

Increasing the visibility of environmental observations and Indigenous Knowledge for local and regional use in the Arctic

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Abstract:

This statement is a collaborative effort to support community-based monitoring (CBM) programs and access to the data collected. We write from the perspective of researchers and community leaders/members working to expand the inclusion of cultural knowledge in curricula, and increase the application of environmental data from observers in local and regional planning for natural resource management, stewardship, and preservation of culture. Indigenous Knowledge continues to be underrepresented and underutilized by the scientific and governmental organizations, missing the opportunity to apply an in-depth source of information for the improvement of community safety and regional policy. This statement offers examples illustrating the importance of community members' knowledge and CBM programs to local information, use and decision-making needs. We emphasize the importance of local and regional uses of these observations, including uses for Indigenous language learning, education, and youth engagement.

Introduction

Community-based and Indigenous-led monitoring programs record observations across a wide range of topics, depending on the goals of the monitoring program. For example, the Alaska Arctic Observatory and Knowledge Hub (AAOKH)¹, a network of Iñupiat observers from coastal Arctic communities, records observations in a narrative format dictated by local conditions and activities in the communities or by the observers. Observations from this network focus on weather and sea ice conditions, hunting, traveling, and cultural activities. Other monitoring programs, such as the Indigenous Sentinels Network (ISN)², provide digital tools, training, and infrastructure to Alaska Native communities, and use standardized and co-created data collection methods for observations that apply more directly to the co-management of resources. However, the structural format of the observations does not necessarily limit the observation scope or application. Furthermore, a monitoring program's scope may change over time or in response to environmental changes. For example, AAOKH's predecessor program, the Seasonal Ice Zone Observing Network (SIZONet), started as a collaboration between Iñupiaq and Yup'ik whaling captains and sea ice scientists to increase safety and knowledge of sea ice. Over time, SIZONet expanded its scope of observation topics and community partners to become AAOKH.

Observations grounded in Indigenous Knowledge provide a holistic and nuanced view of life in Arctic regions and rely on localized methods for collecting data, distinct from conventional scientific techniques. These methods can capture information about complex, critical seasonal events, such as sea and river ice freeze-up and breakup, that are difficult to monitor precisely

due to their localization and often non-discrete nature. In addition to providing local and rapid information, these observations recount shifts occurring in the region due to climate change, which they integrate within Indigenous Knowledge and cultural context.

Connecting community observations to information and community needs

The Arctic environment is rapidly changing, impacting Arctic Indigenous communities' local food harvesting activities, travel, and infrastructure. Annual seasonal freezing starts later, and spring thaw is occurring earlier. These changes impact sea and river ice, which produces a cascade of direct and indirect effects that disrupt plant and animal patterns, creating difficulty in obtaining local foods that many Arctic Indigenous communities continue to utilize. Travel across the ice is also more precarious, and travelers are increasingly prone to accidentally falling through the ice or being cut off from traditional travel routes. Entire villages must move due to storm surges, erosion, and flooding. Local observations provide nuanced, ground-truthed data about weather, ocean, ice, flora, and fauna conditions, helping residents understand and identify trends in regional climate change impacts and environmental fluctuations and supporting processes to plan, adapt, and mitigate. Given this, many communities and local observers support the use of their observational data in research, resource management, and shaping climate change policy.

Monitoring programs are more effective when driven by community priorities and information needs. For example, only one working weather station exists along the coastline in Nunatsiavut, an Inuit self-governing region in northern Labrador, Canada. This is particularly significant as weather and sea ice conditions can differ dramatically even in adjacent fjords, and Inuit travel long distances over the sea ice. The Nunatsiavut Sea Ice Observers program, an initiative of the Sustainable Nunatsiavut Futures project³ co-led by the Nunatsiavut Government, fills these gaps by enabling a network of respected knowledge holders from the Nunatsiavut communities to document environmental conditions, engage local youth around sea ice knowledge and travel safety, and to co-produce research projects with scientists working in the region. Observational accounts include travel routes, fishing spots, and frequently visited areas of cultural significance. Similarly, observers draw from Inuit Knowledge, local knowledge, and their life experiences on the land to identify changes from baseline conditions that would be unobservable by other means.

