![IASC logo] ICARP IV
INTERNATIONAL CONFERENCE ON
ARCTIC RESEARCH PLANNING

ICARP IV

FINAL OUTCOMES REPORT

MARCH 2026

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

ICARP IV at a Glance

The Fourth International Conference on Arctic Research Planning (ICARP IV) process engaged broad communities, including Arctic researchers, Indigenous Peoples, policy-makers, residents and other stakeholders from all countries involved in Arctic research. Participants were tasked with identifying the most urgent knowledge gaps and research priorities for the next decade, and to recommend approaches to address these needs.

ICARP IV was organised into seven Research Priority Teams (RPTs), as follows:

- RPT 1: The Role of the Arctic in the Global Earth System
- RPT 2: Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses
- RPT 3: Understanding the Dynamics and Resilience of Arctic Social-ecological Systems to Foster Sustainable Futures
- RPT 4: Arctic Research Cooperation and Diplomacy
- RPT 5: Co-Production and Indigenous-led Arctic Research
- RPT 6: Education and Knowledge-Sharing In and About the Arctic: Research and Practice
- RPT 7: Technology, Infrastructure, Logistics, and Services

The RPTs' recommended research needs and priorities fall into six broad categories:

- Addressing gaps in scientific understanding and modelling capabilities;
- Improving research infrastructure and observation systems;
- Mitigation and adaptation to changing conditions;
- How research should be conducted;
- Education and outreach; and
- Governance, policy, international collaboration, and funding systems.

Indigenous Peoples' engagement and leadership in research was a strong overarching theme across all RPTs, emphasising the importance of Indigenous-led research, co-producing knowledge, building equitable partnerships, and ensuring that research reflects the needs, rights, and perspectives of Arctic communities.

The ICARP IV Final Outcomes Report and the seven Research Priority Team (RPT) reports are available online. Scan the QR code or go to: **icarp.iasc.info/publications/publications-icarp-iv**

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Table of Abbreviations

AI	Artificial Intelligence	**IPCG**	Indigenous Peoples' Coordination Group
ASSW	Arctic Science Summit Week	**IPY**	International Polar Year
CARE	Collective benefit, Authority to control, Responsibility, and Ethics	**ISC**	International Steering Committee
		OCAP	Ownership, Control, Access, and Possession
FAIR	Findable, Accessible, Interoperable, and Reusable	**RPT**	Research Priority Team
IASC	International Arctic Science Committee	**SAR**	Synthetic Aperture Radar
ICARP	International Conference on Arctic Research Planning	**UN**	United Nations

Preface

The Arctic is warming faster than anywhere else on Earth, driven fundamentally by human-caused climate change. The consequences of this transformation extend far beyond the Arctic, affecting global climate, weather patterns, biodiversity, and communities worldwide. Understanding, mitigating, and adapting to these changes are critically important tasks that require large-scale international cooperation, as well as coordinated and sustained funding.

At the same time, Arctic research is being affected by increasing geopolitical tension and a changing landscape of international cooperation. For example:

- The global COVID–19 pandemic revealed vulnerabilities in Arctic research infrastructure, prompting calls for more resilient systems.
- The invasion of Ukraine by Russia in 2022 has had a deep impact on Arctic diplomacy and research collaboration.
- Broader geopolitical shifts are creating great uncertainties for the support of scientific research and actions on climate change in the Arctic.

Maintaining effective cooperation in this context requires new approaches that emphasise resilience, inclusivity, unity, and a broader recognition of diverse knowledge systems. Cooperation must balance urgent action with a long-term commitment to sustained Arctic research support over the next decade and beyond.

The work of the Fourth International Conference on Arctic Research Planning (ICARP IV) process was shaped by these pressing needs. It identified key research questions in seven topic areas, research priorities to address those questions, and strategies for implementing the research priorities.
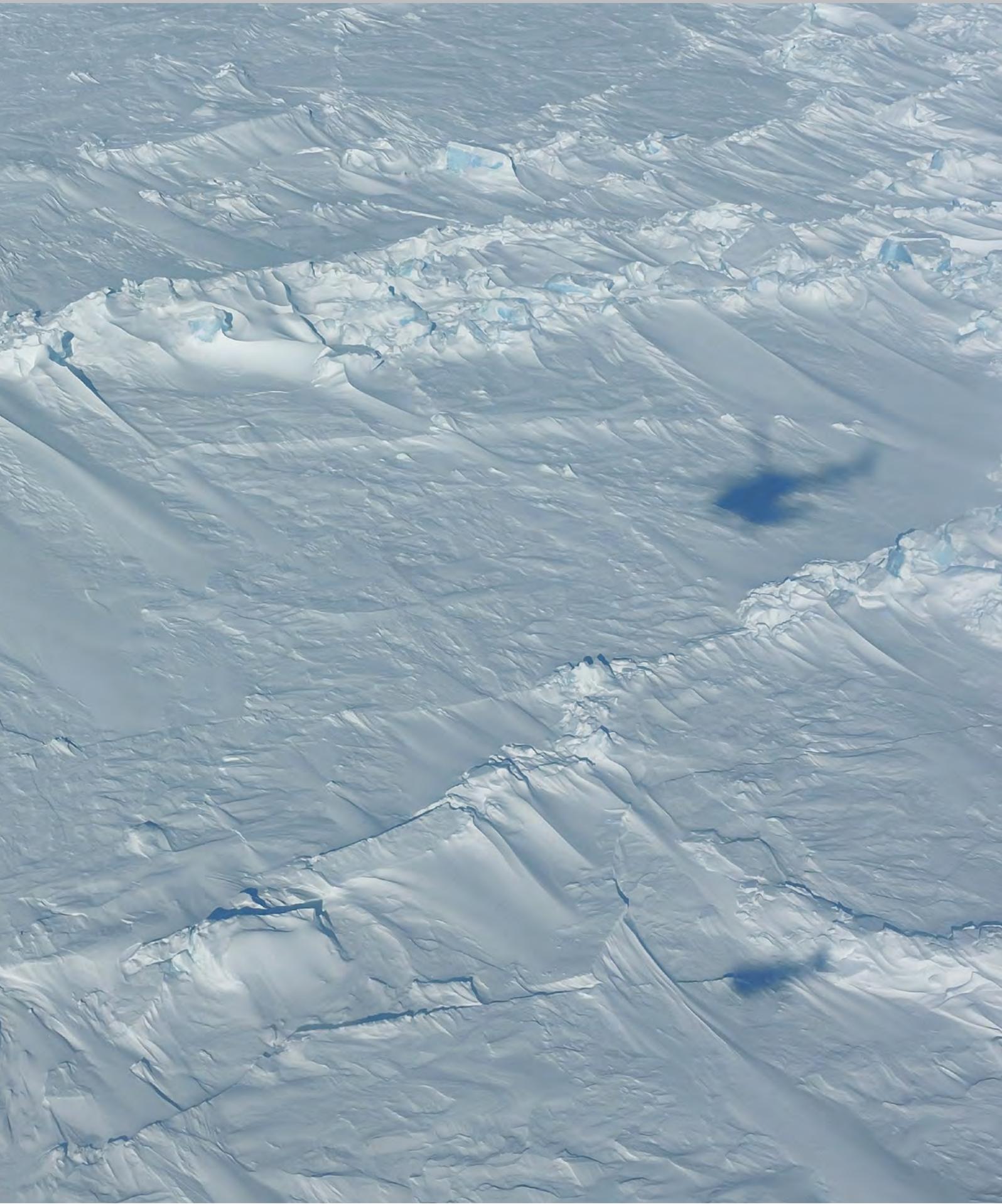
Executive Summary

The Fourth International Conference on Arctic Research Planning (ICARP IV) charts a new path forward for Arctic research leading up to the Fifth International Polar Year in 2032–33. Engaging thousands of Arctic researchers, Indigenous Peoples, policy-makers, residents, and other stakeholders from all countries involved in Arctic research, ICARP IV identifies today's most pressing research questions related to the Arctic, presents a set of research priorities designed to address those questions, and offers practical implementation strategies. It also provides a vision for new and more effective approaches to conducting research in the Arctic, particularly in terms of co-production of knowledge with Indigenous communities.

The research priorities, approaches, and recommendations laid out in ICARP IV serve as a road map to guide Arctic research—and tomorrow's leaders in Arctic science, education, and policy—through what promises to be a decade of rapid changes in the Arctic environment, global geopolitics, and funding ecosystems.

The ICARP IV process, held from 2022 to 2026, was led by the International Arctic Science Committee (IASC) in cooperation with 26 international partner organisations. ICARP IV's recommendations are intended to help guide Arctic research in all fields over the next decade (to 2035), and to inform planning for the Fifth International Polar Year in 2032–33.

ICARP IV's work was conducted through seven Research Priority Teams (RPTs), organised by topic area, that included more than 200 individuals from 28 countries:

- RPT 1: The Role of the Arctic in the Global Earth System
- RPT 2: Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses
- RPT 3: Understanding the Dynamics and Resilience of Arctic Social-ecological Systems to Foster Sustainable Futures
- RPT 4: Arctic Research Cooperation and Diplomacy
- RPT 5: Co-Production and Indigenous-led Arctic Research
- RPT 6: Education and Knowledge-Sharing In and About the Arctic: Research and Practice
- RPT 7: Technology, Infrastructure, Logistics, and Services

ICARP IV emphasised inclusivity in its process, involving early-career scientists, Indigenous Peoples, and local residents in the development of priorities and science plans to address key questions. The ICARP IV process rested on a foundation of the recognition of and respect for Indigenous Peoples' Knowledge and leadership in research, the value of diverse ways of knowing, and the need to invest in meaningful and equitable research collaborations.

Twenty-six international partner organisations were represented on the ICARP IV International Steering Committee, which was tasked to oversee and coordinate the ICARP IV process from 2022 to 2026; identify and develop the overall process's goal, theme, and agenda; and propose mechanisms for action and implementation of the ICARP IV outcomes. An ICARP IV Indigenous Peoples' Coordination Group assisted in and ensured coordination of the efforts to Indigenise Arctic research. All final outcome reports of the ICARP IV process were reviewed by hundreds of members of the ICARP IV partner organisations, including the IASC Working Groups and Committees.

Each of the seven RPTs identified a set of research priorities for the next decade, based on key research needs. The individual RPT reports propose approaches for implementing these priorities, and identify agencies and organisations that could take the lead on implementation. The RPTs also identified cross-cutting research priorities that apply across the RPT topic areas. The key research needs, the implementation actions for the research priorities, and the cross-cutting research questions and priorities are all described in this Final Outcomes report and in greater detail in the individual RPT reports.

The RPTs' recommended research priorities fall into six broad categories:

1. Addressing gaps in scientific understanding and modelling capabilities;
2. Improving research infrastructure and observation systems;
3. Mitigation and adaptation to changing conditions;
4. How research should be conducted;
5. Education and outreach; and
6. Governance, policy, and funding systems.

Audience for this Report

The ICARP IV Final Report is intended for the Arctic research community at large and primarily for the public, policy-makers, and funders to help them understand where our knowledge is lacking and where investments are needed.

A *Summary for Policy-makers* and a *Call for Action for Funders* are also available and published separately, focusing on outcomes and information usable by policy- and decision-makers and funders, respectively.

PHOTO: SUSAN CHRISTIANEN

1. Shaping Arctic Research Priorities through Community-wide Engagement: The ICARP IV Process

IASC´s Founding Articles call upon IASC to periodically review the status of Arctic science. To address this requirement, IASC has organised ICARPs every 10 years since 1995. Each ICARP provides a forum for the Arctic research community to come together to discuss and identify priorities for international and multidisciplinary science.

Previous ICARP Conferences – A Timeline

ICARP I: 1995. Hanover, New Hampshire, USA
ICARP II: 2005. Copenhagen, Denmark
ICARP III: 2015. Toyama, Japan
ICARP IV: 2025. Boulder, Colorado, USA

1.1. ICARP I–III (1995–2015) Legacies

In the early 1990s, as IASC became fully operational, three developments converged to highlight the value of planning for the conduct of Arctic science. First, the end of the Cold War and the emergence of a spirit of regional cooperation in the Arctic opened up the prospect of substantive cooperation between Western and Russian scientists interested in the circumpolar north. Second, the onset of the era of "big science" with research projects involving collaboration among large groups of scientists and research institutes placed a premium on the development of effective coordination mechanisms. And third, the realisation that the Arctic is a dynamic region subject to rapid and often nonlinear changes in both biophysical and socioeconomic terms provided new impetus for conducting coordinated observations in an effort to understand the behaviour of Arctic systems.

ICARP I

IASC took the initiative early on to address this need, beginning with an effort on the part of the Executive Committee to develop a Science Agenda for the organisation and moving forward at the 1994 annual meeting to approve an initial agenda focusing on four broad themes: (1) impacts of global change on the Arctic region and its peoples; (2) Arctic processes of relevance to global systems; (3) natural processes within the Arctic; and, (4) sustainable development in the Arctic. This meeting also generated the idea that it would be useful to convene a larger international planning conference to provide a roadmap for all those engaging in or desiring to engage in research on Arctic topics that would contribute to common themes and produce more robust findings. Thus was born the idea of organising the first ICARP at Dartmouth College in Hanover, New Hampshire, USA from 5 to 9 December 1995.

More than 250 scientists attended the week-long conference in Hanover. This group was notable both for its diversity and for the strong sense of community that pervaded the meeting. The participants in the conference, under the leadership of the Program Steering Committee, produced two documents: an Executive Summary and a Final Report on the work of ICARP I entitled "Arctic Systems: Natural Environments, Human Actions, and Nonlinear Processes."

ICARP II

ICARP II, a 24-month planning process that culminated in a meeting on 10–12 November 2005 in Copenhagen, brought together more than 450 scientists, policy-makers, research managers, Indigenous scholars, and others interested in and concerned about the future of Arctic research. ICARP II was structured around potential research needs under 12 themes identified by the Conference Sponsors and based upon input from the science and Arctic community at large. Each theme was led by an international team of scientists and other experts (e.g., Elders and other leaders from Indigenous Peoples of the North). Conference participants concluded that between ICARP I and II there was a paradigm shift among Arctic scientists from valuing separate and distinct understanding along disciplinary lines to seeking a more multidimensional perspective in research activities. This holistic perspective included the human dimension, Indigenous Peoples' insights, and a more complete integration of Arctic processes in the Earth system. The range of questions, issues, and gaps in understanding identified during the ICARP II process provided the underpinning for the Science Plans and for framing research perspectives and objectives for the decade or two ahead.

ICARP II was a pivotal event for fostering the next generation of Arctic scientists and researchers. One of its major outcomes was the establishment of the Permafrost Young Researchers Network to support early-career scientists in permafrost research, and the conference emphasised the need to train new researchers to lead and engage in Arctic research. This focus has been maintained by IASC workgroups and subsequent ICARPs, with efforts to develop the next generation of researchers through international collaboration, student exchanges, and online education.

The ICARP II process resulted in the development of 11 Science Plans and a Background Paper on Contaminants (available at *https://icarp.iasc.info/publications/publications-past-icarps*) and resulted in several international projects and programmes, mostly within the framework of the Fourth International Polar Year (2007–2008).

ICARP III

ICARP III, which concluded on 23–30 April 2015 in Toyama, Japan, was a more open process than the previous efforts, with the opportunity for the wider Arctic community to contribute to the objectives. It provided a framework to identify Arctic science priorities for the next decade; coordinate Arctic research agendas; inform policy-makers as well as people who live in or near the Arctic and the global community; and build constructive relationships between producers and users of knowledge. ICARP III built on the many comprehensive science plans in use at the time and complemented those with processes to identify gaps needing attention.

ICARP III resulted in a consensus statement identifying the most important Arctic research needs for the next decade; a roadmap for research priorities and partnerships; and identification of the potential and specific contributions of Arctic research partners to the International Polar Partnership Initiative.

ICARP III was structured along scientific themes (Climate System and Transformations; Observing, Technology, Logistics, Services; Societies and Ecosystems; Outreach and Capacity Building). The final conference brought together an international group of more than 700 scientists, students, policy-makers, research managers, Indigenous scholars, and others interested in developing, prioritising and coordinating plans for future Arctic research.

ICARP III provided a framework to further the development of cross-cutting, interdisciplinary, and transdisciplinary initiatives for advancing Arctic research cooperation and applications for Arctic knowledge.

1.2 The ICARP IV Process 2022–2026

ICARP IV was coordinated by IASC, which engaged its partners in Arctic research to enable a community-wide undertaking. IASC recognised the need to include community-wide perspectives, both from the frameworks identified in ICARP III and the acknowledgement over the past decade in Arctic sciences that recognising and working with local, traditional, and Indigenous Knowledges in all aspects of projects leads to better research (i.e., more ethical and stronger outcomes). The ICARP IV process used a bottom-up approach to engage Arctic researchers, rights holders, policy-makers, residents and stakeholders from around the world.

