



**Institut nordique
du Québec**
Together for the North

**ACTIVITY
REPORT**
2019-2020



INQ at a Glance



16

Quebec university member institutions



250+

affiliated researchers



90+

affiliated research entities
(research centres, laboratories, institutes, and groups)



62

research chairs
with an INQ-affiliated chairholder



4

founding nations
(Inuit, Cree, Innu, and Naskapi of Kawawachikamach)



\$700,000

for a joint call for projects
with Sentinel North



3

INQ research chairs



15+

outreach activities in 2019-2020



100+

research projects underway in
Northern Québec and the Canadian Arctic

Vision

The INQ's vision is to develop a sustainable North through innovation and knowledge creation, and by integrating western science with local and traditional knowledge. In partnership with communities, government authorities and the private sector, INQ aims to help secure the well-being of all people in northern Quebec and the Canadian Arctic, now and in the future, by ensuring access to clean energy, conserving healthy ecosystems and the services they provide, building viable infrastructure, supporting economic prosperity and vibrant cultures, and strengthening northern education and healthcare systems.

Mission

INQ's mission is to unite the stakeholders in northern and Arctic research (natural sciences and engineering, health sciences, social sciences, and humanities) to promote innovation, and to create synergy between researchers and the end-users of research so as to provide governments, northern communities, and the private sector with the knowledge and expert workforce required for the sustainable development of Northern Québec and the Canadian Arctic.





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A team dedicated to bringing together expertise in northern research

Introduction

The activities conducted by Institut nordique du Québec (INQ) are attracting an ever-growing and ever more inclusive research community. In a spirit of partnership and collaboration, INQ now boasts 257 researchers spread over 16 universities across Québec.

The vibrancy of northern research in Québec is reflected throughout this 2019-2020 Activity Report. In it, new research maps illustrate the impressive reach of our researchers, students, research Chair members, and partners across the vast North.

This vitality is also evident in the success of the calls for projects launched in collaboration with Sentinel North, and in the promising early days of the two selected research projects.

With an updated governance structure and a strong core network, INQ is well positioned to continue fulfilling its mission to promote northern research in conjunction with Indigenous nations. Its accomplishments are the result of several years of consultations, innovation, and growth in its activities. This effervescence is, in no small part, due to the dedication and passion of outgoing science and innovation director, Louis Fortier.

Over the years, Louis Fortier drew on his colossal experience as a northern researcher to forge a strong and inspirational identity for INQ. Now retired, Fortier leaves behind a flourishing institute in tune with the preoccupations of the research community and northern communities alike.



Jean-Éric Tremblay
Acting Chair, Institut
nordique du Québec
Implementation Committee

René Therrien
Chair, Institut nordique
du Québec Implementation
Committee

Eugénie Brouillet
Chair, Institut nordique
du Québec Executive
Committee

Brigitte Bigué
Director, Administration
and Development, Institut
nordique du Québec



Fishing camp, Lake Surrey,
Kitikmeot region in Nunavut



Press conference at the funding announcement for the construction of the INQ science complex.

INQ science complex takes shape

With its new science complex, Institut nordique du Québec will be even more of a unifying force! A technological and knowledge hub for research on northern development, this pavilion, unique in Canada, will foster northern innovation, interdisciplinarity and teamwork. It will consolidate partnerships developed with northern communities and Indigenous nations, INQ's 15 member universities, the college network and public and private-sector stakeholders.

The funding and construction of this flagship infrastructure for northern research—a major \$83.5 million project—was announced on August 17, 2018, at Laval University. This innovative project has received backing from the Government of Canada (\$25.5 million); the Government of Québec, through Société du Plan Nord (\$27.5 million); and the City of Québec (\$5 million). The remainder of the funding will be contributed by Laval University and its partners. Construction is slated to begin on the complex in 2022.

The INQ pavilion will be the standard-bearer for research devoted to providing answers to the immense challenges related to sustainable development and the upheaval in communities brought about by climate change. It will bring together, under one roof, social sciences and humanities, natural and health sciences and engineering. Its specialized facilities will include laboratories, storage space and workshops for technological innovation and the preparation of terrestrial and marine missions in the North.

With a view to encouraging partnership and knowledge transfer, the complex—the only one of its kind in the country—will house a videoconferencing room for communicating with northern communities and other partners. It will also boast spaces dedicated to training and research end-users.

A growing network

INQ will expand its infrastructure network to better serve local communities and researchers alike. In the coming years, INQ hopes to set up new infrastructure in the Eeyou Istchee-James Bay territory and north of the Saguenay-Lac Saint-Jean region, in collaboration with Université du Québec à Chicoutimi and Université du Québec en Abitibi-Témiscamingue.

REGIONAL RESEARCH STATIONS INQ – AFFILIATED RESEARCH STATIONS

INQ, in collaboration with Société du Plan Nord, has also developed components designed to meet the research needs of communities. These projects are aimed at different regions of the territory covered by the Plan Nord and will ensure INQ's territorial representivity.

Uapishka Research Station in the heart of the Groulx Mountains

This region holds considerable potential for the development of traditional knowledge and scientific research. The uniquely located Uapishka Station is situated in an area that boasts a rich variety of northern ecosystems and remarkable geological phenomena, all within an extraordinary Indigenous heritage setting.

A partnership has been forged between Université du Québec à Rimouski, the Uapishka Research Station and INQ, to enhance research infrastructure in the North. The Uapishka Research Station is a research facility nestled in the foothills of the Groulx mountain range north of the 51st parallel, on the edge of the Manicouagan Reservoir. It offers a setting conducive to northern studies and meets the objectives INQ has set for itself, namely in terms of access to a territory where scientific research has been scarce to date.

Located within the Pessamit Nitassinan on a UNESCO designated territory, the Uapishka Station offers accommodation, meals and logistics support services for scientific research. Open year-round, the station is staffed, in majority, by Indigenous employees.

Umiujaq Research Station in Nunavik

The station is widely used by Canadian and foreign researchers to study climate dynamics, permafrost and sub-Arctic ecosystems. To meet the growing demand for access by researchers, some major expansion and relocation work is planned for this station that has been operated by Centre d'études nordiques (CEN) since 2010. Its administrators are hoping to use this expansion opportunity to innovate and build a test bed to demonstrate new, more eco-friendly and energy-efficient building techniques. Sensors for various energy efficiency parameters will be installed to assess the building's energy efficiency, making this infrastructure a valuable laboratory for demonstrating building techniques adapted to conditions in the North. The new building will be able to accommodate ten people instead of the six that it can currently house. There are also plans to include a room for training and knowledge transfer that will be available to the members of the community.



Station Uapishka



Kangiqsujuaq Landscape

Governance changing with the times

INQ is garnering attention and expanding its membership and its permanent infrastructure is growing fast. To reflect this progress, INQ has undertaken an overhaul of its governance, committees and organizational structure. This is necessary to ensure the Institut's responsible and inclusive growth.

With the implementation phase complete, the implementation committee was dissolved in June 2019. It will be replaced by the scientific and development committee starting in Fall 2020. The current working groups have, for the most part, become permanent committees made up of representatives of INQ's members and partners.

OVERVIEW OF THE MEMBERSHIP

Regular members	Affiliated Researchers	Affiliated Centres	Affiliated Chairs
École de technologie supérieure	3	1	0
École nationale d'administration publique	2	1	0
Institut national de la recherche scientifique	18	4	4
Polytechnique Montréal	7	2	2
Concordia University	4	0	0
Université de Montréal	10	5	2
Université de Sherbrooke	11	8	3
Réseau de l'Université du Québec	0	0	0
Université du Québec à Chicoutimi	15	10	9
Université du Québec à Montréal	15	5	4
Université du Québec à Rimouski	20	8	5
Université du Québec à Trois-Rivières	5	2	1
Université du Québec en Abitibi-Témiscamingue	2	1	0
Université Laval	70	12	18
McGill University	70	16	14
Université TÉLUQ	0	0	0
Associate Members			
Geological Survey of Canada	1		
Laurentian University	1		
University of Ottawa	1		
University of New Brunswick	1		
Université du Québec à Chicoutimi	1		
Total	257	75	62

A growing and vibrant institute

Increasing fuelled by the drive and determination of partners to develop a sustainable North, INQ expanded its membership over the past year. The stakeholders united within INQ now represent higher learning and research institutions from every corner of the province. Here is an overview of the INQ regular members who are leading the way in northern research in Québec.



École de technologie supérieure

ÉTS researchers are contributing to the sustainable development of the North by focusing their efforts on the impacts of climate change on the hydrology of northern regions. They are also interested in the energy sector, specifically dielectric materials, and the effect of ageing insulating systems used in electrotechnics.



École nationale d'administration publique

The researchers at ÉNAP with a focus on the North are renowned for the remarkable quality and complementarity of their work. Some are looking at matters of governance and diplomacy specific to Indigenous communities as reflected in the political discourse and in social media. Others are focusing on government and political science, including an analysis of the factors contributing to both conflict and cooperation among states; nordicity as a component of identity in Canada and Québec; and the role of the Canadian Armed Forces in delivering government services in the North.



Institut national de la recherche scientifique

Three of the four centres that make up INRS are actively involved in INQ'S activities. Eau Terre Environnement Research Centre is devoted to Québec's sustainable development in hydrology, aquatic biogeochemistry, earth sciences, sanitation and reclamation. Armand-Frappier Santé Biotechnologie Research Centre has developed a unique expertise in the areas of human and animal health and sustainable environments, specifically in environmental biotechnologies and environmental toxicology. Urbanisation Culture Société Research Centre, through the DIALOG network and the ODENA alliance, provides leadership in the field of Indigenous studies, supports the social, economic, political and cultural development of Indigenous peoples and offers an innovative space for dialogue between First Peoples and academia.



