Climate Change and Its Impact on National and Human Security

"Freedom From Want and Freedom From Fear"

Symposium Hosted by the
Canadian Forces College
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Executive Summary

The symposium, "Climate Change and Its Impact on National and Human Security", sought to leverage research and discourse to determine how climate change will affect the dynamic environment of security. The primary goal of the symposium was for the audience to hear from senior leaders and experts and get a sense of their ideas for mitigating the impact of climate change for security.

Elizabeth Bush, Senior Climate Science Advisor (Environment Canada), set the stage for the symposium by providing an overview of climate change within the Canadian and global environments. Her presentation was based on findings as reported in *Canada's Changing Climate Report* (CCCR). Key takeaways from her presentation included:

- Canada is experiencing greater climate change than other regions due to its position in the northern hemisphere, though regions of Canada will experience climate change unevenly.
- Environment Canada works with two climate change scenarios — a low-emission scenario and a high-emission scenario — and sets out details of future environmental implications based on each of these scenarios.
- Understanding the human impact on the current environment, and how our current activities affect the future environment, is critical.
- We must immediately act as if we have, today, reached our peak emissions level in order to divert potentially catastrophic climate change.

A keynote address by **Daniel Jean**, former National Security Advisor to Prime Minister Justin Trudeau, focused on "The Climate-Security Nexus". Jean detailed how climate change had not previously been a national security consideration but over the past decade has come to be recognized as a crucial factor in the provision and assessment of security. Key takeaways from Jean's address included:

- Global climate change is a significant factor in security provision and assessments as climate change often underlies security and conflict issues.
- Addressing climate change requires a non-partisan approach.
- Seeking the best use of military and other resources in the face of climate change to produce complementary and effective responses.

Session One, "Environmental Impacts on International and Continental Security", featured presentations by **Captain Steve Brock (**United States Navy, Retired; Senior Advisor, The Center for Climate and Security) and **Lieutenant-Colonel Raymond Chiasson**. Their presentations focused on effects of climate change on migration and infrastructures, and climate change as conflict drivers. Their takeaway points:

- There will be increasing difficulties reconciling climate change as a threat multiplier and its impact on operations.
- Climate change has already had direct impact on infrastructures and operations.
- Traditional orientations to training have been altered, and will continue to be altered, in the face of climate change.
- While climate change is global, variations exist in states' capacities to address climate change.
- Climate change in the North is exacerbated by a lack of infrastructure.
- Climate change in the Arctic is accompanied by shifting geopolitical interests which threaten traditional ways of life.

- The challenge moving forward is to reimagine policy and processes to achieve creative climate security outcomes and to make the best use of available resources.

The focus of Session Two, "How is Canada, and how should Canada be, preparing to address environmental impacts on security?", included presentations by **Brigadier-General Lise Bourgon**, **Lieutenant Commander Oliver Leighton Barrett** (United States Navy, Retired; Senior Research Fellow, The Center for Climate and Security) and **Colonel Claude Desgagné.** These presenters described some of the social, economic, and political consequences of climate change and the impacts of these changes on international and domestic operations. Their key messages included:

- CAF is increasingly being called upon to address climate-related emergencies due to its reputation as action- and results-oriented.
- There are significant impacts on training due to climate change, along with demands to respond to activities/events outside of current training protocols.
- The North is increasingly a costly and complicated area in terms of security and emergency response.
- Emergencies and security require collaboration among a number of groups and agencies.
- Geostrategic risks are emerging and evolving, many of which are based increasingly on climate issues.
- The development of processes must include coherence among, and contributions from, various national units (Department of Defence, CAF, etc.), as well as collaboration with Canada's allies.
- In the face of climate change, the task is to balance operational requirements with sustainability.

The symposium concluded with a presentation by **Major Jean-Francois Lamarche** who summarized three adverse catalysts associated with climate change: resource scarcity, intensity of natural disasters, and climate-induced migration.

Note: This report is summarized and paraphrased based on the interpretations of the author.

Welcoming Remarks

- **Lieutenant-Colonel Claire Bramma, Curriculum Development Officer, Canadian Forces College**
- **Colonel Ryan Jurkowski, Director of Programmes, Canadian Forces College**

The symposium commenced with Lieutenant-Colonel Claire Bramma, Curriculum Development Officer, introducing Colonel Ryan Jurkowski, Director of Programmes, both of Canadian Forces College. Col Jurkowski indicated that the point of the symposium was to leverage research and discourse to discuss how climate change will affect the dynamic environment of security, and to consider methodologies for planning and operations. He expressed his hope that the event would be meaningful for all stakeholders — students, academics, government, and the broader defence community. He thanked external international participants for their contributions and thanked the organizers and local participants. Col Jurkowski indicated that he looked forward to a discussion regarding climate change that is removed from any political lens, a position he believes is central to defence. He stated that the relationship between climate change and human security cannot be ignored, especially by those providing defence for Canada and elsewhere.

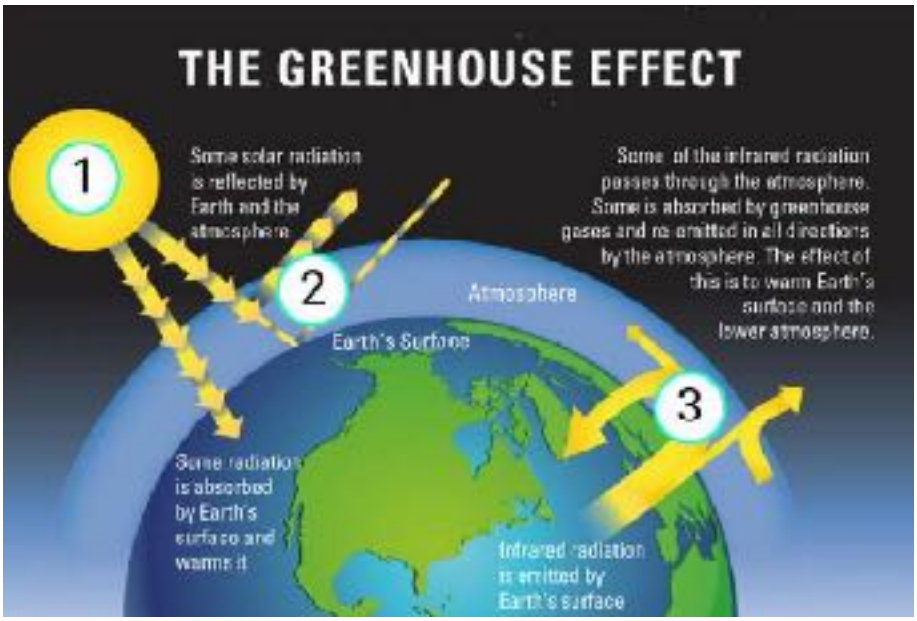
LCol Bramma began by explaining that "freedom from want, freedom from fear", highlights that 'want' and 'fear' are twin development challenges. She commented that the United Nations' eight goals included moving from an initial emphasis on economic growth, to more recently shifting to a balance of human rights with environmental concerns and the resulting cross-cutting security issues. She remarked that since 2011 the facts are clear: climate change is real, is accelerating, and is a threat to security. LCol Bramma indicated that the primary goal of the symposium is for the audience to hear from senior leaders and experts and get a sense of their ideas for mitigating the impact of climate change for security, and how institutions can be more agile in dealing with such threats. Beyond learning from the expert presenters, the student audience would be applying what they have learned to a two-day design thinking exercise preparing students to think about, reflect upon, respond to, and mitigate the impacts of climate change and its implications for security.

Framing the Problem — An Overview

- **Elizabeth Bush, Senior Climate Science Advisor, Environment Canada, Project Lead and Spokesperson**

The presentation by Elizabeth Bush, Senior Climate Science Advisor, was based on findings and observations from *Canada's Changing Climate Report* (CCCR)[1]. This report was released in April 2019 and is a climate science assessment that incorporates an array of scientific literature and assessments by a number of researchers charged with scientifically examining the extant research on climate change. The report focuses on changes in the Canadian environment — from changes in temperature and precipitation, to changes in permafrost and freshwater availability — contributing to our understanding of how these changes affect security both in Canada and globally. This is the first in a series of reports which are part of "Canada in a Changing Climate: Advancing Knowledge for Action."[2] Bush's presentation provided the background and global contexts of climate change, the observed evidence and future warming of the Canadian climate, and the observed and projected changes associated with various environmental features, and future implications.

Bush explained that the Earth's temperature is a product of balancing the sun's incoming light with outgoing energy from the Earth back to space. The 'Greenhouse Effect' is produced by greenhouse gases (GHGs), produced by human emissions, which prevent heat from escaping the Earth. The Greenhouse Effect produces changes in the earth's temperatures because of heat trapped close to earth. Humans emit greenhouse gases primarily through burning fossil fuels and through deforestation.