The ICARP IV International Steering Committee included representatives of the partners engaged in the ICARP IV process, oversaw the implementation of the ICARP IV process, and provided intellectual and organisational support for the undertaking.

The ICARP IV process took place over five phases:

Phase 1 - Preparing for ICARP IV (2022)

Preparation for the ICARP IV process started in 2022 with the forming of the ICARP IV International Steering Committee, composed of the 26 ICARP IV partner organisations. An International Coordination Office for the process was provided by the IASC Secretariat in Akureyri, Iceland.

Phase 2 - Seeking Community Input (2023-2024)

Phase 2 focused on community engagement activities that encouraged anyone within the Arctic research community to contribute to and inform the ICARP IV process. Individuals of all career stages, groups, networks, institutions, and research organisations were encouraged to contribute to the ICARP IV engagement process by participating in or organising an ICARP IV engagement event, seeking endorsement for activities and projects contributing to the process, participating in the ICARP IV survey, and submitting relevant resources and documents from projects that could help inform the ICARP IV process. While not all activities were reported back to the ICARP IV organisers, a list of the reported engagement activities and endorsed projects outcomes is available on the ICARP IV website:

- Endorsed Projects:
  https://icarp.iasc.info/engagement/endorsed-activities
- Engagement Events:
  https://icarp.iasc.info/engagement/events

Once RPTs were established, additional outreach to Arctic community organisations, Indigenous Peoples organisations, schools, universities, and education networks in the Arctic resulted in more engagement from residents of the Arctic in the latter part of the ICARP IV process.

Phase 3 - Defining Research Priorities (2024)

At the start of Phase 3 in early 2024, seven ICARP IV RPTs were created by the International Steering Committee, grounded in the outcomes of the ICARP III process from 2015 (RPTs 1–3) but with some additional relevant topics that needed to be addressed separately (RPTs 4-7).

- RPT 1: The Role of the Arctic in the Global Earth System
- RPT 2: Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses
- RPT 3: Understanding the Dynamics and Resilience of Arctic Social-ecological Systems to Foster Sustainable Futures
- RPT 4: Arctic Research Cooperation and Diplomacy
- RPT 5: Co-Production and Indigenous-led Arctic Research
- RPT 6: Education and Knowledge-Sharing In and About the Arctic: Research and Practice
- RPT 7: Technology, Infrastructure, Logistics, and Services

After an open nominations process advertised via all ICARP IV partner organisations in the second half of 2023, more than 200 individuals from 28 countries were selected by the International Steering Committee to join the teams.

The RPTs were tasked to review and analyse community input, define the needs and priorities for Arctic research for their topic area based on the input collected, and develop recommendations for the implementation of the identified priorities,including potential new alliances and collaborative partnerships needed to address them.

Including Indigenous Perspectives

Most of the RPTs had an Indigenous scholar as co-chair. In addition, an Indigenous Co-Chair was added to the ICARP IV International Steering Committee at the Arctic Science Summit Week (ASSW) 2024. An ICARP IV Indigenous Peoples' Coordination Group was also set up in early 2024 as an informal body composed of Arctic Indigenous scholars engaged in the ICARP IV RPTs and the ICARP IV International Steering Committee to assist in and ensure coordination of the efforts to Indigenise Arctic research.

The RPTs started their work with a series of open workshops organised by each team during the *Arctic Science Summit Week 2024* (21–29 March 2024, Edinburgh, Scotland, UK) and then worked throughout 2024 and 2025 to finalise their results. An *ICARP IV Planning Retreat* organised for the chairs of the RPTs and members of the ICARP IV International Steering Committee from 21–24 October 2024 in Akureyri, Iceland, offered a unique and invaluable platform for face-to-face discussions, fostering cross-disciplinary dialogues aimed at preventing duplication of effort and aligning research outcomes across diverse priorities.

Phase 4 - Consulting on Priorities (2025) - The ICARP IV Summit

In Phase 4, the **ICARP IV Summit** with the theme "Arctic Research Planning for the Next Decade" was held during the Arctic Science Summit Week 2025 in Boulder, Colorado, USA, from 21–28 March 2025. The Summit marked the culminating in-person gathering of the ICARP IV process and served as both a point of synthesis and consultation on the work of the seven RPTs and a bridge toward shaping the Fifth International Polar Year (IPY-5) planned for 2032–33. Each RPT held open Town Hall Meetings to present and consult on their preliminary findings.

ASSW 2025 and ICARP IV Summit 2025

ASSW 2025 and the ICARP IV Summit together convened approximately 1,200 participants, including nearly 900 in-person attendees and roughly 300 virtual participants. Participants represented a broad cross-section of Arctic researchers, Indigenous Peoples and organisations, policy-makers, early-career scientists, and international institutions, underscoring ICARP's long-standing role as a globally inclusive forum for Arctic research planning.

The ICARP IV Summit was embedded within the broader ASSW 2025 programme, which included many community meetings, workshops, and organisational sessions. The Summit itself was structured around the seven ICARP IV Research Priority Team topics, with an additional cross-cutting focus on data management. Over the four-day period, the Summit hosted seven town hall events—one for each RPT—and a total of 73 individual sessions across the priority areas. Across these sessions, 523 abstracts were presented, comprising 357 in-person oral presentations, 46 virtual oral presentations, and 120 poster presentations. Films, art shows and participatory art spaces, sharing of traditional foods, and Indigenous-focused and led sessions were also featured at the Summit. Together, these sessions, exhibitions, and other events provided a concise but comprehensive snapshot of current Arctic research activities, emerging methods, and priority questions spanning physical, biological, social, and human dimensions of Arctic research.

Three plenary panels framed the Summit:

- The panel "What is the vision for the Arctic for the next 10 years and how can ICARP IV contribute toward that vision?" brought together Arctic leaders to emphasise the need for integrative, forward-looking, and inclusive research frameworks.
- The panel "Imperatives for co-production of knowledge and Indigenous-led research" centred Indigenous perspectives and experiences, highlighting why co-production and Indigenous leadership are essential to ethical, relevant, and effective Arctic research.
- The closing plenary convened co-leads from multiple RPTs to reflect on lessons from the Summit and outline pathways for producing the final ICARP IV outcomes.

A major innovation of the ICARP IV Summit was the inaugural Indigenous Pavilion. Conceived as a space for immersive, place-based, and community-centred learning, the Pavilion emphasised Indigenous Knowledge, consultation, creativity, and reciprocity. It provided a dedicated venue for dialogue and knowledge articulation, discussion of historical contexts and healing, and sharing among Indigenous students, Indigenous Knowledge Holders, local Elders, Indigenous researchers, and Indigenous scholars, reinforcing the Summit's commitment to respectful engagement and co-production of knowledge processes.

ASSW 2025 and ICARP IV Summit 2025 *continued*

The ICARP IV Summit culminated in the issuance of two formal statements:

- The official ICARP IV Summit Statement, issued by the ICARP IV International Steering Committee and the Summit Local Organising Committee, articulated the significance of the Summit and its role in shaping future Arctic research priorities.

- Indigenous participants drafted and issued a separate *Statement from the Indigenous Participants of the ICARP IV Summit*, offering perspectives grounded in Indigenous rights, knowledge systems, and research priorities.

Both statements were read during the closing ceremony and serve as key reference points for the continuing ICARP IV process. A list of the sessions and abstracts that contributed to the ICARP IV Summit is available on the ICARP IV website and the ASSW 2025 website.

Phase 5 - Initiating Implementation (2026)

The final results of the ICARP IV process are summarised in a series of reports identifying priorities, knowledge gaps, and pathways for Arctic research over the coming decade:

- A detailed report from each of the seven RPTs, which will be available on the ICARP IV website.

- A final synthesis report summarising the results of all RPTs.

- Shorter summaries for policy-makers and funders.

The final results will be presented at the Arctic Science Summit Week 2026 from 25 March–1 April 2026 in Aarhus, Denmark. The ICARP results will directly inform the priorities of the next IASC Strategic Plan 2027–2036. There will be ICARP implementation workshops at the next ASSW meetings, leading up to the Polar Conference in Korea in 2030. ICARP will contribute directly to the Arctic research planning and projects for the 5th International Polar Year in 2032–33.

1.3. Who Contributed to the ICARP IV Process and ICARP IV Report

The ICARP IV process was a community-wide undertaking engaging Arctic researchers, Indigenous Peoples, policy-makers, residents and other stakeholders from around the world. One of the main goals for the ICARP IV engagement process was to be inclusive, diverse, and engaging to ensure that the scientific priorities for the next decade are firmly grounded in the advice and needs of Arctic scientists and science organisations, Indigenous Peoples, and Arctic rights holders, residents, and stakeholders.

Indigenous Peoples played a central and increasingly visible role throughout the ICARP IV process, reflecting a broader commitment to strengthening equitable participation and inclusion of diverse knowledge systems in Arctic research planning. Structural changes were introduced to support this objective, including the appointment of the first Indigenous Co-Chair of the ICARP International Steering Committee at the ASSW 2024. In addition, an Indigenous Peoples' Coordination Group was established in early 2024 to connect Indigenous scholars participating across the RPTs and the Steering Committee, helping to coordinate efforts and advance shared approaches to Indigenising Arctic research. These developments were supported by targeted initiatives, including a U.S. National Science Foundation–funded project that facilitated dialogue and engagement with more than 100 Indigenous Knowledge Holders, scholars, Elders, and youth across the Arctic and internationally.

Indigenous Peoples' participation was also strongly reflected in the structure and work of the ICARP IV RPTs. Most RPTs included an Indigenous scholar serving as co-chair, to ensure that Indigenous perspectives and knowledge systems informed research priorities and discussions from the outset. Participation by Indigenous researchers and Knowledge Holders increased substantially compared with previous ICARP processes, with nearly 20 percent of all RPT applicants identifying as Indigenous.

Through such status and direct roles, Indigenous participants contributed to advancing interdisciplinary and application-focused approaches to Arctic research, while helping to shape emerging frameworks for the co-production of knowledge between Indigenous Knowledge Systems and Western scientific approaches. Dialogues throughout the ICARP IV process also highlighted structural barriers that continue to limit equitable Indigenous participation in research institutions and funding systems, while identifying pathways for more inclusive research governance grounded in shared decision-making and ethical engagement. Together, these efforts reflect a shift from mere consultation toward effective, meaningful co-development and implementation of Arctic research planning, and provide important frameworks for strengthening Indigenous leadership and participation in future international initiatives, including the Fifth International Polar Year.

Core contributors to and coordinators of the ICARP IV process included the following:

- Twenty-six international partner organisations were represented on the ICARP IV International Steering Committee, which was tasked to oversee and coordinate the ICARP IV process from 2022 to 2026, identify and develop an overall process goal, theme, and agenda; sub-theme research questions; and mechanisms for action and implementation of the ICARP IV outcomes.

- Seven RPTs with more than 200 members from 28 countries were tasked to review and analyse community input to identify priorities, knowledge gaps, and pathways for Arctic research over the coming decade. The Arctic Data Committee provided data support by appointing a data representative for each RPT.

- An ICARP IV Indigenous Peoples' Coordination Group, which assisted in and ensured coordination of the efforts to Indigenise Arctic research.

- The Secretariat of the IASC in Akureyri, Iceland, which coordinated the ICARP IV process from 2022 to 2026.

All final outcome reports of the ICARP IV process were also reviewed by hundreds of members of the ICARP IV partner organisations, including the Working Groups and Committees of the IASC.

Thousands of contributions were made through engagement events at Arctic conferences and meetings during the ICARP IV process, in particular during the Arctic Science Summit Weeks in 2024 and 2025 (including the ICARP IV Summit). Participants at these events included Arctic scientists, from institute heads to early-career researchers and students, and also Indigenous scholars, policy-makers, funders, and other stakeholders and rightsholders engaged in work in the Arctic. Without their crucial contributions, ideas, and suggestions, the work of the process would not have been possible.

2. Arctic Research Priorities 2026–2035

2.1. Research Priorities Overview

Each of the RPTs was asked to identify the following:

- Five of the most urgent **research needs** for their topic area. Research needs included, for example, research needed to address key knowledge gaps, research required to understand and address practice gaps, and research needed to identify investment needs.

- Five of the most urgent **priorities to address these research needs** over the next decade, up to 2035. These included priorities that would specifically address the RPTs' identified research needs, as well as other priorities identified by the RPTs.[1]

- Recommended **implementation actions** for each of the identified research priorities.

- **"Cross-cutting" research needs and priorities** relevant to more than one RPT, along with implementation actions for the cross-cutting research priorities. These needs and priorities are discussed in section 2.2. *Cross-cutting Priorities.*

The RPTs' recommended research needs and priorities fall into six broad categories:

- Addressing gaps in scientific understanding and modelling capabilities;

- Improving research infrastructure and observation systems;

- Mitigation and adaptation to changing conditions;

- How research should be conducted;

- Education and outreach; and

- Governance, policy, international collaboration, and funding systems.

Indigenous Peoples' involvement in research going forward is a strong overarching theme across all the RPTs. The authors of RPT 5, which focuses on co-production and Indigenous-led methodologies, consider all of its research needs and priorities to be cross-cutting, affecting all of the other RPTs.

The sections below briefly summarise each of the RPTs' identified research needs, research priorities, and recommended implementation actions. These summaries are condensed and edited; for complete details readers should consult the full RPT reports, which also include potential actors for the implementation actions (ranging from individuals to government agencies and international organisations).

2.1.1. The Role of the Arctic in the Global Earth System

Focus of RPT and Rationale

This RPT focused on identifying urgent research needs and priorities for improved understanding of variability, changes, and extreme events in the Arctic system, along with their two-way interactions with the global system. The outcomes from this RPT provide foundational information that can facilitate and collaboratively benefit from the work of other RPTs.

The RPT 1 members included 31 internationally renowned senior scientists and promising early-career scientists from 12 countries. Their expertise and research areas cover Arctic and global atmospheric dynamics and chemistry, meteorology, physical and biogeochemical oceanography, sea ice, physical and biogeochemical terrestrial processes, Greenland Ice Sheet, and social impacts.

Summary

All components of the Arctic Earth system, including the atmosphere, ocean, cryosphere, terrestrial systems, ecosystems, and Arctic Indigenous Peoples, have been experiencing dramatic changes during recent decades, largely driven or characterised by Arctic Amplification (a phenomenon in which the loss of heat-reflecting surfaces, such as sea ice, creates a feedback loop that accelerates warming in the Arctic). The Arctic's annual mean surface air temperature warmed by 0.63°C per decade from 1979–2023 (north of 60°N), about three-and-a-half times the global average based on observational data sets.[2]

Despite considerable progress in understanding and attributing these changes, knowledge gaps and grand challenges have emerged on top of existing unanswered questions and unsolved scientific problems. Resolving these knowledge and data gaps requires conducting a comprehensive review and synthesis of the state of knowledge to identify urgent research needs and priorities, along with recommendations for actionable implementation plans.

This RPT identified five broad themes for priority research on the RPT 1 topics and cross-cutting topics with other RPTs:

1. Enhanced high-resolution observations and their integration with model improvements,
2. Two-way interactions between the Arctic and global Earth systems,
3. Attribution of Arctic Earth system changes,
4. Changes in Arctic terrestrial systems and their impacts on local and global hydrological and carbon cycles,
5. Governance between Arctic regional and global politics.

Key Research Needs

- **An observing system for the Arctic Earth system** with vertical profile sampling from the upper atmosphere to the air-ice/sea interface and the intermediate ocean warm layers, especially for winter conditions, with the aims of obtaining a complete year-round picture, improving model representations and assessing the impact of polar processes on global climate.

- **Fully coupled regional models of the Arctic Earth system** capable of better understanding, predicting, and projecting changes in the Arctic Earth system at kilometre-level scales. The urgent need demands a modelling system at regional spatial scales relevant for society, capable of resolving critical processes and interactions in the Arctic climate system that include multiple knowledge sources.

- **Improved understanding of drivers of, model diversity in, and consequences of Arctic Amplification.** State-of-the-art Earth system models struggle to accurately simulate the magnitude of polar amplification. A better understanding of anthropogenically forced changes and the Earth system's internal variability can lead to more accurate representation of processes in models, ultimately improving understanding and projections of future change.

- **Attribution of Arctic Earth system changes across time and space.** Systematic analyses are essential to integrate paleo proxy data, reanalysis products, model simulations, and Indigenous Knowledges. The analyses and co-producing research alongside traditional Knowledge Holders help develop a more robust understanding of the baseline state, internal variability, and associated extreme events in the Arctic Earth system. This facilitates identifying externally forced (e.g., from modern human activities) vs. internally generated changes.

- **Improved understanding of impacts of permafrost thaw on biogeochemical transformations, land-atmosphere interactions, and other processes.** Examples include a better understanding of permafrost carbon dynamics; Arctic mercury and other contaminant mobilisation from thawing permafrost; and impacts of permafrost thaw on increased drying, vegetation, and wildfire feedbacks, as well as on infrastructure.

