

## Survey results

This is a PDF version of [Priorities for a Canadian Permafrost Network](#), as part of the information page [Towards a Canadian Permafrost Network](#).

In a pre-survey to workshop participants in December 2016, we asked “*what top three things do you think a Canadian Permafrost Network should work on to demonstrate its value as a network*”. The responses (over 50 people) have been summarized and cross-referenced with the outcomes of the [The Pan-Territorial Permafrost Workshop in Yellowknife](#), in 2013 which had over 200 participants. The resulting priorities are shown below and can be expanded by clicking on the triangles. While some new ideas have emerged, there are several consistent messages that continue to be on peoples’ minds.

## Permafrost Monitoring

*The systematic and coordinated observation of phenomena with the aim to reveal temporal change and to provide early warning of adverse developments.*

- **Guarantee and coordinate** long-term monitoring with appropriate governance, infrastructure, and strategy.
- **Establish long-term monitoring stations** with protocols and maintenance appropriate for quantifying change on decadal time scales.
- **Represent the diversity of Canada** (e.g., Arctic and mountainous areas, natural and built environment) with the choice of monitoring stations.
- **Include multiple phenomena** such as ground temperature, geomorphic change, or liquid water content in monitoring system.
- **Use multiple sources of data** such as borehole and surface measurements, traditional knowledge, and remote sensing in monitoring.
- **Engage multiple sectors** (industry, government, communities, academia) in monitoring
- **Establish local monitoring** and protocols to support decision making for early warning of adverse developments in key structures or land elements.

## Data Curation

*Integration of data from various sources with quality control and publication mechanisms suitable for enabling its long-term usability and relevance.*

- **Develop infrastructure for data handling**, i.e. ingestion, quality control, access, publishing, referencing, archiving, and interoperability.
- **Provide assistance in data handling** for those generating or using data.
- **Develop and establish standards** for data and metadata in collaboration with users and suppliers of data.

- **Foster data sharing** so that all sectors (industry, government, communities, academia) benefit and contribute. Include relevant non-permafrost data on e.g., climate, water, snow.
- **Develop and establish policies for referencing and use** of data to ensure fairness and reproducibility.

## Synthesis and Future Scenarios

*Coherent reporting of relevant insight and details derived from multiple sources. Levels of uncertainty and disagreement are highlighted, possible future permafrost environments are described based on climate change scenarios and the critical evaluation of models with observations and existing knowledge.*

- **Analyze, synthesize and reconcile** datasets representing different phenomena (e.g., temperature, subsidence), scales, data sources (e.g., remote sensing, ground observations, simulation), ways of knowing (traditional knowledge, science).
- **Create national synthesis reports** on the state and changes of permafrost across Canada, including Arctic and mountainous areas, natural and built environment.
- **Contribute to international synthesis** products and reports.
- **Distinguish regional patterns of permafrost thaw** caused by climate change from **local impacts** caused by anthropogenic or natural disturbances.
- **Simulate future permafrost environments** using well-tested modeling tools and consensus methods and provide variables needed by practitioners.
- **Develop spatial data products** on the characteristics and changes of Canadian permafrost; show climate impacts in useful metrics.
- **Provide consistent input for permafrost models** based on observed climate and simulated future scenarios so that impact studies can use consensus boundary conditions.

## Coordination and Representation

*Working together more efficiently and smoothly and having mechanisms for speaking and acting on behalf of the community.*

- **Build and maintain relationships** across regions and jurisdictions, areas of expertise, and ways of knowing.
- **Develop and prioritize key research needs** through white papers, network documents, etc.
- **Support strategic initiatives** by priority setting, national strategies, and formulation of common goals.

- **Coordinate research** (field, laboratory, theoretical) and facilities in Canada to turn taxpayer investment into world-leading research, strive towards unified conceptual models for permafrost scientists and engineers.
- **Promote the importance of permafrost** and its consideration in development and climate change assessments.
- **Lobby Canadian governments** to support permafrost related research projects.
- **Work towards a formal organization in Canada** for interfacing with national and international organisations.