Source: CCCR 2019 (Nat'l Acad of Science and Royal Society 2014)

The evidence that we are experiencing global warming is substantial, as Bush noted: air and ocean temperature changes, receding glaciers, less ice coverage, reduced spring snow cover in the Northern Hemisphere, rising sea levels, changes in extreme temperatures and precipitation. Bush confirmed that the evidence for global warming is unequivocal.

Human activity drives climate change directly due to the fact that much of human activity results in emissions of carbon dioxide (CO_2). Bush explained that the relationship between human activity and temperature is direct and linear: more human activity produces increased temperatures. Similarly, the less CO_2 emitted (through less human activity), the less global warming there is. It is estimated that since the pre-industrial era, average global temperatures have risen 1°C due to human activity. In the absence of concrete action to reduce human emissions, it is expected that this warming trend will continue and that global warming will increase another 0.5°C by 2040. The challenge for policymakers is to work to stabilize global temperatures, which can occur only through reducing carbon (CO_2) emissions. Bush emphasized that the stabilization of global temperatures, in fact, means that emissions must reach zero. At the same time, zero emissions will not reduce temperatures, and temperatures may continue to climb but at a much slower rate. The bottom line, Bush emphasized, is that warming will persist in future generations, but the rate of warming can decrease only with zero emissions.

Bush explained that the goal of the 2016 Paris Agreement,[3] signed under the United Nations Framework Convention on Climate Change, is to hold global warming temperatures to 1.5°C to 2°C above pre-industrial levels. In 2017, the increase in temperature was already 1°C. To ensure that temperatures do not rise another degree requires rapid emissions reductions.

The CCCR organized the findings of their scientific review around two scenarios: the high-emission scenario, which is characterized by 'no climate policy' with emissions continuing unabated at current levels. In the high-emission scenario, by 2050, the global temperature is expected to rise by 4.3°C. Bush confirmed that a global ice age could occur with a 5°C change. A low-emission scenario would mean a rise by 1.6°C (or .6°C higher than now), but can occur only with drastic measures to reduce emissions effective immediately.

Patterns of warming around the globe are not uniform, as Bush highlighted, and vary according to latitude and configurations of land, water, and ice. Research has shown that warming is greatest in northern latitudes, as well as over land masses (compared with water regions). Because of Canada's extensive land mass at northern latitudes, global warming in Canada is approximately two times the global average. Bush noted that the average temperature in Canada increased by 1.7°C between 1948 and 2016, but in Northern Canada temperatures have risen as much as 2.3°C during the same period. It is believed that the warming is due to human activity and carbon emissions, specifically. Bush emphasized that Canada's future warming depends not simply on Canada's own emissions, but on the

global emission scenario. Under a low-emissions scenario, with an overall rise of up to 2°C, there may be some stability for parts of Canada. Under the high-emissions scenario, the average temperature increase for Canada's north may be up 6°C by the end of the 21st century.

The impacts of widespread warming are evident across Canada, although uneven, and are projected to intensify in the future. Bush explained that global temperature increases have been greatest in the northwest and northern Canada, with less warming in the southeast of Canada. Less extreme cold and more extreme heat is the general pattern across Canada, with colder seasons warming faster than warm seasons. Bush indicated that these patterns are consistent across many indicators: earlier and reduced snowmelt peak flows, less summer water flow, and an increased growing season length by about 15 days to as much as 30 days in some areas. While an extended growing season would appear to be a positive development, an extended warmer season also requires suitable water and soil conditions.

Warmer temperatures mean that there are declines in snow cover across most of Canada as well as declines in snow accumulation. This will affect the Canadian landscape in a number of ways, Bush noted, including freshwater availability, vegetation, and other aspects of the ecosystem. The melting of perennial sea ice and reduced seasonal ice in the Canadian Arctic will affect navigation[4] through the Arctic, as well as Northern residents' traditional ways of life. Bush observed that the overarching conclusion is that with global warming there is an increased likelihood of ice-free conditions in the Canadian Arctic which will have repercussions not only for humans, but also for the environmental conditions that support unique species (and ways of life). Under current warming conditions, north of the Canadian Arctic Archipelago is expected to be the last remaining region with summer sea ice, providing a refuge for various species, yet also creating hazards for shipping transportation with unpredictable ice flows. Bush further explained that Canada's glaciers and ice caps have thinned over the past 50 years and are expected to continue to melt under current conditions. The degradation of glaciers and ice caps in Canada's North will significantly contribute both to declines in the supply of water to streams and to rising sea levels.

> **Climate:** ***"the average, or expected, weather and related atmospheric, land, and marine conditions for a particular location."***
>
> **Climate change*****: "a persistent, long-term change in the state of the climate, measured by changes in the mean state and/or its variability (IPCC, 2013c). Measuring climate change therefore requires long-term observations of climate parameters so that long-term trends can be distinguished from shorter-term variations."***
> [Source: CCCR 2019, p.32]

Local sea levels are expected to rise causing flooding in many of Canada's coastal areas, Bush reported. Rising sea levels will combine with vertical land motions (subsidence or uplift) which points to variability in coastal flooding. While overall global mean sea level is projected to rise, along Canada's coastlines sea levels will rise in some places and fall elsewhere. Bush explained that the 'return period' for extreme water-level events — or the duration between extreme water-level events — will decrease with rising local sea levels, resulting in an increasing frequency of high-water events. With global warming, rare events, or those that once were predicted to happen every 50 years, can occur as often as every two years.

Changes in precipitation levels are also projected for Canada. As Bush described, a warming climate is associated with greater precipitation on average, with more rain in the summer and less snow in the winter. The impact of precipitation changes will be greatest in Northern Canada (which is also experiencing the most warming). Under a high-emission scenario, Northern Canada will experience more precipitation in the form of rain, while Southern Ontario will experience less precipitation. As Bush noted, however, confidence in temperature changes is greater than confidence in precipitation changes because precipitation change is influenced by a number of interacting factors, making precipitation

predictions more difficult. Greater seasonal variation in the availability of fresh water is also expected, exacerbated by global warming, resulting in freshwater shortages in summer — warmer temperatures, reduced precipitation, and smaller snowpacks affect the availability of fresh water.

Weather extremes, Bush observed, will become more intense, and both more frequent and intense in a warmer climate. These extremes will primarily affect vulnerable populations, especially through increased risks such as heat waves, drought, and wildfires. Similarly, increases in precipitation will contribute to flood risks in many urban centres. Bush noted that there is confidence in predictions of the likelihood of intense rainfall due to global warming. Under the high-emissions scenario, a 1-in-20-year hot extreme will become an every-two-year event.

What can be done? Bush explained that Canada has convened a panel of experts to determine where risk can be mitigated. They have concluded that the top six areas of climate change risk facing Canada include risks to: physical infrastructure; coastal communities; northern communities; human health and wellness; ecosystems; and fisheries. These six priority areas will have great impacts for the security of Canadians and the provision of security by the government. Bush reiterated that the rate and magnitude of climate change under high- versus low-emission scenarios project two very different futures for Canada. The low-emission scenario is difficult to achieve because it requires coordinated action by all governments; Bush emphasized that we must immediately act as if we have, today, reached our peak emissions level in order to attain net zero emissions by 2050. There is a huge mitigation challenge in our future, but this scenario will enable adaptation to projected changes in a more organized way.

Bush's message was clear: climate change is real and we are seeing clear evidence of it across Canada. The climate change path we are on means that additional warming and further changes in climate are unavoidable. We must act now to divert this path with timely, ambitious, and enduring action.

Key takeaways:

- Canada is experiencing greater climate change than other regions due to its position in the northern hemisphere, though regions of Canada will experience climate change unevenly.
- Environment Canada works with two climate change scenarios — a low-emission scenario and a high-emission scenario — and details future environmental implications based on each of these scenarios.
- Understanding the human impact on the current environment, and how our current activities affect the future environment, is critical.
- We must immediately act as if we have, today, reached our peak emissions level in order to divert potentially catastrophic climate change.

Keynote: The Climate/Security Nexus

- **Daniel Jean, Former National Security Advisor to Prime Minister Trudeau (May 2016–April 2018)**

Daniel Jean, former National Security Advisor to the Prime Minister, began with the observation that in decades past, there was little association of climate change with national security. This relationship had previously been up for debate. However, as Jean explained, in 2011 climate change came to be seen as a threat to international security, as well as to both human and national security. Mitigating the impact of climate change requires both the military and government to leverage their respective skills and reconsider resource allocation. The types of climate change referenced earlier [by Bush] address the impact of climate on security issues.

