

# Arctic Observing Summit 2022 - Statement of Participants

The need for ongoing improvement to Arctic observation and flow of information and use of data from the Arctic observing system remains ever urgent. The current trajectory of global climate and environmental change continues unchecked, to the detriment of all. Observational information from the Arctic is widely needed at local, regional, and global scales as it is a crucial prerequisite to any informed decision making to respond to and adapt to change both within the region and beyond. The Arctic plays a critical role influencing and driving planetary change and is part of the global geo-political system and earth system. As such, Arctic observing must contribute to and enhance existing global observing networks to support forecasting, planning, adaptation, mitigation, and the identification of emerging issues in the context of ongoing change. The 2022 Arctic Observing Summit (AOS 2022) brought many members of the Arctic observing community back together for the 6th time since 2013, in person and virtually, from across the Arctic and around the world, to continue advancing coordination of the internationally supported Arctic observing system of systems. The AOS is a biennial event convened as part of the Sustaining Arctic Observing Networks (SAON) initiative – to guide the design, coordination, and long-term operation of an international network of observing systems that improves our understanding of and response to Arctic change

The AOS is an iterative process with each Summit building upon the successes and recommendations of the previous Summits. Prior summits have recommended increased Indigenous engagement in both the AOS and broader conversations around Arctic observing; there has been significant progress towards more Indigenous leadership in the AOS. Recommendations around data policy have evolved from recommending broadly open data through the development of FAIR, CARE, and TRUST principles. Implementation working groups at the AOS started by advocating for a system with which to coordinate observing efforts, led the development of the Shared Arctic Variable concept, and are now working on implementing those ideas. Early summits focused broadly on what needs to be done, while the more recent summits have made more concrete recommendations on how to accomplish these goals.

Outcomes and recommendations from AOS 2022 once again underscore the importance of scientific cooperation across national boundaries, the importance of equitable participation of Arctic Indigenous Peoples and communities, and the importance of open and respectful communication among groups. No one nation, culture, discipline, or organization has the capacity to address Arctic change alone or to build out the needed observing infrastructure, including those necessary to support data and information management and knowledge sharing and mobilization. These must be co-developed, co-supported and shared, with all appropriate ethical considerations. Indigenous knowledge is required in equal measure if we are to achieve a sustained observing system that provides the opportunity for a holistic understanding of the Arctic and how it is changing, and that ultimately delivers diverse societal benefits to the people of the Arctic and the people of the Earth.

The AOS 2022 drew representatives of Indigenous People and organizations, the academy, government, and the not-for-profit and private sectors from across the Arctic observing community. This Statement summarizes the main conclusions from the six Summit Working Groups, and the Calls to Action from the participants that were established via consensus processes that included pre-Summit meetings, discussion of short statements on topical issues prepared in advance, and three days of working sessions held concurrently in person in Tromsø, Norway and virtually. It will be complemented by a detailed report to be released through the AOS website later in 2022.

## Key Conclusions and Recommendations

### Working Group 1: Food Security

WG1 comprised Indigenous Peoples and research allies from around the world and around the circumpolar north, resulting in rich discussions and the following takeaways. There are diverse definitions of food security around the circumpolar world, but all include common threads regarding sovereign access to nutritious, traditional food, enabling procurement, preparation, and sharing related to traditional activities, cultural practice, cultural exchange, and knowledge preservation. Each of which are threatened by externally imposed conflicts and drivers such as colonial systems of research, management, and policy; food insecurity is not solved by access to calories alone. When Arctic Indigenous Peoples can direct research, monitoring, management, and policies that impact food security, Arctic observation systems maintain relevance. Facilitating circumpolar knowledge exchange between Indigenous Peoples from different regions supports mutual exploration of cultural approaches, best practices, and ongoing organizing capacity regarding food security and the development of observing systems across the North.

### Recommendations and Action Items:

Working Group 1 recommends that:

- The Arctic Observing community acknowledge, reference, and implement Indigenous recommendations compiled and forwarded from all previous Summits<sup>1</sup> and from IASC Working Group activities<sup>2</sup>.
- Include Indigenous expertise in all AOS working groups and Indigenous-centered and food-security centered conversations and objectives in all working group activities.
- Fund Indigenous representation and liaisons in all circumpolar regions to AOS working groups.
- Directly and appropriately fund existing networks and organizations that focus on food security and Indigenous priorities within AOS, including Indigenous research and governance organizations.
- Arctic researchers engaging with Indigenous People should self-educate on the cultural and historical contexts of the region in which they wish to work before they begin soliciting Indigenous engagement.
- Ensure observations are relevant to end users by building relationships with communities.
- Focus on data and storage ethics to ensure usability and protection for communities.