Polytechnique Montréal

Polytechnique Montréal contributes to the development of the North and northern communities, notably through its engineering research and training. Dams and infrastructure, glaciology, geotechnics and permafrost, environmental engineering, structural geology, hydrology of cold regions, water quality modelling, geothermal energy, mining exploration and operations, and rare earth metals are just some of the areas of specialization in which researchers at Polytechnique Montréal bring their unique expertise to INQ's work. Not only do they contribute by creating knowledge, but also by adapting civil and industrial infrastructure in the face of climate change and the transition to a more sustainable society.



Université Concordia

Concordia University is active in the field of renewable energies. A technical and economic feasibility study on the potential for geothermal systems in Nunavik is underway, with a view to improving access to cleaner energy for remote communities in Nunavik.



Université de Montréal

Université de Montréal is a catalyst for interdisciplinary and interinstitutional initiatives in both animal health and climate science. The university is a pioneer in northern arts studies and in research into the rights of First Peoples and is always at the vanguard on issues relating to territory and societies. Its numerous innovation labs are currently hard at work incorporating knowledge related to experience, memory, culture, heritage, narratives and research. In a perspective of recognition and reconciliation, the university is striving to improve the integration of First Nations and Inuit peoples as well as their philosophies and cultures.



Université de Sherbrooke

Researchers at Université de Sherbrooke are working on the characterization of water and snow in the North. They also specialize in remote sensing and geographic information systems (GIS) and are studying the complex relationships between human activity, climate change and natural risks in the North.



Réseau de l'Université du Québec

The member institutions of the Université du Québec network are conducting a wide range of teaching, research and creation and community services for, by and with various actors and communities in Northern Québec. They are engaged in diverse fields, including the health and development of Indigenous communities, traditional knowledge, promotion and sustainable use of natural resources, ecosystem conservation and climate change. The team at Université du Québec actively supports initiatives put forth by the institutions and their partners and stimulates collaboration to develop relevant, innovative and collective solutions to the major challenges affecting the future of northern territories and their inhabitants.

UQAC

Université du Québec à Chicoutimi

The university boasts expertise in regional initiatives, land planning and use, history and archaeology, economy of the North and eco-consulting. UQAC has also made a name for itself in risk management in remote areas, whether for tourism engineering or the development and safe implementation of outdoor activities (touristic, educational, industrial or scientific).

UQÀM

Université du Québec à Montréal

At UQAM, 14 departments work in the North and Arctic. The training activities dedicated specifically to the North are divided into many disciplines: history, politics, tourism, literature, the arts, religious sciences, linguistics and sociology. UQAM researchers collaborate with Indigenous communities on projects to analyze social, cultural, economic and environmental issues related to the North and the wintry world. The UQAM Northern and Arctic Research Portal, available online, chronicles the research and training activities related to the North and the Arctic that are carried out or organized at UQAM. This portal also aims to strengthen links between researchers from different disciplines and promote the development of multisectoral training activities.

UQAR

Université du Québec à Rimouski

UQAR is home to a diverse group of researchers who focus on northern environments from an interdisciplinary perspective. This critical mass of researchers is spread across several departments, as well as Institut des sciences de la mer, BORÉAS institutional research group, the Uapishka Research Station and five Canada Research Chairs which focus on northern biodiversity, integrative biology of northern fauna, geochemistry of coastal ecosystems, coastal geosciences and marine geology.



Université du Québec à Trois-Rivières

UQTR boasts a dynamic environmental science department and is innovative in research on tourism, economics, engineering and health sciences. Its researchers have developed an interdisciplinary approach to understanding the transformations in northern ecosystems and the cryosphere. Experts in psychoeducation are helping improve services to the Inuit, while UQTR-trained midwives are assisting in childbirth and playing a vital role in Nunavik communities.



Université du Québec en Abitibi-Témiscamingue

From the study of hydrogeological dynamics of aquifers north of the 49th parallel, to analyzing the impact of mining sites on northern biodiversity and developing best practices in ethical research in an Indigenous context, UQAT has positioned itself as a pioneer in participatory research with First Peoples. UQAT researchers have a strong and recognized expertise in forestry. As a result, UQAT hosts l'Institut de recherche sur les forêts (IRF), whose mission is to contribute to the maintenance of forest ecosystem services through an interdisciplinary approach to research, training, and the dissemination and integration of knowledge among the territory's many users.



Université Laval

A pioneer for over half a century in northern and Arctic research, Université Laval is home to several major interuniversity research centres, including Centre d'études nordiques (CEN), Québec Océan (QO) and Centre interuniversitaire d'études en recherches autochtones (CIÉRA). It oversees the Sentinel North research program and is home to Institut nordique du Québec and ArcticNet, three front-line northern research initiatives. CCGS Amundsen, a state-of-the-art research icebreaker deployed in the Arctic Ocean and Takuvik Joint International Laboratory (CNRS/UL), which is devoted to remote sensing of Canada's new Arctic frontier, are also hosted by Université Laval.



Université McGill

McGill University is the architect of the Centre for Indigenous People's Nutrition and Environment, as well as the Centre for Indigenous Conservation and Development Alternatives, the Quebec Centre for Biodiversity Science, the McGill Arctic Research Station and the McGill Institute for the Study of Canada. The mission of the RUIS McGill integrated university healthcare network is to provide Quebecers with improved access to healthcare. It is responsible for a territory stretching from Montreal to Nunavik, where it facilitates the delivery of care to inhabitants, along with teaching, research and the evaluation of healthcare technologies.



Université TÉLUQ

With an outlook that's open to the world, Université TÉLUQ encourages and promotes learning at all stages of life and helps develop knowledge by offering a vast selection of online programs and courses available from anywhere in the world. Its training activities are innovative and stimulating, both in terms of their content and pedagogical approach. Université TÉLUQ's teaching staff is devoted to developing new knowledge, high-level research and educational innovations.

Leading research centres

INQ's affiliated research centres provide varied expertise to Québec's communities in fields ranging from social sciences and the environment to engineering and health. Nearly one hundred such centres are involved in INQ's research programming. Following is an overview of some of the centres at the core of the dynamic northern research scene:



Terrestrial and aquatic environments

Founded in 1964, Centre d'études nordiques (CEN) is a pioneer in northern research in the province, with over 300 researchers, students, interns and professionals from 10 Quebec universities and one college. CEN contributes to the sustainable development of northern regions by fostering an understanding of, and the ability to, predict the changes affecting these environments. Its infrastructure network, made up of 10 research sites spread over a swath of territory stretching some 4,000 km in length, is crucial for northern researchers. CEN also spearheads the SILA network, whose objective is to characterize, quantify and evaluate environmental change. This network comprises over 100 automated stations acquiring data on a variety of environmental variables in eight bioclimatic zones across Northern Quebec and the eastern Canadian Arctic. In addition, CEN manages the freely accessible, online Nordicana D collection, which was created to deal with the ever-increasing amount of data generated by CEN's work and to meet the growing demand for access to it.



Society and culture

The International Laboratory for the Comparative Multidisciplinary Study of Representations of the North, located at Université du Québec à Montréal (UQAM), is a centre for research, documentation and expertise on the northern and winter imaginary in literature, film, the visual arts and popular culture. It compares different northern cultures (Québécois, Inuit, Scandinavian, English-Canadian and Finnish). Since its founding in 2003, the International Laboratory has assembled some fifteen researchers at nearly a dozen universities (Québec, Sweden, Finland, Denmark, France, Israel, Canada, Germany, England, Iceland and Spain). The Laboratory boasts a number of collections and has published books in 14 languages of the North and the Arctic.