Climate change, noted Jean, is a phenomenon that is hard to see, occurs over time, and is costly. Unlike other threats such as terrorism, it is less visible. Yet climate change is occurring close to home. Canada is warming at twice the rate of its global partners. The costs to Canada have increased steadily over the past five years; in 2017, wildfires, floods, and hurricanes cost the United States about $306 billion.[5]

Countries that have not benefitted from capitalism and development will experience the worst of climate change. Jean explained that challenges to equity, fairness, and human dignity (especially for women), among other adversities caused and created by climate change, will be experienced by those who are most vulnerable. In Africa, Southeast Asia, the Caribbean and the Middle East, for example, problems such as limited fresh water, disease, uprooted peoples, and restricted infrastructures are already having an impact on the most vulnerable. Jean observed that climate change exacerbates these conditions and leads to unrest and competition for scarce resources. Those who are dealing with such conditions, or who are forced to migrate due to them, require security.

The connection between climate and conflict is significant and strong. Jean noted that it is possible for climate change to exacerbate conflict, a situation which may subsequently require military intervention. Jean provided examples of how climate change was a prelude to the situation in Syria[6] which in 2006 experienced a devastating drought — drought being one of several complex interrelated factors contributing to the instability of that area. Conflicts over food and water due to drought conditions in both Darfur and Somalia[7] also preceded conflicts among rural populations. Further, Nigeria's conflicts with the Boca Haram[8] surfaced because of climate change issues related to drought.

Jean observed that it is of great importance to engage communities in addressing climate change. Climate change can be seen as a 'threat multiplier' with respect to national security, though there is often limited capacity of governments to respond. The late 1980s, Jean notes, was the beginning of the recognition of the impact of climate change on security. President George H.W. Bush signed legislation considering the impact of climate change on risk to Americans. In 1990, Jean explained, President Bush was one of the first to recognize that climate change respects no boundaries.

The U.S. military and intelligence communities have proposed a number of responses to climate change. Jean referenced the 2019 document, *"Worldwide Threat Assessment of the U.S. Intelligence Community"*, wherein U.S. military and intelligence communities detail a number of human security challenges as a result of the impact of climate change. Jean noted that this document offers an overview of climate changes, such as extreme weather events and diminishing Arctic ice, and the impact of these changes on operations, telecommunications, etc. For the first time in March 2018, Jean stated, the United Nations Security Council recognized the impact of climate threat to Somalia and identified climate change as a destabilizing factor in this area.

Jean described the United Nations Environment Programme (UNEP)[9] and the European Union (EU) working together to produce "A New Climate for Peace"[10] — a document illustrating that climate change is a global threat to security. This document underscores how we must all act quickly or the risk will increase. In May 2018, the Australian Senate released a report on the implications of climate change for Australia's human security, including impacts on health, food, water, and economic security. Jean observed that there are many studies indicating that climate change is a threat to security and that accelerated climate degradation is a threat multiplier.

Jean described how the Department of National Defence document, *Strong, Secure, Engaged*[11], also considers climate change through a security lens. Jean described how this document emphasizes working with a variety of stakeholders, advocates an active versus passive position, and includes mandate letters to its officers with respect to expanding defence operations to address issues due to climate change.

Jean observed that some may ask if applying a national response to climate change is an appropriate use of funds. He suggests there may be a discrepancy between the relief people feel when seeing military on flooded streets, versus their assessment of the cost effectiveness of military resources during such disasters. It remains debatable, he noted, whether this is the best use of military resources.

Gatineau, Québec, provides a recent example with its two major recent floods in 2017 and 2019. In 2017, Jean was serving as a security advisor to the Prime Minister, and was being asked to keep public servants at home in order to keep the roads clear for emergency vehicles. He got a call from his son, who wanted him to volunteer on a sandbagging team. Jean was impressed with the public response and the number of volunteers alongside whom he was working. The debate at that time was over whether the military should have been called earlier and whether they stayed long enough. As Jean was sandbagging, he noted lots of volunteers and yet no sandbags. He observed that sometimes our collective responses are not the most appropriate given the talent of those being deployed and the resources at hand.

Jean confirmed that the future challenge lies in integrating climate change with peace and prevention, as well as with planning for the future of the military. He noted that we all represent fields of expertise and we all agree that climate change is a challenge. Rather than debating whether there is a certain lens that should be applied to this problem, Jean suggested that instead, we need complementary and agile responses. He observed that there is no time left for debate or theories, and that we need concerted action by all to mitigate the reality of the implications of climate change for security.

Key takeaways:

- Global climate change is a significant factor in national security; climate change often underlies security and conflict issues.
- Addressing climate change requires a non-partisan approach.
- We must seek the best use of military and other resources in the face of climate change to produce complementary and effective responses

Discussion

Questions from the audience are highlighted in bold; Mr. Jean's responses follow each question. [Note: responses are paraphrased.]

1. **As a senior public servant, grounded in a transactional relationship that is based on governance through election, how does one rise above the long-term issues that are Canadian, and not liberal, conservative, etc.?** Victims [of disasters] like to see Canadian military planes and personnel — victims are not seeing the Canadian military as representative of a particular politics or political party when it comes to emergencies. Developing systematic responses and protocols that come before the emergencies should be apolitical. If you have not been good at risk identification, that is when it becomes more political — you do not want to leave a vacuum and failure to provide services.

2. **Do you think that the military is responding to events that are actually non-military events? Should provinces be taking more responsibility for disasters, before they call the military? What about the example of Newfoundland — should the military have been called so quickly?** There is a need for everyone to be prepared. What is often missing are the links among the federal, provincial and municipal governments and who should be playing which role; should the military or civilians be responding? Jurisdiction is not clear in some cases. For example, with the forest fires in Alberta, the capacity of both the military and the federal government seemed to come as a surprise. Utility companies have plans in cases of emergency, yet we do not appear to know what resources others can bring to the table.

3. **Have we looked at greater international cooperation to address climate issues; for example, has there been consideration of cooperation/planning, efficiency of response, the fact that northern hemispheric resources could go (are going) to Australia (with its opposite seasons)?** Forest-fire-fighting crews changing between hemispheres — sharing systemic responses — makes sense conceptually (depending upon the issues under consideration), as does sharing assets between countries that have opposite seasons. Preventative initiatives such as these will be most cost-efficient and effective — the more planning that can be done in advance, the better.

4. **Two years ago, the Australian National Aerial Firefighting Centre asked its federal government for federal funding to invest in air tankers.[12] This request was denied. The Australian government invested in F35s. In terms of responses to national disaster, not just in terms of cost-effectiveness but also carbon impacts, what is the carbon impact of responses such as sharing resources between hemispheres?** It is very important to consider the sustainability of responses — every attempt should be made to do less harm. Given the power of procurement and the funds that are spent, incentives for innovation may need to be increasingly emphasized (e.g., green technologies).

6. **With regard to flood zones, especially the situation in Gatineau, there was a disparate impact on either side of the river (between provinces), with some able to rebuild while others were not. Not all are equally affected. Is there some way to ensure that all who are affected are equally able to rebuild?** It is usually the federal government which spends the greatest amount, but provinces make decisions as to how such funding is to be spent. The result is that there may be disparate provincial responses to the same event. The second time Gatineau flooded, some residents were told that they could not rebuild, and/or where they could rebuild through flood modelling. We all have to be more responsible when it comes to prevention.

7. **Although climate change is a global concern and Canada is taking action, other countries are major polluters. Are we looking at climate change as a national security threat in terms of the threat that other actors pose by their failure to address climate change? While we may not deploy to other (polluting) countries, what diplomatic action can be taken against those who are polluting?** The Paris Agreement (2015) was supposed to address this issue. At Copenhagen[13] in 2009, China was not a proactive partner at that event. Although locally it was making some changes due to health concerns, it was not committed at the international level. In Paris, several years later, China was playing a constructive role (recognizing that it came to development later, China should also have the opportunity to benefit as other countries have). The rest of the developed world must convince China that a 'green superpower plan' is in both China's short- and long-term interests. This may not be easy, but in Canada, local governments are investing in local measures. At times, however, there is a gap between official messages and what is done in practice at the local level. The point is that the federal government might not be responsible for the actions being taken locally, and vice versa. We need to ensure that our actions are in line with our words, and we must strive to do better at every level.

8. **There is a partisan aspect to these issues. What is being done to ensure that we are all on the same page regarding the threats of climate change?** The federal government is currently focused on these issues and all parties must work together to see results. The motivation for working together and undertaking various plans often occurs when there is evidence of returns on investment. Building capacity and resilience may depend on individuals and parties being able to see the benefits personally and politically. While there is polarization on many issues, the fact is that few want to change their lifestyles to accommodate the measures that may be required. Despite this, climate change is a problem for everyone, and for all politicians regardless of political camp. We must be looking toward the future and scanning the horizon not only for threats that have no impact on us right now, but also for threats that have an enduring impact if they are not

addressed today. The military is, in the government's eyes, the option of last resort to address climate issues: politicians and the public must understand that climate change is complex and all methods, including prevention, must be considered when attempting to deal with these changes.