---

<sup>1</sup> All previous recommendations forwarded at previous AOS meetings still apply. [reports from previous Summits can be found here: [AOS Reports](#)]

<sup>2</sup> See the IASC Final Report of the Action Group on Indigenous Involvement (2017-2020). [Add link]

- Employ equitable representation and co-production of knowledge to ground the Roadmap for Arctic Observing and Data Systems process. Acknowledge Indigenous Knowledge and values to ensure a representative benefits framework.
- Build on past discussions to support Indigenous capacity in all areas of engagement.
- Continue to foster equality, diversity, and inclusivity within AOS to ensure safe and welcoming research and monitoring environments for marginalized people (i.e., BIPOC, LGBTQ2S+, and disabled) in the Arctic by acknowledging intersectionality.

## Working Group 2: Regional to Global Observing

AOS Working Group 2 acknowledges the need to connect to existing global environmental observing networks with established standards and coordination. The concept of Shared Arctic Variables (SAVs) provides a useful framework for the Arctic region, linking global requirements and local and regional Arctic requirements, and adding value to existing and evolving Essential Variable formulations (e.g., Essential Ocean Variables (EOV), Essential Climate Variables (ECV)). In view of a changing Arctic, it is important to establish an effective system to monitor the health of and changes in Arctic ecosystems to support food security and wellbeing. We recognize that it is necessary to sustain observing systems over the long term (decades+), but that many environmental observations are made in the context of short-term research projects (2-5 years). AOS participants emphasize that the ongoing UN Decade of Ocean Science for Sustainable Development (UNDOS) provides a framework to harmonize Arctic Ocean observing efforts, possibly leading to an Arctic Regional Alliance of the Global Ocean Observing System (GOOS) Regional Alliance (GRA).

### Recommendations and action items:

Working Group 2 recommends:

- Extending global networks further into the Arctic and the Arctic observing community provide observing requirements guiding regional observation design. The multilevel polycentric nature of Arctic observing efforts require effective learning and sharing mechanisms along the value chain of observing.
- Building stronger links among Arctic Indigenous Peoples and Arctic communities and scientists, from the regional to global scale, to increase understanding of requirements and opportunities.
- Moving forward on the formulation of SAVs, keeping in mind existing links to global Essential Variables (EVs) and considering their ongoing evolution.
- Increasing funding specifically for support of long-term (decades +) operation and maintenance of Arctic Observing Systems to maintain time-series necessary for understanding environmental change and variability now and into the future.
- Data centers should apply FAIR (findable, accessible, interoperable, reusable) principles, linking regional observations to global data products.
- Recognizing the large fraction of data collected by research efforts (as opposed to sustained observing systems), we recommend creating incentives and ways to ease the process for sharing data in a timely manner, prioritizing data contributing to the sustained observing system.
- We recommend continued efforts to establish an Arctic GRA under the framework of UNDOS thereby establishing effective connection to the global ocean observing system.

## Working Group 3: Data Sharing

Data is a core component of the Arctic Observing System and sharing data is relevant to all aspects to the design

and implementation of the system. AOS Working Group 3 provided a platform for people to come together and engage in discussion around the many facets of data sharing with sessions on five main themes: sharing and listening, federated search, open science, data policy, and data ethics. Active dialogue included meaningful and productive interaction with the AOS working groups. Through the various sessions, recurring themes emerged such as the need for a continued effort to coordinate and bring data systems together in an integrated Arctic Observing System, and systematically enhancing the usability of scientific data. Focused effort is needed to transform data into products that can support specific activities and applications such as enhancing food security in communities, decision support and the realization of Shared Arctic Variables. The need for data related training and education resources was expressed across several sessions. Organizations developing these resources should work closely with users to better understand motivations, challenges, and applicability.

We further continued conversations surrounding the recognition of the right of Indigenous Peoples and nations to govern collection, ownership, and application of Indigenous data, and the appropriate application of the CARE, FAIR and TRUST principles. Specifically, in the context of data ethics and data rules, and their parts to play in the entirety of the data lifecycle. Many groups including the World Meteorological Organization (WMO), the Arctic Data Committee (ADC) and partners, Group on Earth Observations (GEO), and various regional and national governing bodies are working together to align data policies and develop models for implementing policies in data systems. There are now several funded research projects and national initiatives that should be leveraged to advance this work in concrete ways. WG 3 and AOS attendees note how international coordination has paid off with the launch of the Polar Federated Search tool by the POLDER Working Group. This launch was the result of several years of focused effort, dedication and collaboration that brought together international partners to achieve a shared goal.

