# Guiding Observing Network and Data System Development with Societal Impact Approaches: A Short Statement Calling for an Arctic Community of Practice

Sandy Starkweather[1], Leasi Vanessa Lee Raymond[2], Margaret Rudolf[3], Karen Boniface[4,5], Kaare Sikuaq Erickson[6], Susanna Gartler[7,10], William Manley[1,8], Hazel Shapiro[9]

1. University of Colorado, CO, USA; 2. Concordia University, Montreal, QC; 3. University of Alaska - Fairbanks, AK, USA; 4. European Commission Joint Research Centre, Italy; 5. CNRS, France; 6. Ikaaġun Engagement, AK USA; 7. University of Vienna, Austria; 8. Institute for Arctic and Alpine Research, CO, USA; 9. Interagency Arctic Research Policy Committee, AK, USA. 10. Austrian Polar Research Institute

**Purpose of this statement:**

1. To call upon AOS-relevant partners and participants to evaluate the merits of societal impact approaches as a path toward developing more equitable, salient, and sustainable Arctic observing and data systems
2. To identify good practices and challenges in this work
3. To move toward a community of practice model for societal impact approaches, with one aim being to improve the tools and practices of the SAON Arctic ROADS process.

**Terminology**

This statement speaks to a wide variety of practices, tools, and practitioners; key terms are:

**Societal:** Anything connected to a group living together under a more or less shared order, i.e. a society. The size and nature of 'a society' can differ with context. For example, Indigenous cultures may include human and non-human needs and desires in their concept of society. *For this work, the concept of society is dependent on whether the scope is that of a specific community, region, circum-Arctic, or global.*

**Societal Benefits**: Those outcomes that can have positive impacts on society as a whole like improvements in health, education, the environment, and the overall well-being of a community.

**Societal Risks**: Those outcomes that expose societies to adverse impacts, like loss of infrastructure, livelihood, or subsistence.

**Societal Impacts**: An effect felt on societies, either positive or negative. *For this work, we propose to group both societal benefits and risks under the more general heading of societal impacts.*

**Analytical frameworks**: Conceptual structures that support data organization and shared understanding. They can be descriptive, such as classification systems, or prescriptive, such as decision-making processes.

**Analysis**: The process of interpreting information and data for the purposes of research, e.g. breaking a complex topic into smaller parts or a critical review of the literature to gain a better understanding of it.

**Assessment**: The process of making formative evaluations or judgments about a subject to increase its quality. An assessment could be for a specific project/program or a broad review of a field of study or an ecosystem. *For this work, the term assessment will be used most widely as a mid-point objective between analysis and evaluation within a project/program.*

**Evaluation:** A summative, overall judgment about the quality of a subject.

**Problem Statement**

Scientific and policy-facing literature concerned with Arctic observing, monitoring, and data-sharing activities point to critical gaps, such as poor spatial coverage of in-situ observations compared to mid-latitudes (e.g. Buch *et al.*, 2019; Larsen *et al.*, 2022; OSTP, 2022). In many northern regions, extreme conditions and a lack of basic infrastructure, including telecommunications, increase the costs of maintaining conventional systems and exacerbate gaps (e.g. Petrov *et al.*, 2021). These gaps persist even as Arctic communities face some of the most dramatic environmental changes occurring on the planet (e.g. Williams and Erikson, 2021). Arctic Indigenous societies, by contrast, have pointed out that they live in these 'remote' areas and routinely observe them in support of their subsistence, stewardship, and cultural practices (Daniel, 2019). Further, differing objectives such as those of fundamental research and those of communities seeking climate resilience, for example, point to the need for greater dialog about the benefits of observing and data systems and what different users are hoping to achieve with them. Such contrasting worldviews should raise questions about the decision-making processes, including the conditions for equity therein, for addressing Arctic observing gaps. Addressing such questions is also fundamental to implementing equitable data sharing through the CARE principles for Indigenous data governance (Carroll et al., 2020), and should be visible and reflected in the data governance and management activities of Arctic observing systems.

