ARCTIC PASSION

Deliverable 7.2

Data-driven Subnational Decision-making in the Arctic: Towards identifying the key issues Work-shop Background Paper (Policy Paper)

Version 3

28-September-2023

101003472 | Arctic PASSION

ARCTIC PASSION

Work package

7 – Supporting coherent Policy and decision-making

Task 7.4 - Consultations with decision-makers at the sub-national level

Lead beneficiary

29 - ULAP

Lead author

Pavel Tkach (ULAP)

Contributors

Adam Stepien (ULAP)

Status

Project Coordinator accepted

Dissemination level

PU

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101003472

Data-driven Subnational Decision-making in the Arctic: Towards identifying the key issues

Background paper

Summary

This brief overview is the result of preliminary consultations with subnational decision-makers and serves as a background paper for the workshop aimed at defining key issues for the interaction between subnational governance and pan-Arctic observation systems, including traditional knowledge and the advancements in multidisciplinary Arctic science. This is a part of the Arctic PASSION (Pan-Arctic Observing System of Systems: Implementing Observations for Societal Needs) project, funded under the EU's Horizon 2020 framework programme. One of the goals of the project is to enhance data-driven decision-making and facilitate broad support for sustained Arctic observation.

The purpose of the workshop is to define the main themes with regard to accessibility and use of data and information in subnational decision-making. In 2023 and 2024, the project team will – based on the continued interaction with local and regional decision-makers – elaborate a set of policy papers on the identified themes. Eventually, a set of recommendations specific for subnational needs and good practices will be developed together with decision-makers and stakeholders in a workshop in 2024.

The current paper was written drawing upon earlier projects and analyses, as well as based on insights obtained via a series of preliminary interviews with Arctic local and regional decision-makers.

There is a lot of data and information produced across the Arctic, and it has been an ambition of policy-makers and the research community to bring this data together into sustained, integrated, interoperable and accessible data systems. There has been increased focus on designing the systems and information services so that they fit best the needs of various user groups. Local and regional authorities and agencies are among the key users of Arctic data.

Subnational decision-makers primarily use the information available through national databases and services or produced locally. The national systems benefit from and contribute to pan-Arctic monitoring and are key intermediaries between Arctic science and local and regional governance. More integrated and sustained monitoring also contributes to improved climate, weather and ecosystem modelling, with higher resolution and lower uncertainty, contributing to climate mitigation and adaptation planning, resource governance, risk management and short-term preparedness. Some local and regional decision-makers do use European or global systems. Copernicus services related to flooding, droughts, ecosystem management and climate are perhaps the most prominent examples.

Subnational institutions are also important producers or aggregators of locally produced data generated in planning, management or impact assessment activities. Such information is also coming from the private sector, consulting companies or traditional knowledge-holders. This information is rarely available outside of given decision-making processes and may not be uploaded or linked up to any national, federal or international system.

In the vast, sparsely-populated Arctic areas, municipalities and regions often cooperate with each other with regard to information related to common resources, ecosystems, and projects. They exchange experiences and methodologies and create joint information platforms. Some are also willing to beplaces where new information services are tested.

Traditional knowledge (TK) and community-based observation play an important role in Arctic subnational decision-making, albeit with major differences between sectors and regions. North American regions appear to be relatively more experienced with including TK in decision processes and assessments (partly due to governance arrangements). Across the Arctic, data related to indigenous livelihoods, reindeer husbandry, hunting and fishing is often an effect of working with traditional knowledge-holders or collected during people's performance of activities on the land. However, there is a need to invest in developing methodologies and in trust-building to make the integration of different forms of knowing impactful.

The preliminary interviews and literature review revealed a number of challenges and gaps for data- driven decision-making in Arctic regions and municipalities. Current models and prediction capacities for climate change are often not sufficient in terms of certainty and resolution to properly evaluate adaptation needs and risks and thus plan and prepare. Vastness of Arctic regions results in knowledge gaps regarding, e.g. wetlands in Canadian Arctic, inland ice in Greenland or ecosystems fragmentation in Fennoscandia. Reporting on the Sustainable Development Goals is restricted by insufficient information. Also, local decision-makers expressed the need to obtain data in formats allowing them to interact with different stakeholders without overburdening their own administrative capacities. There are national and international services allowing easy generation of maps, graphs, and visualizations exist, but they could be further developed. The complexity of scientific information is a barrier for smaller administrations.

