. But detailed empirical studies that have been conducted on this case suggest that climate and drought, while an issue in Syria prior to the outbreak of the war, were at best a minor cause in the outbreak of hostilities (Daoudy 2020). Mismanagement of the agricultural sector and the regime's hostility to opposition protests likely explain much more of what transpired than any climate threat multiplier.

National policies to combat climate change, or the lack thereof, may also lead to second-order effects. For example, the European Union's Green New Deal, the United States' "Build Back Better" policies, and China's decarbonization and digital strategies are not just environmental policies but also forward-looking industrial policies designed to position their domestic industries to prosper in emerging low- and no-carbon industries. The European proposals include carbon border taxes that backstop these efforts. The result could be seriously negative trading effects for those states that are slow to reduce their fossil fuel production and consumption (Plummer 2021).

As these examples show, approaches to international security now must contemplate units of scale — from the global, to the national, to the more local or municipal, to the individual (Sikorsky and Veeravalli 2021). This is why the linkages between the traditional fields of human security and climate security are so important. The United Kingdom and other NATO allies have long had human, climate and ecological experts in their embassies and missions around the world. Canada should have the same. These experts play an important role in understanding local conditions, collaborating on risk assessment, identifying "hot spots" and advising on the targeting of development assistance, with a view to preventing the medium- and longer-term impacts of climate change. To support these experts, investments will need to be made in increased open-source scanning of world trends in terms of food supplies, disease outbreaks and extreme weather events, which will be useful in anticipating

where and when disaster assistance and medical aid can be most usefully deployed abroad.

Focusing on the human rights and the social responsibilities of Canadian corporations abroad is also part of this concern. Much of the violence currently related to environmental change is inflicted on Indigenous peoples trying to prevent the destruction of their traditional lands (Menton and Le Billon 2021).

Climate Change and Ecological Transformation

But as our working group discussed, and as others have argued, focusing on climate change alone is not enough. The world must also focus on the larger ecological transformation under way. Not only is climate change worsening, but several other planetary ecological boundaries are also in danger of being transgressed (Rockstrom and Gaffney 2021). The United Kingdom, the European Union and China have already started shaping their diplomatic discourse along these lines (Kalantzakos 2021).

The United Nations Convention on Biological Diversity and its two supplementary protocols were created with the intent of conserving biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources. While the major initiatives of the Convention on Biological Diversity, as well as the next negotiating session of the parties, have been delayed by the pandemic, there are important implications within this convention and its draft Global Diversity Framework in terms of climate policy (Convention on Biological Diversity 2021). Furthermore, illegal trade in wildlife, as well as in toxic materials, and illegal logging are problems that will necessarily engage security agencies in international criminal investigations and prosecutions. While climate change may not be the direct cause of criminal activities, it enhances their social and economic impacts (Stoett and Omrow 2021).

More serious is the ongoing degradation of numerous terrestrial ecosystems, and the subsequent dangers of increasing food supply shortages, species migration and pathogen spread. Reduced hunting ranges for Indigenous peoples and harm to fisheries and biodiversity are all happening simultaneously with climate change, and frequently make ecological adaptation to floods, heat waves and related climate disruptions

more difficult (IPCC 2019, chapter 5). Land degradation relates quite directly to agricultural production, and degraded landscapes are much less able to deal well with climate disruptions. While extreme food shortages frequently generate famine, rather than conflict, as the case of Madagascar in 2021 suggests, the costs in terms of human security are immense. Canada should play a role both in raising the alarm in a timely fashion and in facilitating humanitarian aid internationally.

Climate Change and Adaptation Strategies

Looming over all of this is the question of geoengineering, and possible future efforts to artificially lower the Earth's temperature by injecting materials, such as calcium carbonate, into the stratosphere to reflect sunlight and act as a shade for the Earth's surface. Numerous unknowns about how the Earth system might react to such efforts, and with what consequences in particular places, remain. The potential for unanticipated consequences raises serious questions about the feasibility or desirability of such efforts (Blackstock and Low 2019). In terms of security, one of the most pressing issues might be the danger of leaders of one state, having suffered a major meteorological catastrophe, attributing blame to another state's geoengineering efforts for causing the disaster. The potential for international conflict is but one of the potential difficulties. Although no one took Iran's former president Mahmoud Ahmadinejad seriously when he blamed European weather modification efforts for droughts and water management difficulties in Iran, the precedent is clear (Dalby and Moussavi 2017).

The rapidly growing research into environmental peace building, linked to the United Nations Environment Programme, offers cautionary tales about the need to rethink development (Ide 2020) and the opportunity to link security and environment into climate adaptation strategies (Busby 2021). Supporting these efforts generously could be a key part of the international contribution Canada makes to climate security, in particular through the recently announced NATO Centre of Excellence on Climate and Security and building Canadian expertise in priority areas.