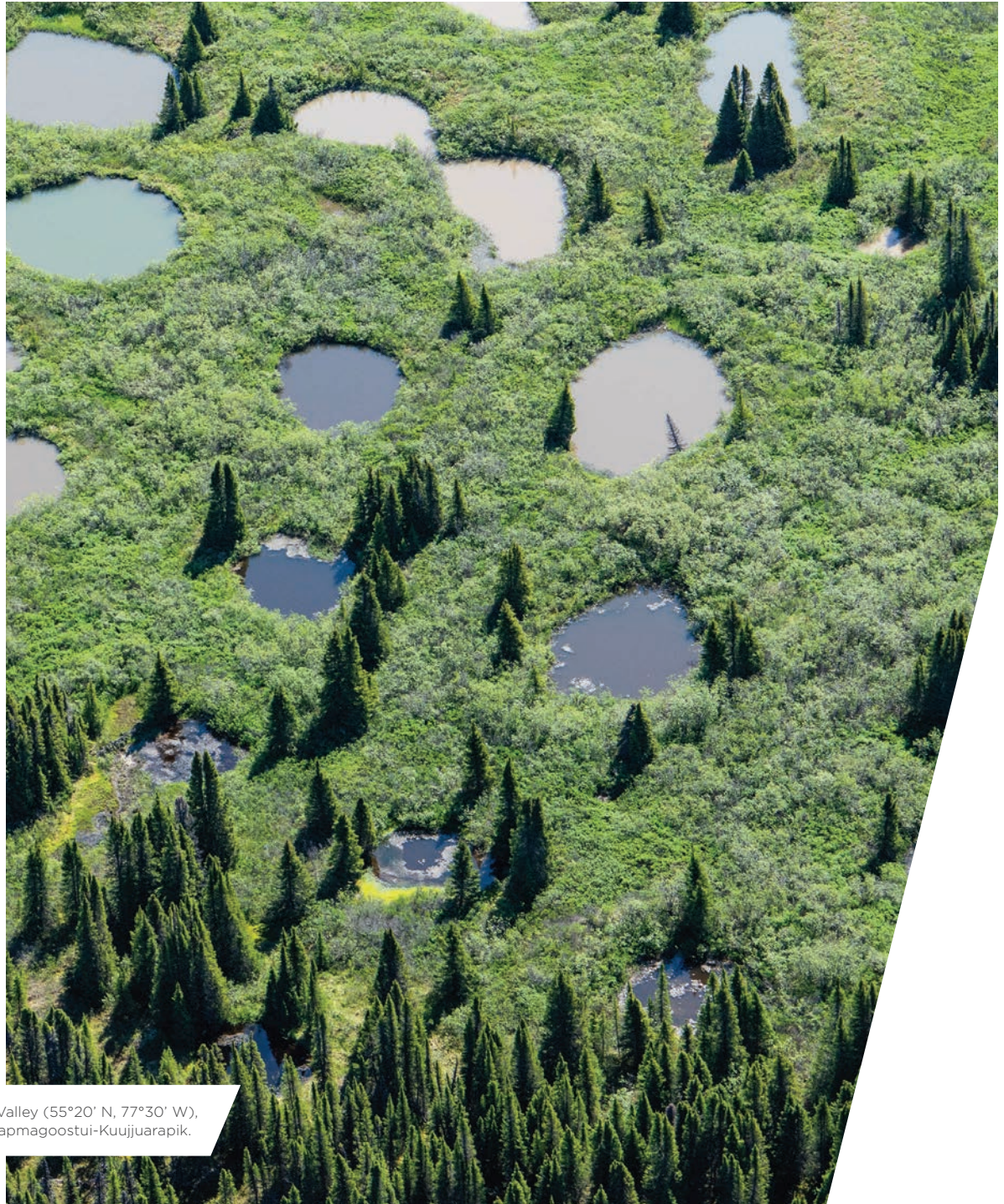
Engineering

The product of the latest innovations in the burgeoning field of atmospheric icing and power network engineering, CENGIVRE has been coordinating research in this strategic area at Université du Québec à Chicoutimi since 2003. The Centre pools expertise and consolidates UQAC's international leadership with its numerous research entities, including the Industrial Chair on Atmospheric Icing of Power Network Equipment (CIGELE); the Anti-icing Materials International Laboratory (AMIL); the Canada Research Chair, Tier 1, on Icing and Power Network Engineering (INGIVRE); the Canada Research Chair on Insulating Liquids and Mixed Dielectrics for Electrotechnology (ISOLIME); the Research Group on Renewable Energy and Impact of Northern Climate (GREEN); and the Electric Machines Identification and Control Laboratory (EMICLab).



Environment, Optics-Photonics, Sustainable Health

Funded by the Canada First Research Excellence Fund, the Sentinel North Strategy enables Université Laval to draw on over a half-century of northern and optics/photonics research. This research strategy focuses on developing new technology, training the next generation of transdisciplinary researchers and improving our understanding of the northern environment and its impact on human beings and their health. Sentinel North draws on the convergence of strategic areas of research in which Université Laval plays a national and international leadership role: northern and Arctic research, optics and photonics, microbiomes and cardiometabolic and brain health. It funds over 150 professors and more than 200 graduate students and postdoctoral fellows working on over 35 transdisciplinary research projects.

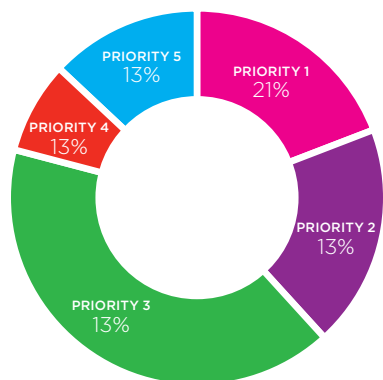


Thermokarst lakes in the Kwakwatanikapistikw River Valley (55°20' N, 77°30' W), north of the village of Whapmagoostui-Kuujuarapik.

Ambassadors for northern research

More than 200 affiliated researchers are shaping northern research throughout the province. Engaged in training the next generation of students and working together to advance a host of multidisciplinary and interuniversity research projects, these researchers are innovating to make the North more sustainable. Some of the INQ-affiliated researchers who are contributing to increasing our knowledge about Northern Québec are profiled on the next page.

DISTRIBUTION OF THE EXPERTISE OF AFFILIATED RESEARCHERS ACROSS INQ'S FIVE RESEARCH PRIORITIES



● Societies and Cultures	53
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Mountains of Bylot Island



Guillaume de Lafontaine
(UQAR)

Guillaume de Lafontaine is a professor in plant ecology and chairholder of the Canada Research Chair in Northern Flora Integrative Biology. His research focuses on the ecological, biogeographical and evolutionary responses of Arcto-boreal flora to the environmental variations induced by historical (Quaternary) and current (anthropogenic) climate changes. The integrative approach he uses in his research offers a conceptual framework that permits the collective study of responses to obtain a global perspective, from genes to ecosystems.



Suzanne Lalonde
(UdeM)

A professor in the Faculty of Law, Suzanne Lalonde is keenly interested in the international sphere and fundamental concepts governing interstate relationships, namely, sovereignty, territory and borders. After focusing her research primarily on the territorial domain, she subsequently developed an expertise in maritime law. Suzanne Lalonde explores the legal issues surrounding oceans, which have become an important reserve of resources and a growing cause of tension in international relations. Her research in international law is aimed specifically at the Arctic region, which is currently facing major challenges related to climate change, maritime nationalism and the exploitation of resources.



Anne de Vernal
(UQAM)

A specialist in paleoclimatology, Anne de Vernal studies ancient climates by analyzing marine sediments collected from the ocean floor using core samples and drilling. Her work focuses on oceanographic, climate and environmental changes in mid-to high-latitude aquatic settings during glacial and interglacial episodes. She studies the assemblages of organic microfossils as bio-indicators of environmental conditions and develops approaches to carry out paleoceanographic and paleoclimatic reconstructions. Her research program aims to elucidate fundamental questions about ice-ocean-climate interactions at millennial and centennial time scales, including hot and cold climate extremes.



Raoul-Marie Couture
(Université Laval)

Chemistry professor Raoul-Marie Couture heads up the aquatic geochemistry laboratory. He specializes in the study of chemical elements in lakes, soils and sediments. His work deals with the environmental and aquatic geochemistry of nutrients, as well as key elements like carbon and oxygen and potential contaminants like arsenic and selenium. He develops numerical models of reactive transport and lake dynamics to interpret data sets acquired in the field in boreal, sub-Arctic and Arctic regions. In doing so, Raoul-Marie Couture seeks to understand the factors affecting water quality, such as trace-element contamination, anoxia, eutrophication and climate change.

Scientific program

INQ's scientific program stems from a massive, comprehensive, and inclusive consultation process involving more than 150 researchers and representatives of organizations and Indigenous nations.

1

Priority 1 | Societies and Culture

Improve our knowledge of social and cultural issues of Northern Quebec by studying different development models as well as heritage, identities, territoriality, knowledge, living environments, and governance. This priority also emphasizes the planning of research agendas, compliance with ethics protocols in Indigenous settings, and the decolonization of research..

2

Priority 2 | Health

In keeping with the themes and priorities identified by people in the North, and using a partnership approach, this priority focuses not only on research into illness and disease, but also on resilience, adaptation, and the positive aspects of health. Intervention research, both clinical and population-based, aims to identify optimal solutions and best practices to improve the health of northern populations and reduce health-related inequities.

3

Priority 3 | Ecosystem Functioning and Environmental Protection

The ecosystems of high northern latitudes are feeling the combined effect of accelerated socioeconomic development, strong demographic growth, and global warming. This priority examines the consequences of such stresses on marine, terrestrial, and freshwater ecosystems in order to preserve and protect the food security and well-being of people living in the North. This research priority explores global warming, thaw, freshwater, food security, and the greenhouse effect, with an emphasis on coastal environments.



4

**Priority 4 | Infrastructure
and Technology**

Developing Quebec's North will require new technologies and infrastructure adapted to its harsh environment characterized by a cold climate, remote communities, and melting permafrost. To address the needs of northern communities, this priority explores issues including the rapid implementation of telecommunications channels, development of environmental technologies to ensure the protection of the potable water supplies of northern communities, the development of infrastructure adapted to harsh environments, and the conversion and management of waste from a standpoint of health and sustainable development.

5

**Priority 5 |
Natural Resources**

The North's ecosystems are home to considerable forest, mineral, hydroelectric, and wind resources. This priority looks at the economic value of natural resources while taking into account the extreme vulnerability of northern ecosystems to climate change and the impact of human activity. In keeping with the aspirations of northern communities, it will study and document overexploitation, seek to achieve social acceptability, and encourage the local spinoffs of economic activity. Through optimization and planning, this priority seeks to develop tools that will ensure that strategic resources in the North are developed in a sustainable manner.

A constantly evolving collaborative effort

The majority of the working groups that helped shape INQ are now standing committees. However, working groups will continue to exist; they will be created on an ad hoc basis to address priority needs identified by northern partners.



WORKING GROUP ON NEW AND RENEWABLE ENERGIES

This group is actively seeking alternatives to the use of fuel oil in the North, a source of energy with a negative impact on the ecological footprint of northern regions. The costs associated with the fuel itself, and with transporting it, also place an economic burden on these regions. The working group is also looking at several other options to meet the energy needs of Québec's remote regions—all of them focused on new and renewable energy—in order to bolster the energy transition essential to the sustainable development of Northern Québec.

Role: To further understanding of the existing energy infrastructure, assess and anticipate energy needs and resources, identify spinoffs of the energy transition, support local stakeholders and transfer knowledge to them, identify legal mechanisms, and propose solutions to improve current legislation.

Leader

Jasmin Raymond
Institut national de la recherche scientifique (INRS)

Members

Morad Abdelaziz
Université Laval

Kodjo Agbossou
Université du Québec à Trois-Rivières

Cédric Arbez
Nergica

Karim Belmokhtar
Nergica

Myriam Blais
Société du Plan Nord (SPN)

Francois Bouffard
McGill University

Martin Bourbonnais
Cégep de Jonquière

Marie-Pier Breton
Société d'habitation du Québec (SHQ)

Christian Carrier
Carboniq

Jérôme Cros
Université Laval

Liliana Diaz
Institut Hydro-Québec en environnement, développement et société

Guy Dumas
Université Laval

Marie-Ève Dupont
Institut de recherche d'Hydro-Québec

Richard Gagnon
Transition énergétique Québec (TEQ)

Kathleen Gauvin
TEQ

Véronique Gilbert
Kativik Regional Government (KRG)

Main achievements:

- 1) Development of partnerships with private Committee companies and government agencies, with a view to creating new multidisciplinary research projects. A project proposed by the group's members received funding as part of the first INQ/SN joint call for projects (2019-2021), and the members are involved in five of the projects submitted for the second INQ/SN call for projects (2020-2022).
- 2) Creation of a portfolio of projects underway or likely to be launched in the near future, to determine the fields of research not currently represented and that should be targeted by future applications for funding.
- 3) Launch of a series of presentations by government, private, and university partners on innovative technologies, with a view to reducing the North's dependence on fossil fuels.

