



HOUSE OF COMMONS
CHAMBRE DES COMMUNES
CANADA

44th PARLIAMENT, 1st SESSION

Standing Committee on Science and Research

EVIDENCE

NUMBER 089

PUBLIC PART ONLY - PARTIE PUBLIQUE SEULEMENT

Thursday, May 30, 2024

Chair: Ms. Valerie Bradford



Standing Committee on Science and Research

Thursday, May 30, 2024

• (1100)

[English]

The Chair (Ms. Valerie Bradford (Kitchener South—Hespeler, Lib.)): Good morning.

I'd like to call this meeting to order.

Welcome to meeting number 89 of the House of Commons Standing Committee on Science and Research.

Before I begin, I'd like to ask all the members and other in-person participants to consult the cards on the tables for guidelines to prevent audio feedback incidents. This is very important to protect the hearing of our interpreters. We are to use only the black, approved earpiece. Keep your earpiece away from the microphones at all times. When you're not using it, please rest it on the stickers placed on the table.

Thank you very much for your co-operation.

The meeting is taking place in a hybrid format. We have several witnesses and members of the committee online.

For those participating virtually, I'd like to outline a few routine rules to follow.

You may speak in the official language of your choice. Interpretation services are available for this meeting. You have the choice, at the bottom of your screen, of floor, English or French. If interpretation is lost, please inform me immediately and we will ensure interpretation is properly restored before resuming the proceedings.

Before speaking, please wait until I recognize you by name. If you are on video conference, please click on the microphone icon to unmute yourself. When you are not speaking, your mic should be on mute.

For members in the room, please raise your hand if you wish to speak. For members on Zoom, please use the "raise hand" function. The clerk and I will manage the speaking order as best we can. We appreciate your understanding in this regard.

As a reminder, all comments should be addressed through the chair.

Pursuant to Standing Order 108(3)(i) and the motion adopted by the committee on Tuesday, January 31, 2023, the committee resumes its study of science and research in Canada's Arctic in relation to climate change.

It's now my pleasure to welcome, as individuals by video conference, Dr. Kirk Anderson, professor and UArctic chair for school eff-

fectiveness, Memorial University of Newfoundland and the University of the Arctic; and Dr. Bing Chen, UArctic chair, professor and associate dean, Memorial University of Newfoundland.

We have Dr. Isla Myers-Smith, professor, University of British Columbia, appearing by video conference.

Also by video conference, from Université du Québec à Rimouski, we have Joël Bêty, professor and Canada research chair in northern biodiversity.

We will give you up to five minutes for opening remarks, after which we will proceed with rounds of questions.

Dr. Anderson and Dr. Chen, I invite you to make an opening statement of up to five minutes. You can divide the time however you like between you.

Dr. Kirk Anderson (Professor and UArctic Chair for School Effectiveness, Memorial University of Newfoundland and the University of the Arctic, As an Individual): Thank you for your efforts as you lead our government in acting on this existential issue.

I am Kirk Anderson. I was a teacher and a principal for nearly 20 years; eight of these were in northern and coastal Labrador. I'm a former dean of education and a past president of the Canadian deans association in Canada. I'm currently a professor at Memorial University and the University of the Arctic chair for school effectiveness.

As dean, I led the development of a \$5-million science, technology, engineering and mathematics, STEM, grant, where we targeted development to enhance field-based skills for teachers. We also piloted a STEM Bachelor of Education focused on elementary teachers.

I also led the development and implementation of a community-based teacher education process called the Inuit-focused B.Ed., or the IBED. This was a partnership with the Government of Nunatsiavut. We worked diligently there to indigenize our approach to teaching. It also included Inuktitut language for the teacher candidates.

Based on that success, I worked to develop and conclude the first contract with the Nunavut Arctic College, where we collaborated to promote and serve the Nunavut teacher education program. This was part of our university's long-term agreement to work with the Nunavut Arctic College and its goal to become an Arctic university.

My key research areas are indigenous schools, teacher development in the north and school leadership. A key aspect of all my work is to empower people and communities, particularly in the north and in an indigenous context, by reshaping educational research and teaching.

Our schools are among the best in the world. We're particularly good at student achievements, asserting social justice and dealing with differences in socio-economic status. Related to this, while faculties of education are strong and we do develop good teachers, we are not so well connected with other academic interests or STEM-focused researchers. In response to this, many of my actions as an educational administrator and researcher are to build indigenous partnerships and reach out to other fields to make teacher development more interdisciplinary and find ways to connect our research efforts, particularly with the STEM areas.

For example, my action plan as a University of the Arctic chair is to create a truly community-based teacher education model for northern schools as well as create a northern and indigenous doctoral group focused on education and reflective of interdisciplinary fields while engaging communities. We must collaborate with the northern communities and other fields in order to empower them to control their destiny.

Thank you.

• (1105)

Professor Bing Chen (UArctic Chair, Professor and Associate Dean, Memorial University of Newfoundland, As an Individual): Thank you, Madam Chair and honourable committee members. Hello from the Arctic.

First, I want to express my huge gratitude to all of you for taking on this very important subject. I also want to apologize for not being there in person due to my travel to Bodø, Norway. Here, I'm attending the congress of the University of the Arctic, given my duties as an academic advisory board member and as a UArctic research chair.

My name is Bing Chen. I'm a professor, UArctic chair and associate dean of the faculty of engineering and applied science at Memorial University. I also served as a founding director of the northern region persistent organic pollution control laboratory, NR-POP. It's the first of its kind in the country. It's dedicated to oil spills and environmental pollution in cold regions and oceans.

I'm also the founding director of the PEOPLE network, which is a pan-Canadian and global network on persistent emerging and organic pollution in environments. As a world-leading consortium, we have over 300 professional members, including more than 200 researchers from over 40 research institutions and 50 partners from government, industry and communities, including indigenous groups in Canada and worldwide.

I'm an elected fellow of the Canadian Academy of Engineering and the incoming president of the Canadian Society for Civil Engineering.

My research targets two major environmental challenges, and they are intertwined.