- **Connecting science processes and Indigenous Knowledges at the Arctic regional and global scales.** This research need relates to growing efforts across the Arctic and globe to use multiple evidence bases to produce knowledge of Earth system change and resultant risks. Strengthening the connection between scientific processes and Indigenous Knowledge Systems is essential to advancing Arctic and Arctic-global linkage research. By bringing together multiple evidence bases, this approach fosters deeper, more holistic understandings of change and the risks faced by Arctic Peoples and ecosystems. Success could be measured by how much Indigenous-led funding exists and how many projects are community-designed, and it is essential that the Indigenous community co-develops this list.

- **Systematic, comparative research identifying possible future avenues for coordinated Arctic-anchored political action** in seeking to govern at the international level the global drivers shaping the physical and political state of the Arctic region. Governance and environmental outcomes in the Arctic are shaped by extra-regional and global processes. How can global governance settings be navigated and used to secure a sustainable, prosperous and just Arctic?

Priorities for Research to Address Key Needs

- **Improve observational capacity and sustain coordinated monitoring in the Arctic, with a strong emphasis on improving vertical profile observations from the upper atmosphere down to sea ice and ocean, and across seasons, focusing particularly on the winter season.** The severe lack of scientific observations—especially during winter, and across the vertical profile of the atmosphere and ocean—hampers development and improvement of our understanding of Arctic processes and parameterisation in models.
  - Recommended Implementation Actions
    - *Make weather balloon observations to be equipped and conducted in a coordinated way for all research vessels in the Arctic and recommend an improvement of satellite remote sensing over the Arctic.*
    - *Build an international initiative to coordinate existing (and foster new) Arctic vertical profile measurements.*
    - *Work in partnership with Indigenous Peoples and Knowledge Holders to integrate Indigenous and scientific knowledge systems, ensuring that data infrastructure supports Indigenous ownership of Indigenous research, equitable access, co-stewardship, and respect for Indigenous data governance.*

- **Improve understanding of Arctic processes that underpin the exchange of radiative and turbulent fluxes between the atmosphere, ocean, sea ice, and terrestrial system**. The ongoing fast-paced changes in the Arctic climate system are driving an urgent need to rapidly develop our capacity to monitor, predict, and project these changes, which in turn requires expedited development of regional modelling systems that include models of all components of the Arctic climate system and the interactions between them at kilometre scales.
  - Recommended Implementation Actions
    - *Foster improved collaboration between the observing and modelling communities, and between the weather and climate modelling communities. Develop best practices in process-based model evaluation.*

- **Conduct coordinated model intercomparisons; develop new and advanced process parameterisations; and apply novel frameworks, strategies, and tools** to advance the understanding of and ability to predict Arctic Earth system changes, with primary focuses on the causes and consequences of Arctic Amplification and two-way interactions between the polar and lower latitudes.
  - Recommended Implementation Actions
    - *Establish a dedicated, international-level project for coordinating multi-model intercomparison; ensure better integration of Arctic-focused research questions in other model intercomparison projects.*

- **Improve attribution studies of Arctic climate change through an integrated, multidisciplinary approach.** Attribution studies aim to identify and distinguish the roles of external forcing and internal variability in Arctic changes. An integrated framework of attribution studies needs to be established, encompassing observations, modelling, aggregation, and connecting local, regional, and global changes. Climate modellers will play an important role in the attribution studies. The same is true for observations from meteorological, satellites, and local (Indigenous) sources for the near-term perspective. Paleoclimate reconstructions will be needed, including high-resolution data for extreme event attribution, for the long-term context.
  - Recommended Implementation Actions
    - Establish a dedicated, international-level project aiming to address attribution of Arctic changes with clear scientific questions, including paleoclimate data and observations (meteorological and Indigenous), model experimental designs, and model intercomparison. Should also address how to use attribution results for policy- and society-relevant applications.

- **Improve understanding of permafrost thawing and its impacts on biogeochemical transformations, land-atmosphere interactions, and other processes.** Permafrost thawing changes landscape, thermokarst extension, hydrology and biogeochemical cycling and represents a fundamental research priority given the profound implications for global carbon dynamics. Recent observations indicate that the Arctic tundra has now shifted from a millennia-long carbon sink to a net source of carbon dioxide and methane.
  - Recommendation Implementation Actions
    - Deploy a comprehensive permafrost coordinated monitoring network with CO_2 and methane flux measurements at at least 50 sites across the Arctic by 2030, including measurements from the snowpack. Existing facilities should be assessed and included when possible for harmonising measurement protocols across the Arctic.
    - *Establish an early-warning system for thermokarst-related geohazards affecting critical infrastructures and ecosystem services.*
    - *Develop standardised biogeochemical monitoring protocols for thermokarst lagoons and streams.*

- **Connect Arctic and global governance processes.**
  This research priority focuses on mapping Arctic
  stakeholders and identifying future pathways for
  Arctic-relevant solutions in global governance. A result
  of research under this priority would be identification
  of tools to advance negotiations in key regional and
  global settings.
  - Recommended Implementation Actions
    - *Map Arctic actor engagement (states, Indigenous
      Peoples' organisations, NGOs, IGOs, researchers) in and
      explore future pathways for Arctic-relevant solutions in
      global governance bodies (biodiversity, justice/
      Indigenous rights, pollution, ocean governance, climate
      mitigation, cryosphere and atmosphere large-scale
      scientific, and policy processes).*
    - *Conduct a large-scale workshop to identify the most
      significant global policy fields shaping Arctic
      governance/sociopolitical outcomes, and then
      conduct qualitative and quantitative analysis of these
      policy fields.*
    - *Develop a large-scale, capstone synthesis involving
      research and policy communities in and beyond Arctic
      states to consider, rank, and synthesise our knowledge
      about Arctic presence in and impacts from global
      institutions and global policy fields.*

- **Explore ways to govern and manage global risks to
  Arctic security.** This research priority focuses on
  marshalling legal and political competence, as well as
  extensive Indigenous Peoples and stakeholder
  engagement, to identify ambitious yet pragmatic and
  realisable agreements that could be pursued under
  even slightly improved conditions for Arctic
  cooperation and global multilateralism. This priority
  would also focus on identifying effective mechanisms
  and means to govern a changing Arctic that could be
  realised in a more modular fashion (between some
  states and actors, with the aim of promoting these
  solutions more broadly as political conditions allow).
  - Recommended Implementation Actions
    - *Conduct updated assessment on threats and sources of
      risk to Arctic maritime security and safety through
      major cross-community/pan-Arctic workshop followed
      by a research synthesis report.*
    - *Identify and conduct up-to-date analyses of key sources
      of risk that require immediate attention; commission
      studies of these sources of risk and consider their
      interplay and changes over time.* This action will
      ensure that Indigenous perspectives on security—
      including food, environmental, cultural, and
      community security—are explicitly included.
    - *Identify pathways for action through large-scale
      transdisciplinary scenario development and
      identification of policy options to mitigate risks under
      multiple scenarios.*
    - *Develop a synthesis of scenarios and research to update
      the baseline assessment on global risks to Arctic security
      and safety, including a suite of policy options that can
      mitigate risk across multiple scenarios.* This action will
      ensure the synthesis reflects multiple knowledge
      systems and Indigenous-defined priorities around
      security, well-being, and self-determination.

2.1.2. Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses

Focus of RPT and Rationale

This RPT focused on future climate dynamics and ecosystem responses. Where overlaps with other RPTs occur (e.g., RPT 1 on the Arctic in the global system; RPT 5 on co-production and Indigenous-led methodologies), RPT 2 focused on *ecosystem responses* within observing–prediction pipelines, ensuring complementarity with other RPTs rather than duplication.

RPT 2 made best efforts to include diverse Arctic voices by recognising the stakeholders for Arctic observing and including their published recommendations, reviewing all questionnaire submissions, and openly debating priorities at the ICARP IV Summit town hall. Nevertheless, limitations remained, including team composition and seasonal time constraints during field seasons. Thus, RPT 2 reflects broad input but cannot exhaust every viewpoint or sub-discipline within the scope and timeline.

Approximately 40 scientists and practitioners shared wide-ranging scientific expertise for RPT 2, spanning atmosphere, cryosphere, terrestrial and freshwater systems, marine science, biogeochemistry, modelling, reconstructing climate, environment and dynamics of past ecosystems, remote sensing, and methodology.

Summary

The research needs identified by RPT 2 focused on improving understanding (including additional data collection) of climate linkages between the Arctic Ocean and surrounding seas, environmental disturbances and ecosystem stability under climate warming, interactions at the interfaces between different environmental spheres (e.g. hydro-, cryo-, bio- and atmosphere), the impacts of changes in the Arctic atmosphere's energy budget and precipitation patterns, and addressing the need to couple models and observations of atmospheric circulation patterns over different spatial scales.

The research priorities identified by RPT 2 included co-developing monitoring and management frameworks with Arctic Indigenous Peoples; using current observations and reconstructions to better understand Arctic Ocean circulation regulation and its interactions with marine biogeochemical cycles and ecosystem functioning; monitoring and modelling Arctic disturbances and ecosystem stability under global change; enhancing integrated land/cryosphere/atmosphere monitoring and modelling; and investigating interactive processes at the interface between spheres.

Common themes across the recommendations for implementing research priorities include co-production of knowledge; long-term monitoring and data collection; interdisciplinary and cross-boundary collaboration; enhanced computer modelling; funding and infrastructure for remote sensing, ship-time, field stations, and computational resources; and capacity building and training.

Key Research Needs

- **Address data gaps in the central Arctic Ocean and knowledge gaps on climate linkages along the Arctic land-shelf-basin continuum and subarctic oceans.** Changes in the Arctic Ocean, especially in the subarctic seas, affect Arctic Indigenous Peoples and their communities, and other human activities (e.g., shipping and fisheries).

- **Fill knowledge gaps in understanding environmental disturbances and ecosystem stability under climate change at different spatial and temporal scales.** Disturbances and more gradual changes have the potential to create feedback loops that could either accelerate or mitigate the effects of climate change, which will have serious socio-ecological impacts (e.g. food security, water, and cultural practices).

- **Address knowledge gaps in the interactions at interfaces between different spheres (e.g. hydro-, cryo-, bio- and atmosphere) that shape Arctic climate feedback mechanisms and Arctic ecosystems' responses.** Interactive processes are often overlooked but can have substantial impact, and represent an important knowledge gap covering local to global and Pan-Arctic scales.

- **Observe and understand the impact of changes in the Arctic atmosphere's energy budget and precipitation patterns, as well as transport of moisture, aerosols and trace gases, including contaminants, on ecosystems and populations.** There is a need to better understand the relevance of local within-Arctic processes vs. external forces, as well as to deepen representation in climate regional models of the complex interconnections.

- **Couple models and observations of atmospheric circulation patterns over different spatial scales, from historical trends and current patterns to future predictions to better understand current state of knowledge and gaps.** Society urgently needs regionally relevant predictions of how changes in atmospheric dynamics impact their everyday lives.

Priorities for Research to Address Key Needs

- **Co-develop integrated monitoring and management frameworks with Arctic Indigenous Peoples.** This approach supports Indigenous rights, sovereignty, governance, and self-determination through equitable partnerships, while delivering actionable research related to urgent climate change impacts such as permafrost thaw, coastal erosion, access to potable drinking water, and food security.
  - Recommended Implementation Actions
    - *Develop co-produced research agendas with Indigenous communities.*
    - *Create methods, protocols, and best practices that bridge Indigenous Knowledge Systems with larger-scale scientific observations.*
    - *Establish training programmes to build capacity for Indigenous researchers in scientific methods.*
    - *Implement long-term, inclusive monitoring networks that integrate multiple knowledge systems.*
    - *Meaningfully invest in Indigenous Peoples' capacity to fully participate in Arctic research.*

- **Enhance integrated cryosphere monitoring and modelling.** The rapid pace of cryospheric change outstrips current modelling capabilities, leading to uncertainties in predicting climate dynamics and cryosphere and ecosystem responses. Enhanced monitoring is critical to capture nonlinear feedbacks.
  - Recommended Implementation Actions
    - *Strengthen Arctic observation networks by expanding and enhancing existing networks' monitoring of key cryospheric feedback processes.*
    - *Improve model parameterisation of cryosphere-climate feedbacks using high-resolution cryospheric data.*
    - *Foster interdisciplinary collaboration and knowledge co-production among climate scientists, Indigenous Knowledge Holders, and policy-makers.*
    - *Develop targeted, actionable policy recommendations for Arctic and global climate adaptation and mitigation efforts.*

- **Assess present and past Arctic Ocean circulation, characterising Arctic land-shelf-basin and Arctic-Subarctic Ocean interactions, and their relations with marine biogeochemical cycles and ecosystem functioning.** Under the new scenarios of global warming with changes in the Arctic Ocean circulation, dense water production, reductions in sea ice, and export of freshwater and carbon/nutrients to the Subarctic Ocean, there is a need to sustain and implement long-term observations in these areas.
  - Recommended Implementation Actions
    - *Coordinate and sustain cross-basin multi-nation wide-area observations, using internationally coordinated icebreakers and long-term in situ observation platforms.*
    - *Achieve interdisciplinary coordinated actions supporting co-development of modular and scalable platforms for data collection and high-resolution observations.*

- **Improve understanding of Arctic ecological disturbances and ecosystem stability under climate change.** Research priorities for Arctic ecosystems should focus on comprehensive, long-term monitoring of disturbances (including paleoenvironmental and paleoecological reconstructions). Identifying potential ecological tipping points is crucial for predicting and potentially mitigating irreversible ecosystem transformations.
  - Recommended Implementation Actions
    - *Prioritise long-term monitoring of disturbances, undisturbed control sites, and ecosystem change.*
    - *Prioritise community-based monitoring.*
    - *Study the socio-ecological impacts of disturbance and change on food security, water, and cultural practices.*
    - *Identify factors that determine ecosystem resilience or vulnerability in the face of rapid climate change.*

- **Identify and understand the underlying key interactive processes at the interface between spheres (e.g. hydro-, cryo-, bio- and atmosphere) to enable prediction of larger-scale impacts and responses through the integration of reconstructions, observations, and modelling approaches.** The coupling between spheres of the Arctic system is changing. To cover interactive processes at the interfaces between spheres, it is a priority to integrate observational, modelling, and reconstruction approaches.
  - Recommended Implementation Actions
    - *Integrate observational, modelling, and reconstruction approaches.*
    - *Form interdisciplinary working groups on small and larger scales (e.g., individual projects and larger consortia).*
    - *Advance technologies and methodologies across scientific fields, specifically targeting interfaces between spheres.*
    - *Identify and study feedback loops that can result in tipping points.*
    - *Increase understanding of cascading effects and linkages across Arctic systems.*

2.1.3. Understanding the Dynamics and Resilience of Arctic Social-ecological Systems to Foster Sustainable Futures

Focus of RPT and Rationale

This RPT addresses research priorities and their implementation on topics such as a sustainable and equitable Arctic economy; adaptive management and Indigenous nature-based solutions; healthy Arctic and healthy Peoples; energy systems; sustainable energy production; reliable, accessible, and cost-effective energy that meets community needs; reliability; resilience; food systems; sustainable production; water security; sanitary health; infrastructure; and migration.

These focus areas exist at a nexus of supporting Arctic societies, their well-being, food access, energy supply, public safety, knowledge, infrastructure development, and economies. This RPT sought to discover and present research priorities that involve and impact the people of the Arctic. The identified research priorities aim to foster sustainable and thriving communities, economic opportunities, effective policies and more. To engage in these priorities equitably, it is essential to draw on both Indigenous-and/or community-led research and Indigenous-and/or community-defined measures in addition to those in the literature to understand these areas of research.

Summary

RPT 3's highest ranking research priorities fell into the following thematic categories:

• Climate and environmental change – implications for social and economic systems;

• Sustainable technology, infrastructure, economy, transportation, and energy;

• Social systems resilience, health, well-being, education, knowledge, and culture; and

• Arctic cooperation, policy, law, sovereignty, diplomacy, geopolitics, and security.

The approach taken to establish these priorities was inclusive and consensus-based, and reflected RPT 3 participants' commitment to equity and diversity. The team used a suite of methods including open engagement at ASSW 2024 in Scotland and the ICARP IV Summit in Boulder, an iterative two-part survey, a document review process, and expert analysis. The inclusion of Arctic Peoples is key when discussing research needs in Arctic regions to ensure that research funds can be prioritised to produce tangible benefits to those who inhabit and care for the region.

Results from the iterative survey and literature analysis were combined using constant comparison analysis. Importantly, the level of consensus that each research need obtained (when looking across survey responses) was recorded and fully considered in the team's selections of research priorities. For example, if there was little to no consensus on a suggested research priority that priority was excluded from the list of top five suggestions but was still included in the full list of options. This approach ensured that the top five research priorities reflected those of the larger community and not just a few individuals. Although this approach was potentially more labour- and time-intensive, it resulted in a transparent and fair process that is reflective of the equity-centred values to which the group is committed. The responses of participants and level of consensus were then used to calculate the overall most highly rated priorities, combining the mean ratings (excluding "Prefer not to respond" ratings) for the level of priority, feasibility, and actionability.