Nicolò Giordano
INRS

Louis Gosselin
Université Laval

Jean-François Gravel
SHQ

Didier Hailot
École de technologie supérieure

Christophe Krolik
Université Laval

Patrick Labbé
Hydro-Québec

Daniel Martineau
Crown-Indigenous Relations and Northern Affairs Canada

Félix Ménard-Saint-Denis
SHQ

Fuzhan Nasiri
Concordia University

Hakim Nesreddine
IREQ

Mathieu Olivier
Université Laval

Taha Ouarda
INRS

Mathieu Payeur
TEQ

Julia Purdy
Natural Resources Canada

Philippe Quessy
SPN

Michel Verreault
SPN

Coordinator
Debra Christiansen-Stowe
INQ



INFRASTRUCTURE MANAGEMENT COMMITTEE

Role: Coordinate and facilitate access to and use of all INQ infrastructure, facilities and services. Optimize the management, use and acquisition of infrastructure for the benefit of the various components of INQ and its partners.

Main Achievement: A Made improvements to Lab-O-Nord, the web-based inventory of all the research infrastructure available to INQ members and developed a policy for the loan and rental of equipment.

Leader

Keith Lévesque
Sentinel North

Members

Alexandre Forest
Amundsen Science

Brigitte Robineau
Québec-Océan

Mickaël Lemay
Centre d'études nordiques
(CEN)

Christine Barnard

CEN

Louis Frenette-Nolin
Université Laval

Marie-Hélène Forget
Takuvik

Nathalie Foisset
McGill University

Stéfane Prémont
Institut national de la
recherche scientifique

Sylvain Tougas
INQ

Coordinator
Debra Christiansen-Stowe
INQ



EDUCATION AND TRAINING

Role: Make an inventory of existing training programs on Northern Québec available at the founding partner universities. Support universities in their initiatives to train students, future stakeholders in the North and professionals working on northern issues. Develop an uncredited continuing education program for transferring knowledge to students, professionals and the general population. Offer an uncredited general training program on Northern Québec in the form of a nanoprogram. Encourage the involvement of Indigenous people in all aspects of training and throughout the students' educational program.

Main Achievement: Designed and implemented a summer school entitled: An introduction to northern research and issues..

Leader

Michel Allard
Centre d'études nordiques,
Université Laval

Members

Caroline Hervé
Université Laval

Gina Muckle
Université Laval

Marie Audette
Université Laval

Jim Howden
McGill University

Marie-France Gévry
Sentinel North

Monique Bernier
Institut national de la
recherche scientifique

Coordinator

Debra Christiansen-Stowe
INQ



SUSTAINABLE DEVELOPMENT COMMITTEE

Role: Draw on the UN's sustainable development goals and validate those that are relevant for the North within INQ, develop appropriate indicators for the North as well as a sustainable development toolbox for northern research.

Main Achievement: Defined criteria to help evaluate the sustainability index of projects funded by INQ.

Leader

Murray Humphries
McGill University

Members

André Potvin
Université Laval

Thierry Rodon
Université Laval

Liliana Diaz

Institut Hydro-Québec
en environnement,
développement et société

Aude Therrien
INQ

Jasmin Raymond
Institut national de la
recherche scientifique

Coordinator

Debra Christiansen-Stowe
INQ



FIRST PEOPLES COMMITTEE

Role: Define joint and specific research needs and priorities for Indigenous communities in the North, define a code for the responsible conduct of research in the North in keeping with the activities of the First Peoples, define Indigenous knowledge and establish its role within INQ.

Main Achievement: Organized and conducted a workshop on Indigenous knowledge.

Leader

Melissa Saganash
Cree)

Members

Ellen Avard
Inuit

Glenda Sandy
Naskapi

Kakwiranoron Cook

McGill University

Mark O'Connor
Société Makivik

Michel J. Tremblay
Université Laval

Najat Bhiry
Université Laval

Serge Ashini Goupil

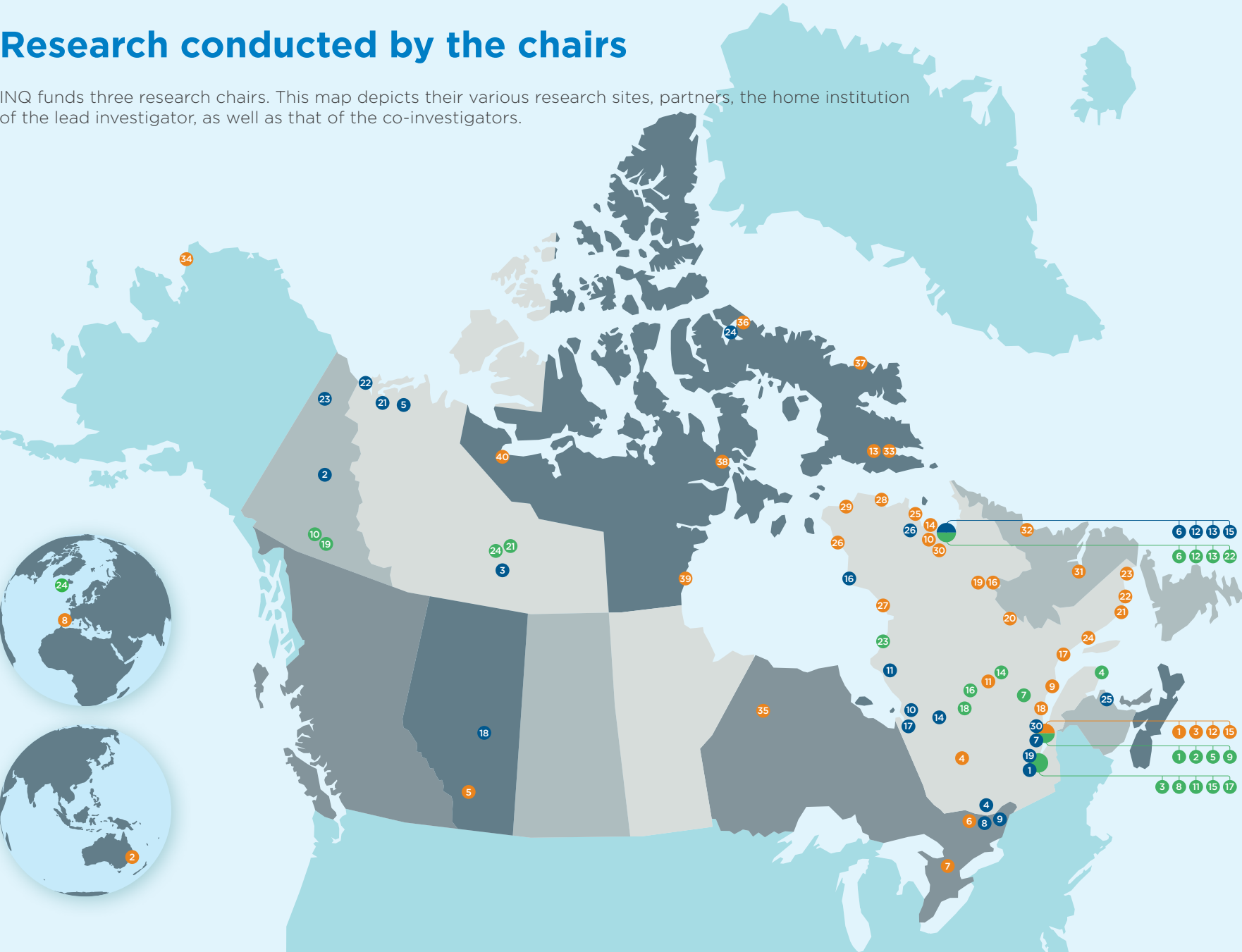
Innu Nation

Coordinator

Aude Therrien
INQ

Research conducted by the chairs

INQ funds three research chairs. This map depicts their various research sites, partners, the home institution of the lead investigator, as well as that of the co-investigators.



● INQ McGill Chair in Northern Research— Wildlife Conservation and Traditional Food

1	McGill University	
2	Yukon Territorial Government	
3	Government of Northwest Territories	
4	Parks Canada	
5	Gwich'in Renewable Resources Board (GRRB)	
6	Makivik Corporation	
7	Ministère des Forêts, de la Faune et des Parcs	
8	Fisheries and Oceans Canada	
9	World Wildlife Fund Canada	
10	Cree Trappers Association	
11	Cree Board of Health and Social Services of James Bay	
12	Nunavik Regional Board of Health and Social Services (RRSSN)	
13	Regional Nunavimmi Umajulivijit Katujaqatigininga (RNUK)	
14	Cree Nation Government	
15	Kativik Regional Government	
16	Nunavik Marine Region Wildlife Board	
17	Eeyou Marine Region Wildlife Board	
18	University of Alberta	
19	Ouranos	
20	Environment and Climate Change Canada	
21	Aklavik	
22	Mackenzie Delta	
23	Old Crow Flats	
24	Eclipse Sound	
25	Tabusintac Bay	
26	Tasiujaq	