The first is persistent and emerging contaminants—such as petroleum hydrocarbons, flame retardants, microplastics, and pharmaceutical and personal care products—that are toxic, carcinogenic, bioaccumulative and persistent in the environment, especially in cold regions like the Arctic. Importantly, most of them are not regulated.

The other major challenge is climate change, which it seems everyone knows. However, what most people don't know is that climate change makes pollution problems much more challenging. In the Canadian Arctic, we are facing increasing risks of oil spills and emerging pollution due to shrinking ice coverage and growing human activities under climate change. They are threatening our Arctic environments and their residents, especially including indigenous communities.

There are pressing needs for better knowledge, technology and policy to support sustainable development. Frankly, we are walking on thin ice. This is why I thank you very much for looking into this subject.

Thank you, Madam Chair.

The Chair: Thank you very much.

We'll now turn to Dr. Isla Myers-Smith for five minutes.

• (1110)

Professor Isla Myers-Smith (Professor, Faculty of Forestry, University of British Columbia, As an Individual): Thank you to the chair and to the members for the opportunity to speak about my research in the Canadian Arctic on climate change impacts.

I'm a Canada excellence research chair in global change ecology of northern ecosystems at the University of British Columbia. I've been working in the Arctic for two decades. Today I'd like to share some reflections on how Arctic research is changing and needs to shift in future as the inclusivity of research changes and climate change impacts accelerate.

I want to start by talking about how the north is experiencing accelerating change and what would have previously been considered extremes are now becoming the new normal.

For example, last summer, 2023, in the western Arctic, we experienced a heat wave in July. Temperatures were around five degrees warmer than the historic maximum temperatures on Qikiqtaruk—Herschel Island on the Yukon Arctic coast, where I work.

After this heat wave, we observed widespread permafrost disturbance, including the formation of 750 landslides, influencing about 1% of this island in just one year. This island has some of the most ice-rich permafrost in the Canadian Arctic and around the circumpolar Arctic, and it has always experienced permafrost disturbances and coastal erosion, but the rates and magnitudes of thaw are accelerating dramatically.

This past summer was also dominated by forest fires, leading to the evacuation of communities within the Northwest Territories. Our research program was threatened with being shut down due to forest fires and the evacuations happening to the south of us. For my research program, permafrost thaw, flooding and forest fires are making it increasingly difficult to study the impacts of climate change.

I collaborate with Inuvialuit and first nations communities, government agencies and different academic researchers to understand how vegetation change is influencing the Arctic, including increases in plants, more shrubs and earlier growing seasons, and how all of that is influencing habitats for wildlife and livelihoods for people.

One example of this collaboration is the porcupine caribou knowledge hub, funded by Canada's strategic science fund through a network now called Braiding Knowledges Canada.

There are five challenges that I would like to raise today.

The first is the importance of including Inuvialuit, Inuit and first nations in the research collaborations. To understand climate change impacts, research is required across different scales, from place-based research that informs local management and adaptation through to circumpolar research that informs earth system models. As the funding models shift, we need to consider all the different types of research and the different types of collaborations required for that next phase of Arctic research following indigenous and global research priorities.

Second, I want to talk about the increased costs of Arctic research and the importance of logistical support. My research program depends on logistical support through programs like the polar continental shelf program and the NSERC northern research supplements, and the logistical support provided by research stations and institutes. As we enhance our collaborations with indigenous partners, our research and logistical costs increase, thus additional funding is required. A lot of these programs aren't providing adequate funding to cover those logistical costs right now.

I also want to talk about the broad sharing of research findings while incorporating factors such as indigenous data sovereignty. As we form a better understanding of climate change impacts around the Arctic, a challenge for researchers is to get that information back to the people who need that information to make decisions. Often our research funding doesn't cover that full cycle of costs from the co-production of the research questions through to the

communication of those findings to broad audiences and the archiving of data. That funding model needs to change.

I also want to touch on building research capacity within the Arctic and bringing people together. New tools such as drones are reshaping how we conduct Arctic research and monitoring. Indigenous guardian programs and different research teams are using the same tools and, by bringing researchers together, we can increase capacity within the north. An example of this is the Yukon drone workshop that we held in the second week of May of this year that brought first nations, government agencies and academic researchers together to share expertise.

The final point I want to make is about the influence of geopolitical events on increased international collaboration. Collaborative research within the Russian Arctic has stopped, and international research teams are pivoting their research programs often towards the Canadian Arctic. New funding opportunities, such as Canada joining the EU horizon program and the NordForsk program, will facilitate even more Arctic research within Canada, but this increased research activity is putting more pressure on indigenous communities. Many of these indigenous communities have capacity issues to engage with this increased research pressure.

Future funding programs should particularly consider how to alleviate the impacts on indigenous communities of the required increased research within the Canadian Arctic.

Thank you very much.

The Chair: Thank you so much. I really appreciate that, Dr. Myers-Smith. That was under the wire.

We'll now turn to Dr. Joël Bêty, professor and research chair in northern biodiversity, for five minutes, please.

• (1115)

[*Translation*]

Mr. Joël Bêty (Professor, Canada Research Chair in Northern Biodiversity, Université du Québec à Rimouski): Thank you, Madam Chair and committee members.

Thank you for focusing on the impact of climate change in the Arctic and for giving me the opportunity to speak with you today.

My name is Joël Bêty. I'm a biologist and professor at the Université du Québec à Rimouski. I've been conducting research projects on Arctic terrestrial wildlife for 30 years in Nunavut. I co-direct the activities of the Canada Research Chair in Northern Biodiversity. I'm the assistant director of the Centre for Northern Studies, which manages research infrastructure in the north and is a strategic inter-university and multidisciplinary group.

The "Arctic Biodiversity Assessment" report clearly showed that climate change is the main threat to Arctic biodiversity and is exacerbating all other threats. This biodiversity is of considerable cultural, ecological and economic value to Canada. Biodiversity contributes to the food security and sovereignty of northern communities. Arctic biodiversity is also important for the rest of the world. The Canadian Arctic is connected to the rest of the planet, partly through the migratory movements of millions of animals that spend part of their lives in the Arctic.