Key Research Needs

- **Funding to support community-based and community-led research (including Indigenous-led) and monitoring in the Arctic.** Funding is needed to build and strengthen the capacity for communities to design, implement, and sustain research that addresses community concerns.

- **Northern-based research facilities and infrastructure.** Northern-based research facilities and infrastructure are needed to provide physical, technical (including data management infrastructure) and organisational support in Arctic communities. Community-based monitoring must be positioned as core observing infrastructure.

- **Cross/Inter-disciplinary/transdisciplinary and cross-sectorial or convergent approaches to research.** Approaches to research that i) consider multiple knowledge systems, ii) integrate multidisciplinary and multimedia methods, iii) involve actors and participatory action across sectors, such as academia, industry, non-profit, government, and iv) often rely on co-creation, co-production and co-interpretation of knowledge.

- **Coordinated, interoperable, accessible, and ethical data repositories.** Interoperable and accessible data repositories are critical to advancing collaborative research, detailed above, and for respecting principles of equity and data sovereignty which are also essential for collaborative research and for community-led research. This includes FAIR (Findable, Accessible, Interoperable, and Reusable) and CARE principles of Indigenous data governance (Collective benefit, Authority to control, Responsibility, and Ethics).

- **Funding to support foundational research.** Funding to support foundational research and activities such as those that require ongoing or long-term support, including i) relationship-building with Indigenous partners; ii) long-term monitoring programmes, including those rooted in Indigenous Knowledges (e.g. Indigenous Guardians); iii) training and capacity building; and iv) exploratory research.

Priorities for Research to Address Key Needs

- **Conduct hazard mapping for key climate change risks and their implications for human communities, food and energy security, local ecosystems, climates, and cultural and economic activity.** This mapping should occur while continuing investigation of impacts of increased occurrences of extreme weather events, weather hazards and climate extremes at human-animal-environmental interfaces.

- Recommended Implementation Actions
  - *Map current weather and climate monitoring programmes (including community-based programmes) in the Arctic to create a database of existing projects.*
  - *Organise community workshops to gather Indigenous Knowledges and local knowledges on climate risks and hazards.*
  - *Establish (e.g., via literature review) the current state of knowledge related to the effects of i) extreme weather events; ii) weather hazards; and iii) climate extremes on humans, animals, and the environment.*
  - *Develop an understanding of impacts of longer ice-free seasons on Arctic species and fisheries of cultural, social, and economic importance, and on changes in landscape and related cultural/non-material ecosystem services.*
  - *Provide training on technical skills for equipment use, maintenance, data stewardship, and other crucial skills for interested Arctic residents.*

- **Advance community- and Indigenous-led approaches to sustainable economies and infrastructure, including energy, waste, sanitation, and other aspects of a functional community in remote Arctic areas.** This research should be conducted by analysing local needs and developing models that support continued long-term human thriveability in the Arctic.
  - Recommended Implementation Actions
    - *Create working groups with community partners to co-create project research questions, goals and scoping, determine appropriate methodology, collect and analyse data, and compile research products.*
    - *Conduct community engagement and capacity building.*
    - *Develop models related to the energy transition, circular infrastructure, economies, etc. specific to each community and reflective of their needs.*

- **Identify and monitor the social and environmental determinants of health for Arctic Peoples.** This work includes understanding: (i) impacts, gaps and opportunities for all aspects of physical security, (ii) Indigenous Peoples' well-being as it relates to self-determination and governance, and (iii) systemic causes of violence against Indigenous individuals.
  - Recommended Implementation Actions
    - *Develop a database of instances of Indigenous self-determination and self-governance.*
    - *Develop an understanding and summary of the status and trends in the health and well-being of Indigenous Peoples in all Arctic regions, including the Missing and Murdered Indigenous Relatives public health crisis.*
    - *Develop an understanding and summary of the status and trends in the environmental health context of all Arctic regions.*
    - *Assess current emergency management strategies (i.e., needs and risk assessments) in different regions of the Arctic.*
    - *Assess current food and housing security context in different regions of the Arctic.*

- **Support broader understanding of the rights of Arctic Indigenous Peoples,** especially in creating regulations, such as those related to commercial maritime activities, harvesting rights/quotas, and Arctic militarisation, understanding the impacts of these activities on Arctic communities, and studying the role of Arctic Indigenous involvement in environmental research (i.e., land, marine, animals, fish, plants, etc.) and subsequent decision-making.
  - Recommended Implementation Actions
    - *Develop a database of instances of Indigenous self-determination and self-governance.*
    - *Develop an understanding and summary of the status and trends in the environmental health context of all Arctic regions.*
    - *Develop an understanding and summary of environmental impacts from commercial activities occurring in the Arctic.*

- **Support community-based observation and monitoring programmes on climate change and adaptation.** This work includes research on impacts of climate change on marine and terrestrial environments important for public services, health, subsistence, and economic activity, etc..
  - Recommended Implementation Actions
    - *Create a database of community-led climate change and other environmental monitoring programmes.*
    - *Conduct outreach with the private and local harvesting sectors (i.e. industry, sport, subsistence fishers, hunters, gatherers, community members) to collect information (i.e., fish, stocks, prices, limits, quotas etc.) on important species and distributions.*

2.1.4. Arctic Research Cooperation and Diplomacy

Focus of RPT and Rationale

The scope of RPT 4 included identifying key research needs and priorities related to effective international cooperation, such as joint funding strategies, connecting national and international funding agencies, effective international guidelines and legislation, sharing of research infrastructure and data, as well as ensuring the value and contribution of Arctic research during times of geopolitical tension. It also focused on pathways for understanding and, where possible, strengthening research cooperation, including research exchange programmes and collaborative observing efforts amidst geopolitical constraints. The team considered how existing cooperation models are being tested and how they must be reimagined to operate effectively in a new, multipolar, and increasingly competitive global environment.

RPT 4 is unique not only because it is the first time ICARP has dedicated attention specifically to research cooperation and science diplomacy but also because the field itself is still maturing, specifically in relation to the Arctic but also more widely. It offers opportunities for both theoretical development and practical application. Most Arctic research cooperation currently relies on some form of diplomatic engagement, which is heavily influenced by political and geopolitical factors. Moreover, developments on the ground can have wide-ranging diplomatic repercussions, making the Arctic an important case study for understanding the role of international research cooperation and science diplomacy.

Summary

RPT 4 examined how Arctic research cooperation and science diplomacy are evolving in a context of accelerating environmental change, geopolitical tension, and institutional disruption. While Arctic research remains central to global climate knowledge, regional governance, and international cooperation, the systems that support it are under increasing pressure from political instability, technological transformation, and uneven access to resources.

Key Research Needs

- **Understand and enhance the resilience of Arctic research collaboration to political change, technological innovations, instability and shocks.** This knowledge can be used to develop informed strategies to help mitigate challenges and sustain or enhance the resilience of critical Arctic research and research infrastructure in the face of political change, instability, and shocks; support research communities to maintain flexibility and adaptability; and inform approaches for re-establishing research cooperation, where and when appropriate.

- **Recognise and implement knowledge co-production, Indigenous-led research, and prioritise the inclusion of Arctic Indigenous Peoples and Arctic communities in Arctic research cooperation and diplomacy.** Arctic research cooperation and science diplomacy still fall short in fully respecting, recognising, and implementing Indigenous Knowledge, research practices, and ethical guidance. Advancing Indigenous rights and sovereignty, while learning from how Indigenous Peoples are reshaping research and diplomacy, can help build a more inclusive, ethical, and equitable roadmap.

- **Examine Arctic research decision-making processes within and between states and strengthen research coordination mechanisms that enhance efficiency and effectiveness.** While there are increasingly frequent attempts to improve coordination among decision-making processes, there are still significant barriers to operationalising the coordination of Arctic research to the degree that the research community generally aspires.

- **Leverage multilateral forums/bodies to support international Arctic research.** There is a need to identify/examine the impacts of changing geopolitical dynamics on Arctic research institutions and to what extent they can play a role in mitigating ongoing (geo)political developments. Such understanding can help leverage their support to Arctic research as well as inform pathways for ensuring more robust/resilient Arctic research moving forward.

- **Strengthen and increase dialogue between researchers and decision-makers on critical Arctic issues.** Continuing to strengthen communication pathways, frameworks for the exchange of information and ideas, and mechanisms for dialogue between researchers and decision-makers is critical to ensure evidence-based decision-making and research that responds to the present and future opportunities and challenges in the Arctic and globally.

Priorities for Research to Address Key Needs

- **Understand the characteristics of Arctic research cooperation and science diplomacy in a transforming world.** Considering the characteristics of Arctic research cooperation and science diplomacy in a transforming world can inform our understanding of the evolving intersection of research cooperation and geopolitics in a region of increasing strategic importance.
  - Examples of Recommended Implementation Actions
    - *Assess collaboration dynamics: identify when research fosters trust versus when it heightens mistrust/competition.*
    - *Conduct "research and security" tabletop exercises with relevant experts and officials.*
    - *Conduct a systematic review and mapping of relationships between formal institutions and informal networks.*
    - *Map regional norms and diplomatic practices; examine how norms persist despite political tension and what mechanisms support them.*
    - *Develop policy and guidance tools: translate findings into frameworks for diplomacy, scientific cooperation, and conflict mitigation.*

- **Enhance the resilience of systems of Arctic research cooperation.** Research into, and actions to support, the resilience of Arctic research cooperation can contribute to the integrity, continuity, and effectiveness of research in a rapidly changing and sensitive region.
  - Examples of Recommended Implementation Actions
    - *Building from earlier work, conduct a comprehensive study, building on earlier work in this area, on how the Arctic research community at large coped with 2020–2022 COVID–19 disruptions to distil lessons on what worked and which mechanisms proved effective and efficient, and what failed.*

- *Develop a concise and policy-relevant definition or formalise a concept of critical infrastructure for international Arctic research; develop a systematic map of its elements; rigorously assess the vulnerability of those assets to environmental, infrastructural, and (geo)political stressors; and propose/develop and set in place adequate safeguarding mechanisms.*
- *Support an assessment of how the Arctic Observing Summit is supporting prioritisation of and building resilience within observing infrastructure, data sharing and interoperability, and information services.*
- *Strengthen existing and, where necessary, create open-access platforms to share best practices, data, high-level project metadata, and policy-relevant findings.*
- *To support communication redundancy, map and assess strengths and weaknesses of existing transboundary mechanisms/institutions for Arctic research cooperation, information exchange, and data sharing, and provide recommendations. Based on this analysis, support and invest in maintaining and, where necessary, strengthening existing mechanisms/institutions to reduce dependency on specific institutions, and adopt a broader systems approach to facilitate resilient communication.*
- *Identify opportunities to build or strengthen ties with relevant global institutions with complementary mandates and/or shared policy interests. Support, facilitate and enhance international activities that provide a platform to diversify connections, geographies and institutions as well as support science diplomacy in action by providing the possibilities for everyone to be involved. Where appropriate, consider more flexible membership arrangements to enable the inclusion of new partners and the ability to adapt to changing research cooperation environments.*

- *To establish safeguards, build neutral consortia and/or distributed hosting of shared information and data into research projects and institutional collaborations where possible. Encourage standardisation of research procedures and data to support interoperability and continuity, where possible.*
- *Develop metrics for Arctic research institutions and Arctic research cooperation generally to enable monitoring of resilience and adaptability to change. Using these resilience metrics, conduct simulations and stress testing of Arctic research institutions and cooperation mechanisms. Use analyses above to inform changes to specific institutions, partnerships, and/or collaborations.*
- *Develop and implement an evaluation framework, informed or developed through Indigenous methodologies, that assesses progress in how international Arctic research initiatives and institutions implement recognition of Indigenous Knowledge, support self-determination, and address the diverse priorities of Arctic Indigenous Peoples.*
- *Develop recommendations for funding systems to support Indigenous-led research to overcome systemic barriers in current funding structures.*
- *Develop risk preparedness training modules for Arctic researchers, including field safety, legal and diplomatic issues, and cybersecurity orientations.*
- *Establish regular joint workshops and exchange programmes among local, national, and global research institutions.*
- *Establish a dedicated working group on research regulation to promote harmonised cross-border standards/procedures for Arctic research.*
- Explore the roles of non-state actors in Arctic research cooperation/systems.

- **Examine the effectiveness of Arctic science diplomacy.** Research into the effectiveness of Arctic science diplomacy is important to ensure that efforts achieve meaningful, sustainable, and equitable outcomes. As Arctic governance and diplomacy become increasingly complex and decentralised, understanding what works—and what doesn't—is fundamental to devising strategies that optimise resource use, foster trust, and generate tangible benefits.
  - Examples of Recommended Implementation Actions
    - *Develop and test a measurable set of Arctic science diplomacy indicators.*
    - *Develop Indigenous-centred research publications that explore Indigenous leadership in international Arctic research, written for a broad readership.*
    - *Develop co-assessment of the effectiveness of Indigenous leadership, that is inclusive of Indigenous evaluation.*
    - *Identify and assess the characteristics of decentralised research institutions and consider lessons learned for resilience.*
    - *Conduct scenario-based exercises designed to deepen understanding of decentralised research decision-making processes.*
    - *Build policy advisory capacity within research institutions to connect scientific outcomes with decision-making.*

- **Assess the impact of emerging technologies and innovations on Arctic research cooperation and science diplomacy.** Technological innovations offer new avenues for remote collaboration, data sharing, and capacity building but also introduce complexities related to dual-use concerns, cybersecurity, and technological asymmetries.
  - Examples of Recommended Implementation Actions
    - *Develop AI ethical guidelines for Arctic research.*
    - *Conduct interdisciplinary expert panels to map tech impacts, identify where existing national/ international legal frameworks are unlikely to provide sufficient safeguards.*
    - *Identify critical technology dependencies for Arctic research.*

- **Develop and implement principles of accessibility, inclusivity, and welcoming in Arctic research cooperation and science diplomacy.** For scientific diplomacy to be effective (see priority #3) and resilient, it must be built upon a foundation of accessibility, inclusivity, and a welcoming environment. These principles are fundamental to building the trust and shared understanding needed for meaningful collaboration between researchers, regional, national and international policy-makers, and Indigenous and local communities.
  - Examples of Recommended Implementation Actions
    - *Create a Task Force on implementing ethical principles of research cooperation and diplomacy within the IASC structure. Find interested academic and IASC personnel to establish a mandate and code-of-conduct. Encourage participation of key stakeholders with focus on underrepresented groups.*
    - *Create a programme in institutions that encourages the implementation of ethical research cooperation and diplomacy guidelines as well as other relevant polar education factors.*
    - *Develop circumpolar guidelines on researcher safety within a research cooperation and diplomacy framework during uncertain geopolitical times.*
    - *Grow and prioritise physical and emotional well-being within Arctic research.*
    - *Increase visibility of underrepresented groups. Engage underrepresented groups in polar science through targeted education and outreach on polar themes, career pathways, and community-building at different career levels.*
    - *Provide robust support and structured mentorship to underrepresented and at risk groups.*
    - *Create polar literacy toolkits for schools with higher populations of underrepresented groups.*
    - *Engage underrepresented groups in polar science through targeted education and outreach on polar themes, career pathways, and community-building at different career levels.*
    - *Develop Arctic/circumpolar safety guidelines.*

- *Plan and teach safe, inclusive, and accessible fieldwork and other research-related endeavours.*
- *Appropriately address bias, prevent harassment, and create consistent and supportive reporting.*
- *Prioritise and address the mental and physical well-being of polar researchers.*
- *Co-develop an evaluation framework with underrepresented groups, especially with Indigenous Peoples.*
- *Define new success metrics for grants, projects, and organisations to concretely measure progress in inclusion, accessibility, and belonging.*

2.1.5. Co-Production and Indigenous-led Arctic Research

Many terms used by RPT 5 in this report have specific definitions (e.g., co-production, Indigenous Knowledge Systems, etc.), and readers should familiarise themselves with the definitions in Annex 3, Definitions of Key Terms, before reading this summary.

Focus of RPT and Rationale

ICARP IV is a call to action: to reimagine inclusive research as an act of humanity, respect Indigenous Peoples' sovereignty, and to ensure that knowledge co-production reflects the futures Indigenous Peoples are building. RPT 5 was composed of Indigenous scholars, educators, knowledge keepers, and allied community members and academics, focusing on the co-production of knowledge and Indigenous-led research. It responds to the commitments established during ICARP III and the strategic priorities of IASC, aiming to strengthen Indigenous Peoples' participation across all dimensions of Arctic research. It outlines specific strategies for

researchers, funding agencies, and policy-makers to prioritise Indigenous leadership, working collaboratively with Knowledge Holders to ensure that research practices remain accountable to Arctic communities.