A variety of Arctic-specific frameworks for assessing societal impacts (e.g. ICC-AK, 2015; Larsen *et al*., 2021; IDA, 2017) have emerged in the last few years to support multi-criteria (e.g. research and food sovereignty) decision-making, including efforts to improve Arctic observing networks and data systems. In Sustaining Arctic Observing Network's Arctic Roadmap for Observing and Data Systems process (SAON's Arctic ROADS, Starkweather et al. 2021; Bradley et al. 2022), impact assessment is called for during the second phase of the efforts undertaken by thematically-driven expert panels to identify foci with broadly shared impacts. Globally, there are numerous frameworks, including the UN's Sustainable Development Goals (United Nations, 2015), CARE principles (Carroll et al. 2020), UN's Free Prior and Informed Consent (FAO 2016), David-Chavez and Gavin (2018) on Indigenous community engagement in climate research, Meadow and Owens (2021) on evaluating societal impacts in climate change research. Within the CARE principles' (Carroll et al., 2020) call for Collective Benefit, the authors emphasize that mutual benefit should be foundational to the co-design and maintenance of observing and data systems with Indigenous societies. These calls are echoed and amplified in human rights frameworks such as the UN Declaration for the Rights of Indigenous Peoples (UNDRIP) (UN, 2007). This short statement presents a high-level summary of relevant activities in order to highlight good practices and challenges in social impact assessment and to lay the groundwork for stronger collaboration across Arctic practitioners.

**Relevant Efforts**

Recent work demonstrates the range of approaches being adopted to better understand how societal impact can guide research planning, policy, and observing and data system development. A high-level summary follows:

- The Arctic PASSION project is developing a framework evaluating societal benefits arising from pilot services developed in the project, in particular by investigating the use of the permafrost monitoring network, the observing system capacity for shipping safety and synergies of systems for improved maritime security, the use of lake ice observations in Finland and the observational capacity for monitoring and predicting forest fires.
- The Inuit Circumpolar Council Alaska (ICC Alaska) developed the Alaskan Inuit Food Security Conceptual Framework (2015), which presents a conceptual framework for food sovereignty including six dimensions of culturally-responsive food security for Alaskan Inuit. Along with the framework, the report provides guidance on developing assessments utilizing the framework.
- The Inuit Circumpolar Council (ICC) developed through a multi-year collaborative process the Circumpolar Inuit Protocols for Equitable and Ethical Engagement (2022) defining what is ethical, equitable, fair, just, and meaningful Arctic research. It presents sets of guidance on engagement through Inuit values, with Indigenous Knowledge, with Inuit communities, through Indigenous methodologies, and through permissions. This ethical framework is crucial when working with Inuit communities in developing assessment frameworks.
- The Hunter/Harvester/Guardian (HHG) Program Evaluation Toolkit (Social Research and Demonstration Corporation 2021) provides guidance on how to develop culturally-responsive program evaluation for Canadian HHG programs. It shows an example of utilizing Inuit societal values and community-driven societal benefit areas in developing an evaluation. It does not present a set framework for assessments but instead encourages co-developing benefits and indicators with community partners.
- The "Nunataryuk" research project has established a comprehensive risk analysis framework (Larsen et al. 2021) for permafrost thaw across four study areas: Northeast Sakha (Yakutiya, Russia), Avanaata Region (Greenland), Beaufort Sea and Mackenzie River Delta (Canada), and Svalbard (Norway). Collaborating with local knowledge and rights holders in these regions, the research team has identified key physical drivers of permafrost thaw hazards, along with their socio-cultural, economic, and health implications, as well as potential adaptation and mitigation strategies. The five key permafrost thaw hazards affecting human life in Arctic ecosystems are: 1) infrastructure failure, 2) disruptions to mobility and supply chains, 3) decreased water quality, 4) challenges to food security, and 5) exposure to infectious diseases and contaminants (Gartler et al. 2023, Larsen et al. 2023). In addition, social indicators on permafrost thaw impacts were identified (Schweitzer et al. 2023).
- Research Networking Activity for Sustained Coordinated Observations of Arctic Change (RNA CoObs) is a US-based project developing a framework to understand perspectives of success between scientists and members associated with past AOS Food Security Working Group (FSWG). The twenty themes of success detail the dimensions of an observing system, processes in improving observing systems, and values in improving Arctic observing. The research breaks down the perceptions of RNA CoObs and FSWG members on each theme, providing insights on negotiating how to develop impact assessments.
- The State of Alaska's Salmon and People (SASAP) developed a well-being framework (2020) for assessing the sustainability and equity of Alaska salmon fisheries. The research developed key domains of well-being with a focus on Alaskan Indigenous Peoples, the development of

