INNOVATION OUT OF THE ARCTIC

BRIEF PREPARED FOR:
THE HOUSE OF COMMONS STANDING COMMITTEE ON SCIENCE AND RESEARCH
SCIENCE AND RESEARCH IN CANADA'S ARCTIC IN RELATION TO CLIMATE CHANGE

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Mission: Canada's premier Arctic think tank. We are non-partisan and a registered not-for-profit. By working with Indigenous corporations and Northern governments, the federal government, private sector, expert Arctic leaders, partners, and our like-minded neighbours, think tanks, organizations, and institutions around the circumpolar region and beyond, our mission is to elevate the national conversation about Canada's North and the Arctic region at home and to provide an inclusive and coordinated platform for Canada to engage in Arctic discussions around the world.

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Executive Summary

The often-made argument when asked about the underdevelopment, underinvestment, and economic hardship that is Canada's North is…well, the North is vast with harsh weather and a small population. It is as if the state of the North is inevitable. The North cannot have good things. Through examples of Canada's Arctic neighbours this brief argues that the creation of an Arctic Innovation ecosystem comprised of academia and Indigenous Knowledge, private industry, and government is not only possible, but could contribute to the North's underdeveloped infrastructure, health system, and economy while making the whole of Canada secure and more prosperous.

Recommendations:

1) Canada needs an Arctic science strategy. The strategy must support the aim of an Arctic strategy (needed as well). The science strategy to needs have a governance structure within ISED (which formally connects to multiple federal departments (e.g. Fisheries and Oceans, DND, CanNor, NRCan) to ensure that research supports the federal priorities of its Arctic strategy (which itself should be a reflection of Canada's overall priorities).

2) Innovating out of the Arctic. There needs to be greater emphasis on connecting new knowledge and applied Arctic research and specifically in the area of Innovation. Canada needs to build innovation hubs in the Arctic. To do that requires a strategic plan, dedicated resources, financial mechanisms, and accountability. The hubs must be designed so they can attract world class researchers, industry, and capital North. Examples of focus areas could/should include transportation, infrastructure, defence and other cold weather technologies; mining innovation, and the blue economy.

Introduction: Cold is the New Hot

The often-made argument when asked about the underdevelopment, underinvestment, and economic hardship that is Canada's North is…well, the North is vast with harsh weather and a small population. It is as if the state of the North is inevitable. The North cannot have good things. Through examples of Canada's Arctic neighbours this brief argues that the creation of an Arctic Innovation ecosystem comprised of academia and Indigenous Knowledge, private industry, and government is not only possible, but could contribute to the North's underdeveloped infrastructure, health system, and economy while making the whole of Canada secure and more prosperous.

The absence of both an Arctic Strategy and an Arctic science strategy, is failing to make the most of Canada's world-class academics and Arctic researchers to the benefit of the North and whole

of Canada, not least the opportunities to foster an Arctic innovation ecosystem for innovating out of the Arctic and the betterment of the whole of Canada. Canada's Arctic neighbours made the decision to do so, and the results year on year are growing exponentially.

The Arctic Neighbourhood: Climate change as the Catalyst for Innovation

Climate change is real and not particular to Canada's North. In Canada it affects Indigenous and all Northerners security and well-being and Canada's national security and prosperity. Canada's climate research is focused on both understanding the impacts and challenges of climate change, not least those impacts on Northern communities as well as adaption. However, Canada's approach to adaptation has been largely limited by a particular understanding of academia's utility. It is also limited by the lack of a fulsome Arctic strategy, one that would clearly define the role of research and science in achieving Canada's strategic goals. A window into the Arctic strategies of our Arctic neighbours highlight how the precise challenges posed by climate change are being used as a catalyst to innovate, prosper, secure, and strengthen their own Arctic communities and national security.

Sweden's Arctic Strategy, for instance, focuses on the prominence of its Arctic and the opportunities that its cold climate creates for enabling new innovations to export around the world. According to its Strategy, Sweden's world-leading innovation clusters around its Arctic is where '[k]nowledge is transformed into new products and services through collaboration between business, academia, the public sector, and by small enterprises in sub supplier chains…' The Strategy goes on to state that Arctic conditions like a cold climate and sparsely populated areas make it possible to provide test and demonstration environments for aviation, automotive, and space industries.

Norway's own Arctic Policy, begins by stating that '[f]urther developing North Norway as a strong, dynamic and highly competent region is the best way to safeguard Norwegian interests in the Arctic.' To achieve this, the government will support industry growth in Northern ocean-based industries, the maritime sector, petroleum, green power-intensive manufacturing, mineral extraction, agriculture, tourism, space infrastructure and the services sector. The Norwegian government will also continue to facilitate innovation, entrepreneurship and start-ups in the north and will promote a well-functioning capital market.