Some Arctic species generate economic benefits estimated at hundreds of millions of dollars annually in southern Canada. Some migratory populations can also cause crop damage and substantial financial losses for North American farmers, partly through the spread of avian flu. As a result, research on Arctic biodiversity is generating knowledge relevant to Canada as a whole and to a number of other countries.

However, we need data from standardized and long-term observations of Arctic biodiversity to detect changes and identify their causes, understand and predict the response of ecosystems to warming, propose adaptation strategies and identify new opportunities.

Long-term observations in the Arctic help differentiate the normal variability inherent in natural systems from abnormal changes caused by rapid warming.

There's currently limited long-term monitoring of Arctic biodiversity at the ecosystem level. Most funding programs support short-term projects that focus on novelty and certain target species. This limits our ability to set up and maintain the long-term monitoring of ecosystems.

There are excellent federal programs to support university researchers in the north, such as the polar continental shelf program and the northern research supplements program. Unfortunately, the budgets for these programs don't align with the rising costs of research in the north and they don't help support enough projects.

Terrestrial research infrastructure also currently limits our ability to meet the needs expressed by northern communities. Increased construction costs recently led to the abandonment of new infrastructure projects in the north.

It's also currently hard for university researchers to find the funding needed to maintain and upgrade research infrastructure in the north.

The funding programs should provide better support for existing infrastructure and help establish memorandums of understanding or co-management committees for the joint use of infrastructure by various Arctic research stakeholders.

Research partnerships between the academic community and northern communities require specific expertise and skills. However,

a number of university researchers need qualified professional help to co-build and co-produce research with northern communities. I think that it would be beneficial to implement a nationwide program to support professional resources that would facilitate collaboration among researchers, experts and northern communities.

Lastly, new funding programs should provide more time for the preparation of applications in order to promote the co-construction of projects and collaboration between university researchers and northern communities.

Of course, the entire university community should step up its efforts to train highly qualified professionals in northern communities, in order to increase their participation and independence in research.

I look forward to answering your questions to the best of my knowledge.

Thank you for your attention.

[English]

The Chair: Thank you so much to all of our witnesses this morning, all of whom were very respectful of our time commitment. I appreciate that.

We're now going to open the floor to questions.

We'll kick that off with MP Tochor for six minutes.

Mr. Corey Tochor (Saskatoon—University, CPC): Thank you so much.

Thank you to our witnesses for your testimony today.

Professor Bêty, you have a very impressive 30-year history of researching the north, especially the animal reproduction side of things.

We do know the importance of the seal hunt to the indigenous population. Can you explain some of your research on seals and the seal hunt that have impacted the north?

● (1120)

[Translation]

Mr. Joël Bêty: Thank you for your question.

Unfortunately, I can't answer it. I'm a terrestrial wildlife specialist. My work focuses on the tundra, mainly terrestrial mammals and birds. I'm not a specialist in marine species.

[English]

Mr. Corey Tochor: Have any of the other witnesses done any work on the seal hunt in the Arctic?

I understand that all this research is in the Arctic, but you're all located in the south.

Professor Myers-Smith, you talked a bit about adaptation, and we've had other witnesses talk about adaptation versus mitigation. In the north, you studied adaptation. Have you done any work on the mitigation of the effects of climate change in the north?

Prof. Isla Myers-Smith: When we think about climate change in the north, the adaptation issues are local, and the mitigation issues are global, beyond the scope of Canada.

Mitigation has to happen at an international scale and at a Canadian scale, but it's less relevant for mitigation to happen within the north because the populations are so much smaller.

The adaptation issues are very much directed to these northern communities. A lot of the research that I do and that my colleagues do does focus on adaptation, but we're thinking about it from my perspective, as a terrestrial ecologist studying plants and often food systems and livelihoods in the north, and the hunting of key wildlife species and the habitat of those species. How will climate change influence vegetation, and how will that influence wildlife, and therefore people?

Mr. Corey Tochor: In that research, what would have been a success story? What have you researched that is actually impacting lives in the north through adaptation?

Prof. Isla Myers-Smith: I work in the western Canadian Arctic. There's a caribou herd called the porcupine caribou herd. I mentioned in my testimony the knowledge hub of the porcupine caribou herd. This effort, which goes beyond just my own research program, brings all the people together who have an interest in that caribou herd. Each year, we meet and we discuss how climate change is playing out and influencing the herd, how vegetation is changing, but also how people are harvesting the herd and what the population levels are. One of the really good-news stories in the western Arctic is that the herd's population levels are healthy at the moment. However, surrounding that herd are other populations of caribou that are not doing as well. We are trying to understand why some caribou herds do well and others don't. We're really thinking forward to the future and whether the porcupine caribou herd will start to decline. All of that research is coming together to help inform local communities as to how to manage that herd.

Mr. Corey Tochor: Thank you.

Professor Chen, I understand that you're from Newfoundland. One of the mitigation strategies involves the utilization of heat pumps. Do you have any personal experience with having a heat pump in your house?

Prof. Bing Chen: Thank you. That's an interesting question.

Personally, I don't have a heat pump.

Our university offers renewable energy education programs. There are teaching materials, and we are attracting students globally. I think doing more renewable energy [Technical difficulty—Editor]

heat pump [Technical difficulty—Editor] the technologies is helping to spread that.

Regarding adaptation, would you allow me to give you some of my examples regarding adaptation for the north, especially by residents in different communities?

By training, I'm an engineer, so I did indeed look at the solutions for how to provide a better technology. One thing is emerging contaminants. There are two ways. One is online and one has to do with shipping. Because the ice cap is shrinking, we have open water channels, and we have more shipping activities in the north. In the Canadian Arctic there's been almost three times as much in the past three decades.

On the other hand, we are also looking at the Polar Code under MARPOL and also our regulation of ships that are producing waste-water discharge that goes into the ocean.

• (1125)

Mr. Corey Tochor: I have limited time here, so I'm sorry to interrupt.

