POLAR
POLAIRE

Polar Knowledge Canada

Science and Technology Framework

2020-2025

Polar Knowledge Canada | Savoir polaire Canada

Canada

Introduction to the Science and Technology Framework 2020-2025

Overview

Rapid and unprecedented climate change is occurring in the circumpolar Arctic, leading to ecological changes in northern ecosystems[1]. In addition, the state of community health and infrastructure in the Canadian Arctic is also complex, with urgent, interrelated issues requiring innovative solutions. The situation demands practical, economically effective, sustainable solutions – solutions that are culturally appropriate and built on a solid foundation of new knowledge.

POLAR will support northern communities in making decisions as they build a future in which they are healthy and thriving, and in so doing, POLAR will contribute to a sustainable world. Through its Science and Technology (S&T) Framework 2020-2025, POLAR will bring together diverse groups of experts who will create purpose-driven knowledge that addresses the most pressing needs Northerners have identified.

1. IPCC, 2018; Meakin and Kurvits, 2009

The S&T Framework is guided by POLAR's Strategic Plan and sets the context for an implementation plan that will be co-developed by POLAR and its partners. The implementation plan will outline in greater details how POLAR will work together with Indigenous, scientific and technological experts to create the new knowledge that is so urgently needed in order to understand and adapt to a rapidly changing Arctic. POLAR commits to returning this new knowledge to northern communities and decision makers in a timely manner. The Framework is organized into the following sections:

- **Introduction:** Provides an overview of the Framework
- **Context, scope and implementation:** Explores the drivers behind the creation of the Framework, its scope, and discusses how new knowledge will be co-created and mobilized with Indigenous partners
- **The Science and Technology Framework:** Describes the S&T Framework through its three goal areas and associated focus areas.

Goals

Goal 1 — Improving knowledge of dynamic northern terrestrial, freshwater and marine ecosystems in the context of rapid change

Goal 2 — Increasing understanding of the connections between northern community wellness and environmental health

Goal 3 — Advancing sustainable energy, technology and infrastructure solutions for the unique environmental, social and cultural conditions in the North

About Polar Knowledge Canada

A sustainable future guided by knowledge and collaboration

POLAR is a federal agency established in 2015 under the *Canadian High Arctic Research Station Act* to undertake and support locally relevant and globally significant knowledge creation. Its vision – a sustainable future guided by knowledge and collaboration – is directly linked to its mission, which is to advance and mobilize knowledge of the polar regions through leadership, partnership and collaboration on polar science and technology.

POLAR's mandate includes advancing knowledge of the Canadian Arctic to improve economic opportunities, environmental stewardship and the quality of life of its residents and other Canadians. POLAR recognizes the value of synthesizing research results from across disciplines when providing information needed for evidence-based decision making, and encourages this approach. These activities are complemented by the promotion of the development and dissemination of knowledge of other circumpolar regions, including the Antarctic.

As part of its mandate, POLAR is responsible for strengthening Canada's leadership on Arctic issues. POLAR delivers a Science and Technology Program and a Knowledge Mobilization Program, and operates the Canadian High Arctic Research Station (CHARS) campus in Cambridge Bay, Nunavut.

About the CHARS campus

The CHARS campus is a world-class facility and a hub for monitoring, research and knowledge mobilization. An important platform for collaboration in Nunavut's Kitikmeot region, the campus welcomes researchers from around the world to work with Kitikmeot experts on improving understanding of the region and how it is changing.

Knowledge Sharing Centre

Geographic Information System (GIS) laboratory

Teaching laboratory

Context, scope and implementation

Setting the context for the Framework

There are many drivers behind the development of the S&T Framework, including climate change, reconciliation, and evolving government policy. Some, but not all, of these drivers are outlined below.