● INQ Northern Sustainable Development Research Chair

1	Université Laval	
2	Griffith University	
3	Institut national de la recherche scientifique (INRS)	
4	Université du Québec en Abitibi-Témiscamingue, Val-d'Or Campus	
5	University of Calgary	
6	Carleton University	
7	Wilfrid Laurier University	
8	Université de Rouen Normandie	
9	Regroupement des femmes de la Côte-Nord	
10	Makivik Corporation	
11	Comité condition féminine Baie-James	
12	Crown-Indigenous Relations and Northern Affairs Canada	
13	Qaujigiartiit Health Research Centre	
14	Kativik Regional Government	
15	Société du Plan Nord	
16	Conseil de la Nation Innu Matimekush-Lac John	
17	Sept-Îles	
18	Sacré-Cœur	
19	Schefferville and Matimekush-Lac John	
20	Fermont	
21	Chevery	
22	La Tabatière	
23	Rivière-Saint-Paul	
24	Havre-Saint-Pierre	
25	Kangirsuk	
26	Akulivik	
27	Umiujaq	
28	Kangiqsujaq	
29	Salluit	
30	Kuujuuaq	
31	Happy Valley-Goose Bay	
32	Nain	
33	Iqaluit	
34	Red Dog Mine	
35	Kingfisher Lake	
36	Pond Inlet	
37	Qikiqtarjuaq	
38	Naujaat	
39	Arviat	
40	Kugluktuk	

● Northern Geothermal Potential Research Chair

1	Institut national de la recherche scientifique (INRS)	
2	Université Laval	
3	École de technologie supérieure ETS	
4	Nergica	
5	Transition énergétique Québec	
6	Englobe - Nunatech	
7	Cégep de Jonquière	
8	Carboniq	
9	Cima+	
10	Yukon Geological Survey / H.S. Bostock Core Library	
11	Institut de recherche d'Hydro-Québec (IREQ)	
12	Kativik Regional Government	
13	Nayumivik Landholding Corporation	
14	Développement économique Chibougamau	
15	Makivik Corporation	
16	Ville de Chapais	
17	Midland Exploration	
18	Osisko Mine	
19	Northwest Territories Geological Survey	
20	University of Reykjavik	
21	Whitehorse	
22	Kuujuuaq	
23	Whapmagoostui	
24	Con Mine	

LEGEND

Chairholder's home institution	
Co-investigators' home institutions	
Partner	
Research site	

Our Chairs in action

INQ NORTHERN SUSTAINABLE DEVELOPMENT RESEARCH CHAIR

Chairholder

Thierry Rodon, Université Laval

Mission

The Chair aims to improve the understanding of northern issues and to rethink development models with a view to informing decision making by federal and provincial governments, municipalities and Inuit organizations in terms of sustainable development.

Summary

With the development of the Knowledge Network on Mining Encounters and Indigenous Sustainable Livelihoods (MinErAL), the Chair spearheaded over 12 comparative research projects on mining developments in Canada. In addition, it evaluated and enhanced the True North Treasure Initiative program when it was renewed by Indigenous Services Canada. The Chair also completed the fly-in/fly-out research project conducted with Regroupement des Femmes de la Côte-Nord. The Mining Economies, Mining Families project led to a number of publications on Indigenous entrepreneurship as part of mining developments in Nunavik and Nunatsiavut. An international summer school was also held in Fermont and Schefferville in May 2019. Over the past year, researchers from this Chair contributed to 13 publications, approximately 30 communications and the training of 27 students.



13 projects underway
13 new publications
23 partners



Complexe minier de Mont-Wright



AN OVERVIEW OF THE RESEARCH CONDUCTED WITHIN THE CHAIR

MinErAL Network

PRINCIPAL INVESTIGATOR: Thierry Rodon, ULaval

CO-INVESTIGATORS: 24 co-investigators at 18 institutions

MinErAL research deals with encounters between Indigenous communities and mining companies in the Canadian North, Fennoscandia, Australia and New Caledonia. The network serves as a forum where Indigenous organizations, researchers and local governments can share knowledge so as to facilitate decision making. In 2018-2019, the members of the Chair conducted research in Nunavut, in the communities adjacent to the Mary River Mine. They also did work in Nunavik, in the communities of Aupaluk and Kuujuaq, where daily life is influenced by the presence of the Raglan and Nunavik Nickel mining companies. With its research, the Chair seeks to maximize the benefits and minimize the negative impacts of resource development. The members of the MinErAL network also carried out research in the three other regions in which the network works.

Evaluation of the True North Treasure Initiative program

PRINCIPAL INVESTIGATOR: Thierry Rodon, ULaval

CO-INVESTIGATOR: Steeve Jacob, ULaval

Indigenous Services Canada tasked the Northern Sustainable Development Research Chair with evaluating the True North Treasure Initiative program and making recommendations to improve it. Over the past year, the Chair team conducted over twenty interviews with regional organizations and community and business representatives to discuss the program's objectives and spinoffs. The report, available on the Chair's website, makes several recommendations, the main one of which is to make the program accessible to more communities. Until now, the True North Treasure Initiative has been earmarked for communities located along the Labrador Trough. The True North Treasure Initiative program, which was renewed in the wake of this evaluation, strives to develop human capital and Indigenous entrepreneurship in the mining sector.

Living with Fly-in Fly-out commuting Experiences of women and communities on the North Shore

PRINCIPAL INVESTIGATOR: Thierry Rodon, ULaval

CO-INVESTIGATOR: Francis Lévesque, UQAT

PARTNER: Regroupement des femmes de la Côte-Nord

This research project on fly-in/fly-out commuting, which sought to gain a clearer understanding of this practice on the women and communities of the North Shore, wrapped up in 2019. While the mass arrival of workers into a region offers the potential for plentiful business opportunities, the reality is not quite so rosy. This human influx has a social and economic impact, both for the host communities and the workers' home communities. In the wake of the release of their report, the Chair and Regroupement des femmes de la Côte-Nord received funding to produce a good practices guide for communities when large development projects are launched.

INQ NORTHERN GEOTHERMAL POTENTIAL RESEARCH CHAIR

Chairholder

Jasmin Raymond, INRS

Mission

The mission of the INQ Northern Geothermal Potential Research Chair is to assess the performance of geothermal systems in cold climates and to adapt technologies to northern environments, so as to foster the emergence of green energy sources. Access to clean and affordable energy is critical for the development of communities and natural resources north of the 49th parallel.

Summary

The Chair researchers evaluated the heat generation potential of different geothermal technologies in the areas of Kuujuaq and Whapmagoostui-Kuujuarapik in Nunavik, the Éléonore Mine, Chibougamau and Chapais in the James Bay area; and on Anticosti Island. They concluded that geothermal heat pumps are the most profitable option among those studied.

The Chair helped implement a dual degree program in earth sciences and renewable energy with INRS and the University of Reykjavik. It also obtained an additional grant from the New Frontiers in Research Fund, which it managed to secure by joining forces with the Northern Sustainable Development Chair. This joint action by the two Chairs paved the way for greater understanding of the energy challenges—both technical and societal alike—faced by remote regions.



8 projects underway
9 new publications
24 partners



Inventory of water supply wells in the Cree and Inuit village of Whapmagoostui-Kuujuarapik, on the Hudson Bay coast.



AN OVERVIEW OF THE RESEARCH CONDUCTED WITHIN THE CHAIR

Potential of shallow and deep geothermal resources in remote regions of the North

PRINCIPAL INVESTIGATOR: Jasmin Raymond, INRS

CO-INVESTIGATORS: Chrystel Dezayes, BRGM; Didier Haillot, ÉTS; Juliet Newson, Reykjavik University; Páll Jensson, Reykjavik University

PARTNER: Community of Kujjuuaq

The goal of this project is to evaluate the use of three renewable energy technologies in the geothermal cluster—heat pumps, underground thermal energy storage and deep geothermal reservoirs—to heat buildings in the North. An analysis of the lifecycle of geothermal heat pump systems has shown that the use of this technology is more advantageous than the diesel furnaces currently used in Kujjuuaq, despite the fact that subsurface temperatures are only slightly above the freezing point. As for thermal energy storage, energy simulations based on local geological and meteorological conditions show that this technique could meet nearly 50% of the demand for heating. Lastly, the use of deep geothermal reservoirs could be envisaged in the mid term to supply future urban heating networks. In the wake of these findings, the researchers have emphasized the importance of developing local expertise so that these technologies can be put to good use.

Overcoming obstacles to the sustainable energy development of the Arctic using thermal storage

PRINCIPAL INVESTIGATOR: Jasmin Raymond, INRS

CO-INVESTIGATORS: Louis Gosselin, ULaval; Christophe Krolik, ULaval; Thierry Rodon, ULaval

The North is the subject of clean technology initiatives, however their scope remains limited due to the intermittent nature of their sources (solar, wind). To enable widespread implementation of these technologies, the project seeks to solve the problem of long-term energy storage in cold climates. A number of maps detailing the underground thermal storage potential are currently under development and will serve as decision aids for urban development planning. The researchers also plan to develop a new, heat-injection technology using solar panels to carry out small-scale subsurface trials. The project includes a political and legal component that will result in a series of recommendations tailored to the social characteristics of Arctic and sub-Arctic regions, so as to enable the implementation of policies regarding energy innovations.

Origin of hydrothermal fluids associated with Takhini Hot Springs, Yukon

PRINCIPAL INVESTIGATOR: Jasmin Raymond, INRS

CO-INVESTIGATOR: Tiffani Fraser (Yukon Geological Survey)

PARTNER: Yukon Geological Survey

Understanding the heat transfer and underground water flow mechanisms responsible for the formation of hot springs in the Western Cordillera is important for broadening the use of geothermal resources in the region. The goal of the project is to develop a conceptual model that demystifies the formation of the Takhini Hot Springs in Whitehorse, Yukon. To achieve this, the Chair's team will measure the hydraulic and thermal properties of rock samples taken in the area. Once the conceptual model is complete, the team will digitally simulate the upflow of hot fluids feeding the Takhini Hot Springs, where water levels at the surface are just over 45°C. The recent discovery of an underground reservoir could lead to it being used to heat nearby communities.

INQ-MCGILL CHAIR IN NORTHERN RESEARCH - WILDLIFE CONSERVATION AND TRADITIONAL FOOD SECURITY

Chairholder

Murray Humphries, McGill University

Mission

INQ's McGill Chair in Northern Research - Wildlife Conservation and Traditional Food Security focuses on the protection and sustainable development of Northern Québec's natural resources. The research looks at how resource development and other forms of environmental change impact the abundance and health of northern wildlife populations and their contribution to traditional food security.