Is the government doing enough to support shipping in the north right now, as sea lanes that we could utilize for shipments are opening up?

Prof. Bing Chen: The reality is that, because of the open ice, we have more activities from the Polar Code areas of our Canadian Arctic. I don't know what the detailed regulation is, but there are other factors. Our observation is that we have growing shipping and railways in the north. This is why globally we are looking into the new contaminants, because all our regulations are targeting the traditional pollution, like grey water. Grey water, especially now—look at the data. We have more cruise ships—I think three times as many—and oil tankers. There's been a two- to three-times increase. Think about the cruise ships that have several thousand people on board.

The Chair: Dr. Chen, that's our time. It's fascinating. Maybe one of the other members of the committee will pursue that.

Now, we're going to turn to MP Chen for six minutes.

Mr. Shaun Chen (Scarborough North, Lib.): Thank you, Madam Chair.

Thank you very much to the witnesses before our committee today.

I'll go back to Professor Chen.

I'm noting here that you are a professor of environmental engineering and a recognized leader in research and applications. This is particularly with respect to mitigating the effects of climate change, as well as responses to emergencies such as oil spills and other disasters. You also have some experience, I understand, in looking at AI-aided decision-making.

I'm curious about this issue. Could you share a bit more about how AI and other technologies can help in tackling climate change?

Prof. Bing Chen: Thank you very much. That's a very interesting question.

I think we are now embracing new technologies, and AI is part of that. There are several things we have been doing.

One is looking at the historical data, because we have invested a lot in data collection over the past decades. It's about using the existing data wisely and developing new methods and measures to find out something we didn't know. That's very interesting.

For example, we are looking at human factors related to oil spills. We look from the top layer of decision-making and policy-making to the bottom—the operators and the crews. What are the human mistakes, such as incomplete training, incomplete knowledge or lack of experience? What are the errors and mistakes made that lead to a disaster and an emergency response? During the response, how do people react, and are there human factors contributing to the consequences? I think we collected several hundred cases and looked at the human factors. The interesting finding is this: Human factors contribute 70% to 80% to all of those man-made disasters, especially related to ships and oil spills. That's one thing we are doing.

We're also using the growing data we're collecting from the air to the sea. We try to predict what's going to happen. What should we do in an emergency, if there's an oil spill incident? Consider the BP oil spill in the Gulf of Mexico. If an oil spill of similar magnitude happened, unfortunately, in the Arctic, that would be a huge disaster. How can we react? How could we be prepared for that? That's what we have been helping professional responders with, in terms of training and support. It's also about how the communities could be prepared. They gain some basic knowledge, in order to understand what a spill is, how you can report it, how you can protect yourself, etc.

For all of those things collectively, you're talking about a huge amount of data. It's also very diverse data, even in the format.... I think that's one of the key challenges. We have a lot of data from different agencies and organizations. They all have, probably, different formats and deposits. How do we consolidate data in a more efficient and timely way and use it to support decision-making for responders, in order to save time, lives and costs? That's what we have been doing. I'm developing some tools for that.

• (1130)

Mr. Shaun Chen: Thank you very much.

I'll turn to Professor Myers-Smith.

You also spoke about data and the importance of sharing broad research findings while respecting indigenous sovereignty. We just heard from Professor Chen about how data over time can be col-

lected and used to fuel solutions. You also talked a lot about the different challenges related to the increased cost of Arctic research and the need to build research capacity in the north.

I want to ask you about the development of an Arctic science strategy. Canada is an Arctic nation. The work you folks are doing is incredibly important. Do you think Canada should have such a strategy?

Prof. Isla Myers-Smith: I definitely think Canada should have one. I think Canada does have, through different agencies, an Arctic strategy in place. Maybe we need to be thinking about updating that strategy, thinking forward to the future of the Arctic, which could be quite different from the Arctic we have experienced in the past, and particularly within a research context.

I've listened to previous meetings of this committee, and I want to echo Joël Bêty's comments also. I think two things have come out. One is this idea of a distributed hub for research logistics, a hub-and-spoke model. The other is having distributed centres that link researchers and indigenous communities. One way you could phrase that is as knowledge hubs across the Canadian Arctic. There are limitations on the community side and there are limitations on the research side, so it would be something in the middle that could bring the research together and help with the communication of that research back to the people who are making policy decisions but also potentially the hosting of research within the Canadian north.

Mr. Shaun Chen: Thank you.

You've mentioned logistics, and that's come across in a number of—

The Chair: You're really out of time, sorry.

Mr. Shaun Chen: Okay.

Just very quickly then, do you find it challenging? You mentioned the use of drones, but we're talking also about logistics for researchers. Do you find there's more capacity that can be built in terms of adopting technologies to support your research in the Arctic?

The Chair: Give a very short answer, please.

Prof. Isla Myers-Smith: The short answer is yes. The technology will continue to shift, so we need to be able to adapt to that changing technology, and keep going out into the Arctic to use that technology to its maximum.

The Chair: Thank you.

Now we'll turn to MP Blanchette-Joncas for six minutes.

[Translation]

Mr. Maxime Blanchette-Joncas (Rimouski-Neigette—Témiscouata—Les Basques, BQ): Thank you, Madam Chair.

I want to extend my greetings to the witnesses here today.

My first question is for Joël Bêty.

Mr. Bêty, I would like to congratulate you on your many years of commitment to scientific research. I know that you have received a number of awards and accolades. It's an honour and a pleasure to welcome you to the committee today.

My first question concerns your work as a professor from the Canada Research Chair in Arctic biodiversity. Can you provide some examples of foreign Arctic research initiatives that Canada could learn from?

Mr. Joël Bêty: Thank you for your question.

There are some good examples in other parts of the world, particularly when it comes to long-term monitoring. Some countries, such as Denmark and Norway, have set up long-term ecosystem monitoring programs in the Arctic tundra, which involve both government and university researchers.