In addition to providing information relevant to local communities and preserving Indigenous Knowledge and culture, CBM programs can provide science and policy organizations with accurate accounts of local information needs and research priorities. An example of how local observations grounded in Indigenous Knowledge have been applied to research projects using a co-production of knowledge framework is the interdisciplinary project, Ikaagvik Sikukun ("ice bridges")⁴. This collaboration between Iñupiaq Qikiqtagruṃmiut Elders and researchers from various institutions explored questions related to sea ice change and subsistence activities in Kotzebue, Alaska. As climate change increasingly becomes a central topic for CBM programs, local observations provide an "on the ground" account of anomalous weather events and impacts on life in the Arctic.

To provide a space for dialogue regarding the use of observations, the Exchange for Local Observations and Knowledge of the Arctic (ELOKA)⁵, an organization that fosters collaboration between resident Arctic experts and researchers to facilitate collecting, preserving, exchanging knowledge of the Arctic, hosted a meeting in 2023 for partners and groups supporting CBM efforts. During this meeting, AAOKH observers shared how they would like Indigenous observations considered for decision-making at the local and national levels. Furthermore, they highlighted the challenge of communicating with a global audience about local-scale events and how gaps in information and communication can lead to poorly designed policies. A better understanding of local events becomes especially important regarding responses to climate change impacts, such as shifts in sea ice phenology and extent. Aqef Waghiyi, working with the Sea Ice for Walrus Outlook⁶ program, shared how hunters in his community of Gambell in Alaska have not been able to access their typical seal hunting area because of the sea ice loss. He is teaching his children how to hunt differently than his father taught him because the sea ice and landscape have changed so much.

As Indigenous communities and organizations seek to become more active partners or lead their own community-based and Indigenous-led monitoring efforts at a local level, demand for tools, data sovereignty protections, and flexible data collection protocols, like those provided by ISN, have increased. An example of the successful braiding of Indigenous Knowledge in environmental co-management practices comes from efforts from the Tribal Government of St. Paul Island's Ecosystem Conservation Office (ECO). During the federally regulated sub-adult male laaquadan (northern fur seal) harvest season, ECO collects harvest information to manage that population.

In Greenland, new national strategies, such as the Greenland Biodiversity Strategy 2030⁷ and the Greenland's Research Strategy 2022-2030⁸, call for enhanced use of scientific and user knowledge in decision-making and research. During 2022 and 2023, strong efforts have been made to get community members' knowledge further involved in the government's decision-making processes on, e.g., quota-setting. At a workshop in Aasiaat⁹, the participants decided to establish an extra-governmental working group to explore how community members' knowledge could be further used for informing the management of living resources.

In December 2023, after almost a year of meetings and discussions, the working group concluded that, if community members' knowledge is to be further used for decision-making, it will require a strong commitment from central government, municipalities, and civil society¹⁰. The working group's recommendations include a call to government to try out ways of incorporating community knowledge into decision-making in practice for different wildlife species in one or two municipalities. The government should also ensure that decision-makers and staff know how to make use of community knowledge in practice, and how to report back to communities. A further recommendation is that the government should enable the delegation of management responsibility for certain resources and areas to local and municipal entities in Greenland.

Additionally, local observations grounded in Indigenous Knowledge provide a connection to language. During the ELOKA meeting, Joe Leavitt and Bobby Schaeffer, both observers with AAOKH, shared their concern for Indigenous language loss. Joe Leavitt also shared how, in the 1970's, 82% of the population spoke Iñupiaq in Utqiagvik, and now only 10% speak Iñupiaq. Losing language is directly related to losing the culture and, with that, the knowledge related to sea ice and the environment. Youth's ability to read sea ice is paramount; having the language and words for it is also an essential part of this knowledge. The word *tuvayuktuk* means the ice is breaking up; with just one word, Iñupiaq can understand what the ice is doing and take necessary action to protect themselves if they are on the ice.