Data-driven Subnational Decision-making in the Arctic: Towards identifying the key issues

Background paper

Pavel Tkach and Adam Stepien, Arctic Centre of the University of Lapland, Finland
Arctic PASSION, Work Package 7, Task 7.4

Sustained pan-Arctic observation and the Arctic PASSION project

Across the Circumpolar North, research stations, meteorological institutes, earth observation satellites, automated monitoring systems, citizen scientists, Indigenous hunters and shipping companies and Arctic businesses produce a **plethora of data**.

However, **the Arctic is a vast region undergoing multifaceted transformation** related to climate change, human activities and long-range pollutants and impacts. There are still significant knowledge gaps in understanding environmental and geophysical processes, climate change, land and ocean dynamics, or a variety of human impacts.[1] A better understanding of the Arctic dynamics and the ongoing and future (e.g. with improved climate models) change is possible only when the big part of the data produced around the region is brought together, made FAIR (Findable Accessible Interoperable Reusable) and translated into models, predictions, assessments, products and services that can be used by decision-makers, Indigenous communities, businesses and Arctic inhabitants. Much of the information may be confined to the drive of an Arctic municipality, a private company or a national database often, a given data is produced within a lifetime of a project, and the data series ends together with funding.

Therefore, for over two decades, the **establishment of a sustained, long-term pan-Arctic observation and monitoring system** has been a goal of Arctic knowledge communities. The challenge has not only been to fill in the gaps and achieve interoperability between national systems but also to integrate land-based with marine-based observations, satellite monitoring with *in-situ* data (to validate and calibrate information obtained from satellites) and community-based observation or traditional knowledge. Integration has also been pursued for Arctic social data. Various initiatives and projects were launched to contribute to these goals, including the Sustaining Arctic Observing Networks (SAON)[2] developed under the auspices of the Arctic Council and the International Arctic Science Committee, as well as EU-funded projects such as INTAROS,[3] or the currently implemented Arctic PASSION. These undertakings have attempted to deal with technical questions related to integrating and accessing the data,scientific disciplines, create spaces for institutional and expert networking, define the mostimportant information that should be monitored in a sustained manner, as well as engagewith traditional knowledge and community-based observation initiatives.

[1] See EU-PolarNet White Papers https://eu-polarnet.eu/category/white-papers/
[2] See https://www.arctic-council.org/projects/saon/
[3] See http://intaros.eu/

Much has already been achieved, but also many **challenges remain**. Data management and data sharing between scientific disciplines is still a problem.[4] One of the sticking points for Arctic data integration remains the interaction of traditional knowledge, community-based observation and the data collected and aggregated by scientists. Nowadays, attention is moving towards making Arctic data more useful (and used) by Arctic decision-makers, rightsholders, and stakeholders. A good example is the Copernicus programme, where a set of services has been developed, covering a broad range of information, from atmosphere monitoring, air quality, emissions, marine safety, seasonal forecasting, land-use mapping, or maritime and border surveillance. Copernicus is currently developing a dedicated Arctic window.

Arctic PASSION (Pan-Arctic Observing System of Systems: Implementing Observations for Societal Needs), the project of which this policy paper and related workshop are part, contributes to addressing the remaining challenges while strengthening the sustainability of the earlier developments. It is a Horizon 2020 project funded by the European Union and brings together 35 institutions from across Europe and around the circumpolar North, led by Alfred Wegener Institute. The project is to respond to the demand for faster access to observational data and services that are increasingly more reliable and diverse, and by that, to facilitate unrestricted access to the latest scientific observations. The goal is to enhance monitoring of ongoing environmental changes, reduce uncertainty in predicting future system changes, support risk assessment, inform and guide mitigation and adaptation measures and support sustainable development in the Arctic and beyond. The core principle of the project is to involve Indigenous Peoples, local populations, decision-makers and a broad range of Arctic stakeholders in the co-creation of useful services. The project includes a number of pilot services that are potentially relevant for sub-national decision-making, including, among others, a permafrost service, local atmospheric pollution forecast service, integrated fire risk management, noise pollution and impacts on marine living resources and lake ice service.