For example, Greenland Ecosystem Monitoring is an integrated long-term monitoring and research program that focuses on ecosystems and climate change in the Arctic. Since 1995, this program has been promoting a much more coherent and integrated understanding of how terrestrial ecosystems work. The program is based on the collection of interdisciplinary data that includes a number of Arctic biodiversity components. As part of this program, 75 scientists go out into the field each year to collect standardized data at the same sampling site. Over 1,000 parameters are measured and made available free of charge. This data is used by program participants, other scientists, the public or external partners to produce a number of scientific articles and assessments or advisory reports.

Norway's Climate Ecological Observatory for Arctic tundra, or COAT, is a similar observation system.

Overall, these long-term and multi-component monitoring programs are highly productive and provide a better understanding of species interactions and the many indirect effects of warming on Arctic systems. These things should inspire us here in Canada.

• (1135)

Mr. Maxime Blanchette-Joncas: Thank you, Mr. Bêty.

Witnesses came here to talk about the competition among countries around the Arctic circle. You just compared different programs abroad. I also read the report on the polar continental shelf program by Canada's chief scientist, Mona Nemer. The report states that Canada should aspire to become a global leader in northern research, because it has one of the largest territorial claims in the Arctic.

Mr. Boudreault, the first chair of Polar Knowledge Canada, said that Canada lacked both the researchers and the funding to carry out northern research.

I would like you to elaborate on this topic.

Mr. Joël Bêty: You referred to the extremely important polar continental shelf program. We were surprised to learn recently that a large part of its budget wasn't permanent. This has obviously caused a great deal of concern for a number of university researchers in Canada.

These budgets don't align with the rising costs of Arctic research. This poses a major issue. In Canada, we have a huge research capacity and a number of global leaders in Arctic research. We must keep this in mind. However, the situation is precarious, given that some funding programs don't reflect the rising costs of research.

There are also programs such as the northern research supplements. I've sat on the selection committees. We're unable to support some excellent projects because of a lack of funding. As a result, we're sometimes unable to fund projects that meet community needs. The amounts received are similar to the amounts allocated 20 years ago. This makes no sense, given that the cost of Arctic research has risen enormously.

In short, Canada is undoubtedly among the global leaders. However, I find this situation precarious. Some programs deserve more attention. We have international leaders in Canada and we must keep that in mind.

Mr. Maxime Blanchette-Joncas: I agree, Mr. Bêty. Northern research can't be conducted with Popsicle sticks.

I often bring up the fact that Richard Boudreault, the first chair of Polar Knowledge Canada, said that a country such as Iceland had proportionally many more researchers than Canada, specifically 13 times more researchers per square metre. We could see that some countries had much higher levels of scientific research activity given the financial support provided by their governments. These countries included Norway, Sweden, Finland and Denmark.

Based on your expertise, I would like to hear your opinion on this data.

Mr. Joël Bêty: I don't have the figures for the number of researchers in other parts of the world. However, I can say that, if more funding is provided for northern and Arctic research, the number of researchers working in the north will increase. A number of universities train people who become highly qualified and ready to get involved in northern research. Of course, funding is needed to support these projects in the far north.

Mr. Maxime Blanchette-Joncas: Mr. Bêty, what are the implications of not having proper long-term funding? How does this affect northern research in particular?

Mr. Joël Bêty: We sometimes need to put an end to certain time series. As I explained earlier, to fully understand the changes and their causes, we need long-term time series. However, given the lack of funding, we sometimes need to put an end to certain monitoring and time series. As a result, we have less of an understanding of the situation.

The lack of funding can sometimes limit our potential impact and our ability to engage with northern communities.

[English]

The Chair: Thank you, Mr. Bêty.

Now we will turn to MP Cannings for six minutes.

Mr. Richard Cannings (South Okanagan—West Kootenay, NDP): Thank you.

Thank you, all, for being here today.

I'm going to start with Dr. Myers-Smith.

On a personal note, I just wanted to say we had Dave Hik here on Tuesday before the committee, so it's wonderful to have another alumna of the Arctic Institute of North America's Kluane Lake Research Station before us who has gone on to do important work in the Arctic.

We were talking earlier about mitigation versus adaptation. I'm wondering if you could comment on the need for simply work that monitors the effects that climate change is having in the Arctic. It's being impacted several times more than we are down here. You talked about permafrost changes, and Herschel Island is the poster child there. Those permafrost melting incidents release methane into the atmosphere, which causes a vicious circle of climate impacts. We have melting sea ice, which does the same there, where you have loss of albedo on the ocean, which warms the earth faster.

How important is it for Canada to be leading the world in monitoring climate impacts in the Arctic?

• (1140)

Prof. Isla Myers-Smith: I think it's vital that internationally we monitor what's going on in the Arctic, and Canada is perhaps the premier hub for leading that international effort. We do need a component of monitoring, because we cannot predict some of the changes that are going on in the Arctic. We need continuous and consistent methods of collecting data to understand the change that's playing out.

We need to understand that change because those feedbacks that can happen within the Arctic—changes to the ecosystems, the permafrost, sea ice—have global implications. We see four times the rate of warming in the Arctic relative to the rest of the planet. The impacts of that warming in the Arctic are influencing the climate for the rest of the planet.

What we do now in terms of releasing greenhouse gases is influencing the Arctic now. Those changes are playing out in a way that we can't fully mitigate at this point. The impacts of those changes that will play out over the coming decades are going to influence that global climate and the rate of warming for the entire planet. What happens in the Arctic will not stay within the Arctic. It's going to influence all of us, and we have to monitor those changes and

have integrated research programs with all players involved to really document the impacts of climate change.

Mr. Richard Cannings: Thanks.

You also mentioned logistic support. We know that the Arctic is a big place. It's very difficult and expensive to travel around. You mentioned the polar shelf project, which has been the heart of logistics for Arctic research for many years. I remember hearing—in 2018, I think—that that project hadn't received an increase in its budget for 20 years. I think there was an adjustment then, but I'm just wondering if you could comment on that logistic support, using the polar shelf project as an example, perhaps, in terms of how much funding it receives and how it should be designed. You talked briefly about the hub-and-spoke model. Perhaps just give us an idea of what you think would work best to support Canadian research in the Arctic.