Co-production of knowledge requires a shift in the way research is imagined, funded and evaluated. It is a relational approach that brings together distinct knowledge systems, Indigenous and Western, on equal terms. Dissemination of Indigenous Knowledges must be understood as a collaborative and interactive process that goes beyond conventional academic outputs. Scholars are asked to confront their own biases and engage with Indigenous Elders, Knowledge Holders, youth and families in processes grounded in reciprocity, respect, and community responsibility.

Frameworks must be both substantive and procedural. Arctic research must ensure that Indigenous Rights Holders are engaged at every stage of research, from setting priorities and designing research to managing data, analysis, and dissemination. This approach upholds self-determination, addresses historical inequities, and fosters mutual capacity within research communities and institutions. It also aligns with international and national legal obligations, ensuring Indigenous rights to maintain, control, and develop their own knowledge systems.

The vision guiding this work is of mutual respect and shared responsibility. It recognises that scientific excellence in the Arctic must emerge from relationships where Indigenous laws, governance, and knowledge systems shape research questions, methods, and outcomes. Co-production is not a checklist or afterthought. It is a practice of actively being in relationship, grounded in trust, reciprocity, and long-term commitments to the well-being of Peoples and place. It honours and upholds mutual respect and responsibility in actionable outcomes through all aspects of research.

Summary

RPT 5 identifies key principles of co-production, listed below, drawn from Indigenous teachings and experiences of Arctic researchers and communities. The principles guide researchers toward equitable, rights-based collaborations that respect and honour Indigenous sovereignty and advance co-production as the transformative foundation of Arctic science.

- **Foundation: Rights and Self-Determination.** Indigenous Peoples of the Arctic are recognised as Rights Holders with inherent sovereignty over lands, waters, governance, and knowledge systems.

- **Relational Accountability.** The engagement between knowledge systems is premised on equality and the complementarity of Indigenous and Western sciences. Partnerships are ethical, sustainable, and transformative.

- **Co-Design and Shared Agenda Setting.** Research priorities are jointly identified with Indigenous Peoples, and Indigenous Peoples must be involved in the design, planning, and implementation of research agendas. Indigenous Peoples must also have formal roles within Arctic research bodies, with permanent structures for Indigenous governance.

- **Consent, Community Leadership, and Equitable Processes.** Indigenous Knowledge Holders, Elders, and community researchers are equitably compensated for their contributions. Training, mentorship, and leadership of Indigenous youth in Arctic research must be supported. Barriers such as compressed timelines, language challenges, and procedural exclusions must be addressed to ensure genuine participation and inclusion.

- **Knowledge Stewardship.** Indigenous Peoples hold authority over the governance of their knowledges, data, and whether or how cultural information is stored, shared, and used. The inseparable relationship between Indigenous Knowledges, languages, identities, arts, and governance systems is protected. Ethical guidelines, rooted in Indigenous protocols and laws, are established.

These principles guided the identification of key research needs and research priorities described below.

Key Research Needs

- **Ensure dedicated funding for Indigenous-led research.** Within each Arctic research funding opportunity, there needs to be separate dedicated streams to strengthen and protect Indigenous-led research, where Indigenous communities and/or organisations or Indigenous researchers working with Indigenous communities and/or organisations are eligible. Funding design and evaluation should be done in partnership with Indigenous governing bodies to ensure equity.

- **Prioritise Arctic research that meets Indigenous community-identified needs and priorities.** There is an urgency to solving problems through research activities in urban centres (where most academic work is based), but that same urgency is not yet extended to rural residents of the Arctic. Prioritising Arctic community-defined needs can be achieved through Indigenous-led initiatives, collaborative research guided by Indigenous leadership, and/or co-productive approaches that share decision-making and responsibility.

- **Bridge, weave, and create knowledge that is deeply co-productive.** Co-productive approaches include a commitment on the part of Western systems to adapt, requiring their flexibility and willingness to embrace a paradigm different from which they originate.

- **Use research activities (within and about the research industry) as a means to decolonise and heal from colonial practices.** The long-term effects of colonisation are poorly understood by the colonising powers that be, which in combination with a culture of limited self-reflection and accountability leads to continued harms in policy and practices enacted on Indigenous Arctic Peoples who are subject to globalised systems as secondary citizens to colonial nations. Western researchers have a unique

opportunity and responsibility to advocate within their system to address past and ongoing harms to Indigenous communities. Decolonizing research spaces will be beneficial to all professionals that inhabit intersectionally oppressed bodies and lived experiences, not just Indigenous individuals, as improving the understanding of artificial limitations upheld in the status quo would allow the research industry to be more broadly inclusive and whole.

- **Identify steps non-Indigenous professionals can undertake to decolonise research spaces, allowing Arctic Indigenous researchers to remain integrated in their communities, self-government practices, and access the research community.** Researchers who engage in work on or about the Arctic from outside the Arctic are benefitting from (employed within) a system that denies its own role in maintaining a status quo of disparity for Arctic residents. To address this, researchers can and should engage in their own education (at a personal level but more so at the level of understanding and reporting within Western systems) about the long-term effects of colonisation and engage in the critical reflection of policies and practices to make obvious to policy-makers when these remain tools of oppression. Creating safer, more inclusive environments that enable meaningful Indigenous participation are also beneficial for other research professionals from varied backgrounds.

Priorities for Research to Address Key Needs

- **Ensure dedicated funding for Indigenous-led research.** This is an area of persistent concern, identified many years ago, and has gone unaddressed; it touches all areas of research and is applicable to all Arctic research topics.
  - Recommended Implementation Actions
    - *Establish dedicated funding streams for Indigenous-led Arctic research.*
    - *Co-develop grant criteria with Indigenous leadership.*
    - *Ensure multi-year commitments.*
    - *Ensure that joint international funding efforts require partnership (or at least consent) with relevant Indigenous organisations.*
    - *Include holistic goals for all topics of Arctic research, especially considering the health and wellness for Indigenous communities.*
    - *Promote Indigenous-led research across Arctic communities and knowledge systems.*
    - *Provide dedicated, funded work on Indigenous data storage, licensing, and sharing methodologies.*

- **Prioritise Arctic research projects that meet Arctic community-defined needs.** When research is practiced as an extractive industry, wherein local communities and the disparities they experience are used as rationale to fund projects, where these communities bear the costs and risks of research activities, yet little to no benefit returns to the community subjected to research, it is inherently unethical. ICARP IV is an opportunity to recognise this history and depart from practices that continue to denigrate the autonomy of Arctic communities.
  - Recommended Implementation Actions
    - *Shift expectations in research project funding to focus on research that meets a defined community need.*
    - *Initiate regular engagement between the research and academic community with Arctic communities and Indigenous Peoples to update local and regional research priorities, ensuring external researchers are guided by known community needs.*
    - *Ensure that research upholds Indigenous rights as it operates on Indigenous lands (including subsurface lands and all waters, air, and space connected to Indigenous lands).*
    - *Create deliverables in partnership with local Indigenous communities.*
- **Bridge, weave, and create knowledge that is deeply co-productive.** The urgent challenges humans are facing and will face, in the Arctic and other regions, are not surmountable by relying upon the schools of thought that have led us to a place of human-caused global instability. Co-productive research practices and the creation of new understanding and knowledge arising from more than Western ways of thinking is necessary for all peoples to adapt and thrive in a rapidly changing landscape.
  - Recommended Implementation Actions
    - *Increase the direct involvement of Indigenous Peoples (governance organisations) and Indigenous researchers (individuals) in Arctic research.*

- *Address knowledge gaps by strengthening methodologies for true co-production of knowledge, especially in the areas of human health and well-being.*
- *Co-develop frameworks that bridge knowledge systems, ensuring Indigenous leadership in Arctic research moves beyond tokenistic (or box-checking) inclusion.*
- *Expand research activities (aka funding) for Indigenous-led land-based monitoring, resilience practices, and climate change mitigation.*
- *Invest in Indigenous-led environmental governance models, including those focused on water, ice, and biodiversity protection.*
- *Develop practical guidance on how knowledge systems can be bridged and translated into meaningful recommendations in support of decision-making without eroding their uniqueness or legitimacy.*
- *Support the transmission of Arctic science knowledge and Indigenous language revitalisation as a means of safeguarding Indigenous Knowledges necessary to engage in deep co-production, encompassing scientific, ecological, ethical, and cultural aspects.*
- *Collaborate with Arctic Indigenous Peoples (governance) and address gaps in ethical research protocols that safeguard Indigenous intellectual property.*
- *Create space for genuine dialogue and collaboration across cultural backgrounds, including mentorship opportunities and strengths-based growth for researchers.*
- *Promote land-based education and research practices in Indigenous and other Arctic communities.*
- *Related to both above, create spaces that foster growth to increase strengths (skills) of researchers and promote land-based education, Indigenous-led teaching of Indigenous constructs for non-local research staff.*

- *Decolonise education systems in the Arctic to reduce attrition of Indigenous students and increase recognition of capable research partners.*
- *Meaningfully involve community members in all aspects of research projects, from design to analysis, including application and archiving of data and output materials.*
- *Emphasise transparency, accountability for researchers as white-collar professionals.*
- *Ensure inclusion of diverse Indigenous perspectives.*
- *Recognise and respect the timelines necessary for collaboration and the approaches to timing (ways of considering time) that vary across knowledge systems.*
- *Develop policies that ensure Indigenous entities' control over data governance, and as a minimum standard, ensure alignment with the OCAP principles (Ownership, Control, Access, and Possession).*

- **Use research activities (in the research industry) as a means to decolonise and heal from colonial practices.** Arctic researchers, spurred to action by Arctic Indigenous Peoples, have an opportunity in ICARP IV to assert the need for better conditions within the industry of research. We can and should develop mutual respect and shared responsibility for the spaces we inhabit and work.
  - Recommended Implementation Actions
    - *Individual researchers are expected to have a baseline of knowledge in the history of colonisation of the Arctic and its past and ongoing impacts on Indigenous nations broadly as well as local residents of any area they wish to research.*
    - *Individual researchers engage in critical reflection of the colonial systems within which they operate and which Indigenous communities are subject to.*
    - *Research institutions recognise and respect the work of critical theorists who seek to illuminate and advocate for changes to systems that create or maintain harm to Indigenous communities, especially in the Arctic.*

- *Research institutions contribute to the advocacy to policy-makers on updating system approaches to reduce harm and no longer maintain disparities for Arctic communities.*
- *Research activities shift toward practices of non-harm and then ethical engagement with Indigenous communities such that research is not an extractive industry.*

- **Decolonise research spaces, allowing Arctic Indigenous researchers to remain integrated in their communities, employ self-government practices, and access the research community.** Indigenous inclusion, and the inclusion of other diverse perspectives, enriches and improves science outcomes. Engaging in open science practices while ensuing Indigenous data sovereignty will further enable decolonisation of data spaces.
  - Recommended Implementation Actions
    - *Non-Indigenous researchers analyse the systems within which they work to identify barriers to the inclusion of broad perspectives.*
    - *Non-Indigenous researchers analyse the systems within which they work to identify elements of policy and/or practice that exclude those from backgrounds other than the majority.*
    - *Research organisations promote and incentivise the equitable representation of professionals with diverse backgrounds and perspectives (including lived experiences and educational choices) at all levels of the research industry (decision-making, planning, working on projects, etc.).*
    - *Consider and weigh (count, value) the role of interdisciplinary and intergenerational knowledge transfer in research proposals for ensuring and strengthening healthy and vibrant communities.*
    - *Develop policies that ensure equitable recognition for the contributions of all research partners, including valuing the time and expertise shared in all aspects of the research process, the risks and opportunity costs undertaken by partners, and consensual use and management of all created data and products.*

2.1.6. Education and Knowledge-Sharing In and About the Arctic: Research and Practice

Focus of RPT and Rationale

RPT 6 encompasses a broad set of activities focused on advancing research on education in the Arctic as well as education about the Arctic, both in the north and globally. "Arctic education" in this context refers to both education in the Arctic and education about the Arctic; when only one of these is intended, it is specified explicitly. The title is intended to reflect that education in the Arctic is a content area for research that stands separate from the need to grow education about the Arctic and to enhance connections between Arctic researchers and educators. The terms "research" and "practice" encompass these multiple goals and are meant to be inclusive of educational practice and practitioners at all levels and in multiple settings, formal and informal. The use of the term "knowledge-sharing" is meant to expand the focus to include diverse knowledge systems, especially Indigenous and local knowledge systems in the Arctic, as well as education in non-institutional settings—on the land, in communities and families, in museums and community organisations, alongside Western science.

Rationale for prioritisation

RPT 6's focus areas address urgent gaps in understanding of how Arctic educational systems function, as well as how Arctic knowledge is generated, shared, and applied—particularly the need for education systems in the north to be more culturally relevant, decolonised, and community-rooted. Strengthening ties between Indigenous Knowledge Holders, local communities, polar educators, and academic institutions creates more inclusive and effective research collaborations and educational practices. Moreover, engaging Arctic youth as active participants and future leaders provides opportunities to develop their skills and ensures the sustainability of research and community well-being in a rapidly changing Arctic environment. These priorities align with broader commitments to sustainability, reconciliation, and capacity development within Arctic research ecosystems.

Summary

RPT 6: Education and Knowledge-Sharing In and About the Arctic: Research and Practice , is a comprehensive synthesis of findings from ICARP IV) and its associated Research Priority Team 6 (RPT 6). The report examines the dual facets of Arctic education: education *in* the Arctic (within Arctic communities) and education *about* the Arctic (in global contexts). It emphasises the importance of integrating Indigenous, local, and Western knowledge systems to enhance educational practices and knowledge-sharing in Arctic regions.
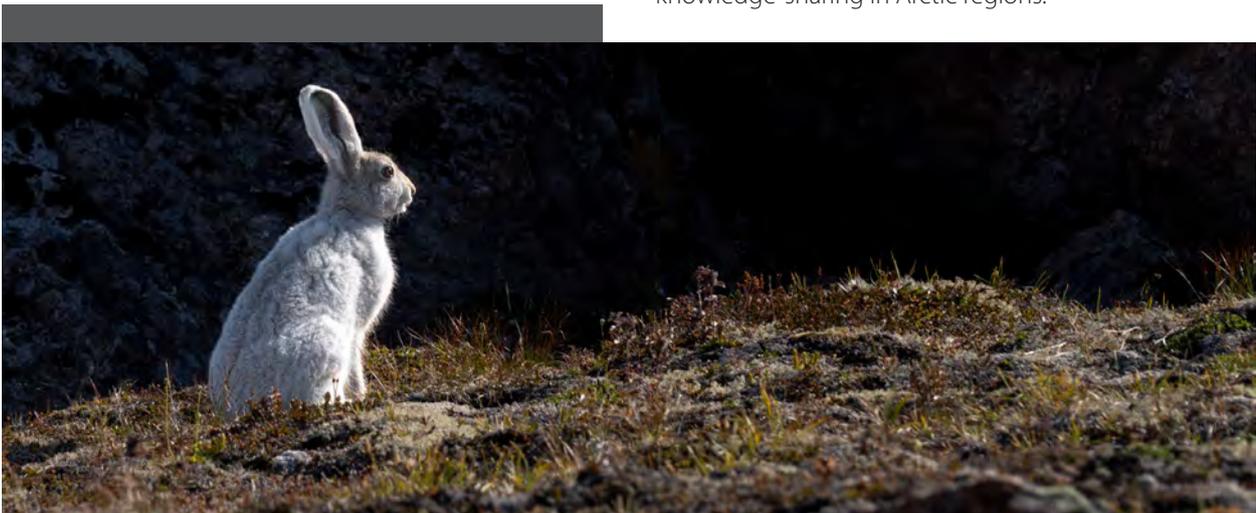
Key Themes and Findings:

1. Integration of Diverse Knowledge Systems:
   - Effective Arctic education requires the recognition and integration of Indigenous, local, and scientific knowledge systems.
   - This approach ensures culturally relevant and epistemically diverse learning experiences, fostering mutual respect and understanding.

2. Contextualised and Place-Based Pedagogy:
   - Education in Arctic regions is most effective when it engages directly with the local environment, cultural practices, and community priorities.
   - Experiential and land-based learning methods are emphasised to promote community resilience and sustainability.

3. Global Relevance and Outreach:
   - Education about the Arctic extends beyond the region, contributing to global understanding of Arctic environmental, social, and political issues.
   - This outreach fosters cross-cultural and transnational collaboration, enhancing global awareness and action on Arctic challenges.

4. Research-Practice Synergy:
   - The report underscores the importance of iterative interactions between research and educational practice.
   - This synergy enables evidence-based interventions, continuous improvement, and knowledge co-production, bridging the gap between theory and practice.

5. Partnerships and Capacity Building:
   - Collaborative networks among researchers, educators, communities, and policy-makers are essential for sustaining effective educational initiatives.
   - Investing in capacity-building initiatives that bridge local communities and global audiences is crucial for scaling innovations and ensuring long-term impact.