See more at https://arcticpassion.eu/

How does the Arctic PASSION support better data-driven decision-making?

The intensity, speed and variability (across the region and from year to year) of transformations in the Arctic possess significant **challenges for decision-making**. While data and both scientific and traditional knowledge are never perfect and cannot provide definite answers for every social, environmental, economic and political choice, they constitute the most robust foundations for decision-making related to the challenges of Arctic change.

Arctic PASSION is **establishing meaningful dialogues** with local and international policymakers. The goal is to understand policy needs and integrate them into project actions. Specifically, the project aims to:

[4] See, INTAROS, Info sheets and booklet. D7.17, at https://intaros.nersc.no/sites/intaros.nersc.no/files/D7.17-final-07Jan2022.pdf

- help to foster the outputs of the Arctic Science Ministerial Meetings (the meetings of Arctic and Arctic-interested ministers of science and relevant stakeholders), particularly regarding sustained funding for Arctic observations;
- consult with and inform Arctic policymakers and Indigenous People through dialogue within the Arctic Council, its working groups and Permanent Participants;
- maintain a close connection with the relevant European Union institutions;
- provide decision-making support on regional and local levels through consultations with stakeholders.

This background paper was produced as an element of Arctic PASSION's dialogue with Arctic local and regional (subnational) decision-makers. The goal is to identify gaps in availability, accessibility and format of knowledge and data, which affect subnational decision-making in the Circumpolar regions. We aim to improve the understanding of knowledge needs in subnational decision-making. These insights can be utilized in developing the pan-Arctic observation systems and in elaborating various data and knowledge services and products. It is crucial that the evolving systems and designed services also address the specific needs and concerns of local and regional decision-makers, as these are not always the same as those of national agencies or the private sector. Moreover, we will identify areas where the subnational decision-makers could contribute to the sustained Arctic observation.

Pan-Arctic data systems and services and subnational decision-making

Domestically produced data – national databases and portals as well as data produced locally dominate the knowledge bases used by local and regional decision-making. There are some **European, Arctic, and global databases that are not used broadly at subnational levels** of governance. Copernicus services are used across the Circumpolar North, not only within the European Arctic.[5] The Copernicus Emergency Management Service (CEMS) is a good example of supra-national data services of clear value for regional and local decision-makers. The European Flood Awareness System, the European Forest Fire Information System, the European Drought Observatory, and their global counterparts (GloFAS, GWIS and GDO) are among the services best known among Arctic decision-makers. A number of initiatives have been implemented to strengthen the concrete outputs from Copernicus, e.g. the KEPLER project[6] , which prepared a roadmap for an improved European capacity for monitoring and forecasting in the Polar Regions. The European Marine Observation and Data Network (EMODnet) – a system integrating marine information – and HELCOM were also identified as important platforms by decision-makers along the North Atlantic coastlines.

The local and regional authorities and agencies often **indirectly benefit from pan-Arctic data systems** without engaging directly with pan-Arctic services or platforms. This is particularly visible in adaptation planning, the effectiveness of which relies on better and higher resolution (thus, more valuable at the local level of governance) climate modelling and predictions. Integrated pan-Arctic data can continuously enhance the climate

[5] Based on conducted interviews.
[6] KEPLER (Key Environmental monitoring for Polar Latitudes and European Readiness) at https://kepler-polar.eu/

prediction capability for flooding risk, permafrost thawing, or changes in average ice and snow conditions. It can also facilitate improved short-term and mid-term forecasts, supporting, e.g. infrastructure management or business planning. In the preliminary interviews conducted for this background paper, experts and officials confirmed the importance of science in such decision-making and the impossibility of moving forward with climate policy-making and implementation without scientific information. This becomes increasingly pertinent, as in some Arctic states, including Finland, Iceland and Canada, regions and municipalities are required to develop own climate mitigation and adaptation policies and plans regularly.

In fact, a **big part of subnational decision-making** regarding biodiversity, resource management, fisheries, aquaculture, etc., benefits from Arctic research as scientists improve the understanding of various dynamics, processes and the state of the environment. Scientific research, when integrated with traditional knowledge and taking advantage of circumpolar and global databases, can provide robust foundations for decision-making.