Summary

The Chair's research is focused notably on health, food security, the harvest and consumption of key wildlife species, wildlife management, governance, environmental protection and the sustainable development of Northern Québec. The researchers co-developed a multidisciplinary project examining the impacts of climate change on local Indigenous food systems in Northern Québec, including Eeyou Istchee and Nunavik.

The Chair's researchers documented the impacts of climate change on several key wildlife species. They also explored the value chain and governance system of lake sturgeon in Nemaska. In Whapmagoostui, the Chair's work brought to light the level of youth engagement in adapting to climate change. In Eeyou Istchee, the researchers examined the strategic environmental assessment process and its role in protecting Indigenous food systems. Over the course of these projects, the researchers worked in partnership and close collaboration with various provincial, regional, and local organizations to co-construct and co-produce their research.

A number of other studies examined the interactions between muskox and caribou in the Yukon and Northwest Territories and analyzed coastal habitats of waterfowl in New Brunswick and Eastern James Bay.



15 projects underway
9 new publications
18 partners





AN OVERVIEW OF THE RESEARCH CONDUCTED WITHIN THE CHAIR

Wildlife, environmental changes and local Indigenous food systems (WECLIFS)

PRINCIPAL INVESTIGATORS: Murray Humphries, McGill, Treena Delormier, McGill, Gordon Hickey, McGill

This new project will identify the observed and anticipated impacts of climate change on key wildlife species that make up the traditional food systems of the Cree of Eeyou Istchee and the Nunavik Inuit. In doing so, the Chair members seek to develop new knowledge related to the harvest and consumption of wildlife species with assessing the impacts of environmental changes on the abundance, distribution and health of these species. The researchers are also aiming to better identify the adaptation strategies of the local Indigenous food systems that depend on these species. A number of disciplines are represented in this ambitious socio-ecological project, namely, natural sciences, health sciences and nutrition, as well as social and political sciences.

Climate change, beaver expansion and stream connectivity for Arctic char in Nunavik

PRINCIPAL INVESTIGATORS: Murray Humphries, McGill, Mikhaela Neelin, McGill

This project aims to document the expansion of the beaver population in Nunavik and its impact on the quality and connectivity of the habitat of Arctic char, a key component of the traditional diet and of the subsistence and tourism economy in Nunavik. In Fall 2018 and Winter 2019, a survey co-produced with the Makivik Corporation was conducted in 10 of the 14 communities in Nunavik on some sixty participants, most of them members of the Inuit communities. The objective was to document their observations and local perspectives on the connectivity of waterways and the impact of physical dams on the salmonid species. Helicopter flyovers were also conducted to document the beaver dams in the Tasiujaq region. In addition to helping advance knowledge about this issue, the researchers plan to play a role in advancing viable solutions for beaver management in the North.

Muskox resource selection and interactions with caribou in Yukon North Slope

PRINCIPAL INVESTIGATORS: Murray Humphries, McGill, Laurence Carter, McGill

This project was co-developed and is being conducted in collaboration with local, regional and territorial actors concerned by the impact of muskox (a species reintroduced in the region) on caribou, which is an important species for traditional food security. The researchers are seeking to document the muskox's habitat use and diet, as well as its impact on vegetation, and to compare it against the data available for caribou. During the summers of 2018 and 2019, a team was deployed between the town of Inuvik, a community in the Northwest Territories, and Ivvavik National Park in the Yukon, to characterize the vegetation and take muskox feces samples to assess the animals' diet. The analysis of these results will provide new knowledge on the impacts of the presence of muskox on land occupied by the caribou. This knowledge could then be taken into consideration in efforts to co-manage these two species on a given territory.

Two INQ/SN joint calls for projects

INQ and Université Laval's Sentinel North (SN) research strategy teamed up to launch two calls for projects among INQ members. The goal? To enhance Québec's knowledge base about the North and the Arctic, in keeping with INQ's scientific program, from a perspective of the sustainable development of Northern Québec and the well-being of the communities living in this vast territory.

The challenges associated with the North are complex, which is why INQ and SN propose an innovative approach based on intersectoral and interdisciplinary research that includes social sciences, health sciences, natural sciences, and engineering. Two projects received funding as a result of the first joint call for projects. The announcement regarding the second call for projects is slated for July 2020.

In total, over \$2 million will have been invested between 2019 and 2023 to launch new multidisciplinary and inter-institutional research projects targeting key challenges facing the northern regions and the Arctic.



TWO CALLS FOR PROJECTS AT A GLANCE

21

projects
submitted

85

affiliated researchers
involved

5

international
collaborators

12

government
organizations

11

regular-member
universities involved

4

associate members
involved

11

private-sector
collaborators

11

northern organizations
involved

Research projects funded by INQ and Sentinel North

INQ is currently funding two research projects. This map depicts the various research sites, partners, the home institution of the lead investigator, as well as that of the co-investigators.

PROJECT 1 Technical-social solutions to expand the use of renewable energy from Whapmagoostui-Kuujuarapik to other regions of Nunavik

- | | | |
|---|---|--|
| 1 | Institut national de la recherche scientifique (INRS) | |
| 2 | Université Laval | |
| 3 | Cégep de Jonquière | |
| 4 | Carboniq | |
| 5 | Nergica | |
| 6 | Englobe - Nunatech | |
| 7 | Transition énergétique Québec | |
| 8 | Whapmagoostui-Kuujuarapik Research Complex (CEN) | |

PROJECT 2 Clarify the relationship between the marine environment and the nutritional qualities of beluga and shellfish in Quaqtaq

- | | | |
|---|--------------------------------------|--|
| 1 | Université Laval | |
| 2 | Université de Montréal | |
| 3 | Quaqtaq | |
| 4 | Nunavik Marine Region Wildlife Board | |

LEGEND

- | | |
|---|--|
| Principal investigator's home institution | |
| Co-investigators' home institutions | |
| Partners | |
| Research site | |



2 projects funded following the first call for projects

TECHNICAL-SOCIAL SOLUTIONS TO EXPAND THE USE OF RENEWABLE ENERGY FROM WHAPMAGOOSTUI-KUJJUARAPIK TO OTHER REGIONS OF NUNAVIK

Applicant

Jasmin Raymond (ETE-INRS)

Co-applicants

Louis Gosselin (Department of Mechanical Engineering, ULaval)

Christophe Krolik (Faculty of Law, ULaval)

Thierry Rodon

(Department of Political Science, ULaval)

Partners and collaborators

NSERC Technology Access Center in Renewable energy and energy efficiency at Cégep de Jonquière

Carboniq

Nergica

Englobe – Nunatech

Transition énergétique Québec

Centre d'études nordiques

Summary

While southern, Canada is gradually shifting away from fossil fuels towards renewable energy, remote Indigenous communities rely on heat and electricity production that is fully dependent on diesel and is highly subsidized. Given the extraordinary transformations that northern regions are undergoing due to climate change, a number of clean technology initiatives have been rolled out. However their scope remains limited, notably because of temporal variations in the amounts of sunlight and wind. In order to achieve mass deployment of these technologies, we need to address the issues of renewable heat supply and long-term energy storage in cold regions. This is the main objective of this research project, which relies on a multi-sectoral approach to tackle the issue, both technically and societally. To this end, the Centre d'études nordiques (CEN) research complex in Whapmagoostui-Kuujuarapik will serve as a living laboratory to develop a concept to integrate hybrid energy systems that can be extended to other villages in Nunavik. The researchers will begin by establishing a balance sheet of the complex's energy consumption. Then, a building model will be developed to simulate the impact of hybrid energy solutions (biomass, solar photovoltaic, wind, geothermal) and determine the scope of savings and the reduction in the carbon footprint. They will also consider the human behaviours that influence energy consumption and that are sometimes difficult to predict. With a view to accelerating the deployment of a diverse energy portfolio, the research team will conduct a thorough analysis of the regulatory and policy frameworks. They will use a multi-sectoral approach to adapt energy system implementation methods to the economic development mechanisms advocated by Indigenous populations, in order to ensure the technologies are integrated in a harmonious manner. The proposed research will help define and optimize energy management strategies adapted not only to the polar climate, but also to the northern socio-political context. The potential benefits of this project are considerable. With viable energy production and storage solutions, renewable energy technologies will finally be able to meet a broader range of needs and play their rightful role in the sustainable development of the North.

CLARIFY THE RELATIONSHIP BETWEEN THE MARINE ENVIRONMENT AND THE NUTRITIONAL QUALITIES OF BELUGA AND SHELLFISH IN QUAQTAQ

Applicant

Jean-Éric Tremblay
(Department of Biology, ULaval)

Mélanie Lemire
(Department of Social and Preventive
Medicine, ULaval)

Co-applicants

Pierre Ayotte
(Department of Social and Preventive
Medicine, ULaval)

Philippe Archambault
(Department of Biology, ULaval)

Marc Amyot
(Department of Biology, UdeM)

Nicolas Derome
(Department of Biology, ULaval)

Partners and collaborators

Nunavik Marine Region Wildlife Board

Nunavik Research Centre –
Makivik Corporation

Fisheries and Oceans Canada

McGill/INQ Chair in Northern Research –
Wildlife Conservation and Traditional
Food Security

Thierry Rodon
(Department of Political Science, ULaval)

Summary

Beluga and shellfish are an integral part of culture, diet, and food security in Quaqtaq. The migrating beluga harvested in Quaqtaq belong to two distinct populations in Hudson Bay, one from the west and the other from the east. A recent study in Nunavik showed that beluga maattaq, an Inuit delicacy made with beluga skin and fat, is exceptionally high in selenoneine, a potential antidote against mercury toxicity. This study, which supports the Nunavik Marine Region Wildlife Board's Hudson Strait pilot project, seeks to provide new knowledge on how the mercury, selenoneine, and fatty acid in belugas vary with respect to their population, diet, age, and sex. Recent work suggests that shellfish, other bottom dwellers, and the sediment on the seafloor, where selenoneine-producing bacteria and fungi can grow, can play an important role in the uptake of food and selenoneine by belugas. Shellfish are also a common fixture of the Inuit diet, and offer significant potential for food insecurity prevention strategies. Moreover, shellfish can serve as indicators of water quality and ocean health since they accumulate contaminants and nutrients when they filter water and algae or consume particles that have settled on the sediment. Since the ocean near Quaqtaq is extremely exposed to the powerful outflow current from Hudson Bay, water quality and settling particles are necessarily affected by any climate-driven changes in the Bay. The various benefits or potential adverse effects of consuming beluga and shellfish are therefore influenced by the rapid environmental changes affecting northern marine ecosystems (warming, sea-ice loss). This project addresses these concerns by considering the relationships between local Inuit knowledge, the physical and chemical properties of the ocean, the marine microbiome, and the ecological pathways through which different key molecules flow from the Arctic environment to the Inuit. A longer-term benefit of the project is to provide the community of Quaqtaq with the means to monitor the condition of the ocean and the seafloor resources in order to continue to consume them in a sustainable manner.