Prof. Isla Myers-Smith: Well, I think a really important point to start out with is that the polar continental shelf funding does support research within and across the Canadian Arctic. I'm working in the far west of the Canadian Arctic, right along the Alaska border, and that program does support my research.

However, the hub for the polar continental shelf is based in the eastern Arctic, so I'm very far from the logistics people. They're still helping me out with the funding even though I'm thousands of kilometres away in the west with my research team.

Just to put some numbers on it, to get to my research site, Qikiqtaruk-Herschel Island, you need to get to Inuvik first. Then you take a one-hour charter airplane flight from Inuvik. A few years ago it cost \$7,000 one way, then \$8,000 one way. This summer it will be \$9,000 to \$10,000 one way, for one trip for a few members of my research team. We have to take multiple of trips per summer, and the costs are accelerating at an enormous pace, because of the cost of fuel and other logistical constraints. The polar continental shelf program comes in and supports those costs to allow us to use our research funds for the actual research. Without that logistical support, we could not go to these sites, and these sites are where climate change impacts are playing out. We need to be there on the ground.

Mr. Richard Cannings: Thank you.

I'd like to turn to Dr. Bêty and ask more or less similar questions. I know, Dr. Bêty, you've studied snow geese, and you mentioned the impacts again, and that what happens in the Arctic affects us further south. Perhaps you could talk about what the populations of snow geese have been doing in response to climate change and other things and how complex that is, and how it affects us in the temperate parts of North America.

• (1145)

[Translation]

Mr. Joël Bêty: Thank you for your question.

I should point out that migratory species are influenced by factors all over the planet. Take the example of snow geese. These birds are affected by both developments in the Arctic and changes in farming practices in the south, for instance.

At the international level, we're seeing an increase in a number of snow goose, duck and goose populations as a result of changes in farming practices. This has considerably increased the density of snow goose populations in the Arctic. These higher densities of snow geese in the Arctic affect the Arctic ecosystems. For example, this can lead to negative effects on plant communities, transform plant communities and adversely affect other species currently in decline, such as birds—

[*English*]

The Chair: Mr. Cannings, perhaps you can pursue this further in your next round. Thank you very much.

We will now turn to MP Lobb for five minutes.

Mr. Ben Lobb (Huron—Bruce, CPC): Thanks very much.

My first question is for Ms. Myers-Smith.

The question is on some of your research and the work you have done on the treeline. Could you expand a bit more on that work and what it's showing you?

Prof. Isla Myers-Smith: Yes, I have done a little bit of work on the treeline. A lot of my research focuses on the shrubline, which is the next line up as you move across the Arctic. As you move northwards, and also as you move up slopes and mountain ranges, you hit an elevational edge, which is where trees stop growing. Beyond that, large woody shrubs stop growing and then you end up with shorter plants, and eventually plants stop growing altogether.

One of the impacts of climate change is that those edges can be moving either northwards or upslope. You get taller vegetation, more woody vegetation and more carbon in that vegetation, but changes to the below-ground environment as well, and that can influence things like permafrost thaw and create some of those climate feedbacks. That changes the habitat for wildlife as well.

Mr. Ben Lobb: The historical shrubline and treeline, what does that tell us? Have you had the ability to do the research on the historical moves up and down?

Prof. Isla Myers-Smith: Yes. If you think about history, we could go back to the last ice age. When we're doing that kind of work, we're working with pollen, so you have a much more coarse understanding of where the treeline and the shrubline were, but in the past, the Arctic has been a pretty shrubby place and treelines have been further north when the climate was warmer. Then the climate got cooler and those lines receded.

What we're actually seeing to a certain extent is the movement of treelines and shrublines northwards, still as a response to the last ice age, but now on top of that we have anthropogenic warming and that movement of treelines and shrublines. The shrubline also moves a lot faster than the treeline, so that vegetation change is happening faster now because of anthropogenic warming on top of that response to the last ice age.

Mr. Ben Lobb: In your 20 years—if I missed it, I apologize—you would have seen a noticeable difference in the move northwards, then?

Prof. Isla Myers-Smith: What we particularly pick up at the sites that I work at is an increase in the shrubs that were already in those ecosystems becoming much more dominant. I have a series of photos that I'd be happy to share with the committee afterwards, where you can see the vegetation change; it's dramatic from the 1980s to now at some of the sites where I work. There were hardly any shrubs and now those landscapes are dominated by thigh-high woody shrubs, really changing the habitats for wildlife and the carbon cycling in these systems.

Mr. Ben Lobb: In this current period of history it's dramatic, but maybe over decades or centuries not as dramatic? Or is this unprecedented right now, do you think?

Prof. Isla Myers-Smith: I would say that the rate of change is unprecedented. It's hard to get that picture going really far back, because it becomes more coarse, but the rates of change in the last three decades are much more dramatic than earlier within the last century. Our projections are that this rate of change is going to increase in future for many parameters within the Arctic.

Mr. Ben Lobb: I have a question on coordination. I think with your experience you might have some important comments for the committee on how well research is coordinated right now across the entire Arctic. How you are able to do your research, contribute and coordinate with other areas? How does that work? Does it need improvement? What are your overall thoughts?

● (1150)

Prof. Isla Myers-Smith: I have devoted a lot of my career to trying to bring researchers together to do what we would call “synthesis”. We're all working at different sites around the Arctic. We work together to pool our datasets and to ask questions with that full circumarctic dataset. Currently, a lot of that synthesis requires individuals putting in their own energy and their own research funds to making that research come together.

There are programs in other countries that focus on funding synthesis alone, and I have benefited from those programs in Germany and in the U.S. I think it could be really exciting if Canada had that same kind of funding just for the synthesis, for bringing data together, for bringing people together and for bringing researchers together with northern communities to look at these questions. I think that's an area where the Canadian government doesn't currently provide very much funding at all.

Mr. Ben Lobb: I think that's a key point. It sounds like internationally there are a few avenues to coordinate the international efforts, but maybe you're correct in your assessment that there may be more the federal government could do to take perhaps a Canadian coordinated leadership role.