Moreover, many **national databases and services** – which are among the main sources of information supporting local and regional decision-making – use and refine data from global systems and at the same time contribute to or are part of these systems. National or federal portals also provide subnational officials with sources and tools for data visualization that can be used, for instance, in the interactions with stakeholders during decision-making processes.

Subnational authorities and agencies are also important **producers of information,** or they are active in aggregating locally-generated information. The data is generated in the course of planning processes, environmental impact assessments, or resource and nature management. According to the preliminary interviews conducted, part of this information is not fed into national or international databases and is not available to other users. Their engagement and involvement in the Arctic information networks could therefore serve to expand the Arctic data system of systems.

Data-Driven Decision-Making: What does it actually mean?

For the purposes of the present background paper, data-driven decision-making (DDDM) can be defined as an ongoing cycle of making choices and taking actions based on the multiple sources of data reproduced and summarized into information and synthesized into applicable knowledge.[7] Graphically, the data-driven decision-making cycle and place of science in such cycle can be illustrated in the following figure:

[7] Mandinach, E.B., Honey, M., & Light, D. (2006). *A Theoretical Framework for Data-Driven Decision Making.* EDC Center for Children and Technology. Access from <https://cct.edc.org/sites/cct.edc.org/files/publications/DataFrame_AERA06.pdf>

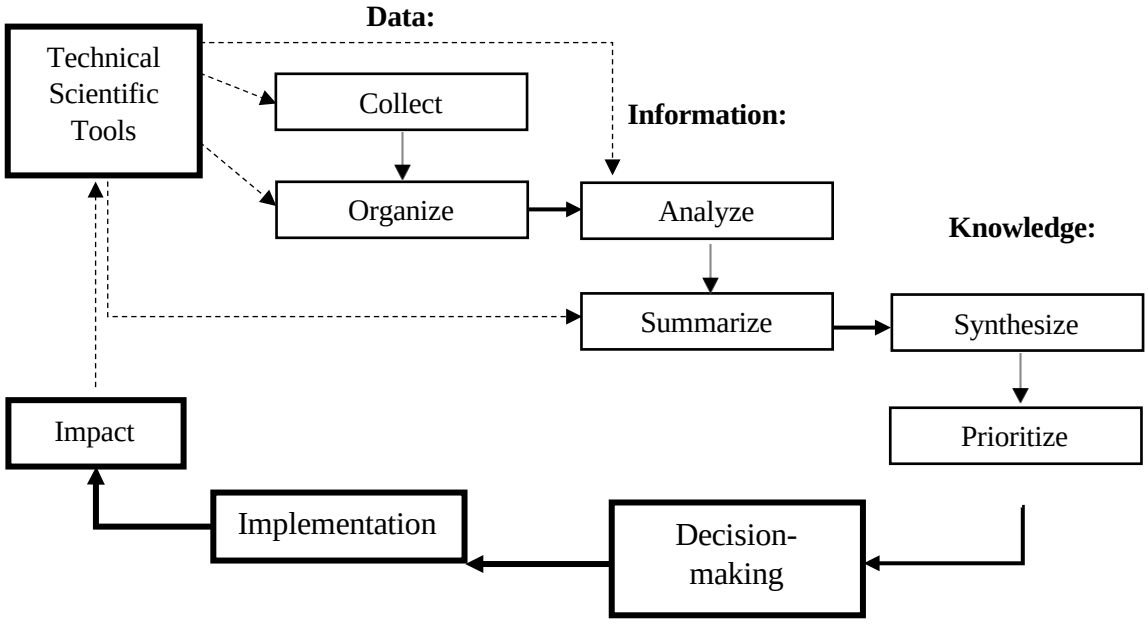

Figure 1. The cycle of data-driven decision-making[8]

The importance of data-driven decision-making is apparent for climate mitigation and adaptation, environmental monitoring, preservation of habitats, and water and land management. These issues cannot be regulated and governed effectively without an appropriate knowledge basis derived from processed (analyzed and summarized) data.[9] Notably, raw data does not have meaning in itself – it has to be interpreted, rendered relevant for a given decision-making process, and presented in an understandable format for all those who take part in that process. Decisions and their implementation in the sphere of environment and climate protection are more likely to be ineffective if they are not based on trustworthy information and processed transparently and reliably.[10]