Session 1: Environmental Impacts on International and Continental Security

- **Dr Paul Mitchell, Director of Academics, Canadian Forces College [Moderator]**
- **Captain Steve Brock, United States Navy (Retired), Senior Advisor, The Center for Climate and Security/The Council on Strategic Risks**
- **Lieutenant-Colonel Raymond Chiasson, Deputy Chief of Staff Operations and Plans, Joint Task Force North**

"The United Nations Intergovernmental Panel on Climate Change (IPCC) now includes a subsection on 'Human Security' in their Assessment Reports. In its first inclusion in 2014, it concluded that climate change is likely to increase climate migration due to resource shortfalls and extreme weather events. This is more likely to occur in low-income developing countries, and has the potential to indirectly increase the risk of violent conflicts, such as civil war and inter-group violence, due to conflict drivers such as poverty and economic shock. Climate change will also have an impact on the infrastructure and territorial integrity of States, and will thus influence national security policies. This panel will consider current and future climate trends and consider actual and potential results."[14]

- **Captain Steve Brock, United States Navy (Retired), Senior Advisor, The Center for Climate and Security/The Council on Strategic Risks**

Captain Steve Brock explained that he started his career as a naval intelligence officer and, at the beginning of his career, attending a national defence university, there was never any reference to climate change and security. He explained that it wasn't until a few years ago that climate change began to appear as a security concern. Climate change is now considered one of the top five national security issues. The most important lesson he has learned, he indicated, is to try to keep climate change in the forefront of our minds. Every (marine) who is dedicated to public security must take climate change into account.

The inaugural "*World Climate and Security Report 2020*",[15] released February 13, 2020, reviews the findings of a number of military organizations and the work they are doing to address climate security. Brock noted that "*Canada's Changing Climate Report*" offers a similar assessment of the climate changes that have occurred, as well as the climate changes that are predicted.

"The security landscape is going to be disrupted significantly as a result of climate change. As military and security professionals, we are warning the public about this threat, but the solutions will mostly be civilian. That includes significant emissions reductions to avoid the worst effects of

Brock explained that it is difficult to reconcile the threat multiplier impact of climate change with operations: climate change exacerbates conflict and the interplay among a number of factors, such as state fragility, changes in the geostrategic landscape, and direct threats to training and tactical assets. Further, he observed, the existential threat of climate change has forced all of us to reconsider how we define security independent of any threat multiplier effect of climate change.

Norfolk, the largest naval base in the world, located in Norfolk, Virginia, is also not immune to the impact of climate change. Brock explained that members of the Norfolk Naval Station, who were deployed at sea, recently came back to experience flooding in their long-term parking lot. Although one solution might be to raise the piers at Norfolk to reduce the likelihood of future flooding, Brock noted that the cost of such measures is prohibitive. While it is critical

to maintain operations, it is necessary to avoid short-term solutions to problems that are likely to be long-term. Brock emphasized that the solution will be to think critically and cooperatively not only about military operations but also about military readiness in the face of climate change. Fighter aircraft, for example, cannot be maintained in flooded areas.

Brock provided another example of climate change impact on operations. Kwajalein Atoll, part of the Republic of the Marshall Islands, houses the Bucholz Army Airfield which is important to U.S. defence in the North Pacific. Although there were early signs of rising sea levels at Kwajalien, this location was chosen for a programme called "Space Fence" — a space surveillance system used to track space debris and satellites in Earth's orbit. Of the many requirements for locating the Space Fence programme, the location was passed for procurement by the oversight committee. Environmental reports, however, indicate that due to global warming, Kwajelein only has about 15 years left due to rising sea levels; the bleaching of the coral reefs means that the reefs no longer provide barriers to absorb waves. Further, the fuel costs required to maintain Kwajalein are prohibitive. As Brock explained, maintaining the Space Fence location at Kwajalein will require significant adaptation to changing environmental conditions.

While assets are being threatened, Brock also explained that the call for the military to participate in natural disaster response is having an increasing impact on the training of officers and undermining more traditional (conflict) training: 'live fire training', for example, has affected combat readiness. Wildfires at Camp Pendleton in California, he stated, not only threatened local area homes but it also threatened Camp Pendleton itself which, in turn, had an impact on training undertaken at that location. Previously, Brock noted that the challenge for base commanders was to get everyone through training and accomplish their missions. Now there must be consideration for how training is being influenced by current conditions at training (when the camp itself is on fire). Questions arise regarding deployment and how officers are deployed in conditions for which they are not trained. Brock explained that deployment to Syria, for example, was accompanied by climate conditions that were not part of officers' training.

Brock elaborated on how climate change creates evolving geostrategic risks. A 2016 U.S. National Intelligence Council memorandum,[16] '*Implications for U.S. National Security and Anticipated Climate Change'*, details a number of threats that are likely to cause and exacerbate national security concerns. This memorandum suggests six pathways through which security will be threatened: "threats to the stability of countries, heightened social and political tensions, adverse effects on food prices and availability, increased risks to human health, negative impacts on investments and economic competitiveness, and potential climate discontinuities and secondary surprises."[17]

'*The World Climate and Security Report 2020*'[18] illustrates that while there are similar globally-held views about the challenges that climate change poses, Brock underscored that differences are found in the economic and institutional capacities available to deal with these challenges. Many of the challenges regarding climate change are the same for various parts of the world, based on ecosystem similarities — which means that there is potential for one global region to learn from another. Brock explained that the notion of "climate-proofing" means recognition that everything is going to be touched by the climate. All plans for the future must therefore include consideration of the planet and the impact of our actions. Policies must be as climate-friendly as possible (e.g., carbon-neutral development, less environmental degradation). The actions that we take in the name of mitigating and adapting to climate change, Brock stressed, as well as the energy transitions we aspire to make, are as consequential as climate change itself: our actions may make situations worse or better. He emphasized that actions that do not have scientific research supporting them should be avoided. Geo-engineering, or climate intervention, often considered a means of reversing the negative impacts of climate change, also present security challenges. Genetic engineering and creating plants/animals to accommodate climate changes have implications for diversity collapse and may not always offer positive long-term solutions, Brock warned. All initiatives must consider both short- and long-term implications for climate.

Brock explained that the global challenge is to reimagine policy processes to achieve creative climate security outcomes. We are entering a new frontier with respect to deterrence policy, which will force us to reimagine security policy. Perhaps this reimagining will be able to address some of the changes that have so far been seen as intractable. Brock noted that the Colombian Peace Agreement, for example, was the first to incorporate climate security. The dispute between the Colombian government and the Revolutionary Armed Forces of Colombia (FARC) resulted in environmental degradation, as well as preventing exploitation of other areas.[19] The peace agreement was to address Colombia's uneven distribution of land. One aspect of addressing environmental degradation is the use of a carbon tax (also put in place in 2016) that will be diverted to sustainability projects such as land management in the Colombian rainforest. Brock notes that we need to be thinking of the possibilities of climate in every security policy that we make. Although Colombia was on the radar due to drugs, the underlying issue of land usage (and land degradation) fuelled further conflict.

The Golan Heights, Brock suggested, is another example of climate change fuelling conflict. The conflict over the Golan Heights has arisen over water rights: the Golan Heights has more water than other parts of the Middle East and is of value to a number of interests. The Middle East, already considered one of the least water-secure areas in the world, is likely to become increasingly water-insecure.

There are many ways to work on climate issues — Brock maintains that we must all think of ourselves as 'climate-aware security professionals' — which does not require high-level political involvement. He notes that for the first time, the United Nations is requiring reports to consider climate security implications of their operations (on people and environments). The UN hears those reports and environmental awareness then creates political awareness. The more the issues are talked about, the more awareness of climate change is created.

Source: The World Climate and Security Report 2020

Brock concluded by pointing out that our 21st-century world presents unprecedented risks in terms of climate and security. He notes that, at the same time, we are also in a period of unprecedented foresight which allows us to anticipate many of those risks due to the application of scientific knowledge and modelling. Together, unprecedented risk with unprecedented foresight means there is a responsibility to prepare. Highlighting the conclusions from the Centre for Climate Security's *World Climate Security Report*, Brock notes that our responsibilities for preparedness include: mainstreaming climate security

governance systems;[20] institutionalizing agencies' climate security; elevating attention to climate security; integrating climate security into relevant priorities; developing rapid response capabilities to manage low-probability high-consequence threats; and developing contingency plans for unintended consequences. Brock asked: How much should security be taken into account in climate issues? Given the fact that the Department of Defence has $750B at its disposal, climate change should be part of all security discussions.

- **Lieutenant-Colonel Raymond Chiasson, Deputy Chief of Staff Operations and Plans, Joint Task Force North**

A member of the Joint Command and Staff Programme, Lieutenant-Colonel Chiasson began by explaining that sovereignty means something different depending on whom you represent and if you are respected for who you are. The Joint Task Force North (JTFN) covers a very large area which is nearly the size of the U.S. land mass. The challenges associated with this area are many, including an infrastructure which is both limited and a challenge to maintain. The North American Aerospace Defense Command's (NORAD) Forward Operating Locations are located in the distant locations of Iqaluit, Yellowknife, and Inuvik. The limited infrastructure requires shared solutions.