indicators based on those domains, and the assessment of current fisheries management to achieve well-being.

- The US Arctic Observing Network (US AON) is a US national initiative to improve observing and data systems in support of societal benefit. It has developed a societal benefit analysis methodology and tool - the Benefit Tool - to support decision-making and planning efforts. Case studies employing this method have created valuable visualizations of the performance and criticality of current assets and demonstrated where key societal objectives are not being well served. While the current tool uses a top-down benefit framework (ADI, 2017), it has the flexibility to incorporate other benefit frameworks and is moving toward a system of cohort ratings to support a multiplicity of world views. The work also supports analysis of both the current and desired state of the system to build toward more beneficial outcomes from observations.

**Identifying good practices for societal impact framework development**

While societal impact frameworks present an opportunity to promote equity and value delivery from Arctic observing, those outcomes are sensitive to the process through which assessment frameworks are developed (FSWG 2022, Starkweather et al. 2022); as ICC (2022) points out in its 2022 statement to AOS, *Categorization is Political*, "By classifying and categorizing Arctic observations in accordance with knowledge systems of the people whose land the observation was taken on, Indigenous-led theories will be given their proper place in the role of Arctic observation." A further observation is that societal impacts are not uniform across diverse cultures, including Arctic Indigenous cultures, and that the ongoing impacts of colonization of Indigenous communities require strong adherence to Indigenous leadership in framework development. From the examples above, several good practices reflect these needs:

- Encourage bottom-up and co-designed framework development
- Adopt rese processes (e.g. community review) and methods (e.g. grounded theory) that support multiple dimensions of equity (see McDermott et al., 2012)
- Seek mechanisms to bridge worldviews related to values and impacts (e.g. Sterling et al. 2020 who bridge between locally defined well-being and global Sustainable Development Goals)
- Understand how existing frameworks for data stewardship like the CARE and FAIR principles can be better reflected in benefit assessments
- Allow for adaptation and evolution in frameworks

**What are good practices for societal impact framework assessment?**

The first protocol of ICC's Circumpolar Inuit Protocols for Equitable and Ethical Engagement reads "Nothing About Us Without Us" and this should extend toward assessing the benefits of Arctic observing and data systems as they intersect with Arctic Indigenous Communities. The examples provided in this document provide some good starting points for respecting this and other ethical engagement protocols referenced in this short statement. The following recommendations for assessment practices build on those for framework development:

- Follow relevant ethical engagement protocols

- Allow for multiple values and/or benefit frameworks related to different perspectives, needs and worldviews
- Adopt cohort rating approaches to reflect the full range of impacts and to support group-wise analysis to understand the impacts of positionality on assessments
- Include expertise in Indigenous evaluation methods
- Adopt methods that assess the current state of systems against desired future states (i.e. Theory of Change approach) to work toward collective benefit in assessment outcomes

**Call to the AOS**

This short statement will advance the needed dialog during a parallel session at the AOS of the same title. During that session, at the broader AOS, and in future actions, this statement calls for:

- Continuing to examine practices of framework development and promoting good practices, which include adopting safeguards to achieve equity, co-designing assessments, using flexible tools, and incorporating a multiplicity of views
- Advocating with funding agencies and applicants to recognize the important role of these practices in their solicitations, planning grants, and full awards
- Better disseminating good practices through increased publications and/or the development of a web portal that shares case studies, such as those highlighted here
- Advancing a stronger international community of practice in impact assessment