Local, national and international data sources in subnational decision-making and planning

Arctic subnational decision-makers, experts and scientists interviewed by the authors of the current brief usually indicated that most or all the data used in climate and environmental decision-making were sourced at the **national level or produced locally**. International databases appear to be rarely used by subnational decision-makers, and information coming from supra-national systems is usually mediated by national scientific agencies. However, in the use of the domestic data sources and evaluating the share of the international data sources, there were and are several features:

[8] Reproduced from: Mandinach, E.B., Honey, M., & Light, D. (2006). *A Theoretical Framework for Data-Driven Decision Making.* EDC Center for Children and Technology. Access from <https://cct.edc.org/sites/cct.edc.org/files/publications/DataFrame_AERA06.pdf>

[9] Provost, F., & Fawcett, T. (2013). *Data Science and its Relationship to Big Data and Data-Driven Decision Making.* Big Data. Mar 2013. pp. 51-59. Access from <https://www.liebertpub.com/doi/full/10.1089/big.2013.1508>

[10] Towe, R., et. al. (2020). *Rethinking data-driven decision support in flood risk management for a big data age.* Journal of Flood Risk Management. vol. 13, issue 4. Access from <https://www.liebertpub.com/doi/full/10.1089/big.2013.1508>

1. For the municipalities with low population, small territory and/or limited scientific capacities, data-driven decision-making – including the collection and reproduction of scientific data – is a sphere for **intermunicipal cooperation** with the purpose of mutually beneficial knowledge exchange. Municipalities that are unable to fill existing knowledge gaps effectively seek to form partnerships with neighbouring municipalities in order to strengthen their collective scientific capacities. Such an approach to increasing scientific capacities is, for instance, utilized by Icelandic municipalities, especially in relation to intermunicipal projects like the construction of roads, pipelines and tunnels.
2. Some municipalities use the results of interregional and international **cooperation with neighbouring regions** as a primary knowledge source, including reports and surveys produced from domestic and international data sources. This is the case, for instance, in Canada's Yukon and Northwest Territories and in Alaska. There, decision-makers benefit from Quarterly Climate Outlook[11] – a digital report on notable weather events and observed overall temperature averages and precipitation totals, developed jointly by Alaska Centre for Climate Assessment and Policy, US National Weather Service Alaska and Environment and Climate Change Canada (Federal Government department). Moreover, Alaska, Yukon, Nunavut, Manitoba, Saskatchewan, and Alberta have ongoing cooperation on wildlife management, especially migratory species, in terms of data collection,reproduction and utilization in decision-making while taking into account features of individual municipalities and regions.
3. Except for the above-mentioned practices of using results of interregional and international cooperation, such as reports and outlooks, the preliminary research carried out by the authors of the current brief identified that decision-makers use domestically-produced and maintained knowledge and data, but **methodologies for analysis and reproduction** are sometimes jointly developed via interregional cooperation or shared with neighbouring states. This is the case in the management of shared waterways, like the Tornio river, flowing via Swedish Norrbotten and Finnish Lapland, where joint monitoring is necessary and carried out regularly. That applies to the cooperation of the Finnish Lapland and Swedish Norrbotten.
4. In many cases, municipal authorities in the Arctic **engage private stakeholders**, such as consulting firms, to perform observations, monitoring, and evaluation. That, for example, applies to the cooperation of Icelandic municipalities and firms like Landsnet and Environice, who mainly develop, analyze, and reproduce their own primary data rather than secondary data from other institutions. Companies performing monitoring and analysis often develop their work on an in-situ basis and with a predominantly domestic focus.

Arctic regions, municipalities and stakeholders within these regions (e.g. Indigenous communities and the private sector) produce **data within specific decision-making processes** or monitoring environmental and social changes of relevance for policy, business development or livelihood. In Finnmark, for example, the aquaculture companies monitor algal blooms, and the county administration is working together with the industry

[11] See <https://uaf-accap.org/2021/05/30/alaska-and-northwestern-canada-quarterly-climate-weather-report-march-may-2021/>

towards establishing a joint database. However, a big part of the collected information does not find its way to any national or international databases.