Chiasson described the population of the North — approximately 114,000, comprising First Nations, Inuit, Métis, and non-indigenous peoples. The Canadian Armed Forces (CAF) and the programmes it supports (such as Canadian Rangers, Junior Rangers, and Cadets) consist of 3.3% of the total population. Chiasson explained that there are comprehensive land claims in the North and everything done in this region has to work with an indigenous framework.

Climate change in the North consists of a number of concerns, as Chiasson highlighted. For example, permafrost issues have resulted in the degradation of capabilities. As ice cover changes, accessibility to resources (and motivation to access such resources) also changes. Russia[21] has continually entered the Arctic airspace signalling its interest in this region. While CAF has not responded to natural disasters in the North, it is working to build capacity through operations such as Operation Inuk, which works with communities. Chiasson noted that CAF worked with the Yukon Government to determine how it would respond to a natural disaster (such as fire). The goal was to bring partners together and to develop common understandings of pressures on each stakeholder. This cooperation stressed resilience for communities and reinforced that the military should be seen as a last resort, with a focus on developing stakeholder capacities.

Chiasson noted that sea ice melting also brings challenges: the way the currents flow through the NW passage means that ice blocks play havoc with predetermined routes. Ice floes can quickly block passages due to the combination of winds and tides, leaving formerly open channels closed. The fluidity of the ice floes is a misunderstood aspect of the NW passage. Although they are an attraction for tourism development, Chiasson explained that operators must have their own emergency systems at the ready. For example, in August 2018, a Russian passenger ship ran aground with 162 people aboard.[22] The ship's operator dispatched another of its icebreaking fleet to rescue passengers and crew, reaching the grounded vessel in advance of the Canadian Coast Guard. Occupants of the grounded ship were taken to a remote Nunavut community that had little infrastructure to handle the guests, and were then flown out of the area from the community's small airfield. Chiasson emphasized that both ice floes and vessels running aground can be a hazard. At present, there has not been a huge increase in traffic in the North and those who do go are prepared. Another example of climate change affecting the North is Tuktoyaktuk, Chiasson explained. On the Beaufort Sea, Tuktoyaktuk faces an uncertain future due to erosion issues.

"Shifting geopolitics", Chiasson noted, aptly describes the greater foreign interest in the Arctic which influences domestic security and surveillance in the North. This foreign interest appears primarily to be

about resource extraction. Further, globalization and large-scale development have an increasing impact on northern security. There is the expectation of greater investment by foreign corporations — although Chiasson explained that there is now a moratorium on oil and gas development in the North (until 2022) despite the substantial interest in recommencing research into oil and gas in this region. Other resources are also affected, Chiasson notes, such as fish species typical of more southern regions being pushed into northern waters and therefore affecting traditional means of living.[23]

Tourism has become of significantly greater interest in Canada's North, explained Chiasson. Tourism may affect ties to land and land claims, threatening traditional livelihoods. Hunting has provided sources of food where infrastructures are missing. As the climate changes, there is increasing reliance on goods from the south to address diminishing traditional sources of food. Chiasson explained that due to the lack of infrastructure, any single emergency can have a significant impact on the system. For example, one medical emergency means that the supply of fuel may be negatively affected for quite some time. Rotating power outages may be a means of addressing a fragile infrastructure. The notion of infrastructure as it relates to climate change, Chiasson noted, may force a wholesale change in places such as Tuktoyaktuk which loses more land each year to the encroaching sea.

Chiasson cautioned that 'southern solutions' don't necessarily work for northern situations — many solutions assume an infrastructure that may not exist. Collaboration is required and is necessary in the northern context.

Chiasson summarized that there are a number of climate change impacts that are of particular relevance to the provision of security, and which include: 'severe weather, rising sea levels, and warming temperatures'. More and more globalization, as well as an increasing global population, shifting geopolitical concerns, and increasing consumerism are factors influencing the defence/security environment. He concluded that related security concerns such as humanitarian crises, human migration, food shortages, and increased competition (for limited resources) will continue to be prominent on the security landscape.

Key takeaways:

- There will be increasing difficulties reconciling climate change as a threat multiplier and its impact on operations.
- Climate change has already had a direct impact on infrastructures and operations.
- Traditional orientations to training have been altered, and will continue to be altered, in the face of climate change.
- While climate change is global, variations exist in respective capacities to address climate change.
- Climate change in the North is exacerbated by a lack of infrastructure.
- Climate change in the Arctic is accompanied by shifting geopolitical interests which threaten traditional ways of life.
- The challenge moving forward is to reimagine policy and processes to achieve creative climate security outcomes and to make the best use of available resources.

Discussion

Questions from the audience are highlighted in bold, and responses are from: Elizabeth Bush, Daniel Jean, Steve Brock, Raymond Chiasson, and Paul Mitchell (moderator). [Note: responses are paraphrased.]

1. **With regard to reimaging policy, there seems to be a conflict between having a huge defence budget and yet not doing such simple things as changing transportation systems. Why do we appear to choose complex solutions over simplicity?** Response 1: 'We' are all the players in the world, meaning that we all have a role to play in finding answers. Complex problems often require complex solutions. Decisions aren't made by the collective but by experts in their fields. It isn't the mission of the Pentagon to look at light bulb policies. Why, for example, do we put the preponderance of money toward national security rather than to the environment? It is easier politically to budget for national security than for other societal purposes (defence is more likely to be supported by the public). We have seen climate change coming for decades — there has been great scientific foresight with regard to climate changes — but what looks like a lack of foresight is a lack of political leadership. Response 2: If we think of solar radiation, we know that aerosols are thought to counter the impacts of greenhouse emissions by providing cooling (reflecting the sun's rays back from the earth). While we may not be able to counter global warming by stopping our use of aerosols,[24] limitations on aerosol use do make a difference. There had been past hesitation because of the idea that we should be looking toward only very large-scale prevention initiatives. The scientific community is now looking toward more immediate and small-scale solutions that address the notion of simplicity.
2. **The U.S. military is considered one of the most trusted institutions, though the DOD hasn't been audited for 20 years; similarly, Canada hasn't been doing peacekeeping for 20 years. The point is that the public may misperceive what is happening within our militaries. A recent cost-of-war project report stated that the U.S. military is the largest institutional consumer of fuel. Why is there so little push back on what the military actually does?** Response: The American public is comfortable with giving 70% of its budget to the military. At the same time, national security should be defined more broadly and should not be entirely the role of the military alone. Although the United States Department of Defense is a massive consumer of oil and gas and also claims a huge proportion of the U.S. federal budget, civilians think of military as the leaders — there is the potential for the military to actually assume that role in terms of green, environmentally friendly actions.
3. **Social and human behaviour is very difficult to change. Should we strive for human change or environmental change?** Response: We need to have popular support for environmental initiatives. It is important to broaden the conversation to include what we want for our children and grandchildren (the future) rather than what we have to change today. If we could focus on the future, it might reduce polarization across groups (who see themselves as inconsistently affected).
4. **Is it possible that there are environmental and scientific features that exist today (such as concrete buildings and precise temperature estimates) that make it difficult to effectively compare temperatures from today to 100 years ago?** Response: Data records over time employ technical records of temperatures. Homogenized data sets take into account changes in measuring techniques, and climate change recordings are very carefully measured. In the CCCR [*Canada's Changing Climate Report*], there are many sources of data used. All evidence points to, for example, sea levels rising globally as coast lines have specific features that may be measured over time.

Session 2: How is Canada, and how should Canada be, preparing to address environmental impacts on security?

- **Lieutenant-Colonel Claire Bramma, Curriculum Development Officer, Canadian Forces College [Moderator]**
- **Brigadier-General Lise Bourgon, Canadian Joint Operations Command (CJOC)**

- **Lieutenant Commander Oliver Leighton Barrett (USN, Ret'd), Senior Research Fellow, The Center for Climate and Security**
- **Colonel Claude Desgagné, Director General Capability and Structure Integration**

"The second panel seeks to build upon discussions of challenges that were presented during the morning session and to discuss some actions that can be taken to address the social, economic, and political consequences of climate change that are being felt globally. How can we address the impacts, on the current geopolitical order, of increased drought; climate-induced forced migrations; and the melting of the polar ice caps? What should we consider when planning and executing international and domestic operations in regions that have been severely affected by climate change? What is the impact on infrastructure and how should we and our allies be preparing? How will this affect the CAF's force and capability development?"[25]

- **Brigadier-General Lise Bourgon, Canadian Joint Operations Command (CJOC)**

Brigadier-General Lise Bourgon's presentation began with a focus on the Canadian Armed Forces (CAF), Operation LENTUS[26] — the operation which manages responses to natural disasters in Canada. Bourgon stated that from 1990–2010, there were six deployments, and from 2011–2019 there have been 30 deployments. The likely cause of the significant increase in deployment over the last decade is climate change, as well as an appetite for CAF involvement at both the provincial and federal levels. Municipalities and provinces are increasingly turning to the military for responses to crises. In turn, CAF calms the crisis and are the 'do-ers' in these situations. Bourgon reiterated that rather than being seen as a last resort, many view the CAF as their first response choice.