RPT 6 positions Arctic education as a critical field of inquiry and practice, with implications for research, policy, and pedagogy across multiple scales and settings. The report concludes with strategic recommendations to enhance both education in the Arctic and education about the Arctic. These include supporting interdisciplinary research, expanding access to culturally and contextually relevant curricula, fostering international collaboration, and investing in capacity-building initiatives that bridge local communities and global audiences.

Key Research Needs

- **Arctic education resources at all levels (primary, secondary, and postsecondary) alongside Arctic research need to be co-designed/co-produced with local and Indigenous communities to ensure equitable partnerships and meaningful outcomes.** Including this need emphasises ethical research practices, acknowledges Indigenous Knowledge Systems, and ensures educational content is accurate, respectful, and locally grounded.

- **Arctic community members, educators, and researchers need, on an ongoing basis, to define collectively the key information about the Arctic that should be disseminated as well as the barriers, gaps, and needs in support of formal teaching and informal public engagement in and about the Arctic.** This step establishes a clear foundation for curriculum development and outreach, ensuring education efforts address real deficits rather than duplicating existing work.

- **We need strategies to ensure that educators worldwide know about and can access curated materials and the essentials that should be taught about the Arctic.** Without accessible resources, even well-defined educational priorities cannot reach classrooms, limiting the global impact of Arctic science and awareness.

- **Identify what is needed to plan, train, and evaluate science communications and education outreach for early-career Arctic researchers.** Effective planning, training, and evaluation of science communication and education outreach for early-career Arctic researchers is essential to build their capacity to share knowledge with diverse audiences, from policy-makers to local communities.

- **Strengthen communication between Arctic scientists, policy-makers, educators, and Arctic communities and provide sustained support to efforts to increase these connections.** This work ensures that cutting-edge research and policy discussions translate quickly into education and community and public engagement.

Priorities for Research to Address Key Needs

- **Study multiple approaches for transforming education so that it better meets the needs of and represents Arctic Peoples and places.** Education in the Arctic must be rooted in the realities of the region's peoples, futures, histories, and geographies. Decolonizing education is not only a justice issue—it is essential to the region's sustainability, resilience, and identity.
  - Recommended Implementation Actions
    - *Develop collaborative frameworks for co-design of curricula and teaching methods.*
    - *Establish pilot projects in Arctic communities to trial education models.*
    - *Provide education and professional development and for educators with Indigenous Knowledge Holders.*
    - *Secure sustained funding mechanisms for community-driven education initiatives.*
    - *Create platforms for knowledge exchange and community of practice development.*

- **Explore how to build bridges between Indigenous Knowledges, local knowledge, and Western science systems within Arctic education systems.** Both Indigenous and local knowledge systems with Western science are essential for holistic understanding of Arctic change. This requires respectful relationship-building, ethical frameworks, and shared governance in research.
  - Recommended Implementation Actions
    - *Establish ongoing forums for dialogue and collaboration between Indigenous Knowledge Holders, local experts, educators (broadly defined) and scientists.*
    - *Develop joint research projects that integrate Indigenous, local, and Western science knowledge.*
    - *Create training and capacity-building programmes for researchers and community members on cross-knowledge communication.*
    - *Implement ethical guidelines and protocols for knowledge-sharing and data sovereignty.*
    - *Share successful models and lessons learned through publications, conferences, and community meetings.*

- **Understand the role that education at multiple levels and in different settings plays in supporting sustainability in Arctic communities.** Education is a key lever in advancing sustainable development and community resilience. However, its current role in Arctic sustainability—both environmental and socio-cultural—remains understudied.
  - Recommended Implementation Actions
    - *Conduct community-based research to document how education supports sustainability goals.*
    - *Develop curricula and programmes that embed sustainability and community priorities.*
    - *Facilitate knowledge exchange forums between educators, community leaders, and sustainability practitioners.*
    - *Secure multi-year funding for community-driven education sustainability projects.*
    - *Monitor and evaluate the impact of education on sustainability outcomes in Arctic communities.*

- **Determine how to attract and retain educators, whether local or from outside the region.**
  Recruiting and retaining qualified, culturally competent educators remains one of the Arctic's most pressing systemic challenges.
  - Recommended Implementation Actions
    - *Co-develop localised teacher education and certification programmes.*
    - *Establish mentorship and support networks for educators in Arctic regions.*
    - *Invest in blended and distance learning infrastructure for teacher development.*
    - *Provide financial incentives and housing supports to attract and retain educators.*
    - *Recognise and support local educators, including Elders and language speakers, through flexible accreditation.*

- **Identify ways to bring together government, higher education, and community resources in support of Indigenous language revitalisation.**
  Indigenous Languages are foundational to cultural continuity, intergenerational knowledge transfer, and identity in Arctic communities as well as long-term climate and environmental knowledge, as discussed earlier in this report. Indigenous language revitalisation intersects with mental health, youth well-being, governance, and sovereignty. Yet revitalisation efforts remain chronically under-resourced and siloed.
  - Recommended Implementation Actions
    - *Support Elders and language Knowledge Holders as core educators and co-developers of curriculum..*
    - *Fund and scale immersion programmes, language nests, and on-the-land cultural learning initiatives.*
    - *Establish shared repositories of Indigenous language and knowledge resources, controlled by communities.*
    - *Develop culturally responsive teacher education pathways that prioritise Indigenous Languages and pedagogies/andragogies.*
    - *Facilitate cross-sector partnerships to strengthen Indigenous language policy and funding across education systems.*

2.1.7. Technology, Infrastructure, Logistics, and Services

Focus of RPT and Rationale

RPT 7 included a globe-spanning group of 23 Arctic researchers, logisticians, Northern community members and practitioners. It distilled a wide body of literature on Arctic research, focusing on the technology, infrastructure, logistics, and services that support science. Using the expertise of the team members, the pre-existing knowledge in relevant literature, and Arctic research community input, participants worked in subteams focused on the four topic areas. Each subteam drafted gaps and priorities which were iteratively consolidated. Significant progress was made in advance of and during the ICARP IV Summit in Boulder, Colorado, USA (March 2025), where RPT 7 presented on its draft gaps and priorities.

A wide range of topics were suggested for inclusion in RPT 7, to the extent that it became a catch-all for issues not noted within the other RPTs. The team was not able to address all suggestions in its report. Several consistent, recurring themes were moved to the cross-cutting priorities, while other topics such as cybersecurity and AI impacts were alluded to in the RPT 7 report but not addressed despite being foundational issues for research in the coming decade.

Summary

RPT 7 addressed key gaps and priorities in technology, infrastructure, logistics, and services that will support Arctic research in the next decade. These gaps and priorities may require research or they may be issues of focus and implementation. RPT 7 presented this information as a road map for policy-makers, funding agencies and scientists, acknowledging the extensive body of thought work on which its report is based.

Arctic research relies on technology, infrastructure, logistics, and services specifically designed to address the unique challenges posed by the Arctic's extreme climatic conditions and fragile ecosystems. Technology provides innovations that facilitate remote operations while also compressing distance for communication and information transfer for remote locations, operations, and communities. **Technology** also encompasses innovations in the fields of power, transportation and biology that will support infrastructure and logistics. Research **Infrastructure** encompasses essential facilities such as research stations (both year-round and seasonal), vessels, aircraft, vehicles, autonomous vehicles, and support staff and is closely linked to general infrastructure, such as roadways, ports, satellites, energy, computer and communication networks. **Logistics** are built around the procurement, maintenance, utilisation of these assets. **Services** can support the on-site or remote needs for research including lodging, meals, communications and data hosting, safety, remote access, and science support.

Many of the requirements for Arctic research are also critical to the sustainability of Arctic communities. This report seeks to point out the intersection of research and community needs. Technology and infrastructure represent significant long-term investments that may benefit scientists, Indigenous Peoples, and local communities, while logistics and services provide essential research support and may contribute to Northern economies. The RPT 7 participants acknowledge that infrastructure and technology also have the potential to harm Northern communities; it is critical that communities are involved in making decisions about technology, infrastructure, logistics and services that impact them.

Key Takeaways

a. **Sustainability must guide all investments.** For example, diesel dependency remains the norm for Arctic research operations, yet it is costly, carbon-intensive, and increases particulate matter emissions which can compromise the accuracy of climate data collection. Research priorities must accelerate the development of renewable energy systems, advanced batteries, low-emission transport, and resilient communications. These systems can benefit both researchers and communities, lowering costs, reducing health risks, and enabling sustainable Arctic living.

b. **Distributed observing systems are critical.** The Arctic is changing faster than any other region on Earth. To capture these changes, research requires spatially distributed, long-term, and year-round observations across spheres (hydro-, cryo-, bio- and atmosphere). Next-generation remote sensing, highly elliptical orbit satellites, and cabled or autonomous ocean observatories must be developed alongside international coordination of research stations, vessels, and icebreakers. These investments provide the backbone for predictive climate models and informed decision-making at national and community scales. Reliable infrastructure with redundancy and proper logistical support are essential for proper functioning observing systems and to avoid data gaps.

c. **Remote and virtual access is a necessary innovation.** Reducing the environmental and economic costs of Arctic research will require advanced remote and virtual access systems. Automated instrumentation, intuitive virtual platforms, and expanded broadband capacity will allow more researchers to participate without extensive travel. Remote and virtual access can be developed within Arctic communities to capture human observations, provide economic input, and to share digital access with Arctic communities, hence supporting education, telemedicine, local monitoring, and emergency preparedness.

d. **Indigenous participation strengthens Arctic science.** Indigenous Peoples are leaders in monitoring, interpreting, and responding to Arctic change. Formalising Indigenous governance roles in research—including research review boards, data sovereignty protocols, and Indigenous-led or co-managed repositories—ensures that knowledge is protected, respected, and mobilised appropriately. Co-designing and maintaining infrastructure, logistics, and data systems with Indigenous Nations creates solutions that are both scientifically rigorous and socially equitable.

e. **Cross-cutting priorities require systemic attention.** Sustained funding, field safety, data harmonisation, and cybersecurity are essential foundations for Arctic science. Without stable, predictable investment, long-term observing systems and skilled technical workforce development cannot be maintained. Without safety planning—including multi-use infrastructure for evacuation and disaster response—neither researchers nor communities can thrive. Without harmonised, secure, and sovereignty-compliant data practices, Arctic knowledge risks fragmentation or misuse, particularly in the context of Artificial Intelligence (AI).

Key Research Needs

- **Improved technologies.** Existing technologies such as batteries and ROVs/AUVs need to be further developed for Arctic environments.

- **Sustainable Arctic technology, infrastructure, and logistics.** The growing scientific, economic, and political interest in the Arctic requires coordinated solutions that ensure responsible development while reducing ecological footprints.

- **Securing observational data and integration of observing systems.** Inconsistent data collection hinders the comprehensive monitoring of the Arctic's rapidly changing environment. A network of collaborative observing systems, and the harmonisation of measuring methods, are necessary to ensure the best possible coverage and quality of observational data, including real-time measurements.

- **Indigenous Knowledges in research and ethical human dimensions of infrastructure.** Sustainable Arctic research requires governance structures that promote Indigenous leadership and equitable partnerships. Ethical field practices are essential to ensure that research infrastructure reflects both scientific and community priorities.

- **Expansion and development of remote and virtual access services to research infrastructure.** Challenges such as logistical barriers, lack of standardisation, and cybersecurity risks limit effective remote and virtual access to research infrastructure.

Priorities for Research to Address Key Needs

- **Develop and deploy environmentally and socially sustainable Arctic infrastructure and logistics.** It is critical to continue to develop and deploy Arctic infrastructure and logistic systems that are environmentally appropriate and suited to the unique challenges of the polar region.
  - Recommended Implementation Actions
    - *Develop renewable energy solutions for Arctic logistics, and implement sustainable energy solutions for infrastructure.*
    - *Invest in research and development for automated systems for logistics operations in remote areas.*
    - *Establish partnerships between governments, private sectors, and Indigenous organisations to co-create infrastructure projects that respect ecological sensitivities and minimise disruption.*
    - *Undertake collaborative planning: for example, international coordination of Arctic research infrastructure to efficiently address international science priorities, maximise the use of available resources and reduce redundancies.*
    - *Reduce expired installations, and remove research-associated waste or expired sites.*
    - *Coordinate and engage with Indigenous and Northern communities to provide long-term investments in logistical and infrastructure needs.*

- **Maintain and develop distributed research infrastructure to provide sustainable observing platforms in support of societal and scientific needs.** We need observations that provide: 1) spatial coverage across ecosystem gradients on the land, in the ocean and atmosphere (representative sampling) 2) in-depth, process-based measurements and experiments (land-based flagship observatories and research vessels), and 3) continuous, long-term, year-round observations to capture spatial changes, understand underlying mechanisms, and to capture both long-term trends and short-term variability.

  - Recommended Implementation Actions
    - *Maintain and improve the existing long-term observation platforms and develop new spatially distributed research infrastructure and observation platforms.*
    - *Develop and implement societally and environmentally responsible practices for building and operating infrastructure jointly with local and Indigenous communities.*
    - *Minimise the environmental impact of infrastructure through sustainable facilities and capabilities.*

- **Enhance remote and virtual access to research infrastructure.** Remote and virtual access are strategies to reduce the environmental impact of Arctic research which may reduce the costs and carbon necessary to transport researchers from the mid-latitudes into the Arctic. Automated technologies and the integration of local researcher support from Arctic communities may increase observing and monitoring efficiency. Further, logistics and other services provided by Northern residents may provide employment and other benefits for Arctic communities.
  - Recommended Implementation Actions
    - *Enhance international collaboration and establish agreements for remote and virtual access.*
    - *Expand access to research infrastructures and their remote and virtual access services to complement field-based research.*
    - *Cultivate innovation and develop new methods and services for remote and virtual access provision, for example by implementing Digital Twins of specific areas.*
    - *Ensure seamless, economic and sustainable remote and virtual access services through integration with development of infrastructure, logistics, and technology.*

- **Develop and deploy next-generation remote sensing technologies to strengthen Arctic climate, environmental, and ecosystem monitoring.** The Arctic's rapidly changing climate demands enhanced real-time monitoring to better predict and mitigate environmental shifts, and for better informed decision-making on climate adaptation strategies.
  - Recommended Implementation Actions
    - *Deploy and release advanced active microwave (SAR) data for permafrost monitoring.*
    - *Implement drone systems for mapping and monitoring environmental changes in the Arctic.*
    - *Conduct continuous, long-term year-round observations in the deep Arctic Ocean using cabled observatories as well as autonomous (stationary or mobile) platforms.*
    - *Organise autonomous underwater and under-ice vehicle observing campaigns and extend coverage of observations to otherwise inaccessible regions.*
    - *Provide researcher access to new icebreakers.*
    - *Ensure all data collected in the North are stored in curated, well-managed repositories, while respecting Indigenous ownership and rights.*
    - *Ensure respect of Indigenous Data Sovereignty with regard to data collected on their territories or data that may impact Indigenous interests or resources.*
    - *Support the development of Digital Twins (or multi-layer portals offering data and predictive model results for an entire region). The layers would cover the natural and social sciences.*

- **Improve renewable energy production and advance new technologies in partnership with Indigenous and local communities to support sustainable research, and living, in the Arctic.** The high cost of energy in the north impacts both research and residents. Optimising energy efficiency in all infrastructure and technology projects is a fundamental starting point. Development and deployment of sustainable energy systems will benefit research and Northern communities.
  - Recommended Implementation Actions
    - *With the consent of local and Indigenous communities, expand use of wind, solar, and alternative fuels through small-scale pilot projects.*
    - *Continue innovation in clean transportation, such as expanded testing and development of electric vehicles.*
    - *Assess the value and impacts of innovations to energy infrastructure and technologies through evaluations that are co-produced with or validated by Indigenous and Northern communities.*

2.2. Cross-cutting Research Needs and Priorities

Each of the RPTs was asked to identify cross-cutting research needs and priorities that are relevant to more than one RPT. As with the main RPT research needs and priorities, the cross-cutting research needs and priorities identified by RPTs fell into several categories:

- Addressing gaps in scientific understanding and modelling capabilities;
- Improving research infrastructure, data accessibility, and observation systems;
- Mitigation and adaptation to changing conditions;
- How research should be conducted;
- Education and outreach; and
- Governance, policy, international cooperation, and funding systems.

Three of the RPTs focused on topics that are relevant to the areas covered by the other RPTs, so all of their identified research needs and priorities are considered cross-cutting:

- Co-production and Indigenous-led research (RPT 5)
- Education and knowledge-sharing (RPT 6)
- Technology, infrastructure, logistics, and services (RPT 7).

This Final Outcomes report provides a brief overview below of the types of cross-cutting research needs and priorities identified by the RPTs. For further detail, readers should consult the individual RPT reports. The RPT reports also describe recommended implementation actions for the cross-cutting priorities, along with potential implementation actors.