An example of how environmental observations grounded in Indigenous Knowledge provide an opportunity for sharing language can be seen in an observation submitted by AAOKH observer Billy Adams from Utqiagvik, Alaska, on June 29, 2017.

*"In the 80's up to about 2000, we waited to go out in small boats to hunt. First, the top would melt in late May, early June then the water would drain, which we call *kinniqtit*, meaning most of the melt water would drain and then [be] safe to travel. Then the beach edge would melt 20-30 feet along the shore called *killingiqtit*, ocean or lagoon; then people would travel down the coast to camp out called *taggiuqtik* to hunt seals on top of the ice and hunt for ducks till *nalukataq* time or whole summer. Then, wait for big west or south winds to bring water level up and for pack ice to hit shore ice; then shore ice would come up onto beach call it *qauq* meaning, it is freed. The east winds would blow it off the beach and then finally go hunt walrus and bearded seals in boats by the first week of July or first 10 days of July. In modern times today, we are on the water with our boats by 25-30 June. So it is 3 weeks average, say 21-25 days break up. This changes planning for hunts."*¹¹

Engaging youth in CBM through hands-on learning and digital tools

Many projects partnering with ELOKA aim to engage and share their project with youth. For example, Calista Education and Culture (CEC)¹², which represents over 1,300 Yup'ik tradition bearers of the Yukon-Kuskokwim delta in southwest Alaska, is concerned about the loss of Traditional Knowledge and has been working to document Yup'ik place names and develop curricula to share them in schools. CEC and ELOKA have partnered to develop an online atlas that allows youth to participate in documentation and sharing of place names and related cultural knowledge. Another program that is working to integrate community-based monitoring and cultural knowledge into the classroom is TWILD (Tū'desē'cho Wholistic Indigenous Leadership Development)¹³. TWILD is an Indigenous non-governmental organization and not-for-profit land-based leadership and cultural revitalization group from the Tahltan nation that connects with Tahltan community members on and off the territory, and with youth in meaningful ways that focus on a holistic land-based learning experience. The community-led environmental monitoring program developed by TWILD, currently monitors and collects freshwater quality data, historical weather data, and wildlife activity. In 2024, they will expand their environmental monitoring to include Tahltan food sovereignty and land management in a way that aligns with their cultural values. In partnership with ELOKA, TWILD is developing an online atlas incorporating Tahltan and historical place names, cultural histories, and CBM data and

information. This resource will support the integration of cultural and environmental knowledge into curricula and classroom use for the school district.

Currently, AAOKH is securing funding to support a youth and community engagement project based on the observations recorded by the network of community observers. This new project developed in response to observer requests to increase participation and engagement with local youth from their community. For example, Kotzebue observer Bobby Schaeffer shared, "I am doing this [recording observations] for my grandchildren and great-grandchildren. I think the more exposure, the better for the benefit of our planet." This project leverages the long record of observations stored in the AAOKH database¹⁴ to achieve the primary goals of engaging youth and local organizations in the use and application of AAOKH observations.

In 2024, the Nunatsiavut Sea Ice Observer program is launching a youth engagement program called "Nature Detectives", designed by Nunatsiavut youth James Jacque, the local program coordinator. Detectives is a program for children in grades K-5 that uses land-based pedagogy to engage children in observing the environment around them to plant the seeds of interest and care for their safety and the well-being of their communities.

Conclusion

As CBM programs provide resources for local communities related to data collection, preservation of cultural knowledge and language, and youth engagement, they also provide an opportunity for the larger research community outside of these communities to learn about local priorities and information needs, as well as climate change planning and adaptation priorities.