Bourgon explained that the CAF are now being called in anticipation of need of help and are increasingly called before an emergency situation is declared. One-third of requests for assistance (RFAs) occurred prior to declarations of emergency (floods in Quebec; BC and Alberta fires; hurricane relief) and prior to the emergency's exceeding provincial capabilities. When the CAF shows up ahead of time, they may be able to mitigate the impact of the event versus addressing damages afterwards.

The public increasingly views the CAF as a first-response choice, Bourgon indicated, rather than as a last resort (and are seen as crisis responders versus consequence managers). Bourgon noted that the impacts/costs for the CAF are that while soldiers are deployed on LENTUS, for example, they are not training for other military activities. Bourgon offered solutions to this predicament which could include: getting more people to serve — so that there are more personnel available to be deployed to disasters; reconsidering how training is done; making better use of reservists; and reconsidering the flexibility of employment associated with reservists.

Operation LENTUS costs money — Bourgon explained that there has been little cost recovery since before 1996. Over the last three fiscal years, CAF has spent $17.5 million (about 2.4% of CAF budget) on Operation LENTUS. Having the right people in the response process, Bourgon emphasized, increases the likelihood of being able to manage crises. At the same time, CAF has on occasion been asked to provide services for which they are not trained. For example, CAF was asked to assist in the provision of social activities in the prevention of youth suicide.

Operations are affected by communication and media, Bourgon explained. Regarding communication, the CAF age- and gender-based analysis during the Quebec floods, for example, determined where vulnerabilities exist (e.g., it was determined that when two soldiers came to the door, older citizens were scared). The media also play a role in operations, as Bourgon observed: CAF has been in the position of first hearing of requests for assistance from politicians who talk to the media about needing the military, prior to any formal request for assistance having been made. CAF then has to move quickly to respond in anticipation of the formal request.

The impact of climate change on Arctic operations, Bourgon reiterated, is profound. Melting ice means more traffic through the North. In the early 1990s, there were 5-10 vessels per year. Today there are over 130 vessels and over 385 voyages. The traffic is rapidly increasing on a yearly basis, with a 21% increase from 2016 to 2017. Bourgon indicated that it has become increasingly difficult to monitor this area and requires more assets to effectively monitor this region. As this area becomes increasingly used, there are more traffic, more danger, and more maritime incidents. Although it is actually the duty of the Coast Guard to patrol the Arctic, Bourgon noted that the military are often called in. Rescues, however, are often dependent upon private vessel owners to come to the rescue of their own ships. Few platforms and few resources characterize the North and although CAF is responsible for search and rescue from the air, Chinooks are often days away and rescues are challenging. If something were to happen on a flight crashing in the Arctic, Bourgon confirmed that rescue would be extremely difficult.

CAF works with a number of groups to enhance security. Bourgon explained that Contingency (CONPLAN) Renaissance is the CAF's plan to deploy to disasters overseas when directed to do so by the Government of Canada (upon request from other nations). CONPLAN seeks to identify and help to understand what is happening in the face of climate emergencies (e.g., hurricanes) worldwide. She clarified that Global Affairs Canada (GAC) provides tools to determine what assistance can be provided to other nations, while the Disaster Assistance Relief Team (DART), consisting of CAF and civilian experts, provides resources to support emergencies occurring in other countries. Bourgon emphasized that interdepartmental coordination makes a difference, as does a reliable process. For example, CAF requires a letter from GAC who make a request that is vague enough that the response by CAF is not limited. Capacity building with partners such as the Caribbean Disaster Emergency Management Agency (CDEMA) is facilitated by having a CAF person embedded in these partner groups.

Bourgon concluded with the observation that while HMCS (Her Majesty's Canadian Ships) are great resources in disaster management, they take a number of days to get to locations. The challenge moving forward, Bourgon reiterated, is for CAF to be able to address and respond to the needs of the Canadian government both quickly and effectively.

- **Lieutenant Commander Oliver Leighton Barrett (USN, Ret'd), The Center for Climate and Security**

Lieutenant Commander Oliver Barrett's presentation, entitled "Climate Change: Helping Canada's Partner Nations to Manage Risks and Consequences", focused on three major points: First, how climate change enhances state fragility; second, how partners (United States and Canada) are helping fragile states; and finally, Canada's role in addressing climate change.

Barrett asked, 'Why do national security and defense communities care [about climate change]?' First, he explained, human security risks scale up in the context of climate change. States that are fragile become increasingly fragile and may collapse, and conflict is heightened. Second, there are changes to the geostrategic landscape which make certain regions of much greater interest, in terms of both exploitation of these regions and maintaining security of these regions. The Arctic and the South China Sea are two examples. Finally, Barrett observed that there are direct threats to militaries due to climate change: bases may be at risk, training and training ranges may undergo change, and tactical and strategic assets may be threatened. All of these issues must be assessed in terms of their high-probability, high-consequence risk.

Barrett referenced a quote by Navy Admiral Samuel J. Locklear: "While you're here, you may not have a conflict with another military, but you will have a natural disaster that you have to either assist in, or be prepared to manage the consequences on the other side. And that has been true every year."[27] The orientation of operations moving forward must recognize that the likelihood of dealing with a natural

disaster is much greater than that of combat. Given that this is the case, Barrett raised key questions: "How will an evolving, climate-driven geostrategic environment affect the Canadian Armed Forces' role at home, and overseas? Are the climate-driven challenges compelling enough to warrant a reassessment of Canadian security posture and especially how armed forces are equipped, trained, and deployed? Are the Canadian Armed Forces prepared for an increased demand for HA/DR (high availability/disaster recovery) services both at home and abroad? How should they adapt?"[28]

Barrett explained that geostrategic risks are changing primarily within four regions which are (increasingly) 'on the radar', due to factors that include, for example, political instability, social and political tensions, etc. These regions include the Arctic, due to melting ice and shifting dynamics associated with access to resources and transportation; and the Indo-Asia Pacific region, including the South China Sea, which, Barrett noted, is experiencing increases in coastal and urban populations, with melting glaciers influencing life in these two areas. The Americas have experienced increasing numbers of storms, flooding, and forced migration due to climate change. Both the Middle East and Africa are experiencing political instability due to shifting demographic factors combined with climate change. Barrett confirmed that all sociopolitical issues are exacerbated by climate change.

A particular hot spot described by Barrett is the Americas. This region is characterized by a greater frequency and intensity of weather events, more dramatic rainfall, and longer drought periods. Barrett explained that climate dynamics (such as extreme weather events) may have a negative impact on state fragility and forced migration. Stress is placed on local governments as the frequency of natural disasters increases. Barrett pointed out how, for example, Hurricane Maria in 2017 devastated the power and infrastructure resulting in an exodus leaving Puerto Rico — lack of power was the straw that broke the camel's back. Within nine months, it was found through a wide-ranging corruption investigation that senior government officials had been arrested who had claimed to be working for the Puerto Rican people in the face of this disaster. The Puerto Rico example illustrates that political changes and crises may be preceded by environmental and climate issues.

Accumulated Cyclone Energy (ACE) "*is a measurement of the activity of a hurricane season, based on storm intensity and duration. It is calculated for each individual storm by taking the sum of the storm's intensity, in knots, squared, at six-hour intervals, divided by 10000. For instance, if a storm had 40-knot winds for one advisory, the ACE for that advisory would be 0.16. The sum of the Accumulated Cyclone Energy values for all storms in a season is the total seasonal Accumulated Cyclone Energy*."
[Source: https://www.cyclonicfury.com/2017/05/23/accumulated-cyclone-energy-what-it-is-how-it-is-calculated-and-how-it-determines-seasonal-activity/]

The 2017 hurricane season was a particularly active storm season. Barrett provided details: during 2017, there were six major hurricanes, ten hurricanes, and 17 named storms. Hurricanes Harvey, Irma, and Maria were the source of most of the destruction. It is estimated that, collectively, these storms cost $300 billion and were responsible for 3364 deaths. Barrett further notes that 2017 recorded the most fatalities in a single season since 2005; and 2017 scored the highest 'accumulated cyclone energy' (ACE) since 2005.

Barrett briefly described his own hurricane experience. He was in Orlando during Hurricane Wilma in 2007, staying in a Holiday Inn. From what weather reports had indicated, the hurricane appeared to be on a path that would avoid hitting Orlando, but it hooked and came in from behind. He described the sound as 'like nothing else' and 'like a wild animal coming after you'!