Some Arctic regions suggest that they could be **good places to test** various information services and that they have the needs and capacities to engage.

At the same time, some of the Arctic regions are **dependent on international scientific involvement**, for example, Greenland, which was and continues to be a relevant place for international scientific research and a significant source of information for not only Greenland's municipalities but also for the Arctic Council and Nordic Council of Ministers.

Knowledge and data availability and accessibility gaps

The results of preliminary research carried out by the University of Lapland team identified some examples of knowledge gaps that affected or may affect data-driven decision-making and planning at the subnational level:

Region/Country	Identified knowledge gaps
USA (Alaska)	Experts in Alaska emphasized that the region has gone backwards in 'in situ' data, particularly with precipitation. Moreover, there appears limited integration for certain types of data at the federal level, which is a challenge for Alaska with 340 different communities. The majority of communities have automated weather stations at the airports, but most of the weather/air information has been collected not by the communities themselves but by the US Federal Aviation Administration, which does not incorporate data into standard climate products/knowledge. Because of the rapidly changing sea ice patterns and seasonality of sea ice, Alaskan scientists and decision-makers require more oceanographic data, especially characteristics of winter seasons. And as another knowledge gap affecting water management in Alaska, experts named the lack of sufficient and continuously updating hydrologic information, especially related to water temperatures.
Canada (Yukon, NWT, Nunavut)	Wildlife management is affected by a lack of extensive knowledge about the impacts of climate change on the distribution and abundance of species; about pests and invasive species and the effects of their presence on the environment. Permafrost has been identified as an always-changing gap. Climate management is affected by a lack of better approaches to interpreting data rather than standardizing data. In Yukon, municipal and regional level experts face difficulties related to the mapping of wetlands due to the absence of stable services functioning in the region. Moreover, climate management in Arctic Canada has been affected by too general reproduction of climate data, reflected in the absence of regionalization of climate models for further decision-making.

Greenland	The primary challenge for Greenland in terms of collecting and reproducing data for subsequent decision-making is the geographical extent that always has and will continue to put restrictions on the possibility of covering environmental and climatic parameters important for decision-making fully. That implies that the primary scientific gap existing nowadays in Greenland is the lack of services, methodologies, and data collection techniques capable of covering the whole geographical extent of Greenland.
Iceland	The environmental and climate management in the state is affected by a lack of extensive knowledge on land use and the effects of climate change on land use, primarily the use of different types of soil, grasslands, and wetlands. Insufficient knowledge of potential consequences of introducing different types of trees (invasive/non- invasive) to the Icelandic forestation processes. At the municipal level in the Northeast region of Iceland, much attention has been paid to the gap related to awareness about the newest technologies in waste disposal and services for carbon emissions reduction.
Norway (Troms og Finnmark)	As in many other regions, the climate models and predictions are seen as lacking sufficient resolution and certainty to allow for a more robust basis for adaptation planning (e.g. changes to North Atlantic circulation and their local consequences, impacts of climate change on aquaculture). A number of projects have been implemented to address this challenge. For many sectors, the lack of long-time data sets at locally and regionally relevant resolution was mentioned as a shortcoming, as it would contribute to better policy-making and reporting on the progress of SDGs (for regions and municipalities, but also for local businesses). The county also struggles with obtaining appropriate information about historical and current Sámi land use, as historical, long-term data are often unavailable. Exchange of information with Russia has always been a challenge, and now it has become impossible, and it is important for many aspects related to the shared Barents Sea. Information serving better marine spatial planning is expected to become increasingly important in the future with the rise of the blue economy and more extensive use of the oceans.
Sweden (Norrbotten)	The environmental management in the region is affected by poor knowledge about terrestrial environment monitoring, lack of division of habitats following the importance and extinction criteria and insufficient awareness of biodiversity matters related to reindeer grazing and of effects of grazing on wetlands conditions. Moreover, water management is affected by the lack of its own fish counting systems.
Finland (Lapland)	The need for higher resolution of climate models and increased certainly has been mentioned in relation to adaptation planning and long-term risk management.

Table 1. Knowledge gaps

In the interviews, most decision-makers emphasized that a common challenge for the science-policy nexus is **the overly complex format of knowledge produced** by scientists. Decision-makers without scientific background find it difficult to analyze and understand provided information. Additional work on simplifying information by analyzing secondary sources, which is time-consuming, especially when the decision should be fast and effective.