Norway's Arctic Cluster Team, for instance, aims to build expertise at all levels, develop innovation, and contribute to the commercialization and scaling of solutions. Its focus areas include new green value chains, digital transformation, and infrastructure for innovative development. The Arctic Cluster Team is made up of large and small organizations that have a

wide range of areas of expertise and come from various parts of the value chain. 'Together they form the industrial center of gravity in the north.'

Finland, home to its Arctic VTT Technical Research Centre, turned a section of the Norwegian-Finnish E8 interstate Arctic highway into a testing track for EV's precisely because the road is snowy, icy, dark and windy, with extreme weather. The road includes built-in sensors to measure vibration, weight, pressure, acceleration, surface slipperiness, etc. Recognising significant global interest in the Arctic and cold regions, the VTT Technical Centre is focused on 'developing knowledge and solutions for reliable and sustainable operation methods for the delicate cold climate environment'. Its focus is on 'creating solutions for sustainable and safe offshore, marine, coastal and infrastructures and operations in harsh and demanding cold climate environments…which are developed by utilizing multidisciplinary research on material and environmental science.'

The challenges of adaptation around building housing on permafrost is another example for turning crisis into innovation opportunities out of the Arctic. The town of Longyearbyen, Svalbard for instance had a pilot housing project consisting of three building blocks worth of new apartments. The project installed sensors into the ground to measure the impacts of steel construction on the changing state of permafrost. That knowledge will be used to build more climate resilient infrastructure going forward. Svalbard is also home to the global seed vault which is facing its own challenges of permafrost melt. Thus, the importance of resilient infrastructure is not to be underestimated.

The housing crisis in Canada's North is not only decades long but, despite investments, is worsening year over year. The North not only needs more houses, including more affordable housing, but houses that are built using new (and to be developed) innovative technologies (e.g. smart, connected, cold-weather and climate resistant materials) that are resilient and able to withstand the impacts of climate change today and into the future. Canada could make the decision that innovating out of the North is possible. It could build a strategy and roadmap with guaranteed strategic investments and financial mechanisms that would help attract private capital and industry North.

A housing incubator could enable Canada's best and brightest researchers (from engineering to architecture) to innovate out of the North and in partnership with Northerners. With strategic focus, resources could be dedicated to finding new cold-weather, sustainable, and culturally appropriate infrastructure solutions for Northern housing and critical infrastructure, more broadly. The impacts of climate change are not reserved only for the North. New infrastructure resilient technologies designed to withstand extreme weather could very well be adapted so that

such technologies can scale and be exported around the world, well beyond Canada's North and the circumpolar region. To do so, however, the necessary national leadership to make the decision to do so with the strategic follow-up required to see it through.

As it stands, Iqaluit's 94-room hotel and conference centre was built in 2019, using modular hotel rooms fabricated in and imported from China. Rather than seizing an opportunity for Canada to innovate, the lack of an Arctic science or innovation strategy for the North has resulted in importing Chinese technologies and built infrastructure where local labour equated to adding 'siding and window trim'.

Adaptation versus Innovation

Where there is Canadian research focused on cold-weather technologies for infrastructure, the technologies are being borrowed from other countries for implementation rather than being created. The Northern Transportation Adaptation Initiative is one such example. While the initiative includes cooperation with Industry, the focus was on adaptation rather than innovation. For instance, the project employs thermo-syphon foundation systems to address permafrost melt. However, the technology itself is patented in, and imported from, the U.S. The subsidiary, Arctic Foundations of Canada, builds, supplies, and installs thermosyphon configurations for the Canadian market. Yet, Arctic Foundations is an Alaskan company, which owns the patent for its technology.

Canada's lack of Innovation out of the Arctic speaks to the broader strategic shortcomings about Canada's approach to its North. The fact that Canada's largest Northern territory does not have its own University is testament in and of itself. Likewise, existing Arctic science and academic expertise is underutilized and carried out without strategic purpose, roadmaps, milestones, or coordination.

Moreover, Canada's current approach towards Arctic science is not keeping up with the scientific trends, commitments, coordinated policies, and innovative potential of our Arctic neighbours. In fact, the knowledge, research, interest, and innovations of non-Arctic states coming out of the Arctic despite not being Arctic states themselves, in cases, supersedes Canada's.

For Canada to catch up, much less keep pace, an Arctic science strategy built from an Arctic strategy is an imperative. It must also include clear linkages to the rest of Canada's federal departments and specific mandates for where and how it will fulfill those aims. Today the reality is that ISED is missing in the North altogether. It has one office in Newfoundland and Labrador, yet Saskatchewan is responsible for the whole of the NWT, Montreal for the whole of Nunavut, and Yukon is represented out of B.C.