Climate change has also meant that the military is, both literally and figuratively, increasingly 'getting its feet wet'. As Barrett illustrated, the U.S. North Command deployed more than 8000 active duty service members, as well as 1600 air missions, for Hurricane Maria (Puerto Rico 2017). There were also strategic

airlift missions also deployed delivering food and water. At roughly the same time, Barrett explained that the U.S. Southern Command was dealing with the Leeward Islands which were also being hit by Hurricane Irma (2017). The Southern Command deployed 300 service members and ten army and marine helicopters to evacuate 2200 U.S. and other citizens. A further four Hercules aircraft, the USNS Spearhead vessel, and P3C Orian reconnaissance aircraft were deployed. As there are more emergencies, Barrett emphasized, more military deployment is required to help. Although dual deployments are difficult, Barrett explained that it may be possible for one Command to help the other Command (e.g., North Command helping South Command) in emergency situations.

In 2019, with winds peaking at 185 mph (295 km/h), Hurricane Dorian was one of the most powerful hurricanes recorded in the Atlantic Ocean. Barrett explained that Hurricane Dorian surpassed the previously most powerful hurricane, Hurricane Irma (2017), as the most powerful on record. Unusually, Hurricane Dorian stayed as a category 5 and remained in place for 24 hours over the Abaco Islands (east of Florida). Over 50 people were killed and 70,000 were left homeless. Barrett noted that the Canadian response to this event was the deployment of the CDAT (Canadian Disaster Assistance Team) to the Bahamas to help those affected. The Canadian government helped transport Jamaican soldiers to the Bahamas via the Hercules aircraft, as the Jamaican army did not have its own aircraft. Barrett observed that CAF might expect more knocks on the door for assistance in the future.

Barrett concluded by asking, 'What's next for Canada?' There is an urgency to assess adequacy, capacity, and force capacity in the face of various demands. Barrett maintained that regardless of whether CAF is demand- or threat-oriented, climate change must figure prominently. The Centre for Climate and Security has developed a framework for considering unprecedented risks, unprecedented foresight, and responsibility to prepare for the future [see diagram, p. 15 above]. Barrett noted that as Chuck Hegel, former United States Secretary of Defense (2013-2015) observed, "Politics or ideology must not get in the way of sound planning." Sound planning includes taking a proactive stance and addressing the reality of climate change for military operations.

- **Colonel Claude Desgagné, Director General Capability and Structure Integration**

Colonel Claude Desgagné provided a summary of his discussion focussing on the force development process, including allied foresight analysis; climate change deductions and military implications; and force development — both implementation and initiatives.

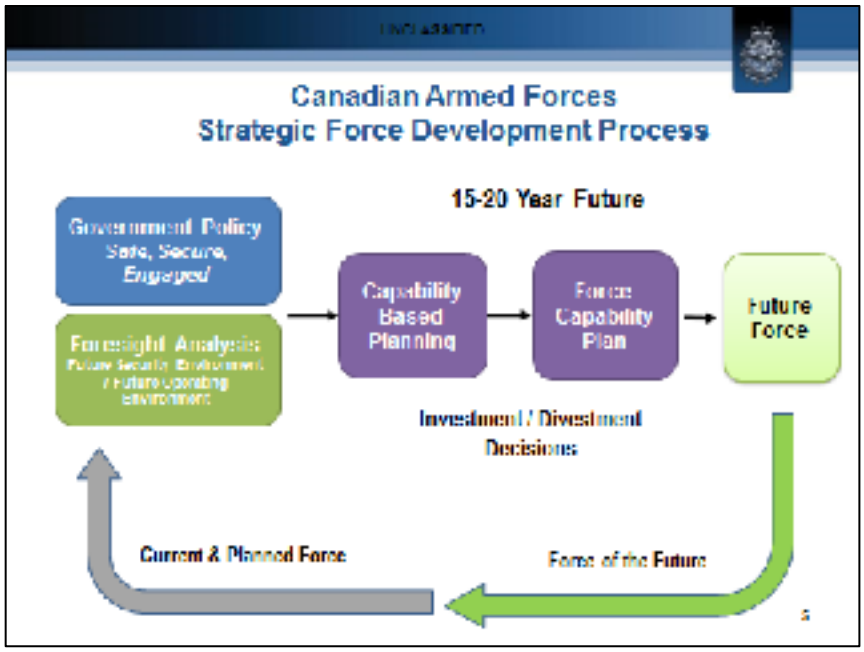
Desgagné explained that "force development process" includes the 'what' and the 'how' of what is being done with respect to climate change. He maintained that the good news is that a discussion of these issues is happening with target audiences, such as CFC students, who will be tasked with acting on the issues identified today. What 'force development process' does is to 'develop capabilities required to produce strategically relevant' military forces. The military is to provide the Department of Defense with advice regarding current and future capabilities. Essentially, 'force development process' must anticipate and develop capabilities that produce strategically relevant operations.

Force development process must also address the question of 'how', Desgagné further stated. All of the government units involved in the provision of 'force' are tasked with aligning to deliver on a 'force capability plan'. This plan outlines the capabilities required to effect strategic intent. In other words, Desgagné noted, units' services must align to ensure that the preferred outcomes can be achieved through 'equipment, infrastructure, personnel and training, technology, operational procedures, and readiness'.

Desgagné explained the various elements involved in the force development process. First, government policy (the Department of Defence policy, *Safe, Secure, Engaged*) must be considered along with a 'foresight analysis' (an analysis and understanding of the future security and operations environment,

including climate change). Next, government policy and foresight analysis inform 'capability-based planning' and then 'force capability' planning. Together, these elements predict, fourth, what is required for 'future forces'.

'Foresight analysis' considers potential future implications of actions undertaken today anticipating what the Forces of the future will face. Not only is foresight analysis undertaken with the federal defence policy in mind, but it is also conducted with an eye to the federal government's foresight activities. As Desgagné further noted, foresight analysis means taking into account what our allies have determined is in their own respective futures. A number of Canada's allies have undergone similar foresight analysis processes (US, UK, NATO, Australia, New Zealand and France, for example) and have identified similar security environment issues. Collectively Canada's allies have identified, Desgagné explained: increasing international instability, with increasingly diffuse economic power coupled with increasing influence of non-state actors; multipolarity and redistribution of global power; multidimensional power; differential socio-economic impacts; the rise of cyber issues, including managing information; various technology and scientific trends which threaten security; and climate change issues.



Source: Desgagné Slide 5/27

Desgagné reviewed the allies' collective insights into climate change which confirm that climate change is characterized by high impact and high certainty. Climate change is likely to fuel migration and increase urbanization, which will result in greater competition for resources. The implications are more competition for funding and resources from respective governments to address climate changes. Desgagné stated that there will likely be improvements to capabilities as forces will have to respond at a faster pace and manage capacity while operating in extreme conditions. He further noted that there are likely to be disturbances related to supply chain disruptions as a result of extreme conditions.

The Department of Defence policy, *Strong, Secure, Engaged*, identifies various climate change issues, recognizing that climate change will affect citizens globally, is 'borderless', and will aggravate existing vulnerabilities, Desgagné noted. The Arctic is identified as a particular vulnerability as it is the nexus of climate, trade, security, and safety issues. Desgagné further identified that there will be a need to bolster response capabilities as there is increasing need for forces at home to address natural disasters. At the same time there is increasing international interest in the Arctic, which also draws upon existing resources. He stated that Canada's defence policy is committed to climate change objectives as articulated by the Government of Canada, and recognizes the need to partner with like-minded agencies and allies to address climate challenges.

Desgagné explained that capability-based planning (CBP) addresses three central questions: 'What do we think we will need to do in the future? How well do we think we will do with the CAF we have? What changes would make us better?' He notes that CBP will identify investments and divestments that ensure

maximization of force capabilities. Various units associated with Defence (Canadian Army, Royal Canadian Air Force, and Special Operations Forces) provide the services to operationalize the planning.

The Canadian Army, Desgagné indicated, is perhaps best positioned to appreciate the reality of climate change and to recognize the fact that the Arctic is warming. Arctic Operations are a priority for CAF, as is the provision of security for the Northern populations. The Arctic requires a balance between appreciating and caring for the environment, with army readiness for combat operations. Force projection assets, he notes, are of even greater significance in terms of the mobility, capacity, and reach of assets in the North.

The Royal Canadian Navy views climate change as a priority and has taken steps to becoming 'greener' in terms of its ships and bases, Desgagné observed. He listed a number of specific projects that address climate change, such as higher water levels through jetty recapitalization; Arctic offshore patrols and humanitarian assistance/disaster response (HADR); monitoring climate change; and operating joint support ships with HADR capability.