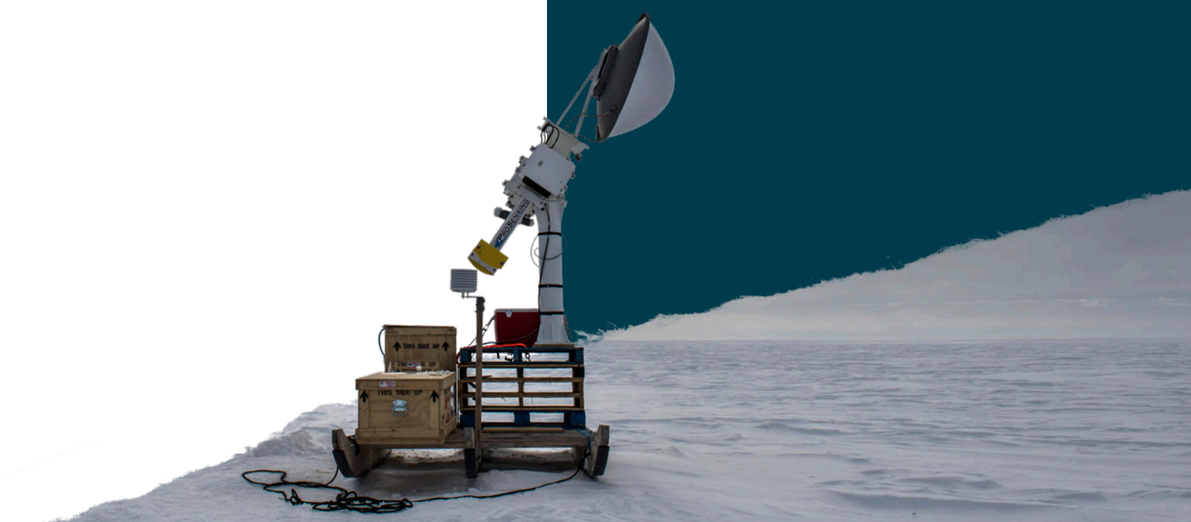
- The air temperature in Canada's Arctic region is warming at a rate of at least double the global average[2]. These shifts have social, cultural and economic effects on northern communities in Canada, including impacts on country foods, housing stability, human health, tourism, shipping and safety.
- Recent advancements in Canada such as the Truth and Reconciliation Commission's Calls to Action, the 2018 Principles Respecting the Government of Canada's Relationship with Indigenous Peoples and the recognition and implementation of an Indigenous Rights Framework are leading to significant changes to relationships with Indigenous Peoples in support of reconciliation.
- The Government of Canada is investing $3.8 million[3] in a strategic plan to identify new ways of doing research with Indigenous communities to advance reconciliation.
- Supporting the implementation of the Arctic and Northern Policy Framework.
- The Government of Canada's Science Vision, which has led to a $10 billion[4] investment since 2016 to strengthen science, supports evidence-based decision making and nurtures a culture of curiosity and creativity in Canada.
- The Government of Canada's 2018-2020 National Action Plan on Open Government "represents an earnest attempt at co-creating and building a common platform for shaping and influencing the actions and policies of government."[5]
- The 2018 Arctic Council Agreement on Enhancing International Arctic Scientific Cooperation "encourages holders of traditional and local knowledge to participate in scientific activities under the Agreement."[6]
- Inuit Tapiriit Kanatami's (ITK) 2018 National Inuit Strategy on Research identifies "areas for partnership and action that can strengthen the impact and effectiveness of Inuit Nunangat research for Inuit".[7]
- POLAR's 2018 Northern Housing Forum, which created a constructive conversation with diverse experts in the northern housing domain as well as community members, focused on identifying specific solutions and recommendations to address the well-known and complex northern housing challenges.
- Under the CHARS Act, the President of POLAR is responsible for submitting to the Board for approval a Science and Technology plan by the year 2020.