**References**

Bradley, A., Eicken, H., Lee, O., Gebruk, A., Pirazzini, R. 2023. Shared Arctic Variable Framework Links Local to Global Observing System Priorities and Requirements. Arctic. Vol. 74 No. 5 (2021): Supplement 1. https://doi.org/10.14430/arctic76429

Buch, E., Sloth Madsen, M., She, J., Stendel, M., Ole Krarup Leth, Ann Mari Fjæraa, Mikael Rattenborg Copernicus report: Arctic In Situ Data Availability, https://insitu.copernicus.eu/library/reports/CopernicusArcticDataReportFinalVersion2.1.pdf

Carroll, S.R., Garba, I., Figueroa-Rodríguez, O.L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R., Sara, R., Walker, J.D., Anderson, J. and Hudson, M., 2020. The CARE Principles for Indigenous Data Governance. Data Science Journal, 19(1), p.43.DOI: https://doi.org/10.5334/dsj-2020-043

Daniel, R. (2019), Understanding our environment requires an indigenous worldview, *Eos, 100*, https://doi.org/10.1029/2019EO137482. Published on 05 December 2019.

David-Chavez, Dominique M., and Michael C. Gavin. 2018. "A Global Assessment of Indigenous Community Engagement in Climate Research." Environmental Research Letters 13 (12). https://doi.org/10.1088/1748-9326/aaf300.

Donkersloot, Rachel, Jessica C. Black, Courtney Carothers, Danielle Ringer, Wilson Justin, Patricia M. Clay, Melissa R. Poe, et al. 2020. “Assessing the Sustainability and Equity of Alaska Salmon Fisheries through a Well-Being Framework.” Ecology and Society 25 (2): 1–19. https://doi.org/10.5751/ES-11549-250218.

Ellam Yua, J. Raymond-Yakoubian, R. Aluaq Daniel. and C. Behe. 2022. A framework for co-production of knowledge in the context of Arctic research. Ecology and Society 27(1):34. https://doi.org/10.5751/ES-12960-270134

Food and Agriculture Organization of the United Nations. 2016. “Free, Prior and Informed Consent: An Indigenous Peoples’ Right and a Good Practice for Local Communities - Manual for Project Practitioners.,” 1–52. https://www.fao.org/3/i6190e/i6190e.pdf.

Institute for Defense Analyses (IDA), 2017: International Arctic Observations Assessment Framework. IDA Science and Technology Policy Institute, Washington, DC, U.S.A., and Sustaining Arctic Observing Networks, Oslo, Norway, 73 pp., https://www.arcticobserving.org/news/268-international-arctic-observations-assessment-framework-released

Inuit Circumpolar Council. 2022. Categorization Is Political: Using Grounded Theory in the Creation of Controlled Vocabularies. https://iccalaska.org/wp-icc/wp-content/uploads/2022/04/AOS-2022-Categorization-is-Political.pdf

Inuit Circumpolar Council. 2022. Circumpolar Inuit Protocols for Equitable and Ethical Engagement. https://iccalaska.org/wp-icc/wp-content/uploads/2022/06/EEE-Protocols-LR-1.pdf

Inuit Circumpolar Council-Alaska (ICC-AK). 2015. Alaskan Inuit Food Security Conceptual Framework: How to Assess the Arctic From an Inuit Perspective. Technical Report. Anchorage, AK

Larsen, J.N. et al. 2021. Thawing Permafrost in Arctic Coastal Communities: A Framework for Studying Risks from Climate Change. *Sustainability* , *13*(5), 2651; https://doi.org/10.3390/su13052651

Larsen, J. N, Gartler, S., Meyer, A., Ingimundarson, J. H., Povoroznyuk, O., & Schweitzer, P. (2023). D 9.5 Risk model, with identified key risks. Nunataryuk Project. https://zenodo.org/records/7569426