Climate change mitigation and observations are directly related. Throughout the meeting hosted by ELOKA in 2023, climate change was a recurring topic of discussion. "The world is on fire, and people are watching it burn" was a sentiment shared by Bobby Schaeffer and others. From the discussion, the observers and group felt a sense of urgency and frustration from the little response from world leaders to the calls for action. The observers reiterated the importance of having their observations and local knowledge influence decision-making and policy-making. Billy Adams, an AAOKH observer from Utqiagvik, Alaska, shared, "It seems like we are hidden from the rest of the world. Some people don't know that we exist", and agreed that local observations should impact policy. Participating organizations agreed that increasing collaborations and dialogue among CBM and observer programs would benefit local data collections and global messaging. Furthermore, any effective observing system depends on the means and ability of communities and Indigenous leaders to participate equitably throughout the entire process, from inception and design to implementation and dissemination of knowledge.

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Participating Organizations

The Exchange for Local Observations and Knowledge of the Arctic (ELOKA) fosters collaboration between resident Arctic experts and visiting researchers to facilitate collecting, preserving, exchanging, and using local observations and Indigenous knowledge of the Arctic. ELOKA provides data stewardship and user support to Indigenous communities to ensure the management, presentation, and sharing of their data and knowledge ethically to work toward information and data sovereignty for Arctic residents.

The Indigenous Sentinels Network (ISN) provides digital tools, training, and infrastructure to Alaska Native communities to document knowledge and data on the health and dynamics of the non-human environment. The ISN platform promotes coordinated community-driven monitoring that centers Indigenous food and data sovereignty in the design and functionality. Indigenous communities, Indigenous consortia, non-profits, and other user organizations are empowered through ISN to collect and mobilize their data for desirable purposes, including policy and decision-making.

The Alaska Arctic Observatory and Knowledge Hub (AAOKH) is a network of Iñupiat observers from coastal Arctic communities who share expertise and knowledge of changing environmental conditions in collaboration with academic researchers from the International Arctic Research Center at the University of Alaska Fairbanks. AAOKH supports local observers in documenting regular observations about sea ice conditions, wildlife, weather, coastal waters, and community activities. Observers maintain ownership of their observations and consent to share them, which they archive in an ELOKA open-access database and share digitally through Facebook and a biannual newsletter.

Tū'desē'cho Wholistic Indigenous Leadership Development (TWILD) is a Tahltan NGO founded by seven Tahltan members wanting to contribute to their community. TWILD operates community-led monitoring; this program monitors water, plants, and wildlife in the Tahltan Territory. Their goals include using observations to create adaptive strategies to continue Tahltan ways of life and food sovereignty and to provide land-based learning opportunities for youth through the land-based leadership program Tene Mehodihi and partnership with local schools.

The Nunatsiavut Sea Ice Observer program, within the larger Sustainable Nunatsiavut Futures project, started in 2021 to support a network of Inuit knowledge holders (Observers) in coastal communities of Nunatsiavut. Local observations of the coastal environment inform understanding of the dynamic coastal ecosystems along a latitudinal gradient in northern Labrador and contribute to planning and research in aid of community-level management, mitigation, and adaptation needs in the face of continued and rapid climate change. Future data-sharing practices will be co-designed by all research participants and centralize the goals of educating broader audiences whose decisions impact people's lives in Nunatsiavut and promoting respect and recognition for Inuit knowledge holders through integrating multiple knowledge systems.

The Piniakkanik Sumiiffinni Nalunaarsuineq (PISUNA) program in Greenland was developed in 2009 by Greenland's Ministry of Fisheries and Hunting with fishermen, hunters, and others to inform adaptive management of Greenland's living resources¹⁵. Acknowledgments: Financial support for the activities in Greenland was received from the EC projects FRAMEwork, ECS, BESTLIFE2030 and MoRe4nature (grants 862731, 101058509, 101096887 and 101133983) and the Danish Agency for Science and Higher Education through the UArctic (grant 5228-00001B).