2. Meltofte, 2013; AMAP 2017; IPCC 2018; Bush and Lemmen, 2019
3. https://www.ic.gc.ca/eic/site/131.nsf/eng/h_00000.html
4. https://www.ic.gc.ca/eic/site/131.nsf/eng/h_00000.html
5. https://open.canada.ca/en/content/canadas-2018-2020-national-action-plan-open-government
6. https://arctic-council.org/index.php/en/our-work2/8-news-and-events/488-science-agreement-entry-into-force
7. https://www.itk.ca/national-strategy-on-research/

POLAR's added value: Synthesis and collaboration

POLAR will bridge knowledge gaps by forging relationships and sharing information. This collaborative, interdisciplinary approach constitutes the focus of the CHARS campus and the exchanges through which POLAR will advance and mobilize polar knowledge.

POLAR will synthesize information from across disciplines, including Indigenous knowledge, into accessible resources that provide policy-makers with insights needed for evidence-based decision making.



Scope of the Framework

The Framework encompasses the natural and, increasingly, social sciences across the North. This framework puts a specific, higher-resolution focus on natural sciences in the geographic region around the CHARS campus, referred to as the CHARS Environmental Research Area (ERA). This area includes the communities of Ulukhaktok, Kugluktuk, Cambridge Bay, Gjoa Haven, Taloyoak and Kugaaruk.

The Framework covers POLAR's knowledge creation and mobilization activities. These activities help create an environment in which both Indigenous knowledge and science contribute to addressing challenges in the North.

The Framework will be reviewed on a regular basis over the next five years to ensure ongoing relevance, build on lessons learned, and to continually improve POLAR's approach to creating and mobilizing new knowledge.

Ulukhaktok

Kugluktuk

Cambridge Bay

Gjoa Haven

Taloyoak

Kugaaruk

How the Framework was developed

As a first step, POLAR conducted a comprehensive review of existing statements of northern research priorities and strategies. POLAR then engaged with Northerners (Indigenous and northern organizations and governments, as well as academic institutions) and other Canadians to identify the most important knowledge gaps in Arctic natural and social sciences as well as energy, waste, wastewater and housing technology development, testing and demonstration. POLAR heard important messages about how new knowledge should be applied and shared, as well as key principles and approaches to be considered when conducting science in a northern context.

POLAR integrated the results of its targeted engagements with information from the development of the Arctic and Northern Policy Framework and other relevant work from national Indigenous organizations, the federal government, territorial governments, northern educational institutions, non-governmental associations and national organizations. The mandates and programs of other northern organizations were also considered.

Methodology

Comprehensive review of existing statements of northern research priorities and strategies;

Engagement sessions: Hosted 75 organizations across 17 northern communities at meetings;

Call for input: Received 380 online survey responses from Canadians more broadly;

Document review: Analyzed documents, including input from the Arctic and Northern Policy Framework consultations;

Public review of the draft S&T Plan: Reviewed by close to 70 individuals and organizations from five northern regions (Nunavut, Northwest Territories, Yukon, Nunavik, and Nunatsiavut);

Guided by the Framework the next step is the codevelopment of an implementation plan.

Implementation

“While a lot of research is conducted in the North, Arctic research agendas, questions and methodologies are often determined in the South… and Arctic communities are often not meaningfully engaged, consulted or informed.”

Ikaarvik & Ocean Wise

Following the initial engagement efforts and additional feedback received, POLAR committed to a co-development process to implement the S&T Framework. The process will include Inuit, First Nations, Metis and Northerners.

The implementation plan will identify co-developed priorities, detailed research questions, methods and activities to advance toward three interrelated goals.

Under the plan, new knowledge will be co-developed through collaborative analysis of research findings from multiple disciplines. It will then be synthesized and disseminated in a timely manner nationally and internationally as accessible information products.

Implementation will be guided by the key principles outlined in Figure 1 on page 14.

POLAR will achieve its results through:

Direct delivery: POLAR using its own staff and operating funds to collaborate with those who have shared objectives.

In-kind support: POLAR offering researchers access to the CHARS campus and to technical support from POLAR staff, and by welcoming researchers from around the world to work with Kitikmeot researchers to focus on understanding the region and how it is changing.