Likewise, despite that 75% of Canda's coastline is its Arctic, there is not an Arctic located ocean supercluster. A January 2024, one-off supercluster workshop in Iqaluit had the following takeaways. There are significant data gaps that remain including gaps in baseline data of Arctic resources. There is a shortage of publicly accessible data, no interoperability of existing datasets, and overall insufficient capacity. The Summary Report also highlighted that the Arctic needs long-term thinking, funding commitments, and partnerships that support local capacity. Despite a clear message towards the importance and need for strategic long-terms commitments, the recommendations and next steps provided none.

DND is another example where there is substantial opportunity to innovate out of the North. The 2024 defence policy update, 'Our North, Strong and Free' is argued to be an 'investment in Canada and Canadians…from coast to coast to coast…[and] the advanced technology innovation economy that will define our future'. Towards that aim, the policy calls for 'accelerat[ing] digital transformation and upgrade infrastructure' and a plan to establish Northern operational support hubs. The hubs, according to the policy, will be 'significant opportunities to establish multi-purpose infrastructure that serve the Canadian Armed Forces, other federal partners, territorial governments, Indigenous partners, and northern communities, wherever possible.'

The Defence Policy update aligns with NATO's own perceptions about Arctic innovation. According to a 2021, Strategic Foresight Analysis Report on the Arctic, NATO states that '[by] its very nature, the Arctic will be a region of technological transformation'. The report calls on NATO to increasingly work with the commercial sector to leverage new developments for enhanced predictions and understanding of Arctic operational conditions. NATO's Innovation Fund and DIANA program (Canada is member) are two areas that will likely play a key role in helping to advance those aims.

DND is another such area where and Arctic science strategy connected to a fulsome Arctic strategy would structure and enable collaboration between DND, ISED, academia, Industry, and Northern communities to innovate cold weather defence technologies out of the Arctic with multi-use and multi-purpose potential. One example of this is the U.S. Arctic science policy, which is connected across federal agencies through the United States Arctic Research Commission. The Arctic Research Commission sets research priorities to support the U.S. National Strategy for the Arctic Region and coordinates with US Agencies including the USDA, Commerce, DoD, DOE, Health and Human Services, Homeland Security, Housing, NASA, and NOAA, among others.

Research and Innovation out of the North The incubators, start-ups, innovation clusters and otherwise that are populating the Northern regions of Canada's Arctic neighbours' underscores the lost opportunities by Canada's failure to place strategic focus on its

North. Many in Canada will be quick to charge that Canada is not like other Arctic nations. Canada's North is too big, it has no infrastructure, it is too remote, and the list goes on. Yet, around the Arctic from Greenland to our Nordic neighbours and Longyearbyen, Svalbard at 78 degrees North, innovating out of the Arctic has proven not only possible but successful when leaders decide it is possible and make the strategic policy decisions to do so. Canada is an OECD country, member of the G7, NATO and believes in science. Surely, being able to attain a sustainable, prosperous and secure Canadian North is not a matter of destiny. It is a matter of decision.

Research and Innovation in Canada's North: The Future Comes Down to Decision

Canada's current state of Arctic research mirrors the broader Canadian consciousness of the value, potential, and role of the North. Where Canadians see challenges, crises, and impossibility, our Arctic neighbours see opportunity for research and innovation. They know that strong Northern regions are the key to being strong Arctic nations and they make the necessary strategic investments. The many conversations taking place around Canada regarding R&D, Innovation, start-ups, VC and pension fund investments rarely, if they ever do, focus on the North, innovating out of the North, or that Canada's North has a valuable much less invaluable role to play in Canada's potential for global leadership on the global stage.

Such discussions, however, first require a national vision – an Arctic vision of what Canada wants its Arctic to be in 2030, 2040, and going into the second half of the 21st century. It also requires leadership and strategic thinking realised through an Arctic science strategy that connects the dots between science, Innovation, defence, capital investments, and building Northern capacity and infrastructure. Arctic science, as such becomes the intersection of the production of knowledge and applied research with the strategic mandate to help create the solutions required to address the needs of Northerners, enable a sustainable, secure, and prosperous North, and advance Canada's Arctic prosperity, security, and leadership.

Northerners exclaim that they want to thrive and not just survive. Yet, when it comes to all things North, Canada seems to be stuck in an outdated narrative based on a world and Arctic that no longer exists. Canada's Arctic conversation is stuck in a time when global politics was not Arctic politics, the Arctic was the only front lines of climate change, Indigenous self-determination was an aspiration rather than legal reality, and the Northern regions of our Arctic neighbours were not their greatest national strengths.

While there is a belief by some Canadians that the Arctic belongs in a snow globe the rest of the world is building net-zero energy systems, bridges, and boats where there was once ice. At some

point, Canada needs to think differently and to think bigger. If the answer is always going to be to throw up our hands and exclaim - we are not our Arctic neighbours, the North is too cold or it is too hard to solve our problems much less turn them into opportunities, then it begs the question as to whether our North can or should be ours at all.

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