Prof. Isla Myers-Smith: Yes.

The Chair: Thank you.

We'll now turn to MP Kelloway for five minutes, please.

Mr. Mike Kelloway (Cape Breton—Canso, Lib.): Thank you, Chair.

It's great to be here in person on this committee. There has been some great testimony.

I have three questions, one for Dr. Anderson, one for Dr. Chen and one for Professor Myers-Smith.

For many years I worked at Cape Breton University and Nova Scotia Community College. While I was at Cape Breton University, I had the privilege of spending some time at Unama'ki College, where the research side was focused on indigenous knowledge, traditional knowledge and western science.

Dr. Anderson, I'm wondering If you can unpack, just briefly, the importance of indigenous knowledge and observations when it comes to climate change in the Arctic. Do you think the indigenous knowledge side is being adequately represented in current studies of climate change in the Arctic?

Dr. Kirk Anderson: I think we're trying. Certainly it's getting a lot of talk and airplay. An example of one of the things we deal with in respect of indigenous knowledge or northern engagement in education, in my view, is that in the discussion on access to the north by shipping, there was no mention of the fact that as shipping advances north, it disrupts indigenous travel routes. The question for me is around how we defend indigenous travel routes, not how we more successfully have ships from the south go north. That's an indigenous perspective. That's a local perspective.

I think we're doing better at it. I would argue, again, that we have villages and hamlets all across the north, and we have people who live there who are quite skilled. We should be leaving something to the benefit of those communities that stays with them when our researchers leave. Now, we're doing better at that, but a more formal arrangement where we're including indigenous peoples and people who are educated will benefit us from the indigenous perspective.

Kudos to Cape Breton University for the great work they're doing, as well.

Mr. Mike Kelloway: Thank you, Dr. Anderson.

Dr. Chen, your testimony and some of your answers to the questions really got me thinking about the contaminants in the north, climate change and the climate crisis. As parliamentary secretary for fisheries, oceans and the Coast Guard, it's of particular interest to me where I live, on the east coast, what's happening with respect to environmental change.

You talked about two issues, contaminants and climate change. Then you talked about prognostication. I wonder if you could take just a little bit of time to unpack some items that may keep you up

at night in terms of where we're going. You did highlight it in terms of the impact to the environment. I'm wondering if you could take one specific example, for maybe 50 seconds or so, before I move on to Professor Meyers-Smith.

Prof. Bing Chen: Yes. That's a really good question.

One example I can tell you about is the project I did last year. We collected water and soil samples from Yellowknife around Great Slave Lake. It was really community-based. We had community members on the team. We tried to identify the amount of PBDEs. That is a very typical flame retardant, and it's claimed to be an emerging contaminant. It's toxic, carcinogenic and everywhere, from our sheets to our cars to our appliances.

We collected more than 150 samples of soil and water. Surprisingly, there was almost 100% detection of PBDEs. They're not only on the surface; they're also deep, even in the permafrost. Those contaminants are now everywhere. Even microplastics go very deep. We detected microplastics 1.5 metres deep, and you can drill permafrost like concrete.

Those things are already there. How do we protect our communities from that when it's in the rivers and the lakes and the food—in the food and water?

• (1155)

Mr. Mike Kelloway: Thank you, Professor. I have to stop you there. I have a bit less than 30 seconds left.

Professor Meyers-Smith, you talked about the hub-and-spoke example. I'm a big proponent of that. We talked about building capacity in indigenous communities. I'm wondering if there are one or two things you could give us advice on to work on that. Obviously, there's money, but is there something else we need to be doing that we're not doing now?

I'll yield the floor after your answer.

Prof. Isla Myers-Smith: A very quick response to this is that people capacity is a limitation as well. We need the money, but we also need the people, and we need people who have the training to bring together academic research, government research and the work that indigenous communities are doing on monitoring ecosystems. We need that to happen in a distributed fashion across the Canadian Arctic covering areas close to communities but also areas further away from communities.

The Chair: Thank you very much.

We'll now turn to MP Blanchette-Joncas for two and a half minutes.

[Translation]

Mr. Maxime Blanchette-Joncas: Thank you, Madam Chair.

I'll continue the discussion by turning to Mr. Bêty.

Can you provide some examples of the Quebec government's contribution to research in the Canadian Arctic?

Mr. Joël Bêty: I would say that one of the Quebec government's strengths is probably the establishment of strategic interuniversity and multidisciplinary groups, such as the Centre for Northern Studies, Québec-Océan; the Centre for Biodiversity Science; and the Centre interuniversitaire d'études et de recherches autochtones, or CIERA.

These strategic groups support some or all of the northern research carried out by Quebec researchers. This significantly boosts the ability to share infrastructure data and encourages broader collaboration in Arctic research. Moreover, these groups strongly encourage the recruitment of new university researchers who focus on northern research. This obviously contributes to Canada's research potential in the north.

The Institut nordique du Québec, or INQ, was recently created to bring together researchers from various centres and research groups that work on sustainable and ethical development in northern areas. The INQ is supported by the Quebec research fund; the economy, innovation and energy department; and the Société du Plan Nord. Quebec's Société du Plan Nord also supports projects, mainly in Nunavik, another major part of Canada's Arctic territory. A number of initiatives significantly help to train highly qualified professionals in northern communities and increase our research capacity in the north.

Mr. Maxime Blanchette-Joncas: Thank you, Mr. Bêty. I'm proud to hear that.

How can we help university researchers and northern communities work together and share knowledge more effectively?

Mr. Joël Bêty: As I said earlier, I think that we really need help. Communities sometimes need as much help with finding funding and experts as expert researchers need assistance to better support and help communities. This requires highly qualified professional resources that specialize in this type of interaction to optimize collaboration, partnership and co-construction. I don't think that we have enough of these committed professionals who help both communities and university researchers.

Mr. Maxime Blanchette-Joncas: Thank you, Mr. Bêty.

[English]

The Chair: I appreciate that.