Funding support: POLAR providing grants and contributions aligned with POLAR’s objectives to qualified external recipients through open, competitive funding processes.

Leveraging external capacity: POLAR influencing others to work on the priorities of northern residents to achieve shared goals and create new knowledge that is locally relevant and globally significant.

POLAR strives to decrease barriers and increase opportunities for Indigenous and local leadership by supporting skills development, facilitating career exposure, and inspiring Indigenous youth to pursue education in Science, Technology, Engineering and Mathematics (STEM) subjects.

By recognizing Indigenous Peoples as equal partners with legitimate authority, and including them in the decision-making process, POLAR will demonstrate leadership in how the Government of Canada approaches research, policy development and governance in the spirit of reconciliation.

Figure 1 Key principles and practices guiding implementation

Co-development

Engage with Indigenous partners to co-develop an implementation plan, which would include fundamental principles of working together, priorities, methods and approaches.

Collaboration

Collaborate with northern and Indigenous communities and organizations, other government departments, research institutions and the private sector, and leverage resources to deliver on the Framework and implementation plan.

Capacity building

Build capacity for community-based monitoring and northern-led research among Indigenous and local leadership.

Community involvement

Support community leadership in knowledge creation initiatives, training and knowledge mobilization.

Knowledge mobilization

Ensure Indigenous knowledge and scientific findings create new knowledge that is made available to all Canadians for use in policy and decision making, and tailor knowledge products to different audiences.

Data management

Facilitate improved data stewardship and use standard methodologies, where available, to ensure that metadata and data generated are findable, accessible, and ethically open whenever possible.

The S&T Framework 2020-2025

The S&T Framework includes three interrelated goals based on input gathered through northern and public engagement activities.

Goal 1

Improving knowledge of dynamic northern terrestrial, freshwater and marine ecosystems in the context of rapid change

It is recognized that knowledge is necessary at local, regional and global scales to better inform models and predictions. Possible activities where POLAR and its partners could focus their efforts include:

- **Collecting baseline information** on terrestrial, freshwater and marine ecosystems, including abiotic elements such as the cryosphere (permafrost, snow and sea ice); and
- **Monitoring and integrated modelling** of terrestrial, freshwater and marine ecosystem changes where baselines have been established.

It is anticipated that specific attention will be paid to country foods, the state of food webs and species of conservation concern.

Progress toward this goal will result in better understanding of northern ecosystems and their interactions, and the identification of key species for assessment and monitoring.

High snow goose populations have a major effect on some Arctic ecosystems

Lichen is an important food for arctic herbivores

Tiny springtails (collembola) are common in the Arctic

Goal 2

Increasing understanding of the connections between northern community wellness and environmental health

It is recognized that Northerners could benefit from a better understanding of how changes in the environment affect food security, community well-being and traditional lifestyles. Possible activities where POLAR and its partners could focus their efforts include:

- **Community-led research** (in ecosystems with long-term datasets) **on abundance and diversity** of country foods and their predators, including their habitats and how these changes affect food security and wellness;
- **Enhancing knowledge of diseases** in northern wildlife, including impacts on country foods; and
- **Better understanding of the effects of environmental change** on community wellness.

Progress toward this goal will result in improved community wellness and better understanding of:

- Fish and wildlife population health and dynamics (e.g. demographics, trends, body conditions, disease incidence) and their implications on country food quality and supply;
- The effects of local pollution and human activities on the environment (e.g. air quality, water quality) and community wellness; and
- The connections between human activities and environmental impacts.