Desgagné explained that the Royal Canadian Air Force is considering adaptive capabilities for global operations to offer assistance to allies, as well as investigating operating and maintenance procedures that address climate extremes and climate trends. Desgagné spelled out that the operational tempo is likely to increase, along with changes in aerial surveillance zones. He further suggested that supply chains may experience greater vulnerability and that there may be threats to energy security, which may also have an impact on operations. Special Operations Forces, he confirmed, are built around highly skilled survivalists who are attuned to the complexities of environments. It is expected that natural disasters will continue to contribute to political instability globally; that migrations will be resource-driven; and that new opportunities for exploitation will continue to emerge.

The Greening Government Strategy (GGS), observed Desgagné, aspires to reduce emissions by 40% by 2030, and by 80% in 2050. This strategy will include property, fleet, procurement, and adaptation commitments to climate change. The Department of Defence *Energy and Environment Strategy* includes a number of goals such as 'energy efficiency, sustainable operations, green procurement and sustainable real property'. Since 2005, Desgagné confirmed that DND's greenhouse gas emissions from building and commercial vehicles have been reduced by 31%. Having said that, National Safety and Security (NSS) emissions from 2018-19 increased from 2005. Desgagné noted that DND innovation initiatives to address climate impact include, for example, competitions aimed at academics and industry for new research grants (IDEaS Programme); along with 'pop-up cities' that make use of integrated water, energy, and waste systems for temporary camps during operations; and focussing on means of storing low-cost energy.

Desgagné concluded with a list of key messages: Climate change is real and serious, and is one of many factors in the 'force development process'. There is widespread recognition that all stakeholders, including allies, academics, and industry, need to work together and do their respective parts to address these issues. Finally, the challenge for Defence is to balance operations with sustainability.

Key takeaways:

- CAF is increasingly being called upon to address climate-related emergencies due to its reputation as action- and results-oriented.
- There are significant impacts on training due to climate change, along with demands to respond to activities/events outside of current training protocols.
- The North is increasingly a costly and complicated area in terms of security and emergency response.
- Emergencies and security require collaboratively working alongside a number of groups.

- Geostrategic risks are emerging and evolving, many of which are suffering from climate issues.
- The development of processes must include coherence among, and contributions from, various national units (Department of Defence, CAF, etc.), as well as collaboration with Canada's allies.
- In the face of climate change, the task is to balance operational requirements with sustainability.

Discussion

Questions from the audience are highlighted in bold, and responses are from: Lise Bourgon, Oliver Barrett, Claude Desgagné, Elizabeth Bush, and Claire Bramma (moderator). [Note: responses are paraphrased.]

1. **What are the opportunities, if any, that a changing climate might provide to us?** Response 1: The whole of government working together and playing together to find a solution is an opportunity, as is the contribution of all partners at the table toward finding a solution. The more we know about each other, the better we can work together. Response 2: We need all of society, government, and civil society, not only to develop, and have in place, contingency plans, but also to exercise plans to ensure that they work (tabletop scenarios). Practising exercises and practising disaster response require a planned, practised paradigm shift. Response 3: One opportunity is to give more responsibility to provinces and municipalities. Society has to take responsibility and not see problems as being solved only by the 'little green men' [military] taking control rather than taking responsibility for themselves. Opportunities for planning and practice are difficult to create, however, in the face of daily activities consisting of traditional training.
2. **Rather than focussing on military activities, what about equipment and operations and their impact on climate?** Response 1: NATO has been considering this question and Europe is better at using energy than we are. Currently the most reliable energy is in the form of fossil fuels, and attempts are being made to monitor and improve our carbon footprint. Response 2: The Air Force is attempting to reduce equipment carbon footprint by using simulators. Response 3: Greater demands must be placed on decision-makers to make the right call for specific equipment and more pressure needs to be placed on leaders to put their money where their mouth is when it comes to security and defence. Response 4: We need to ask if we are procuring the right things. For example, Australia bought planes, but is that a priority? Ships were deployed with the Australian fires — perhaps ships are better choices based on the nature and severity of situations Australia faced. Brazil faces a similar situation in dealing with their fires. The point is that there may be a bias toward the familiar when confronting risks that are immediately in front of us.
3. **Is there an expectation that there will be growth in extremism associated with climate change, and are there assessments of climate change fueling extremist activity?** Response: Yes, we see that there is evidence for climate change and extremism. In the case of the failed state of Somalia, 35% of the population are young males who aligned with radical groups to fulfill basic needs including shelter, food, and support. Although different areas have different recruiting pools, the relationship is similar.
4. **Given that the speed of procurement is legendarily slow, and knowing that the government wants net zero emissions, are these factors in planning when decisions today don't come into effect until much later?** Response: The idea of considering climate change/sustainability has only recently begun, and procurement today started five years ago. Perhaps going forward there will be greater emphasis on green procurement, as well as consideration for the future maintenance of purchases made today and the impact maintenance may have for sustainability.

5. **It was suggested that tropical storms have increased as have fires, yet there is sometimes conflicting information. With conflicting information, how are decisions made?** Response 1: Decisions can be made based upon a number of factors, though intensity and severity figure prominently. Response 2: The emphasis is on the demands for service, responding, and calls for help, and less about why something has occurred. Response 3: Findings should be assessed with a certain level of confidence. In the case of sea level rise, etc., numbers may not reflect that change has occurred. One has only to look at the physical evidence to observe reality. Response 4: Data questions really aren't the issue as there are good historical data that clearly indicate changes over time. Perhaps we would be better off looking to the future and what the future holds, rather than being mired in the past. We know, for example, that the atmosphere is holding more water now, today, and we need to look forward as the past won't hold the answers. Response 5: We need to consider the seasonal differences and changes we have seen regarding wildfires, etc., and consider how seasons are likely to look in the future given what we now know.

6. **Is NATO considering its capabilities and best practices and incorporating environmental assessments into operations?** Response: Yes, NATO has the capability to bring together best practices regarding climate change — perhaps even more so than the United Nations and other collaborations.

7. **How is training different now?** Response: From a tactical level, we train to deploy. What we need is more training between partners and better coordination regarding performance among and between organizations.

8. **What is the plan to reduce the carbon emissions from DND — and are there exemptions given politics and ideologies?** Response 1: With respect to the Chuck Hegel comment, he was the person who recently brought climate change to the forefront. Whether we should focus on climate change/disaster versus war preparation/conflict is a somewhat dated orientation as more needs to be done to continue to reconcile these emphases. Response 2: Part of the reason that national security vehicles don't yet meet emission standards is that they must be designed to be effective in all weather. DND is not being lazy with regard to emission standards but is rather trying to evolve so that effectiveness can be combined with environmental standards, but we aren't there yet.

Synthesis: Summarizing the Day's Presentations

- **Major Jean-Francois Lamarche, Canadian Armed Forces**

Having done a lot of research and reflection on the impact of climate change on security in Canada, Lamarche explained that the Arctic is getting lots of attention although climate change is complex and goes beyond the Arctic. The breadth of climate change is wide and strategic implications are broad.

Lamarche explained that a rise in global temp can result in a wide variety of environmental changes. He noted in particular three adverse catalysts associated with climate change: resource scarcity, intensity of natural disasters, and climate-induced migration. First, in terms of resource scarcity, competition for resources is more intense; there is less food and greater demand for it. An increased demand for resources such as energy, wood, or coal might also mean nuclear proliferation.

Second, with respect to natural disasters, Lamarche noted that with an increase in the number of disasters, there are also fewer resources to go around. An increase in natural disasters means that people will be forced to leave their homes and become climate refugees. Migrants usually do not qualify for the same benefits and rights as non-migrants.

Third, Lamarche explained that with climate-induced involuntary migration, estimates are that by 2050, there may be up to one billion climate refugees. He observed that we have already seen that migration

sparks conflict in already unstable regions, including Darfur, Yemen, and the Arab Spring. All of these conflicts were based on lack of resources. During the period 1950-2000, conflicts were in climate hot spots.

Environmental insecurity is a global strategic problem, Lamarche confirmed. Although climate change is not the sole factor causing increasing security concerns, it comes at the same time as the occurrence of other aggravating factors. This nexus of factors has been formally recognized by many countries. Climate change is typically seen as a threat multiplier in the United States. Since the last defence strategy in 2017, Lamarche noted, the number of environmental concerns has increased but there are few answers. While building icebreakers and reducing carbon footprint of contracts is a start, many methods of addressing climate change must be implemented.

Lamarche observed that we have seen a steady increase of domestic deployment over the past few years and this trend has resulted in greater public expectations regarding how and when the military is deployed. In a 2019 interview, Lamarche referred to comments by senior military officials who indicated that the military is being stretched beyond its capabilities. While traditional instruction and combat take up a great deal of time, the addition of increased training expectations associated with dealing with climate change has stressed CAF resources.

Climate change must be addressed on a global scale and our focus should be placed on societal impacts of climate change, Lamarche noted. We may, in fact, need to reallocate funds away from defence to other priorities to most effectively deal with climate change. The U.S.military has shifted focus to large-scale defence — which means that Canada may have to worry even more about the Arctic.

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