In preparation for AOS 2024, the data sharing community will continue to enhance and increase support for international collaborations through the Arctic Data Committee and its partners and task-specific working groups such as POLDER. During the periods 2022-24 task groups will focus on establishing context and interoperability of data that builds on newly interoperable metadata realized through the Federated Search tool. Enabling interoperability includes compelling system owners to make existing data and services available in standardized form to user communities, enabling cost-efficient integration of data in various types of decision support systems (community, scientific, management, industrial, etc.). Finally, to ensure long term sustainability and secure the current success and future viability of these initiatives, the data sharing community plans on developing new data education and training initiatives for early career scientists and researchers.

## **Recommendations and action items:**

Working Group 3 recommends:

- Continuing to enhance and increase support for international collaborations through the Arctic Data Committee and partners, including working with Indigenous organizations and communities to increase their collaboration in organizationally and culturally appropriate ways.
- Supporting initiatives such as the POLDER federated search catalogue and development of similar tools that focus on data interoperability.
- Supporting efforts establishing context around data through application of standardized data documentation. Data providers should be encouraged to make new and existing data and services available in standardized form, enabling cost-efficient integration of data in various (scientific, management, industrial, ...) decision support systems according to the needs of the data consumers.

- Further development, alignment, and practical implementation of data policies across research and operational communities. Specifically, we call for the engagement of governments, Indigenous organizations, and the broad Arctic community in a joint effort of the Arctic Council, Arctic Spatial Data Infrastructure, and Arctic Data Committee to facilitate the development of research data policy for the Arctic.
- Investing in the development and promotion of data education and training initiatives for early career scientists and researchers, leveraging existing investments by organizations including the Arctic Institute of North America, NSF Arctic Data Center, Polar Data Catalogue, and other institutions.

## Working Group 4: System Integration

The Sustaining Arctic Observing Network’s (SAON) Roadmap for Observing and Data Systems (ROADS) process is in large part structured around Shared Arctic Variables, a means of organizing observing efforts across sectors and disciplines in the Arctic. The process of establishing Shared Arctic Variables (SAVs), consisting of sets of observables that can be used to tackle a number of problems/issues, is about understanding the holistic relationship between societal needs, data, and approaches. SAVs should have direct impacts on society, and we envision that the process of developing SAVs can be a tool of self-empowerment to solve problems at a local/regional level. The process of defining a SAV would then extend the conversation to other regions or the panarctic scale.

SAVs are not the same as essential variables, though some SAVs may map onto larger global observation network definitions. In defining an SAV, themes identified should cross multiple information user groups but do not have to be shared across all entities in the Arctic. Defining an SAV should first be able to identify connections across existing efforts and identifying gaps second. SAVs can include observables (data), information requirements, methods, and services.

The process should put people first. Starting with the nucleus of a boundary spanner and an expert panel key in first exploring the theme, the process then grows outward, through an iterative process, to identify gaps and add experts and information users until we have all relevant perspectives involved. The process will require culturally responsive facilitation and conflict resolution, as new people are brought into the process. As the SAV process proceeds, we identify the need for widespread review along the way, pledges from observers, and endorsement from the ROADS Advisory Panel<sup>3</sup>.

Through the two mock panel sessions during the 2022 Arctic Observing Summit, we have made strides in defining the process, and expect to learn from the SAV pilot efforts, understanding that the process will need to be revisited and evaluated regularly.

### Recommendations and action items:

Working Group 4 recommends that:

- The ROADS Advisory Panel provides a clear process and specific instructions to projects and organizations who are poised to lead development of Shared Arctic Variable definitions. WG4 summit outcomes include a proposed detailed process that the ROADS Advisory Panel may adopt.
- Projects (specifically, RNA CoObs and Arctic PASSION) should start the process of proposing themes to the ROADS advisory panel. These will serve as pilots of the SAV definition processes and may be related to the themes explored during the AOS 2022 Mock Panel sessions.

---

<sup>3</sup> Define ROADS Advisory Panel

- RNA CoObs and Arctic PASSION should meet regularly to discuss the status of proposed SAVs, lessons learned, and how the process may need to evolve.
- These projects should bring one or more SAV proposals to the stage of soliciting widespread feedback before the 2024 AOS
- The ROADS advisory panel should seek funding support for Indigenous liaisons and indigenous-led theme development. Capacity sharing within the ROADS process is critical to developing SAVs with widespread utility.
- Indigenous groups (possibly the Food Security Working Group) with existing background in the AOS and ROADS process discussions should lead the development of themes to center the needs of Indigenous communities in the process.
- WG4 will provide the ROADS Advisory Panel with information on running mock expert panels as a possible outreach and capacity development tool.

## Working Group 5: Utility & Benefits

### Key Themes and Takeaways:

Improved understanding of the Arctic climate system through the design and integrated operation of an international network of observing systems is critical to facilitating informed decision-making, and the implementation of systemic actions in support of utilities and benefits. Working Group 5 discussions built on work from previous Summits to examine frameworks, mechanisms, and practices that would help ensure utility and societal benefits are derived from observations.