Beluga

INQ training

INQ offers an ever-growing range of training opportunities targeting diverse audiences. Training has been at the very core of INQ's activities since its founding. The following are two success stories that bear witness to INQ's commitment to train researchers and engaged citizens in the realities of northern Québec and the Arctic:

AN INTRODUCTION TO NORTHERN RESEARCH AND ISSUES

An initiative Education and Training Committee, the first INQ Summer School was held May 6 to 10, 2019. Developed by northern experts, the five-day summer school helped equip young researchers to prepare and carry out their field work in the North. A multidisciplinary team of 22 university researchers and 11 mentors from northern organizations offered a training program that they themselves would have liked to have experienced in the early days of their careers. The 33 participants, from nine educational institutions and two external organizations, had varied backgrounds in natural sciences, health sciences, social sciences, languages and media arts. The content of the summer school lectures and discussions touched on the changing natural environment, history, governance and political issues of the North, as well as Indigenous culture and contemporary social issues, collaborative and participative research and the coordination and management of northern research projects.



Workshop on collaborative research at the Kondiaronk Community Hall in Wendake

MOOC “NORTHERN QUEBEC: ISSUES, SPACES AND CULTURES”

Responsible Professor

Thierry Rodon, ULaval

Through a hundred or so filmed interviews, the massive open online course (MOOC) gives a voice to specialists and people involved in northern issues. Thanks to its broad diversity of credible and engaged stakeholders, the MOOC aims to foster a greater understanding of the cultures of northern populations, the place this territory occupies in the collective imagination, the different visions for its development and its sociopolitical development over time.

The MOOC at a glance:

- Launched in **2017**
- Available in **2** participants enrolled since its launch
- **8 827** people enrolled in 2018-2019
- **2 231** personnes inscrites en 2019-2020
- **100** filmed interviews
- **47** stakeholders
- **15** university stakeholders representing **6** universities
- **22** Indigenous stakeholders representing **4** nations
- **10** non-Indigenous representatives



Highlights

INQ's actions are a reflection of its mission, namely to unify northern research stakeholders and create synergy between researchers and the end users of research. A number of important milestones were reached this year in our efforts to engage partners and put science to work for the communities. Among them were new partnerships, networking among the three Chairs, mobilizing projects, and key reflections.

1

STRATEGIC PLANNING 2019-2020 Drafting

Since its creation in 2014, INQ has chalked up numerous accomplishments, rallied northern researchers, and forged strong ties with institutions of higher learning, northern communities—including Indigenous nations living in the North—and public- and private-sector organizations. In order to maintain this momentum and fulfil its mission to ensure the sustainable development of the North, INQ gathered the members of its implementation committee for a brainstorming session in December 2018. Together, they identified six priority themes:

- > Research and training
- > Networking and partnerships
- > Mobilizing knowledge, technology transfer, and innovation
- > Infrastructure
- > Communications and outreach
- > Governance and funding

The committee reflected on its 2020-2025 strategic planning, which will be released in late 2020. As a result, this year was devoted in large part to drafting and approving our strategies.



2

INDIGENOUS KNOWLEDGE WORKSHOP

April 2-3, 2019

Funded by the Plan Nord Initiative Fund, the Cree Nation Government, and INQ, the Indigenous Knowledge Workshop brought together researchers and members of the Indigenous communities in Northern Québec to reflect on the conditions and tools needed to improve the transfer of know-how and knowledge between these two groups. The event was organized by the First Peoples Working Group, and was held in the Cree community of Oujé-Bougoumou, attracting some thirty representatives from the four nations in Northern Québec, as well as researchers from several INQ member institutions.

3

TRIPARTITE STRATEGIC ALLIANCE

April 16, 2019

INQ, UQAR, and the Uapishka Research Station signed a partnership agreement this winter. The agreement expands the network of northern research stations and research projects in the northeastern section of Québec's boreal forest. The alliance will foster skills development and socio-professional integration among Indigenous peoples, especially youth, as well as accessibility, exploratory activities, and the dynamic and contemporary occupation of the Nitassinan.

Created by the Pessamit Innu Council and the Manicouagan-Uapishka World Biosphere Reserve, this infrastructure is the only active research station devoted to northern studies on the North Shore. The inauguration of the Uapishka Research Station was hailed by dozens of research institutes in Québec and internationally, including UNESCO. The station is already a stellar regional example of co-management with the Innu, and a hub for the advancement of science and Indigenous identity. Its scientific and accommodation facilities make it an ideal site for conducting research on this relatively unexplored northern territory.



Uapishka
Station

4

CENTRE DÉCLIC

June 1 -2, 2019

Two INQ-affiliated researchers and a PhD student offered outreach activities in the form of presentations to the public at Foire Écosphère - Environnement et écohabitation and at Festival marin des Escoumins, in collaboration with Centre d'excellence sur le dialogue entre les scientifiques et le public (Déclic). Déclic promotes the sharing of scientific knowledge with a view to helping individuals and society as a whole make more informed decisions. Official partners since 2019, INQ and Centre Déclic will work to develop new talks and lectures as they pursue their shared goal of transferring knowledge in layperson's terms to the general public.

5

MEMBER TOUR

Several key dates

This year INQ embarked on a tour to visit its regular members, the goal being to discuss with affiliated researchers the possibilities provided by the Institute while, at the same time, gaining a better understanding of the range of expertise available in northern and Arctic research. So far, it has visited UQAC, UQTR, UQAR, and Université de Sherbrooke. Most of the researchers affiliated with the member universities have readily agreed to this opportunity for discussions and dialogue — a unique occasion to forge lasting ties.

UQAC: October 25, 2019

UQAR: February 3, 2020

UQTR: November 29, 2019, and January 24, 2020

Université de Sherbrooke: February 10, 2020

The tour will continue in 2020-2021.



6

GRANTS RECEIVED

INQ is always on the lookout for funding opportunities to enhance its offerings, whether it be training, knowledge transfer, student mobility, or other services. This year, it received three grants:

- A \$10,000 grant from the Nordic Council of Ministers, received in conjunction with our international partner UArctic, which was awarded the same amount. This grant will help offer students the unique opportunity to attend an international event—the Arctic Circle Assembly— in Iceland.
- A \$39,000 grant from the Government of Québec's Canadian Relations Support Program (PARC). It will go to funding a general and cross-sectional training session in northern and Arctic issues that is offered annually to the INQ community active in the North.
- A \$40,000 grant from the DIALOGUE program at Fonds de recherche du Québec (FRQ), which will be used, notably, to offer a workshop, in collaboration with INRS, to demystify the communication tools with the potential to promote interactions between the scientific community and the general public.

7

NATIONAL BUILDING RECONCILIATION FORUM

INQ, along with Université Laval, the Université du Québec network, and all of Québec's Indigenous nations, is proud to partner with the organizers of the upcoming National Building Reconciliation Forum, an initiative created by Universities Canada in 2015 in the wake of the calls for action launched by Canada's Truth and Reconciliation Commission. The Forum, which will be marking its 6th edition, is held every year at a Canadian university. In the spring, the event partners submitted a proposal to host the event, which will be held in Québec in the fall of 2020. A broad partnership between the academic sphere and the Indigenous communities, based on a co-creation model, was set up to lay the groundwork for the event, whose objectives include increasing knowledge about the realities and challenges Indigenous people face in relation to post-secondary education.



Meetings and outreach

Over the years, the following gatherings have become central to INQ's event programming. These events help forge lasting ties both with up-and-coming scientists and with actors from Québec and around the world who are committed to the sustainable development of the North.

1

MY NORTHERN PROJECT

May 23, 2019

Six of the 15 participants in the competition won over the judging panel at this INQ flagship event in which doctoral students have five minutes to present their northern research project in as dynamic and accessible a manner as possible. These talented communicators represented Québec at the international final of the competition which was held at the Arctic Circle Assembly in Reykjavik, in October 2019. Mon projet nordique / My Northern Project is organized by INQ and FRQNT and is part of an international partnership with UArctic.



2

ARCTIC CIRCLE ASSEMBLY

October 10 to 13, 2019

An INQ delegation took part in the Arctic Circle Assembly in Iceland. René Therrien and Jean-Éric Tremblay, respectively chair and acting chair of the implementation committee; and Brigitte Bigué, INQ director of administration and development, attended this international gathering. They were accompanied by the doctoral students who won the Québec final of the Mon projet nordique / My Northern Project competition: Laurent Ferrier, PhD candidate in engineering, UQAR; Élisabeth Gouin, PhD candidate in architecture, Université Laval; Marta Moreno Ibáñez, PhD candidate in earth and atmospheric sciences, UQAM; Thomas Pacoureaux, PhD candidate in earth sciences, INRS; and Anaïs Remili, PhD candidate in natural resource sciences, McGill University.