Larsen, J.R., et al. 2022. Procedure for ongoing collection and collation of European Polar observing capacities and activities, WP 6 – European Polar Coordination Office Deliverable No D6.1. Bremerhaven, Germany, EU-PolarNet, 35pp. DOI: http://dx.doi.org/10.25607/OBP-1889Meadow, Alison, and Gigi

McDermott, M.H., Mahanty, S. & Schreckenberg, K. 2012. Examining equity: a multidimensional framework for assessing equity in payments for ecosystem services. Environ. Sci. Policy, 33, 416- 427. DOI: https://doi.org/10.1016/j.envsci.2012.10.006

Meadow, A., Owen, G. (2021) Planning and Evaluating the Societal Impacts of Climate Change Research Project: A guidebook for natural and physical scientists looking to make a difference. https://climas.arizona.edu/publication/report/planning-and-evaluating-societal-impacts-climate-change-research-projects.

Office of Science and Technology Policy (OSTP). 2022. ON THE NEED TO ESTABLISH AND MAINTAIN A SUSTAINED ARCTIC OBSERVING NETWORK. https://www.iarpccollaborations.org/members/updates/23552

Petrov, A.N., Hinzman, L.D., Kullerud, L. *et al.* Building resilient Arctic science amid the COVID-19 pandemic. *Nat Communications* 11, 6278 (2020). https://doi.org/10.1038/s41467-020-19923-2

Schweitzer, P., Gartler, S., Ingimundarson, J.H., Meyer, A., Larsen, J.N., Povoroznyuk, O. 2023 D9.5 Indicators of permafrost thaw impacts and of adaptation effectiveness in Arctic coastal communities. Nunataryuk Report.

Social Research and Demonstration Corporation. 2021. Hunter/Harvester/Guardian Program Evaluation Toolkit. 110 pp.

Starkweather et al. 2021. Sustaining Arctic Observing Networks' (SAON) Roadmap for Arctic Observing and Data Systems (ROADS). *Arctic Vol. 74 No. 5 (2021): Supplement 1*. https://doi.org/10.14430/arctic74330

Starkweather et al. 2022. Arctic Observing Summit. Equity and Shared Benefit – Revisiting the Concepts and Practices of the International Arctic Observing Assessment Framework https://arcticobservingsummit.org/wp-content/uploads/2022/02/2022_027_Starkweather.pdf

UN General Assembly, United Nations Declaration on the Rights of Indigenous Peoples: resolution / adopted by the General Assembly, 2 October 2007, A/RES/61/295, available at: https://www.refworld.org/docid/471355a82.html [accessed 25 January 2024]

UN General Assembly, *Transforming our world: the 2030 Agenda for Sustainable Development*, 21 October 2015, A/RES/70/1, available at: https://www.refworld.org/docid/57b6e3e44.html [accessed 25 January 2024]

Gartler, S., Scheer, J. and Meyer, A. 2023 "It's all connected. Key Risks from Arctic Permafrost Thaw". Graphic in Arctic Permafrost Atlas, Westerveld, L. et al. and the NUNATARYUK consortium (eds.). GRID-Arendal, Arendal, Norway. https://www.flickr.com/photos/gridarendal/53409965509/in/album-72177720313528949/

Williams, D., Erikson, L. 2021. Frontiers in Climate. Knowledge Gaps Update to the 2019 IPCC Special Report on the Ocean and Cryosphere: Prospects to Refine Coastal Flood Hazard Assessments and Adaptation Strategies With At-Risk Communities of Alaska. https://doi.org/10.3389/fclim.2021.761439

Food Security Working Group (FSWG). 2022. Arctic Observing Summit Conference Statement, 2022. https://arcticobservingsummit.org/wp-content/uploads/2022/08/AOS_2022_Conference_Statement.pdf

Appendix

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Used for decisionmaking | | | |
| | | | | | | | |
| | | | | | | | |
| grass roots | | | | | | | Top down |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | Used for communication | | | |