INTAROS project established that for national decision-makers, the greatest value is long-term monitoring that forms the basis for assessment of the status of the Arctic environment in general and of pollution, climate change and living resources in particular. The needs are different at the level of operational services. The local communities, on the other hand, need information about the long-term changes that may directly influence their living conditions, allowing better planning, as well as dedicated operational products that can help in daily occupation, especially land-based, traditional activities.

Community-Based Monitoring, Traditional Knowledge and Local Decision-making

TK, particularly held by Indigenous knowledge-holders, can be defined as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment".[12] The acknowledgement of the **value of Traditional knowledge** (TK) constitutes one of the distinctive features of Arctic cooperation and many aspects of Arctic governance. There have been numerous attempts to bring together TK and scientific information in the hope of arriving at a better understanding of the Arctic human-natural systems and the transformations they undergo, as well as making better and fairer decisions.

However, the **challenges for TK and scientific knowledge interplay** remain significant. The two systems represent different ways of knowing, with TK being a holistic system anchored in community spirituality and history, and thus, specific TK insights may be misunderstood if not placed within this broader knowledge environment. Some scientists are still concerned and lack a methodological toolkit to properly engage with TK, while traditional knowledge-holders are often sceptical about working with scientists. Lack of trust and dedicated human, time and financial resources raises barriers on both sides. TKis also the knowledge that may be owned by a community or a given person, which mayconstitute another barrier to TK-science interaction. Clearly, for science and decision-making to benefit from TK, it is usually important to engage in a meaningful manner withknowledge- holders rather than simply make use of the TK-based information.

There are very **few examples of community-based monitoring** programmes established or supported by local and regional authorities. There are, however, areas where the authorities rely on community and Indigenous observation and knowledge, in particular with regard to traditional livelihoods, spiritually important sites, reindeer herding or hunting.

[12] Berkes, F. (1999). Sacred Ecology: Traditional Ecological Knowledge and Resource Management. Taylor and Francis.

Just as there are difficulties in bringing together scientific and traditional knowledge, bringing traditional knowledge into decision-making is often a challenge. All interviewees highlighted that they make efforts to facilitate broad participation and acquire information from different sources and that they see clear positive inputs of that engagement into the understanding of the situation and decision outcomes. However, in some cases, there are no **robust procedures and methodologies for integrating scientific and traditional knowledge** at the sub-national decision-making level in terms of reporting, acknowledging inputs and weighting different information sources. Governance structures and processes in North America appear to be often more experienced and exposed to working with traditional knowledge compared to the situation on the European side of the Arctic. There are usually stronger legal requirements related to land claims agreements, co- management structures, as well as to resource and environmental regulations. There is also a tradition among scientists and officials of engagement with traditional knowledge- holders. A good practice is to involve knowledge-holders as co-producers and experts rather than simply as informants.

Projects dedicated to **improving Arctic observation** have increasingly involved community-based observation and traditional knowledge. It is one of the goals of the Arctic PASSION. Earlier, the KEPLER project advanced the cooperation with reindeer herders from different Arctic regions in order to verify the remote sensing snow and ice data.[13] Another good example is the PISUNA project,[14] which established a network of local natural resource experts in Greenland in cooperation with the Greenlandic governmental agencies.

The way forward: addressing gaps and challenges

The purpose of this policy paper is to outline initial findings related to the gaps and challenges at the nexus of Arctic data and knowledge systems and subnational decision- making. The paper does not provide answers and solutions to problems identified through interviews and in desk research and presented above. Rather, together with the outcome of the Scoping Workshop held virtually on the 8th of July 2022, this paper opens the pathway towards specific reflection on chosen themes through 2022-to-2024. This future work will ultimately contribute to rendering Arctic PASSION outputs increasingly relevant for regional and local decision-making in the Arctic. The work on specific topics – as was the case with the current background paper – will be carried out via close interaction with decision-makers and key subnational governance stakeholders. Recommendations will be co-produced with Arctic decision-makers during a dedicated workshop held in the final phases of the project.