## Communication and Knowledge Mobilization

*Exchanging information and moving available knowledge into active use by means and language suitable to the intended recipient.*

- **Communicate the current state and observed/anticipated permafrost change** to policy makers, communities and the wider public. Produce coordinated and large-scale syntheses relevant to practitioners and researchers and use diverse ways of communication (report, workshop, comic, social media,...).
- **Provide annual updates** on state of permafrost in Canada.
- **Make permafrost information accessible and usable** for stakeholders, provide explanation, high-level data.
- **Create Canadian spatial data-products** for conveying key information on permafrost issues (e.g., ground ice, thermokarst vulnerability, permafrost characteristics, permafrost change) in a standardised form.
- **Visualise relevant information** in an appropriate way to communicate existing knowledge to diverse audiences, maintain consistency over time.
- **Provide a Canadian website for reporting permafrost research** in Canada and worldwide, compile and share recent research information
- **Improve the awareness of the Canadian population** about challenges related to permafrost and the impacts of our choices as a country.
- **Facilitate communication between communities and scientists** with discussion forums, meetings, and seminars for stakeholders and researchers to interact on key issues.

## Education and Training

*Teaching particular knowledge and skills, educating highly-qualified personnel (HQP) with respect to permafrost issues and ways to tackle them.*

- **Offer Northern HQP training** for addressing permafrost issues; include "non-traditional" HQP, community members, public works foreman, etc.

- **Foster broad competence** based on combined university/college and "on the ground" training in permafrost issues, provide specialized permafrost knowledge as required by government and industry as part of education.
- **Improve integration** of permafrost science with impacts on northern ways of life, culture, economy, society; blend natural & social sciences for value-added, relevant, northern-oriented research; build relationships and partnerships.
- **Provide training and mentorship** for early-career scientists.
- **Help obtain resources for students** doing permafrost research in Canada.

## Adaptation to Changing Permafrost

*Actions taken to help communities and other stakeholders to better cope with the effects of permafrost and its thaw.*

- **Ensure adequate resources and capacity** in affected communities for implementing adaptation strategies.
- **Develop tools and best practices** for adaptation, mitigation and intervention for the built and natural environments.
- **Provide information products and maps** to communities.
- **Identify short and long-term concerns** of permafrost thaw for communities.
- **Work with communities** to help them implement measures for better coping with consequences of permafrost thaw.

## Science and Engineering

*Investigating the functioning and behavior of permafrost environments and designing, building, and using structures adapted to function in permafrost environments.*

- **Develop monitoring methods** for changes associated with permafrost degradation (e.g., temperature, surface deformation, ice loss, degassing) also for foundations.
- **Develop tools and strategies for data handling** in order to enable effective curation of permafrost information.
- **Define key metrics of permafrost change** to be used nation-wide.
- **Investigate permafrost impacts on related systems** such as water resources, wildlife, and forests.
- **Reconcile learning and data derived from** ground observations, remote sensing, and simulations
- **Identify hazards and risks** associated with changing permafrost conditions from a Canadian perspective.
- **Improve risk reduction and impact mitigation** methods related to permafrost.
- **Provide reliable models** to simulate permafrost processes and phenomena, enable joint use of models with ground observations and remote sensing data.

[http://carleton.ca/permafrost/network\\_survey/](http://carleton.ca/permafrost/network_survey/)

- **Improve design for infrastructure** in warming permafrost and corresponding regulations and standards, develop decision-support tools.
- **Develop retrofitting solutions** for existing infrastructure in warming permafrost.

The workshop at Carleton on **February 14 & 15, 2017** will provide further opportunity for reviewing these priorities and then developing ways to move forward on key topics of interest. The network is intended to provide an enabling environment for working on these priorities and for finding sustainable solutions.