In addition to the Mon projet nordique / My Northern Project competition, INQ, Société du Plan Nord, and Québec's Ministry of International Relations and La Francophonie co-organized a session entitled Preserving the Biodiversity – Exploring New Conservation Planning Models (Part 2). Over 100 people attended the panel discussion featuring Jason Allaire, director of shared services Nunavut at Agnico Eagle; Brandon Laforest, senior specialist in Arctic species and ecosystems for WWF Canada; Jean Lemire, Québec government envoy for climate change, northern and Arctic affairs; and Jean-Phillipe Messier, director of the Manicouagan-Uapishka Biosphere Reserve.

Another highlight of the international gathering: Canada's ambassador to Iceland, Anne-Tamara Lorre, showed a keen interest in northern research when she met with our students. The ambassador subsequently referred them to people in Iceland likely to be interested in their work.

3

4^e JOURNÉE DE LA RECHERCHE NORDIQUE DE MCGILL NORTH

January 24, 2020







The 4th annual McGill Northern Research Day attracted some fifty attendees and provided a platform for a dozen speakers to present their research. Founded in 2016, McGill North is an initiative of the INQ-McGill Chair in Northern Research—Wildlife Conservation and Traditional Food Security.












Research activities and outreach by INQ-affiliated students

This map depicts the home institution and research sites of INQ-affiliated students.

● Research sites of students from the INQ-McGill Chair in Northern Research—Wildlife Conservation and Traditional Food Security

- 1 Mistissini 
- 2 Nemaska 
- 3 Whapmagoostui 
- 4 Tasiujaq 
- 5 Tabusintac Bay 
- 6 Yukon North Slope 

● Research sites of students from the INQ Northern Sustainable Development Research Chair

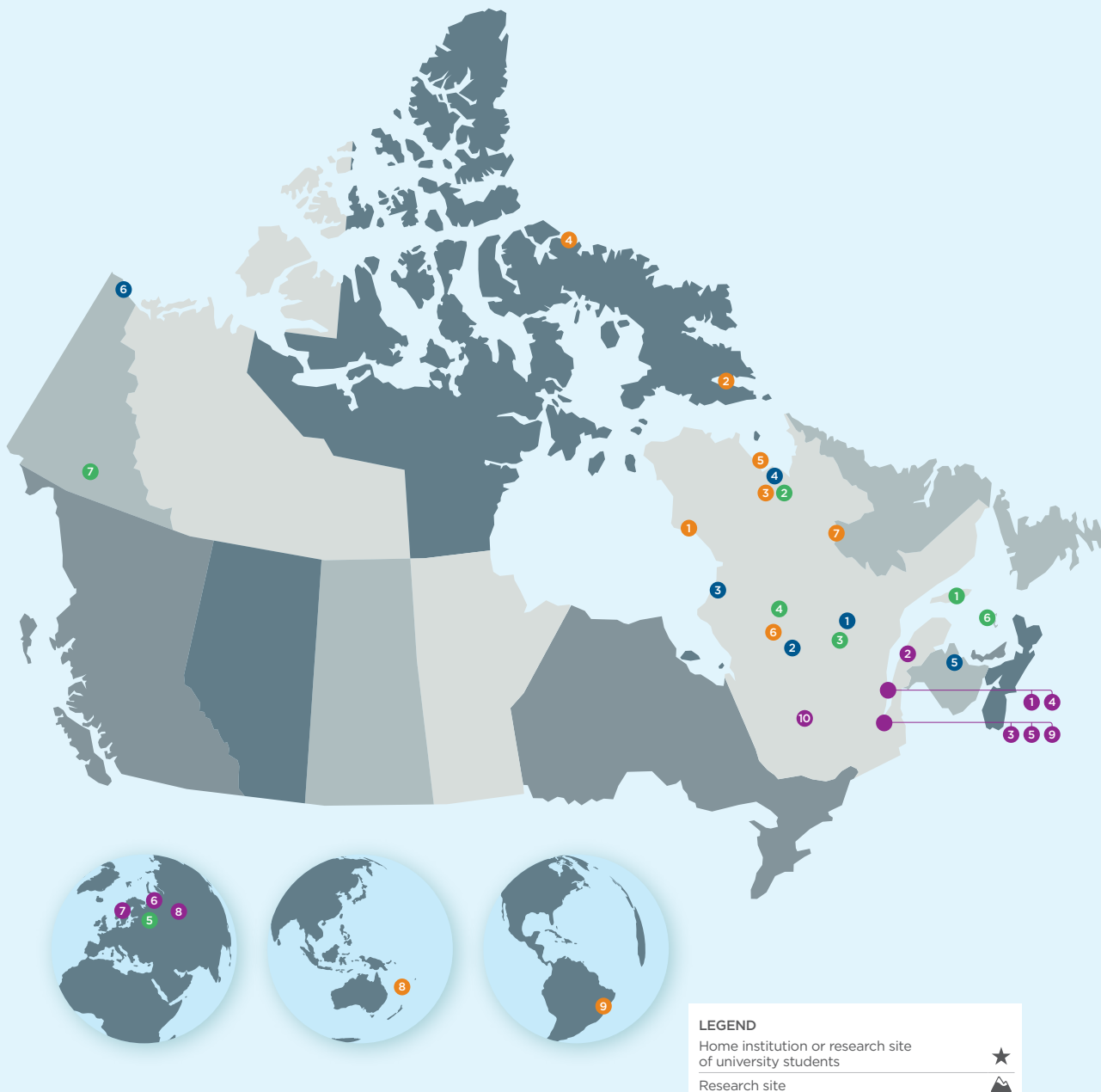
- 1 Inukjuak 
- 2 Iqaluit 
- 3 Kuujuaq 
- 4 Pond Inlet 
- 5 Aupaluk 
- 6 Nemaska 
- 7 Matimekush and Kawawachikamach 
- 8 Noumea 
- 9 Brazil 

● Research sites of students from the INQ Northern Geothermal Potential Research Chair

- 1 Anticosti Island 
- 2 Kuujuaq 
- 3 Chibougamau 
- 4 Eleonore Mine 
- 5 Stockholm 
- 6 Îles-de-la-Madeleine 
- 7 Takhini 

● Home institutions of students who participated in one of the international finals of the annual Mon projet nordique / My Northern Project as part of the Arctic Circle Assembly in Iceland

- 1 Université Laval 
- 2 Université du Québec à Rimouski 
- 3 Université du Québec à Montréal 
- 4 Institut national de la recherche scientifique (INRS) 
- 5 McGill University 
- 6 University of Lapland 
- 7 University of the Faroe Islands 
- 8 Northern (Arctic) Federal University 
- 9 Université de Montréal 
- 10 Université du Québec en Abitibi-Témiscamingue 



Outreach and Strategic Positioning

With a view to promoting synergy among stakeholders in northern research, INQ is regularly involved in scientific dissemination and outreach activities organized by its partners. The Institute also maintains dialogue with political authorities, to highlight both the key challenges in the North and the Arctic, and the research being conducted across this vast territory.

Over the past year, INQ supported its partners in organizing scientific seminars:

- April 16, 2019 | Laxmi Sushama, researcher at McGill University, Climate-Engineering Dialogue in the Context of Arctic Engineering Systems. Partner: Canadian Meteorological and Oceanographic Society
- August 19-21, 2019 | 18th International Conference on Cold Regions Engineering and the 8th Canadian Permafrost Conference. Partner: Canadian Geotechnical Society, Québec Division
- January 29, 2020 | Alain Mailhot, researcher at INRS, Définition d'un climat de référence et développement des projections climatiques pour le nord du Québec. Partner: Québec-Océan

INQ also took part in a number of annual assemblies spotlighting research conducted by several of its affiliated research entities.

- August 26-28, 2019 | Annual scientific meeting, Sentinel North
- December 2-5, 2019 | Annual scientific meeting, ArcticNet
- February 13-14, 2020 | Conference, Centre d'études nordiques (CEN)
- March 9-11, 2020 | Scientific meeting, Québec-Océan

INQ's senior management periodically takes part in strategic and political talks in order to provide government decision-makers with the knowledge and know-how crucial to the sustainable development of Northern Québec and the Canadian Arctic while showcasing Québec's expertise and leadership in northern sciences.

- May 9, 2019 | Followup meeting between INQ executive members and Nancy Hamzawi, Assistant Deputy Minister of Science and Technology, Environment and Climate Change Canada, as well as several members of her team
- May 17, 2019 | Presentation about INQ and its mission to politicians Catherine McKenna, Canada's Minister of Environment and Climate Change; Jean-Yves Duclos, Minister of Families, Children and Social Development; and Joël Lightbound, MP for Louis-Hébert

- May 28, 2019 | INQ executive directors present the Institute to a Swiss delegation invited by Université Laval.
- June 11, 2019 | Meeting with Ségolène Royal, France's ambassador to the Arctic and Antarctic regions
- August 19-22, 2019 | Profile of INQ and its mission during the 2019 UArctic Rectors' Forum, Ottawa
- September 6, 2019 | Meeting with a delegation from the University of Tromsø about international mobility for students and researchers
- February 21, 2020 | INQ executive directors take part in a meeting with the Consul General of the United States in Québec City, Mélanie Zimmerman, to discuss the issues and challenges facing northern and Arctic regions and the research being conducted in the North in collaboration with local communities.
- March 12, 2020 | Meeting with Hanne Christiansen, Vice-dean of Education and Head of the Geology Department at the University of Svalbard (UNIS) The discussions focused on possible collaborations for student training.

2019-2020 INQ Committees

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A team dedicated to bringing together expertise in northern research

Left to right:

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2. **Gabrielle Lévêque-Huot**, Secretary
3. **Sylvain Tougas**, Web Developer
4. **Brigitte Bigué**, Director
5. **Debra Christiansen-Stowe**, Operations Coordinator
6. **Aude Therrien**, Research Professional
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8. **Julie Dionne**, Administrative Technician (absent)
9. **Viktoria Miojevic**, Research Assistant (absent from the photo)
10. **Robert Sauvé**, Strategic Advisor for the North and the Arctic, Université Laval (absent from the photo)

Samuel Auger and Claudine Trudel from Université Laval's Communications Department also contributed to the production of this report.



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