A brief report from the June 2022 workshop can be accessed at: https://nextcloud.awi.de/apps/onlyoffice/s/7CxQdP8bEpfeSDm?fileId=76217623 or https://zenodo.org/record/7090739 (the workshop report was produced in July 2022).

[13] KEPLER at https://kepler380449468.files.wordpress.com/2021/06/kepler-deliverable-report-1.2.pdf
[14] PISUNA project at http://www.pisuna.org/documents/FS%20Greenland.PISUNA.%20FINAL.pdf

Drafting this background paper: Methodology

This policy brief is a descriptive report aimed at scoping relevant issues for further work in Arctic PASSION Task 7.4. The paper was compiled based on semi-structured, in-depth interviews with different stakeholders. T7.4 researchers pre-defined three groups of potential informants for interviews:

- Representatives of science agencies/institutions – primarily at the subnational level - capable of providing insights on technical gaps in data and knowledge, and experience in communication with municipal/regional/national governance bodies;
- Municipal/regional/national officials, such as Mayors or Ministers, capable of providing insights on gaps in understanding of science-based data and knowledge coming to municipality/region, and experience in communication with science agencies/institutions;
- Environmental/climate/science managers/advisors affiliated with national/regional/local governance bodies and capable of providing insight on gaps related to the practical use of science-based data and knowledge in further policy-making processes. The importance of this group was further underscored while conducting the interviews.

Identification of possible interviewees was primarily conducted via an overview of the official web pages of municipalities, organisations and institutions in question. In addition, T7.4 researchers conducted a review of the subnational climate and environmental plans. Authors and officials responsible for drafting such documents were contacted. The success in organising interviews was contingent upon the willingness of approached persons to be interviewed. Persons from Canada and Iceland proved to be the most responsive, while we were able to interview only few persons from Greenland and the United States in the initial, scoping phase of the project. As the Arctic PASSION project outputs can provide a relatively greatest added value for the European Arctic and North Atlantic subnational authorities (due to the linkages with the EU, its policies, Copernicus services and other EU data services), we put particular attention to securing participation of officials and informants from these regions. A significant number of interviewees from Iceland is a result of better access of T7.4 researchers to these stakeholders. Despite the relatively higher number of Icelandic interviewees, their inputs were treated as Iceland-specific (arguably, Iceland has a peculiar set of challenges and dynamics) and did not affect the outputs presented in the paper (as well as the choice of the key issues identified for further work) more than insights obtained from interviewees from other countries.

The structure of the interview had been divided into the following sections:

1. The state of data-driven decision-making and planning in the region.
2. Community-based monitoring, local experience and traditional knowledge in the decision-making and planning.
3. National, interregional and international administrative and scientific cooperation in the decision-making and planning.
4. Knowledge gaps and vision to the future.
5. Future of cooperation of scientists and decision-makers.

This structure had been developed to acquire views on past, present and future needs of data-driven decision-making and planning in targeted Arctic regions; to analyze the relevance of the various levels of cooperation, science, community-based monitoring and traditional knowledge in subnational decision making and planning; as well as to conclude with scientific topics to which the Arctic PASSION project should pay immediate attention.

The current Policy Paper served also as the Background Paper for a Scoping Workshop. As it was a part of a scoping exercise, the initial aim of this document was not to achieve a complete geographical balance but to cover different categories of stakeholders and obtain different insights.

Preliminary interviews were conducted with experts and officials from the following bodies:

- Regional Council of Lapland, Finland
- Lapland Centre for Economic Development, Transport and the Environment, Finland
- Finnish Environment Institute, Liitteri Portal
- County Administrative Board of Norrbotten, Sweden
- Municipality of Lulea, Sweden
- Troms and Finnmark County, Norway
- Municipality of Tromsø, Norway
- The Government of Yukon, Canada
- The Government of Northwest Territories, Canada
- Alaska Centre for Climate Assessment and Policy, USA
- Ministry for Agriculture, Self-Sufficiency, Energy and Environment of Greenland
- Ministry for the Environment and Natural Resources of Iceland
- The Environment Agency of Iceland
- Westfjords Regional Development Office, Iceland
- Municipality of Akureyri, Iceland
- Municipality of Dalvik, Iceland
- Municipality of Siglufjordur, Iceland