We now will turn to MP Cannings for two and a half minutes.

Mr. Richard Cannings: Thank you.

I'm going to go back to Dr. Bêty.

You were making some points about long-term datasets earlier, and I wanted to give you an opportunity to expand on that. We've heard from others in this study about the importance of those and how critical it is to keep the funding going on those long-term datasets, because once they're broken, we've lost a priceless set of information.

I'll let you comment on the value of those datasets and that research and how we could be doing a better job of funding and promoting that.

• (1200)

[Translation]

Mr. Joël Bêty: Thank you again for your question.

As I said, long-term datasets provide a better understanding of the causes of changes. Obviously, changes can be caused by global warming, but sometimes by other factors too, including factors outside the Arctic. Long-term datasets make it possible to differentiate between normal and abnormal variations and to identify causes.

The issue is that our funding systems focus much more on short-term, novelty or species-specific projects. This is a real issue when it comes to understanding the impact of climate change on Arctic ecosystems.

Also, the different components of ecosystems don't react at the same speed. Some components react quickly, while others react much more slowly. Sometimes, our long-term time series help us understand the diversity in the reaction of ecosystems. The next Arctic ecosystems will be different. There will be a regeneration and reassembly of ecosystem components that don't react at the same speed. Long-term datasets help us detect this type of change and better anticipate it.

[English]

Mr. Richard Cannings: Dr. Myers-Smith, do you want to quickly comment on long-term datasets as well? You deal with them all of the time.

Prof. Isla Myers-Smith: I would absolutely echo everything Joël Bêty just said.

I would just like to highlight one thing.

On Qikiqtaruk—Herschel Island we've been collecting various datasets. One was the depth of the active layer. It was something that had been stopped and our research group brought it back as a long-term dataset. Then last summer, suddenly a massive permafrost thaw event happened. If we hadn't been collecting the long-term data, we wouldn't understand right now what was happening and we wouldn't be able to make predictions of what's going happen next summer and into the future.

You can't always anticipate the changes that are coming. You have different rates of change for different parameters of these systems. The impacts are global and also local, and are vitally important. We need the data to understand the change that's going on.

Mr. Richard Cannings: Thank you.

The Chair: I want to thank our witnesses, Dr. Kirk Anderson, Dr. Bing Chen, Dr. Isla Myers-Smith and Dr. Joël Bêty. It was very fascinating testimony.

We'll suspend briefly so that we can come back and resume in camera.

If you have anything that you want to add, you may submit that to the clerk. Please also see the clerk for any questions.

[Proceedings continue in camera]

Published under the authority of the Speaker of
the House of Commons

SPEAKER'S PERMISSION

The proceedings of the House of Commons and its committees are hereby made available to provide greater public access. The parliamentary privilege of the House of Commons to control the publication and broadcast of the proceedings of the House of Commons and its committees is nonetheless reserved. All copyrights therein are also reserved.

Reproduction of the proceedings of the House of Commons and its committees, in whole or in part and in any medium, is hereby permitted provided that the reproduction is accurate and is not presented as official. This permission does not extend to reproduction, distribution or use for commercial purpose of financial gain. Reproduction or use outside this permission or without authorization may be treated as copyright infringement in accordance with the Copyright Act. Authorization may be obtained on written application to the Office of the Speaker of the House of Commons.

Reproduction in accordance with this permission does not constitute publication under the authority of the House of Commons. The absolute privilege that applies to the proceedings of the House of Commons does not extend to these permitted reproductions. Where a reproduction includes briefs to a committee of the House of Commons, authorization for reproduction may be required from the authors in accordance with the Copyright Act.

Nothing in this permission abrogates or derogates from the privileges, powers, immunities and rights of the House of Commons and its committees. For greater certainty, this permission does not affect the prohibition against impeaching or questioning the proceedings of the House of Commons in courts or otherwise. The House of Commons retains the right and privilege to find users in contempt of Parliament if a reproduction or use is not in accordance with this permission.

Also available on the House of Commons website at the following address: <https://www.ourcommons.ca>

Publié en conformité de l'autorité
du Président de la Chambre des communes

PERMISSION DU PRÉSIDENT

Les délibérations de la Chambre des communes et de ses comités sont mises à la disposition du public pour mieux le renseigner. La Chambre conserve néanmoins son privilège parlementaire de contrôler la publication et la diffusion des délibérations et elle possède tous les droits d'auteur sur celles-ci.

Il est permis de reproduire les délibérations de la Chambre et de ses comités, en tout ou en partie, sur n'importe quel support, pourvu que la reproduction soit exacte et qu'elle ne soit pas présentée comme version officielle. Il n'est toutefois pas permis de reproduire, de distribuer ou d'utiliser les délibérations à des fins commerciales visant la réalisation d'un profit financier. Toute reproduction ou utilisation non permise ou non formellement autorisée peut être considérée comme une violation du droit d'auteur aux termes de la Loi sur le droit d'auteur. Une autorisation formelle peut être obtenue sur présentation d'une demande écrite au Bureau du Président de la Chambre des communes.

La reproduction conforme à la présente permission ne constitue pas une publication sous l'autorité de la Chambre. Le privilège absolu qui s'applique aux délibérations de la Chambre ne s'étend pas aux reproductions permises. Lorsqu'une reproduction comprend des mémoires présentés à un comité de la Chambre, il peut être nécessaire d'obtenir de leurs auteurs l'autorisation de les reproduire, conformément à la Loi sur le droit d'auteur.

La présente permission ne porte pas atteinte aux privilèges, pouvoirs, immunités et droits de la Chambre et de ses comités. Il est entendu que cette permission ne touche pas l'interdiction de contester ou de mettre en cause les délibérations de la Chambre devant les tribunaux ou autrement. La Chambre conserve le droit et le privilège de déclarer l'utilisateur coupable d'outrage au Parlement lorsque la reproduction ou l'utilisation n'est pas conforme à la présente permission.

Aussi disponible sur le site Web de la Chambre des communes à l'adresse suivante :
<https://www.noscommunes.ca>