All of this underlines the fact that a significant part of Canada's international efforts must include investment in climate and ecological adaptation and resiliency. Therefore, Canadian foreign

development assistance and climate adaptation and resiliency funding programs need to be prioritized to help with governance initiatives focused on preventing conflict in areas that are especially vulnerable to climate disruptions.

New Approaches and Mitigation Strategies

True national security requires a global vision. Coming out of the pandemic, and building on the work of the United Kingdom, Australia and other NATO allies, the time is right for Canada to undertake its own integrated review of its diplomatic, security and intelligence organizations. The review should consider how they work together in the new changing natural and political environment, with climate change and other ecological transformations being a key part. NSICOP, created in 2017 to look at crosscutting issues that affect national security without being constrained by the mandate of individual organizations or their review bodies, should be tasked with such an integrated review. The goal should be to ensure that better intelligence on changing ecological and economic circumstances around the world, which is needed to enhance Canada's responses to immediate, medium- and long-term crises, will be available.

Mitigation strategies in the approach to these problems are also available. Vulnerabilities can be anticipated and prepared for by using scenario exercises that involve officials from multiple organizations collectively examining their assumptions, plans and practices. This type of approach using scenario exercises and planning will be facilitated by increased open-source scanning of world trends in terms of food supplies, disease outbreaks and extreme weather events, which will be useful in anticipating where and when disaster assistance and medical aid can be most usefully deployed abroad.

Canada's Role

As noted in the IPCC's *Sixth Assessment Report*, current climate scenario modelling suggests that global surface temperature will continue to increase until at least the mid-twenty-first century and global warming of between 1.5°C

and 2°C will be exceeded during this century unless deep reductions in carbon dioxide and other greenhouse gas emissions occur in the coming decades. Without action, many changes in the climate system are anticipated, including increased frequency and intensity of hot extremes, marine heat waves and heavy precipitation; agricultural and ecological droughts in some regions; and increasing intensity of tropical cyclones, as well as reductions in Arctic sea ice, snow cover and permafrost (IPCC 2021).

In response to these threats, NATO met in June 2021 and released the Climate Change and Security Action Plan (NATO 2021), which called for the following measures to support its work and contribute to the global response to climate change:

- annual climate change and security impact assessments;
- incorporation of the results of these assessments into its work on resilience, civil preparedness, defence planning, capability delivery, assets and installations, standards, innovation, training, exercises, and disaster response;
- information on and descriptions of how NATO will mitigate emissions at its facilities, including the scaling of low-carbon technologies through its procurement practices; and
- enhancement of outreach by strengthening exchanges with partner countries and increasing dialogue with civil society, academia and industry on climate change and security issues.

As part of this summit, Canada announced that it would host a new NATO Centre of Excellence focused on climate change and security.

The creation of a NATO Centre of Excellence in Canada has profound transformative capacities for our understanding of climate security impacts and response policies. The government should speed its foundation and implementation, and the NATO Climate Change and Security Action Plan should be central to its terms of reference and early activities. In particular, the NATO Centre of Excellence should galvanize the production of annual climate change and security impact assessments, as called for in the NATO action plan. These assessments should be an important piece in implementing the NATO plan for greater outreach to both NATO partner countries and the public at large.

Canada, as demonstrated by its proposed NATO Centre of Excellence, has an opportunity to truly lead on the issue of climate change and security. Such leadership starts at home with the implementation of public policies that support Canada's international commitment to the Paris Accord and the target of net-zero emissions by 2050. On the security side, Canada must implement the NATO action plan and must increase the Canadian public's awareness of the linkages between climate change and national security and involve Canadians in the dialogue about the choices that we must make to address them.

Risks to Military Infrastructure and Reliance on Fossil Fuels

As the federal government's largest landowner, the Department of Defence maintains some 21 military installations, including thousands of buildings and millions of acres of land. Canadian Forces Base Halifax, Canada's largest naval base and home to the Atlantic Fleet, will face challenges related to sea-level rise and the potential for flooding (International Military Council on Climate and Security 2021). Canadian Forces Base Esquimalt, home to the Pacific Fleet, faces similar issues. Inland installations are likely to be impacted by drought, forest fires and flooding. Northern and Arctic installations are likely to be impacted by sea-level rise, ice melts and permafrost thaws. All this points to the urgent need for climate adaptation planning for critical military infrastructure. The *Defence Energy and Environment Strategy, 2020–2023* (Government of Canada 2020) sets a target for such an assessment. This is an important first step.