Cross-cutting Research Needs and Priorities Identified in RPTs

Gaps in Scientific Understanding and Modelling Capabilities

The RPTs identified a range of topics where improved understanding is needed, such as Arctic freshwater and global ocean circulation, the vertical structure of the Arctic Ocean-Earth System, and global atmospheric impacts of Arctic wildfires. They also identified priority areas of improvement in modelling capabilities, such as evaluating applications for machine learning and Artificial Intelligence, enhancing modelling capabilities for projections of terrestrial ecosystem responses.

Improving Research Infrastructure, Data Accessibility, and Observation Systems

The RPTs identified priorities such as ensuring long-term observational capacity for the Arctic Earth system; harmonising and standardising data collection; and sustaining Arctic research infrastructure (e.g., research stations, vessels, and data and observing systems) as essential assets for long-term science and security.

Mitigation and Adaptation

Priorities identified by RPTs included improving the health and well-being of Arctic residents, facilitating just transitions in natural and social subsystems, and promoting community and human security.

How Research Should be Conducted

Many of the priorities identified in this area focused on promoting and empowering Indigenous leadership in Arctic research; prioritising research that meets needs identified by Arctic Indigenous communities; recognising and working with diverse knowledge systems (including Indigenous Knowledge Systems) and methodologies for data collection, analysis, and application; decolonisation of research practices and spaces; recognising Indigenous Knowledge in decision-making processes; data sharing and open science; and field safety.

Education and Outreach

Identified priorities in this area focused on activities such as training and supporting early-career researchers; engaging Arctic youth in education, research planning, and decision-making; evaluating education and outreach activities; ensuring that academic researchers foster and recognise outreach and service contributions by researchers; and supporting data literacy.

Governance, Policy, International Cooperation, and Funding Systems

The RPTs identified needs to develop cooperative and innovative funding models, ensure the continuity of funding, ensure effective policymaking and governance, seek justice and inclusivity in research and policy processes, and improve understanding of governance systems in the Arctic.

3. Toward International Polar Year 5, 2032–2033

The 5th International Polar Year (2032–33), or IPY-5 for short, is being organised with unprecedented urgency due to rapid environmental and social changes in the Polar Regions. There is widespread concern about crossing thresholds that may irreversibly alter life in the Arctic, Antarctic, and around the world. IPY-5 will build on four groundbreaking IPYs since 1881 and millennia of Indigenous Peoples' Knowledge, that together form a long chain of coordinated polar research and credible scientific evidence and knowledge on socio-ecological changes in the Polar Regions.

Most recently, the fourth IPY (2007–2008) drew together evidence from thousands of participants emphasising that polar changes have global consequences. IPY-5 will encourage and enable vital cooperation across countries, disciplines, and knowledge systems to coordinate research, observations and monitoring, as well as innovative expeditions in the Polar Regions to produce urgently needed and actionable knowledge to more deeply understand global processes, support informed decisions, and offer effective and implementable solutions.

IPY-5 will:

- Extend observations of accelerating changes, and establish new baselines to guide actions;
- Harness new tools and methods developed since IPY-4, across disciplines and knowledge systems;
- Advance transdisciplinary research by recognising and working with and across diverse knowledge systems including from natural sciences, social sciences, humanities research, and Indigenous Knowledges; and much more.

This momentum aligns with international developments such as the 2023 Helsinki Declaration, ICARP IV, and the UN Decades of Ocean Sciences, Cryospheric Sciences, Ecosystem Restoration, and Indigenous Languages.

IPY-5 will work with and alongside these and other initiatives, which together highlight the need for greater international coordination to provide evidence for effective decision-making on urgent global issues.

IPY-5 will create knowledge for action with direct societal relevance:

- Direct benefits for local communities, youth, global public, and Indigenous Peoples;
- Knowledge that informs decision-making at local, regional, and global scales;
- Partnerships between scientists, academic institutions, Indigenous Peoples, and local organisations through co-design of research projects and co-production of knowledge;
- Equitable, inclusive, and diverse capacity building for youth and early-career researchers; and
- Education and outreach that raise awareness of the importance of Polar Regions worldwide.

IPY-5 will strengthen international coordination and collaboration toward a common purpose for collective benefit, enabling the global polar research community to achieve together what no single nation can achieve alone.

ICARP IV Contributions to and Connections with IPY-5

Each of the RPTs was asked to prepare recommendations on how to track the implementation of ICARP IV research priorities over the next decade, identify which organisations should be involved in tracking, and how the implementation actions should be included in planning for IPY-5. The detailed recommendation tables are available in the individual RPT reports.

In addition, RPT 6 provided several overall recommendations on tracking strategies that could apply the RPT implementation actions:

Implement annual and biennial reporting for youth councils, Arctic education and training programmes, and funding initiatives to build a longitudinal dataset.

Institutionalise ICARP IV attribution through citation language—"Produced under ICARP IV process"—in curricula, publications, and publicly funded materials.

Embed youth and Indigenous leadership into the IPY 2032–33 planning by establishing governance roles, showcasing successful projects, and highlighting co-developed practices.

Align funding portfolios and tenure criteria with ICARP IV priorities to ensure continuity and reinforcement of Arctic research goals.

4. Call to Action

The Arctic is undergoing profound and accelerating transformation, with consequences that extend far beyond the region itself. The research priorities outlined in this report represent more than a summary of current knowledge gaps—they provide a foundation for the next decade of coordinated Arctic research. Together, they form a roadmap for sustaining and strengthening Arctic observing systems, advancing understanding of interconnected environmental and social change, and ensuring that research remains relevant to the communities who live in and depend upon the Arctic. The urgency of Arctic change requires a renewed commitment from researchers, educators, institutions, and funders to move from planning to implementation.

Achieving the vision articulated through ICARP IV will require sustained international cooperation and long-term investment in Arctic research infrastructure, monitoring, and knowledge systems. In a time of geopolitical uncertainty, the Arctic research community must reaffirm its shared commitment to collaboration across borders, disciplines, and cultures. Maintaining open channels for scientific cooperation is essential not only for advancing knowledge but also for supporting informed decision-making in the face of rapidly evolving environmental and societal challenges.

A defining strength of the ICARP IV process has been its commitment to inclusivity and partnership with Indigenous Peoples of the Arctic. The collaborative and co-developed approach taken in this process demonstrates how Arctic research can be strengthened when Indigenous leadership, knowledge systems, and priorities are recognised as foundational to research planning and implementation.

Looking ahead, the Arctic research community has an opportunity and a responsibility to build on this momentum. By supporting the next generation of researchers and educators, investing in sustained observations and community-based monitoring, and advancing truly co-productive approaches to knowledge creation, the priorities identified here can guide meaningful progress toward the Fifth International Polar Year and beyond. This report is therefore not only a synthesis of ideas, but an invitation: a call for the global research community, institutions, and funders to work together in shaping a resilient, collaborative, and impactful future for Arctic research—one that serves the Arctic and contributes to the well-being of the entire planet.

Annexes

Annex 1: ICARP IV International Organisational Structure

1.1. ICARP IV International Steering Committee & ICARP IV Partner Organisations

The **ICARP IV International Steering Committee (ISC)** consisted of appointees from all **ICARP IV partner organisations** and was tasked to oversee and coordinate the ICARP IV process from 2022 to 2026, identify and develop an overall process goal, theme and agenda, sub-theme research questions, and mechanisms for action and implementation of the ICARP IV outcomes.

Name	ICARP IV Partner	Name	ICARP IV Partner
Co-chairs:			
Henry Burgess	International Arctic Science Committee (IASC)	Dalee Sambo Dorough (Iñupiaq)	ICARP IV Indigenous Coordination Group
Committee Members:			
Sourav Chatterjee	IASC - Atmosphere Working Group	Tatiana Degal (Itelmen)	International Arctic Social Sciences Association (IASSA)
Henrieka Detlef	IASC - Marine Working Group	Richard Essery	International Association of Cryospheric Sciences (IACS)
Catherine Chambers	IASC - Social and Human Working Group		
Yulia Zaika	IASC - International Science Initiative in the Russian Arctic (ISIRA)	Inigo Martinez	International Council for the Exploration of the Sea (ICES)
Matthew Druckenmiller	IASC - ICARP IV / ASSW 2025 host	Kjersti Gisnås	International Permafrost Association (IPA)
Gerlis Fugmann	IASC - IASC Secretariat	Melody Burkins	International Science Council
Larry Hinzman	IASC - Past ICARP IV Chair	Maribeth Murray	International Study of Arctic Change (ISAC)
David Hik	IASC - Past ICARP III Chair	Sara Olsvig (Inuk)	Inuit Circumpolar Council (ICC)
Lauren Divine	Aleut International Association (AIA)	Radovan Krejci	Ny-Ålesund Science Managers Committee (NySMAC)
Chantelle Verhey	Arctic Data Committee (ADC)		
Rolf Rødven	Arctic Monitoring and Assessment Programme (AMAP)	Maria Pia Casarini	Polar Educators International (PEI)
		Máret Haetta	Saami Council
Jon L. Fuglestad	Arctic Science Funders Forum	Emmanuel Boucher-Fassett	Sustainable Development Working Group (SDWG)
Hyoung Chul Shin	Asian Forum for Polar Science (AFOPS)		
Harmony Jade Sugaq Wayner (Alutiiq)	Association of Polar Early Career Scientists (APECS)	Sandy Starkweather	Sustaining Arctic Observing Network (SAON)
Svein Mathiesen	Association of World Reindeer Herders (AWRH)	Heikki Lihavainen	Svalbard Integrated Arctic Earth Observing System (SIOS)
Amy Lauren Lovecraft	Climate and Cryosphere (CliC)		
Courtney Price	Conservation of Arctic Flora and Fauna (CAFF)	Dag Avango	The Arctic Six
Maria Grigoratou	European Polar Board (EPB)	Kirsi Latola	University of the Arctic (UArctic)
Dirk Mengedoht	Forum of Arctic Research Operators (FARO)		
Alternates:			
Paula Kankaanpää	IASC - Alternate	Sarah Strand	Association of Polar Early Career Scientists (APECS) - Alternate
Muyin Wang	IASC - Atmosphere Working Group		
Lisa Winberg von Friesen	IASC - Marine Working Group	Edward Hanna	Climate and Cryosphere (CliC)
		Katy Smith	Forum of Arctic Research Operators (FARO)
Andrey Petrov	IASC - ICARP IV / ASSW 2025 host	Inga Beck	Polar Educators International (PEI)
Federica Scarpa	IASC - IASC Secretariat		

1.2. ICARP IV Indigenous Peoples' Coordination Group

The ICARP IV Indigenous Peoples' Coordination Group (IPCG) was an informal body composed of Arctic Indigenous scholars engaged in the ICARP IV RPTs and the ICARP IV International Steering Committee to assist in and ensure coordination of the efforts to Indigenise Arctic research.

Name	Affiliation	Country
Margaret Anamaq Rudolf (Iñupiaq)	University of Alaska Fairbanks	United States
Heather Sauyaq Jean Gordon (Iñupiaq)	Sauyaq Solutions, LLC	United States
Varvara Korkina Williams (Kumandin)	Dartmouth College	United States
Dalee Sambo Dorough (Iñupiaq)	University of Alaska Anchorage	United States
Tatiana Degai (Itelmen)	University of Victoria	Canada/Russia
Cana Uluak Itchuaqiyaq (Iñupiaq)	Virginia Tech	United States

1.3. ICARP IV International Coordination Office

The **Secretariat of the IASC** in Akureyri, Iceland coordinated the ICARP IV process from 2022 to 2026:

Name	Role
Gerlis Fugmann	ICARP IV International Coordinator / IASC Executive Secretary
Federica Scarpa	ICARP IV Project Officer / IASC Communications Manager

1.4. ICARP IV Research Priority Teams (RPTs)

The ICARP IV RPTs, which conducted their work in 2024 and 2025, consisted of experts and Knowledge Holders nominated by all ICARP IV partner organisations or self-nominated via an open call for members in the second half of 2023. They were tasked to review and summarise the wider community input provided for their topic area through the open engagement phase from 2023 - 2025 by defining knowledge gaps and research priorities. They developed possible science and educational plans, as well as recommendations for implementation of these priorities incorporating community input.

The following seven ICARP IV RPTs were set up:

- RPT 1: The Role of the Arctic in the Global Earth System
- RPT 2: Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses
- RPT 3: Understanding the Dynamics and Resilience of Arctic Social-ecological Systems to Foster Sustainable Futures
- RPT 4: Arctic Research Cooperation and Diplomacy
- RPT 5: Co-Production and Indigenous-led Arctic Research
- RPT 6: Education and Knowledge-Sharing In and About the Arctic: Research and Practice
- RPT 7: Technology, Infrastructure, Logistics, and Services

An informal 8th Research Priority Team on "Data" was covered by the members of the Arctic Data Committee represented on each of the RPTs.

To ground the process in the outcomes of the last ICARP III (2015), the topic areas include the ICARP III themes (from the final ICARP III report) plus additional relevant themes. Each RPT also considered several cross-cutting themes in their work, including but not limited to co-production of knowledge.

The preliminary results of their work was presented at the ICARP IV Summit / ASSW 2025 in Boulder, Colorado, USA (20 – 28 March 2025) to discuss and consult on the initial outcomes. The teams afterwards finalised their outcomes until the end of December 2025. The results were published during the Arctic Science Summit Week 2026 from 25 March - 1 April 2026 in Aarhus, Denmark.
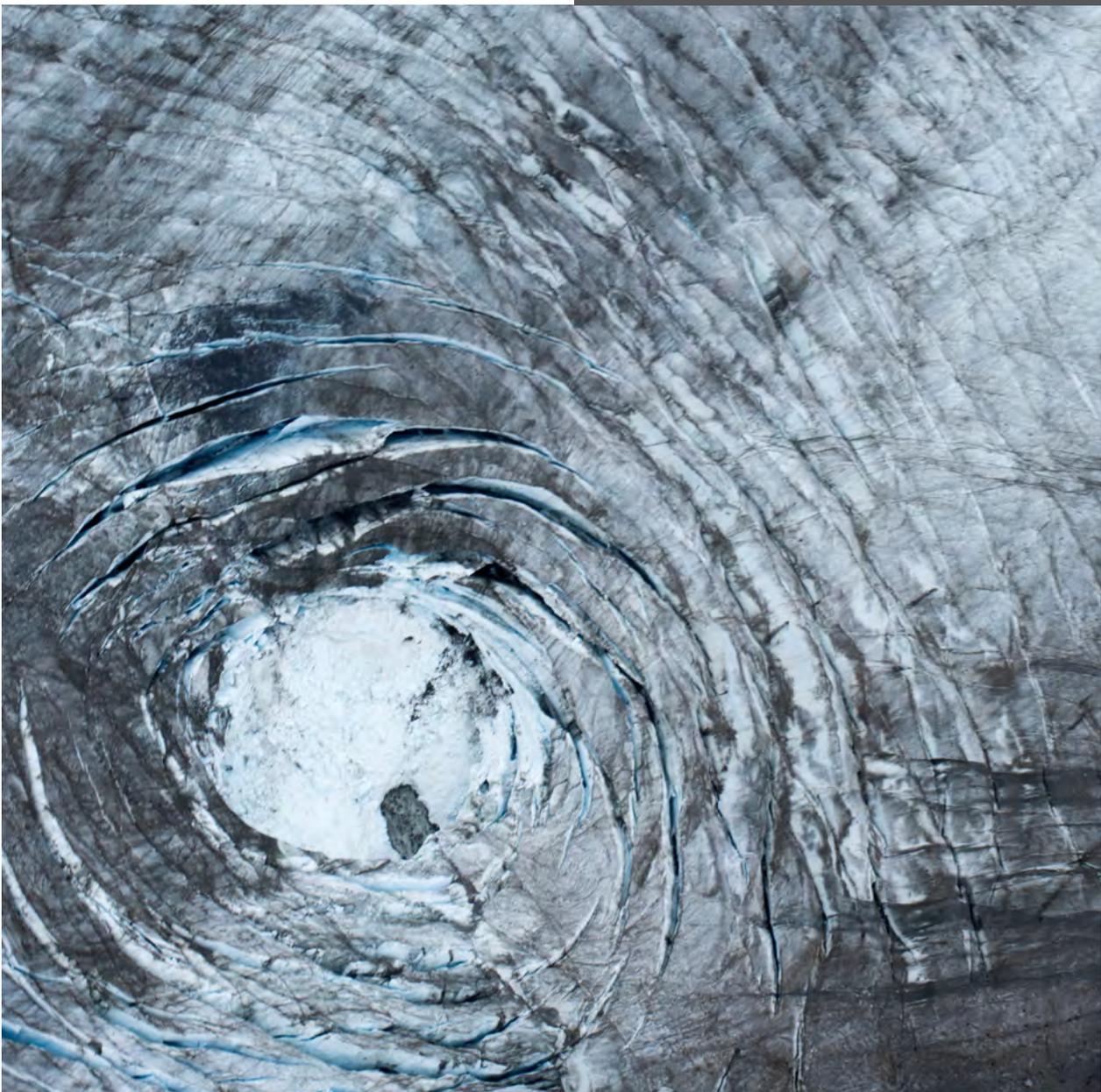
Co-chairs of the ICARP IV RPTs:

Name	Affiliation	Country
RPT 1: The Role of the Arctic in the Global Earth System		
Xiangdong Zhang	North Carolina State University	United States
Kabir Rasouli	Desert Research Institute	United States
RPT 2: Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses		
Syndonia Bret-Harte	Institute of Arctic Biology/ Department of Biology & Wildlife, University of Alaska Fairbanks	United States
Wilson (Wai Yin) Cheung	Queen's University, Ice Climate and Environment Lab (ICElab), Department of Geography and Planning	Canada
Robbie Mallett	Earth Observation Group, UiT The Arctic University of Norway	Norway
Margaret Anamaq Rudolf (Iñupiaq)	International Arctic Research Center, University of Alaska Fairbanks	United States
RPT 3: Understanding the Dynamics and Resilience of Arctic Social-ecological Systems to Foster Sustainable Futures		
Jackie Dawson	University of Ottawa	Canada
Heather Sauyaq Jean Gordon (Iñupiaq)	Sauyaq Solutions, LLC	United States
RPT 4: Arctic Research Cooperation and Diplomacy		
Jennifer Spence	Belfer Center, Harvard Kennedy School	United States
Malgorzata Smieszek-Rice	Arctic Monitoring and Assessment Programme (AMAP) / UIT The Arctic University of Norway, The Norwegian College of Fishery Science	Norway
Tom Barry	University of Akureyri	Iceland
RPT 5: Co-Production and Indigenous-led Arctic Research		
Anita Lafferty (Dene Cree)	University of Alberta	Canada
Stacey Kangipneq Lucason (Yup'ik)	Kawerak, Inc.	United States
Norma Shorty (Tlingit)	Arctic Athabaskan Council	Canada
RPT 6: Education and Knowledge-Sharing In and About the Arctic: Research and Practice		
Inga Beck	LMU Munich	Germany
Diane Hirshberg	University of Alaska Anchorage / University of the Arctic	United States
RPT 7: Technology, Infrastructure, Logistics, and Services		
Dariusz Ignatiuk	University of Silesia in Katowice/Polish Polar Consortium	Poland
Cana Uluak Itchuaqiyaq (Iñupiaq)	Virginia Tech University	United States
Marin Kuizenga	University of Alaska, Toolik Field Station	United States

More information on the work and a full composition of the RPTs can be found on the ICARP IV website: *https://icarp.iasc.info/engagement/research-priority-teams* **as well as within the seven ICARP IV Research Priority Teams Final Reports.**

Annex 2: ICARP IV Summit 2025

The ICARP IV Summit held during the Arctic Science Summit Week 2025 from 20–28 March 2025 in Boulder, Colorado, USA was the summative event of the ICARP IV process with around 1,200 participants.

2.1. ICARP IV Summit Host Committee and ICARP IV US National Steering Committee

The ICARP IV Summit Host Committee was formed by the host of the ICARP IV / ASSW 2025 in Boulder, Colorado, USA, and worked closely with the ICARP IV International Steering Committee. The Conference Host Committee, advised by a US National Steering Committee, committed to providing an outstanding venue for sharing scientific achievements, advancing collaboration, and planning for the future of Arctic research.

PHOTO: MARIASILVIA GIAMBERINI

Name	Affiliation	Country
ICARP IV Summit Host Committee		
Matthew Druckenmiller (chair)	National Snow and Ice Data Center, University of Colorado Boulder	USA
Gijs de Boer	Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder	USA
Mariama Dryák-Vallies	Polar Science Early Career Community Office, University of Colorado Boulder	USA
Katie Ellis	National Snow and Ice Data Center, University of Colorado Boulder	USA
Gerlis Fugmann	IASC Secretariat	Iceland
Linda Pendergrass	Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder	USA
Andrey Petrov	ARCTICenter, University of Northern Iowa	USA
James Rattling Leaf (Rosebud Sioux)	Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder	USA
Sandy Starkweather	Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder	USA
James Temte (Northern Cheyenne)	Alaska Pacific University	USA
Varvara Korkina Williams (Kumandin)	Institute of Arctic Studies, Dartmouth College	USA
Mistia Zuckerman	National Snow and Ice Data Center, University of Colorado Boulder	USA
ICARP IV US National Steering Committee		
Matthew Druckenmiller (co-chair)	University of Colorado Boulder	
Andrey Petrov (co-chair)	University of Northern Iowa	
April Melvin (co-chair)	U.S. National Academies Polar Research Board	
Melody Burkins	Dartmouth College	
Lee Cooper	University of Maryland	
Dalee Sambo Dorough (Iñupiaq)	University of Alaska Anchorage	
Bruno Grunau	National Renewable Energy Laboratory	
Nagruk Harcharek (Iñupiaq)	Voice of the Arctic Iñupiat	
Adelheid Hermann (Dena'ina Athabascan)	University of Alaska Fairbanks	
Diane Hirshberg	University of Alaska Anchorage	
Martin Jeffries	Retired and Polar Research Board Chair	
Brendan Kelly	University of Alaska Fairbanks	
Terri Mitchell	Ukpeaġvik Iñupiat Corporation Science	
Lynn Palensky	North Pacific Research Board	
Julie Raymond-Yakoubian	Kawerak, Inc.	
Christina Schaedel	Woodwell Climate Research Center	
Jackie Qataliña Schaeffer (Iñupiaq)	Alaska Native Tribal Health Consortium	
Sorina Stalla	Interagency Arctic Research Policy Committee	
Audrey Taylor	Arctic Research Consortium of the United States	
James Temte (Northern Cheyenne)	Alaska Pacific University	
Merritt Turetsky	University of Colorado Boulder	
Craig Tweedie	University of Texas at El Paso	
Ross Virginia	Dartmouth College	
Gabriel Wolken	University of Alaska Fairbanks and Alaska Division of Geological & Geophysical Surveys	

2.2. ICARP IV Summit Statement

The following statement was issued by the ICARP IV International Steering Committee in cooperation with the ICARP IV Conference Host Committee on 28 March 2025.

This week nearly 1,200 international scientists and researchers, Indigenous Knowledge Holders, and community members from across the Arctic and beyond gathered at the University of Colorado Boulder in the United States for the Fourth International Conference on Arctic Research Planning (ICARP IV). This Summit brought together representatives of Arctic Indigenous Peoples in equal and respectful partnership with scientists, researchers, educators, and representatives from many organisations to identify future international Arctic research priorities for the coming decade.

The Summit was a call to action. The Arctic is changing faster than anywhere else on Earth, fundamentally driven by human-caused climate change. The consequences of this transformation—melting ice, shifting ecosystems, thawing permafrost—not only affect the Peoples of the Arctic, but also extend far beyond, affecting global climate, weather patterns, biodiversity, and communities worldwide. Understanding, mitigating, and adapting to these dramatic environmental changes to benefit the Peoples of the Arctic, its environment, and the world are critically important tasks.

The ICARP IV Summit not only elevated attention toward critical research priorities and needs; it was also an opportunity to reimagine and create new commitments to how we do Arctic research to serve society. The ICARP IV process rests on a foundation of the recognition of and respect for Indigenous Peoples' Knowledge and leadership in research, the value of diverse ways of knowing, and the need to invest in meaningful and equitable research collaborations. Arctic research must collectively advance understanding across science disciplines and Indigenous Knowledge Systems, the health and well-being of all Arctic Peoples, ecosystem stewardship, international and cross-cultural partnerships, and shared commitments to address the climate and environment crisis. Despite real progress, comprehensive observation and data systems, approaches for usable research to inform decision-making, equitable and ethical ways of working together require enhanced and innovative international action to achieve success.

Participants at the Summit came together in a spirit of open and international partnership to share their ideas, to build teams, and showcase practical examples of how to make a step-change in this work. There has never been a greater need for large-scale international cooperation to tackle the most significant Arctic research questions and to produce practical results. Advancing our understanding of and responses to the transformative changes taking place across the Arctic will require increased, coordinated, and sustained research funding commitments from across all nations interested in the Arctic region, ensuring equitable access to funding for researchers, Arctic Indigenous Peoples, and all organisations that support critical research logistics and operations.

The final results from this multi-year ICARP IV process, which will be available in early 2026, will identify the most pressing Arctic research priorities for the next decade and establish a roadmap for action and how we will work together in the lead up to the 5th International Polar Year in 2032–33. The challenges ahead demand bold, sustained, collaborative, and visionary research.

2.3. Statement from the Indigenous Participants of the ICARP IV Summit

The statement below was written by Indigenous participants attending the ICARP IV Summit in Boulder, Colorado, USA from 25–28 March 2025, and read during the Closing Ceremony of the ICARP IV Summit on 28 March 2025. The official ICARP IV Summit Statement was issued independently on 28 March 2025 by the ICARP IV International Steering Committee and the ICARP IV Summit Local Organising Committee.

"We, the Indigenous Peoples from the Arctic region, united by our deep connection to ancestral lands and waters, feel compelled to address urgent concerns about our future. As everyone knows, the Arctic has been our homeland for thousands of years. Our knowledge is central to our survival, to the integrity of our communities and to the delicate balance and biodiversity of the region.

The ever-increasing external pressures on our communities and the natural world upon which we depend are immeasurable. For example, unregulated resource extraction, loss of biodiversity, increased shipping, and the climate crisis. They are compounded by present attempts to diminish our distinct status as Indigenous Peoples with inherent rights affirmed in international and national laws, policies, and constitutions.

Therefore, we extend the following requests to all engaged in Arctic research in order to prioritise and accommodate the inclusion of our distinct status and our right to "maintain, control, protect and develop" our knowledge through fair and equitable co-production of knowledge. We seek to promote the interconnected nature of our knowledge, culture, arts, language, and identity in addressing and responding to Arctic change.

We appreciate the past contributions of IASC and Indigenous Peoples. We are grateful for the space to actively participate in the plenary sessions, Research Priority Teams, and related processes. Yet, more must be done to increase the direct engagement of Arctic Indigenous Peoples to guide the ever-increasing research agendas implemented across our Arctic homelands.

Our effort to Indigenise Arctic research is sourced in our collective right to self-determination. This distinct political right is recognised as a prerequisite for the exercise and enjoyment of all other human rights. Therefore, scientists must also acknowledge and advocate for our self-determination in Arctic research.

We have consistently stated that our knowledge will improve science, but we must be able to participate on an equal basis and consistent with both moral and legal imperatives that often challenge researchers, universities, funding agencies, and organisations.

Regarding our future participation, we call for a continuing formal role within the ICARP process or more broadly a permanent role within IASC itself, one collaboratively designed with Indigenous Peoples. The same consideration should be given to the International Polar Year (2032–33). This may require adjustment of procedural aspects and removal of structural, financial, and other barriers. We remain concerned about the compressed time constraints for our involvement; language barriers; and other hurdles that stifle our direct role.

Intersecting issues include safeguarding data sovereignty and supporting youth involvement; and addressing the lack of compensation for Indigenous Knowledge Holders and Indigenous researchers. There are many more concerns surrounding Indigenous Knowledges, but it is our hope that, through our direct participation, we can alter the course of Arctic research towards equitable futures for Indigenous Peoples and all of humanity.

In this way, we can help to shape actual research objectives and identify concrete steps to embed Indigenous Knowledge, equitable co-production of knowledge, Indigenous values, and our priorities within research frameworks and outcomes.

In conclusion, for decades, we have "invited you to our table" and underscored the value of our "intricate knowledge." Through the manifestation of our rights, we can help all others to ensure sustainable, healthy, and vibrant Arctic communities. We must be able to determine and define the well-being of the Arctic from our own perspectives. We must be able to exercise our right to free, prior, and informed consent in relation to Arctic research. We share our requests within the framework of our collective human rights. These rights serve as our standards, our lens, our desires, and our self-determination."

Annex 3: Definitions of Key Terms

Many terms used by RPT 5 in this report have specific definitions, which should be reviewed before reading the summary of RPT 5's research questions and priorities.

- **Indigenous Peoples**
  Indigenous Peoples are self-identified groups who have historical continuity with the original inhabitants of their lands, predating colonisation or the formation of current states. Indigenous Peoples are not a homogenous group but consist of diverse Nations, societies, cultures, languages, governance systems and territories. They should be referred to by their proper names (for example: the Inuit, Tlicho, Sámi, Iñupiat, and Yup'ik, etc.) and as proper nouns.[3]

- **Indigenous Knowledge Systems**
  Indigenous Knowledge Systems are rigorous knowledge systems. Each Indigenous Knowledge System integrates social, ecological, cultural, spiritual, physical sciences as well as humanities and all other aspects of experienced life. Each has its own epistemology and functional, complete, cohesive structure to create, organise, store, and maintain knowledge. These systems include empirical observations, and are generated and refined by Indigenous Peoples across generations. An Indigenous Knowledge System is fundamental for interpreting, adapting to, and managing its local environments.

There is no single definition of Indigenous Knowledge, so researchers must utilise the definition used by Indigenous partner(s). Indigenous Knowledge Systems are rooted in millenia of lived experience, oral traditions and relational practice throughout the Arctic regions and beyond.

- **Academically Trained Knowledge Systems**
  Coined by Denaakk'e Scholar Nikoosh Carlo as a preferred term over "Western science." It captures the pluralism of disciplines and education systems, while recognising that Indigenous Knowledge Systems are rooted in experiential and relational ways of learning and knowing. In addition, it recognises that concepts of expertise within academia and policy decision-making contexts are often rooted in academically trained knowledge systems degrees.

- **Indigenous Research Methodologies**
  Indigenous methodologies are based on practices that Indigenous Peoples have conducted prior to colonisation and continue to do so today. They are based on relationality and embedded in the knowledge systems of each Indigenous People. Indigenous research methodologies may include cultural, social, political, linguistic, community, spiritual, and interspecies relations, and come with their own practices, criteria and processes of rigour, credibility, and legitimacy.

[3] Younging, G. (2018). Elements of Indigenous style: A guide for writing by and about Indigenous Peoples. Edmonton, AB: Brush Education.

- **Co-Production of Knowledge (CPK)**

  Co-producing knowledge means working together through all phases of research: identifying the problem, shaping the questions, implementing the work, analysing results, and collaboratively disseminating and evaluating the outcomes. It is a process to bring together more than one way of knowing and being in the world (knowledge system) for creating new understanding. For research in the Arctic, it usually means non-Indigenous researchers closely collaborating with Arctic Indigenous Peoples.

- **Indigenous-led Research**

  Indigenous-led research is initiated, directed, and primarily governed by Indigenous Peoples, communities, or organisations, ensuring that Indigenous perspectives, priorities and ways of knowing are central at every stage.

  Indigenous-led research stems from the lifelong relations the Indigenous researcher(s) carry forward with them and can be conducted using only Indigenous methodologies and methods, and/ or the co-production of knowledge (engaging Indigenous and non-Indigenous Knowledge Systems). Indigenous-led research validates Indigenous Knowledge Systems, privileges ethical engagement and cultural safety. It requires that research outcomes directly benefit and build capacity within the relevant communities. Also, ensuring respectful handling of data, long-term accountability, and adaptation of methodologies while honouring Indigenous protocols, values and governance structures.

- **Indigenous-informed Research Perspectives**

  Indigenous-informed research perspectives are approaches to research that centre Indigenous worldviews, knowledge systems, values and lived experiences at every stage of inquiry, whether or not the research is fully led by Indigenous Peoples. This includes projects and methodologies where an Indigenous person or group operates as an adviser to a research team, such as partner, collaborator or colleague.

- **Indigenous Self-Determination and Self-Government**

  Self-determination is the collective rights of Indigenous Peoples to freely make decisions about their political status, economic, social and cultural development as well as the internal affairs of their communities, without external coercion or domination. This includes governing their own institutions, safeguarding and revitalising culture and languages, managing land and resources in accordance with their values and priorities.

  Self-government is a way of operationalizing the right to self-determination and varies significantly from one Indigenous People to another. In general, it refers to the recognised authority of Indigenous Peoples to exercise internal decision-making and autonomy over matters such as law, education, health, economic development, social services, cultural affairs and territory. Indigenous researchers participating in ICARP IV emphasise that all Indigenous Peoples have processes in place to examine and discuss issues and priorities. Indigenous Peoples' laws and protocols are distinct and take into account how to govern and uphold relations with their histories, lands, waters, people, other species, and cultural aspects.

The colonial history and present across Arctic countries has led to unequal recognition and underrepresentation of Indigenous Knowledge in academia and this needs to change. A key step involves shifting the practices of non-Indigenous researchers and institutions to actively recognise the legitimacy of Arctic Indigenous Peoples' Knowledge and integrate it into mainstream scientific regimes.

ICARP IV Final Outcomes Report
March 2026

This ICARP IV Final Outcomes Report serves as
a special edition of the IASC State of Arctic Science Report.