Muskox on Victoria Island

Arctic char research

Cambridge Bay, Nunavut

Goal 3

Advancing energy, technology and infrastructure solutions for the unique environmental, social and cultural conditions in the North

It is recognized that Northerners have concerns over water quality and interest in additional cost-effective options for waste and wastewater management, alternative and renewable energy solutions, and building technologies designed for northern conditions. Possible activities where POLAR and its partners could focus their efforts include:

- **Supporting the testing and demonstration of clean energy solutions** (e.g. energy storage, biofuels, advanced renewable energy technologies) by industry, government and academia prior to technology deployment in remote northern communities, including the support of pre-commercial and commercially available technologies;
- **Improving waste and wastewater treatment** by supporting new and emerging technologies (e.g. waste-to-energy, grey and black water, green-housing, recycling) that decrease pressure on landfills and improve water quality. This will help to reduce health risks associated with open burning and leaching of contaminants into the environment; and
- **Facilitating the development of innovative, affordable and culturally adapted homes** that can be constructed and maintained using sustainable materials and the capacity available within communities.

Progress toward this goal will result in better understanding of:

- Suitable energy, waste, wastewater and housing technologies for remote northern communities; and
- The unique cultural, environmental and technical considerations for northern housing.

Smart meters monitor electricity use for clean energy research

Solar tracker collects data to determine potential for solar power generation

Experimental solar panels on CHARS campus Main Research Building

Polar Knowledge Canada

Science and Technology Framework

2020-2025

Polar Knowledge Canada | Savoir polaire Canada

Canada

Our Vision

A sustainable future guided by knowledge and collaboration

Overview

This is a summary of Polar Knowledge Canada's Science and Technology (S&T) Framework 2020-2025.

Developed with the input of Indigenous and northern communities and other Canadians, the Framework will be used to guide the co-development of an implementation plan. That plan will outline how POLAR will collaborate to deliver on the Framework including the co-development of priorities, methods and approaches.

Purpose

The purpose of the S&T Framework is to outline how POLAR will work together with Indigenous, scientific and technological knowledge holders to create, synthesize and mobilize knowledge to better understand and adapt to a rapidly changing North. Returning knowledge to the hands of northern communities and decision makers supports sustainable and evidence-based decision making.

Key principles and practices guiding implementation

- **Co-development**
- **Community involvement**
- **Collaboration**
- **Knowledge mobilization**
- **Capacity building**
- **Data management**

Goals What knowledge or solution gap is to be filled?	Advancing knowledge What changes could be derived and/or new knowledge developed?	Mobilizing knowledge How could outputs be used and shared?
Goal 1 Improving knowledge of dynamic northern terrestrial, freshwater and marine ecosystems in the context of rapid change	▪ Understanding of northern ecosystems and their interactions ▪ Identification of species for assessment and monitoring	▪ Knowledge, data and results exchanged with and used by national and international networks ▪ Summaries provided to local, regional and national decision makers ▪ Activities complement those of local, territorial and federal organizations
Goal 2 Increasing understanding of the connections between northern community wellness and environmental health	▪ Understanding of fish and wildlife population health and dynamics and their implications on country food quality and supply ▪ Understanding of the effects of local pollution on the environment and community wellness ▪ Understanding of the connections between human activities and environmental impacts ▪ Improved community wellness	▪ Activities to support and complement work of territorial and federal governments, national Indigenous organizations and academic networks
Goal 3 Advancing sustainable energy, technology and infrastructure solutions for the unique environmental, social and cultural conditions in the North	▪ Understanding of suitable energy, waste and wastewater technologies for remote northern communities ▪ Understanding of the unique cultural, environmental and technical considerations for northern housing ▪ Decrease in diesel dependency ▪ Adoption of suitable technologies ▪ Reduced long-term health and environmental impacts associated with water and waste treatment ▪ Holistic approach to improved housing	▪ Data, results and knowledge to inform decision-makers, local communities and technology developers ▪ Activities to complement those of federal organizations and academic networks

info@polar-polaire.gc.ca

	English	Français
Twitter	@POLARCanada	@POLAIRECanada
Facebook	@PolarKnowledge	@Savoirpolaire
Instagram	@polar.knowledge	@savoir.polaire

Website (English)
canada.ca/polar

Website (French)
canada.ca/polaire