



July 15, 2022

Submitted to: [adaptation@ec.gc.ca](mailto:adaptation@ec.gc.ca)

### **Feedback on Canada's National Adaptation Strategy**

On behalf of the Canadian Permafrost Association (CPA), we would like to thank Environment and Climate Change Canada for the ability to review the discussion paper titled *Preparing for Climate Change* (May 2022) and provide feedback on the development of Canada's National Adaptation Strategy (NAS) concerning permafrost change.

Permafrost underlies more than half of Canada and Northern regions are experiencing climate warming at a rate that is two to four times the global average. This unprecedented warming is accelerating permafrost thaw which is significantly impacting the land, infrastructure, and livelihood of Northerners. In addition, Canada's permafrost carbon emissions are unknown and unaccounted for in global climate models.

The CPA's mission is to bring communities, researchers, and practitioners together to advance the understanding of permafrost environments. Our organization was founded in 2018 to coordinate permafrost stakeholders across the country and provide a link to international partners. We work closely with NSERC PermafrostNet and strongly endorse the three recommendations on the NAS provided by Dr. Stephan Gruber and Dr. Janet King, NSERC PermafrostNet's Scientific Director and Board of Directors Chair, respectively. The CPA's perspectives on these three recommendations (rephrased from the NSERC PermafrostNet feedback on NAS) are:

#### **1) NAS must explicitly include permafrost change:**

Permafrost is a fundamental component of the Northern environment. All Northern development projects must account for permafrost and this consideration is increasingly challenged by climate change. Upon review of the discussion paper, we concluded that permafrost is not sufficiently addressed nor acknowledged. Compared to floods and fires, which are mentioned numerous times throughout the document in detail, permafrost is only generally acknowledged within the first few pages as being impacted by climate change. However, in the North, all five NAS systems are impacted by permafrost change and all seven key groups acknowledged in the NAS whole-of-Canada approach struggle to make informed decisions due to the lack of coordinated permafrost information and services. Unfortunately, Canada's leading Permafrost Scientists and Engineers were not included in any of the five expert advisory tables where



they could have contributed meaningful feedback to all of them. The CPA believes that the NAS represents a critical opportunity to coordinate efforts to address the persistent and profound impacts of permafrost change on Northerners, Canada, and beyond.

**2) NAS must create a permafrost focal point to ensure long-term coordinated action:**

Permafrost is interdisciplinary. Engineers, geoscientists, hydrologists, ecologists, climatologists, environmental scientists, land use planners, and Indigenous and community knowledge holders are all key groups that contribute to the understanding and prediction of permafrost processes for the whole of Canada. Currently, Canadian permafrost activities and priorities are uncoordinated because we lack a focal point to ensure a unified, long-term vision. Considering the changes currently experienced in permafrost regions, Canada cannot afford to continue with such fragmented efforts. Canada must follow the approach taken by other permafrost nations and establish a co-developed focal point that has a shared strategy, representation from the whole-of-Canada key groups, and strong Northern and Indigenous leadership.

The creation of a permafrost focal point would further assist in targeted capacity building. To date, there is insufficient capacity of permafrost scientists and engineers in Canada needed to address challenges from permafrost change. The lack of permafrost capacity is especially severe in the North where adaptation is acutely needed. The NAS offers a path towards closing this capacity gap by acknowledging that adaptation implementation requires understanding fundamental permafrost processes and a focal point that brings together knowledge-generators, policy-makers, and practitioners.

**3) NAS must include Permafrost Knowledge Services.**

Canada is lacking a reliable national service where Canadians can access and share information on permafrost conditions, hazards, and the results of permafrost prediction models. Permafrost knowledge services are required to inform adaptation decisions concerning sustainable economic development in the North that benefits the whole country. Like climate services or earthquake services, an institution with sustainable funding is needed to develop permafrost knowledge services that maintain long-term monitoring and provide future projections. Such a service should not be considered a research effort and cannot be left under the management of a research institution. As NSERC PermafrostNet highlighted in their letter, a national permafrost knowledge service would attract additional value from international research activities – often conducted in Canada – for the benefit of people living in Canada. In addition, international contributions to a national permafrost knowledge service would inherently inject Canadian needs and priorities more effectively into these circumpolar efforts. The permafrost knowledge service should also demonstrate competence regarding permafrost carbon feedback and provide information on GHG emissions from thawing permafrost to inform policymakers on Canada's path towards Net Zero.