However, beyond the risk to military infrastructure, the Department of National Defence is the largest user of energy and the largest emitter of emissions in the federal government (ibid., 7). Beyond Canada's borders, the use of fossil fuels in far-flung military operations requires major logistics efforts to get fuel to military outposts and, in the process, makes them vulnerable to interception, as the US military learned the hard way in both Afghanistan and Iraq. Thus, as recent NATO announcements have made clear, in dealing with climate impacts, the military sector is also being called upon to reduce its use of fossil fuels and develop long-term plans to get to net-zero emissions by 2050. The Department of Defence has taken steps in this regard, procuring renewable energy, and investing in green buildings and energy efficiency. Dealing

with transportation and aviation fuel consumption will prove more difficult but is a necessary next step (Mertins-Kirkwood and Somers 2021).

Canada's North

It is in Canada's Arctic that climate and ecological transformations are having, and will have, their greatest impact.

Canada has the largest landmass and longest coastline of all NATO members. It is also at the forefront of new technologies related to remote sensing, AI and advanced computing, as well as the monitoring of emissions and environmental change. It follows that Canada should lead an international effort on climate, environmental and security monitoring of the Arctic. This effort should be tied to a national strategy that monitors our own key national geographies, including coastlines and permafrost. Such monitoring efforts are a better path to future security than an enhanced military presence (Depledge and Lackenbauer 2021). If these monitoring efforts are linked to the development of next-generation climate models (as they should be), the United Kingdom could be a key strategic partner (The Royal Society 2021).

The warming Arctic is both more accessible and more hazardous. The retreat of Arctic sea ice is especially noteworthy, but while there are simple assumptions that the lack of sea ice will open up new navigational possibilities, it is also the case that the reduction of sea ice may make these waters, as well as those further south off of Newfoundland, more dangerous, due to the mobility of what ice remains (Barber et al. 2018). Novel wind patterns in the Arctic region are likely to occur, creating hazards to shipping that are more difficult to anticipate (Howell and Brady 2019). If further oil and gas exploration on the Arctic seabed is not constrained by climate change policy, less predictable movements of sea ice will make it even more hazardous, especially because of the lack of spill cleanup capabilities and the general difficulty of operating in Arctic waters. Spill events on the Russian side of the Arctic might also affect Canadian waters, as currents and winds carry pollutants across the pole. Enhanced environmental monitoring is a key function for government, but surveillance is a matter for defence, coast guard, natural resources, climate change and numerous other agencies, all of which need coordination for effective domain awareness.

As sea ice coverage is reduced, sea levels rise and coastal permafrost melts. Coastlines are receding, making community relocation away from eroding coastal locations necessary in many places. Planned retreats may be essential for human security in some Arctic coastal regions and, insofar as these include security infrastructure, will require planning in advance to ensure access to functional facilities in the future. Port facilities in particular need careful planning to ensure that novel ecological conditions are anticipated (Stephenson and Pincus 2018). It is essential that Northern residents be a part of the decision-making process. This is especially important because Northern residents' ecological knowledge and abilities to facilitate environmental monitoring, in addition to their role in traditional sovereignty operations, are key to the Canadian presence in the High Arctic. But the human costs of failing to adequately prepare Northern populations, listening to Inuit and Northern populations' concerns, or perpetuating the colonial relationships that have marred Northern policy for so long in Canada, will be considerable. The tragic history of forced Inuit resettlements in the High Arctic in the early years of the Cold War obviously must not be repeated. Sovereignty in the Canadian Arctic is now entwined with attempts to rectify some of these past choices, and this is the current context for linking security to climate in the region (Greaves and Lackenbauer 2021).

The rapid reduction in Arctic sea ice has already dramatically changed traditional hunting practices for Indigenous peoples. Thawing permafrost is undermining numerous buildings and is making land transportation more difficult as road foundations give way. The shorter winters reduce the time ice roads are usable, adding to logistics difficulties for mining companies. Improving infrastructure and rethinking practical engineering and architecture to build in these novel ecological circumstances are required. Upgrading military and security facilities to make them resilient to extreme weather events is especially important because they are most likely to be needed when disaster strikes.

Increased ocean-going traffic in the Arctic has raised security concerns given the recently enhanced Russian military presence there, as well as the emerging Chinese interest in potential trade routes and possible new mineral resource sites. Insofar as China currently produces many of the world's solar panels and other related technology,

having reliable sources of mineral supply makes sense to Chinese planners, hence their worldwide interest in supply chains is entirely predictable, even if it involves novel ventures in places not traditionally of concern to them. Likewise, if North American corporations are going to produce solar panels, batteries and related technologies for the new energy economy, then working to secure supplies of key mineral elements, including rare earths and lithium, is a priority. However, given the speed of innovation in these sectors, it is very difficult to predict which resources will be critical in the years ahead. Pursuing new mineral sources through access to Arctic regions where rapidly thawing permafrost makes surface transport difficult will also have to be approached cautiously.