Deliberations focused on bridging the communities of practice among Indigenous Peoples, interdisciplinary researchers, the private sector, and stakeholders through the synergistic coordination of networking resources to ensure that data from the Observing System is available, easily accessible, and usable. Many elements of the System are already established but there are discontinuities (e.g., proper communication, varying worldviews, local priorities, and value systems) that need to be addressed in order to maximize potential benefits to end users.

### Recommendations and action items:

Working Group 5 recommends:

- Supporting efforts aimed at developing broader data literacy (e.g., sharing, ownership, data end-use policies etc.) amongst the Arctic observing network to inform partnership and ensure equity in relation to access and use and benefit.
- Conducting a structured review to evaluate how the Arctic Observing System and observational data is providing utility and benefit -- beyond its inherent value to the scientists collecting it. This is a formidable task but one that is necessary to determine whether the observations collected are mobilized for use and if so, who is using these observations, and for what purposes.
- Partnering with the private sector to facilitate data acquisition and knowledge sharing. Removing barriers to accessing data acquired by the private sector sharpens the benefits of information provided by observing systems.
- Establishing regional coordination hubs to facilitate observing research to practitioners, especially in the areas of emergency, risk, food security and hazard management as these are examples of critical societal needs for communities with limited funding and resources.

## Working Group 6: Capacity Sharing

### Key Themes and Takeaways:

The creation of the Capacity Sharing Working Group was an important initiative of the AOS 2022, reflecting the need for specific and cross-cutting attention on this topic. An immediate observation is that views across AOS participants are diverse. Sometimes diverging definitions of what capacity is, especially between scientists, organizations, and Arctic communities, are driven by regional concepts, and cultures that strongly influence the types of recommended actions that emerge under the theme of capacity. While no common definition was reached, this relevant starting point from one participant was offered: *Capacity means to create the space, opportunities, and means which enable everybody to work together and learn from each other*. To develop this common understanding, we recommend continuing to support and develop this working group under the AOS.

Key capacities that were identified as needed fell into two general areas as relates to the purview of the Arctic Observing Summit. The first being those capacities needed within Indigenous communities to determine their own research priorities and lead their own culturally informed initiatives in support of those priorities. The second being those capacities needed within a more traditionally Western science context to support Early Career Researchers (ECRs) and the types of needed bridging functions across different activities (e.g., making scientific knowledge more accessible for decision making or end-users and creating training and education for data services) that are often difficult to support with revolving and time-limited research funds. To bring both general areas together, there is the need to build understanding about the true value of capacity sharing for all sides and to equally value Indigenous Knowledge, Traditional Knowledge and academic research.

A model for progress emerged from the Capacity Sharing Working Group discussions and shifted focus from capacity building (one-way educational character) to capacity sharing (two-way exchange character). That was the on-going need to bridge between Indigenous capacities and those of Western scientists to make meaningful progress on capacity sharing between AOS meetings. A safe space for having these difficult conversations between outside researchers and Indigenous Arctic communities is needed to prevent well-meaning individuals from talking past each other due to a lack of common understanding, or fear of admitting a lack of understanding. While capacity building should include self-directed learning by Western educated scientists about the culture and historical context of an Arctic community prior to working in the Arctic, such training and education is needed but still not a substitute for grounding those insights in relationship building and fostering attitudes of humility towards work in the 'north'. This was aimed for the crosscutting WG discussions, yet it was very tough to have these conversations because not everyone is on the same page with the same understanding. However, at the closing plenary the clear message from an ECR and an Arctic youth was that they can be crucial bridge builders between the science community and the Arctic communities. To support relationship building between these two communities early enough, pre-funding from funding agencies for up-front engagement is essential.

### Recommendations and action items:

Working Group 6 recommends that:

- ECRs and Arctic Youth should have key roles in the development of SAVs and the broader ROADS process and in other international bodies, institutions, and organizations.

- SAON and the ROADS process should recognize the importance of engaging with Indigenous youth (in the Arctic Council Permanent Participant's organizations) and ECRs (represented by APECS) as it develops its plans and begins to initiate the development of Shared Arctic Variables as well as for committee work. A proposed follow-up initiative is 'Bring a youth or ECR to SAON year'.
- WG6 will investigate mechanisms to support learning from past capacity sharing efforts by developing a "resource hub" of relevant trainings, videos and reports (e.g., IASC Task Force reports).
- WG6 will discuss and identify training opportunities and learning materials that the science community can use to build their own capacity to work more ethically and equitably with Northern communities.
- Funding agencies should offer up-front funding to facilitate cross-cultural and transdisciplinary dialogue between the science community and Arctic communities before research projects get fully funded and begin.