The interdisciplinary nature of permafrost-related science and engineering must be reflected in the development and operation of a permafrost knowledge service. The service must include aspects from earth sciences, climate sciences, hydrology, geotechnical engineering, social sciences, and indigenous knowledge. Adaptation to permafrost thaw can only be successful if all these components are included and therefore, they must also be represented in a permafrost knowledge service.

The CPA, together with NSERC PermafrostNet, strongly endorses the whole-of-Canada approach and recognizes the roles that various stakeholders must play to achieve this. Efforts made in Canada in recent years, such as the formation of the CPA and progress within NSERC PermafrostNet, are steps in the right direction. However, considering uncertainties and the impacts that permafrost change has directly on the livelihood of Northern communities (e.g. via infrastructure failure), and indirectly on the earth's atmosphere (e.g. via permafrost carbon feedback), the CPA strongly recommends that permafrost change is prominently addressed within the NAS through the recommendations proposed in this letter.

Thank you again for the opportunity to provide feedback on the development of the National Adaptation Strategy.

Sincerely,



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Enclosure:

**Feedback on Canada's National Adaptation Strategy (Discussion Paper – May 2022)**  
- Submitted on July 10, 2022 by Dr. Gruber and Dr. King, NSERC PermafrostNet





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Ottawa, July 10, 2022

### **Feedback on Canada's National Adaptation Strategy (Discussion Paper - May 2022)**

Thank you for the opportunity to comment on the emerging National Adaptation Strategy (NAS). We congratulate you on your commitment to developing this framework for building forward-looking climate resilience for all Canadians. Our input will focus on permafrost change, recommending three key refinements to the discussion version of the NAS.

**Permafrost change is a critical but underestimated component of slow onset climate change impacts that affects or will affect, nearly half of the exposed Canadian landmass. In a rapidly warming world, Canada cannot afford to keep it a *known unknown*.**

Current and expected future impacts will damage or destroy infrastructure (e.g., community buildings, transportation, communication, defence, resource extraction), undermine the sustainability of communities (e.g., reduced availability of goods, health services, communication, or clean water; disaster response and recovery), and negatively impact ecosystems, traditional lifestyles (e.g., via effects on access to the land, wildlife, food sovereignty, or cultural continuity), economic development and sovereignty.

These effects reinforce each other and widen the existing infrastructure and services gap in Canada's north. Emerging studies are revealing the high costs for adaptation to permafrost thaw that will be required and will continue to steeply increase until the end of the century and beyond. We can choose to follow a path with steep growth of these costs by remaining largely reactive in our approach, or conversely, to make early and lasting investments in adaptation that will dampen the increase in cost and enable a wider range of co-benefits.

We acknowledge that investment in adaptation should not distract from the importance of ambitious mitigation of climate change, which will determine the long-term trajectory of permafrost thaw. Informed climate change mitigation decisions necessarily require quantitative understanding of permafrost change because the self-reinforcing feedback between



anthropogenic climate change and permafrost thaw impacts the amount of greenhouse gases that humans can emit when aiming to remain below 1.5 °C or 2 °C of global warming. The thawing of permafrost causes emissions of carbon dioxide and methane that are currently not comprehensively accounted for in Earth system models and global emissions budgets. Progress on quantifying and predicting permafrost thaw, therefore, offers an important convergence of informing adaptation and mitigation actions alike.

While all efforts to adapt to permafrost change and to quantify its role as a climate feedback mechanism would be encouraged, we recommend that priority be given to actions that can drive systemic and national approaches. We suggest three key changes to the Framework:

- 1) Including permafrost change in the NAS with clarity and specificity.** This is important because it is a persistent, pervasive, and profound impact that requires urgent and coordinated attention. Permafrost change affects all five systems of the NAS and all key groups identified in the whole-of-Canada approach. It has real potential to worsen existing inequalities, and Indigenous peoples will disproportionately experience the effects of permafrost change. The discussion version of the Framework addresses rapid climate change impacts that are visible as extreme events or disasters and require immediate emergency response. However, even though Figure 1 of the NAS discussion document identifies slow onset impacts such as sea ice and permafrost change, these impacts, although also extreme, are essentially not mentioned again in the document. Permafrost change creates comparatively slow-moving impacts that are already causing disastrous social and economic effects, and the rates of these impacts are growing rapidly. Permafrost is hidden in the ground and often remote, and impacts tend to lag behind changes in the atmosphere. What is more, permafrost change does not have champions and institutions that are as well positioned as those concerned with changes in the atmosphere and hydrosphere. For these reasons, permafrost change still largely remains a *known unknown* in Canada. The NAS is an opportunity now for elevating adaptation actions, services, and research concerning permafrost change so that everyone living in Canada is resilient to climate change and, in this context, to advance Indigenous capacity and knowledge use in a key area of Northern climate decision-making. In doing so, Canada can become a leader in adapting to climate change – in the North, in the Arctic, and in its mountain ranges that similarly face increasing hazards from permafrost thaw.
- 2) Creating a clear focal point to inform priorities and drive action regarding permafrost change.** This is important because fragmentation of efforts risks that adaptation responses to permafrost change will be unfocused, inefficient, not serving key stakeholders, and therefore, not fulfill the national need. While permafrost change is relevant to all of the Five Systems of the NAS and all Key Groups identified in the whole-of-Canada approach, there is no focal point that could drive critically needed action



coherently. To ensure an informed and effective response we recommend that an overall intent regarding coordination and coherent, co-developed guidance on adapting to permafrost change across the Five Systems and the Key Groups be included in the Framework. A clear commitment to a shared approach, with strong Northern representation in governance and capacity, is crucial for success.

- 3) Creating permafrost climate services.** Only reliable services can deliver permafrost knowledge to inform adaptation decisions efficiently and consistently. Permafrost climate services are needed so that Canadians can access information on the risks from permafrost they face in their communities and are a prerequisite for improved regulatory and policy measures, guidelines, codes, and standards. The ability to quantify future risk is also important to avoid a scenario where future development will become uninsurable and for reducing disaster risk for vulnerable regions and populations. Permafrost climate services will also help advance permafrost research (in science and engineering) to better address the questions relevant to adaptation. Climate services are being introduced in Canada and internationally for providing decision support derived from climate information for assisting individuals and organizations in making improved forward-looking decisions. The framing of climate services (e.g., by the World Meteorological Organization) with its emphasis on co-development to inform adaptation decisions is particularly valuable in a permafrost context. Permafrost climate services, however, are new and positioned at the intersection of climate science, permafrost science, and geotechnical engineering. Their co-development, implementation, and delivery will require stable and networked capacity across sectors, regions, and ways of knowing – with data derived from observation and computer simulation being an important complement to practitioner, local, and traditional knowledge that exists in permafrost regions. Capacity and sustained funding to Northern organizations with mandates related to permafrost are especially important for enabling robust collaboration and services. Finally, permafrost climate services will allow deriving more value from the results of international research – often conducted in Canada – for the benefit of Canadians, and to align this research better with Northern needs.

We strongly endorse the whole-of-Canada approach and recognized the roles that key groups and citizens will need to play to achieve this. In a similar spirit, NSERC PermafrostNet was funded (2019–2024) as a Strategic Partnership Network to unite key scholars and stakeholders from government agencies, industry, and Indigenous communities with the common goal of boosting Canada’s ability to adapt to permafrost thaw.

NSERC PermafrostNet has advanced permafrost knowledge for adaptation and data interoperability and is training and connecting a new generation of experts. Several lines of research, for example developing and prototyping components of permafrost climate services,



could expand into supporting early deliverables in the NAS context. Based on networking differing sectors and its shared governance, the network now catalyzes an open and inclusive strategic thinking exercise toward a vision and strategy for Canadian permafrost knowledge. With this, we are building toward co-developing a collective approach to inform actions to adapt and build resilience to permafrost change. We are available to brief you on our efforts in research, networking, and building strategy and would be pleased if they could help inform the development and implementation of Canada's National Adaptation Strategy.

Thank you again for the opportunity to provide perspectives and comments on the development of the National Adaptation Strategy.

With regards,

Dr. Stephan Gruber, NSERC PermafrostNet Scientific Director  
Canada Research Chair in Climate Change Impacts/Adaptation in Northern Canada,

Dr. Janet King, Chair, NSERC PermafrostNet Board of Directors