As mentioned previously, there are numerous gaps in monitoring capabilities, and this is one area that Canada, in cooperation with other agencies such as the National Aeronautics and Space Administration and the European Space Agency, needs to address. But on-the-ground facilities to provide bases for surveillance drones, as well as traditional aircraft for monitoring, will also be needed to both facilitate search-and-rescue operations and provide up-to-date environmental data and situational awareness. Many of these functions might be better served with civilian, or coast guard, agencies continuing to take the lead, as is being done with Canada's new icebreakers, to minimize perceptions that the Arctic is a venue for military competition.



Recommendations

→ True national security requires a strategic vision. The national security and intelligence advisor to the prime minister should be tasked with undertaking an integrated review of the rapidly changing context of national security, emphasizing the effects of climate change and other key ecological transformations. This review must be whole of government in nature, to avoid the silos that have hampered strategic policy in the past, must engage expert stakeholders from the academic and private sector communities, and must involve real

public consultations. An internally led review would best be matched by independent study by Parliament of the climate change and national security nexus, conducted either by standing committees of the House and Senate or by the security-cleared NSICOP, with its special access to classified records and briefings.

- The Canadian government must move to quickly adopt the NATO Climate Change and Security Action Plan, with the speedily constituted NATO Centre of Excellence at the heart of Canada's work in this field.
- Canada, in line with its NATO counterparts, needs increased awareness of climate change security impacts. Canada must quickly implement the NATO recommendation to produce its own annual climate change and security impact assessment, and provide leadership in threat assessments for the NATO community. Research in disaster security clearly shows that changing climate and environmental circumstances often expose unanticipated vulnerabilities in key national systems. New and better approaches to threat assessments will help identify such security vulnerabilities.
- Like the United Kingdom and other NATO allies, Canada should have experts in the fields of human security and climate security embedded in its intelligence-gathering structures. To support these experts, investments will need to be made in increased open-source scanning of world trends in terms of food supplies, disease outbreaks and extreme weather events.
- While timely humanitarian response during crises is important, so too are meaningful investments in climate adaptation and resiliency, especially in areas vulnerable to climate disruptions.
- Canada should lead an international effort on climate, environmental and security monitoring of the Arctic. This effort should be tied to a national strategy that monitors its own key geographies, including coastlines and permafrost. These monitoring efforts should be linked to the development of next-generation climate models.

→ Finally, enhanced environmental monitoring is a key function for government, but surveillance is a matter for defence, coast guard, natural resources, climate change and numerous other agencies, all of which need coordination for effective domain awareness. Efforts should not be duplicated. Organizations need to move beyond departmental silos. A fusion centre for intelligence and information on climate change and security impacts would be an important path to achieving domain awareness.

Conclusions

Climate change is having increasingly severe impacts on ecological systems, societies, economies and infrastructure. Insofar as it makes people and places more vulnerable to disruptions, it affects security as broadly understood. As the pandemic, wildfires, floods and storm events have made clear in recent years, Canadians are vulnerable in numerous ways to changing ecological and economic circumstances. They may also be impacted by international efforts to counter climate change, and this new context must also be incorporated into how the government develops plans for the future.

Global climate change presents unique challenges to high-latitude nations. Although global climate change affects Canada right across the country, it is perhaps most evident in the rapidly heating Arctic region. The rapid changes to permafrost and Arctic sea ice emphasize the point that assumptions about the past being a useful guide to future conditions are no longer helpful. There is no choice but to attempt to adapt to rapid change in the region. Enhancing Canadian facilities there — civilian and military — will enable better monitoring of environmental conditions, as well as the increased presence of shipping as the ice recedes. Enhanced facilities will also support further necessary adaptations by local communities, as well as emergency responses.

Slowing down climate change by rapidly moving to a post-carbon-fuelled economy is the key to making it easier to cope with disruptions. Upgrading government facilities and civilian infrastructure to anticipate more extreme circumstances is an essential step to providing for the larger

security of Canadians. Doing so while reducing the use of carbon fuels offers the opportunity to think in innovative ways about how to power and protect essential infrastructure. Careful monitoring of changing circumstances, both at home and abroad, to spot dangerous trends well in advance is the key to preventing disruptions; the failure to plan for the COVID-19 pandemic and act in a timely fashion is a lesson that needs to be taken seriously by all security planners.

The nightmare scenario for climate change is the international community failing to act quickly and reduce the use of carbon fuels, while also failing to enhance the ecological resilience of not only the natural systems remaining relatively undisturbed but also the artificial landscapes of agriculture, which provide much of the food that humans consume. Should accelerating climate change increasingly destabilize food production and make water resources increasingly unpredictable in key areas of the world, the prospects for international conflict will rise. Robust international organizations will be needed to manage such tensions and head them off prior to major hostilities. Conversely, it is also clear from the historical record that collaboration on water management projects frequently enhances peaceful international relationships (Ide and Detges 2018). Active diplomacy will be essential for national security for most states, including Canada.

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