Arctic SDI 2019–2021 Biennial Report

Developing the Spatial Data Infrastructure for the Arctic

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Message from the Arctic SDI Board Chair

It has been my pleasure to serve as the Chair of the Arctic SDI Board concurrently with the Icelandic Chairship of the Arctic Council for the past 2 years. During those two years much has changed in the world and not everything has gone as planned due to Covid-19. The eight nations involved in the Arctic SDI co-operation and our team of experts have, however, continued to work on Arctic SDI issues as much as possible and in this report, we highlight the accomplishments of the Arctic SDI during the Icelandic Chairship, acknowledging that they are a result of years of cooperation and efforts of our members in all our eight countries.

The theme of the Iceland's Arctic Council Chairmanship program for 2019-2021 was „Together towards a sustainable Arctic" and reflected Iceland's commitment to the principle of sustainable development and referred to the necessity of close cooperation between the states and peoples of the region and beyond.

In the Arctic SDI cooperation Iceland emphasis was on the future to come. Focus was set on partnership with stakeholders as well as getting better access to data, especially data related to the Arctic Marine Environment and data to monitor climate changes in the Arctic. As these were the main priorities Arctic SDI attempted to ensure that scientists, resource managers, decision makers and citizens could discover, access, combine and use trusted data to conduct research, make informed decisions and respond to issues and emergencies in a changing Arctic. In the

development of a regional spatial data infrastructure for the Arctic, Arctic SDI builds on international standards and existing spatial data infrastructures. The Arctic SDI also focuses on aligning its activities with the work of international organizations.

In November 2020 I had the honour of presenting Arctic SDI to the Arctic Council virtual SAO plenary meeting. The main message brought forward was the importance of access to data and specially making Arctic Council Working Groups data available online in a standardized manner. That would increase the visibility of reliable, publicly accessible, geodata of the Arctic region. The message was very well received and resulted in ongoing work between the Arctic Council secretariat and Arctic SDI in developing a data policy for the Arctic Council. In relation to this work, *the need for implementing guiding principles on management of and access to data, generated by the Arctic Council, was recognized in the Reykjavik Ministerial declaration.* This was an important milestone in Iceland's chairship of the Arctic SDI.

When Nations of the world will have recovered from the COVID-19 pandemic, I believe that actions against Climate change will be the main issue again for the Arctic and for humanity on earth. The Arctic SDI will continue to provide it's services and best practice solutions free of charge to facilitate data exchange and spatial data management to benefit research and decision making in the Arctic.

Sincerely,
Eydís Líndal Finnbogadóttir
Director General, National Land Survey of Iceland

Why an Arctic SDI

The Arctic is one of the most valuable regions on the planet. It is dramatically changing and the eight Arctic nations (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States) coming together with a coordinated approach around common standards and goals is critical.

The Arctic SDI is a collaborative initiative with a goal to promote partner-based development of an Arctic spatial data infrastructure. The aim of the infrastructure is to allow access to interoperable data and tools supporting monitoring and decision making for politicians, governments, policy makers, scientists, private enterprises, and citizens in the Arctic.

The National Mapping Agencies provide authoritative, reliable, and interoperable data from their own holdings. As a collaborative initiative, the Arctic SDI can facilitate and enter into partnerships to deliver access to data from other reliable authoritative sources to ensure that spatial data is easier for Arctic stakeholders to access, validate and combine with other data. Using available data helps us to address common problems and ensure a common understanding and adequate response to the rapidly changing Arctic.

Successes and Accomplishments in 2019-2021

In 2020 the Arctic SDI Board approved the **Arctic SDI Strategic Plan 2020 – 2025** that targets the challenges of the Arctic to develop policies based on reliable Arctic data. The new strategy shifts the focus towards building the basic Arctic spatial data services and developing user friendly tools to focus on outreach, establishing partnerships and facilitating data management best practices and data stewardship in support of the development of the Digital Arctic. Focus is still - but not only - on the activities of the Arctic Council and its working groups

Collaborative partnerships are in place with key stakeholders like the Arctic Data Committee (SAON/IASC) and the Arctic Regional Hydrographic Commission to provide terrestrial, marine and atmospheric spatial data and services in regional SDIs. Together, Arctic SDI and Arctic Data Committee facilitate an infrastructure to connect users across domains to valuable spatial data to support research, monitoring, business development, public management, emergency preparedness and decision making in the Arctic.

The Arctic SDI Board endorsed in 2020 the work to facilitate discussions with domain experts on the governance, processes and development steps necessary to create a **Pan-Arctic Wetland Inventory Map** in cooperation with Conservation of Arctic Flora and Fauna Working Group (CAFF). A pan-Arctic wetlands map would provide a valuable dataset as well as to enhance the state of knowledge on the status of Arctic wetlands and the effect climate change has on them. The methodology used to create a Canadian Wetlands Map will be applied to the creation of a Pan-Arctic Wetland Inventory Map.

Responding to a request from the Arctic Council Senior Arctic Officials and the Arctic Council Secretariat the Arctic SDI is now involved in drafting a **Data Policy for the Arctic Council**. The drafting will be in cooperation with other data focused Arctic Council entities and Arctic SDI partners (Arctic Council working groups, Arctic Data Committee, Arctic Council Indigenous Peoples Secretariat, Arctic Regional Hydrographic Commission, Norwegian Polar Institute).

The Arctic SDI have also contributed to the document "Alignment of Polar Data Policies - Recommended Principles" expected soon to be published. The document is a collaborative effort by members of the Scientific Committee on Antarctic Research (SCAR), the International Arctic Science Committee (IASC), the Sustaining Arctic

Observing Networks (SAON) initiative, and the Southern Ocean Observing System (SOOS). Related to this and initiated by Arctic SDI, the need for implementing guiding principles on management of and access to data generated by the Arctic Council, was recognized in the **Reykjavik Ministerial declaration**.

Outreach

The web presence of Arctic SDI improved much when a new web design was published in december 2019 with updated content, especially about the Arctic SDI Services. Additionally, Guidelines for Data Providers were published on a new Website in december 2019. The guidelines demonstrate what to ask for when demanding data as part of an assignment. In addition to a suite of communication materials, the Arctic SDI web pages contain strategic documents such as SDI Manual for the Arctic, Strategic Plan 2020-2025 and Arctic Evaluation documents.

In connection with the presentation of Arctic SDI in the Arctic Council virtual SAO plenary meeting in November 2020, a short video was produced about the need for making data available online in a standardized manner. The video and others made by Arctic SDI can be viewed on the Arctic SDI Youtube site.

Before the COVID-19 epidemi cancelled and changed conferences and meetings around the world, the Arctic SDI had active participation in the UN-GGIM 9th session side event together with ARMSDIWG and OGC Marine WG. In November 2019 the Arctic SDI presented and hosted a workshop during the Polar Data Forum III in Helsinki and were active in the Arctic Circle conference in Iceland in October same year. When conferencing was brought back online conferences the Arctic SDI has had a strong presence in a few of them, such as the 50th International Arctic Workshop, Hack the Arctic hackathon and 10th International Forum „Arctic: Today and the future".

The Arctic SDI's key stakeholders are the Arctic Council and its Working Groups and the Arctic SDI provides bi-annual reports of accomplishments, goals and priorities, including partnerships, to the Arctic Council through CAFF.

In addition to drafting a Data Policy for the Arctic Council, the Arctic SDI is also working with the Arctic Council Secretariat on Data Stewardship aiming to increase the capacity to store and distribute Arctic Council data and to build the capacity to create and publish interactive maps on the Arctic Council website using Arctic SDI data and embedded maps functionality.

Delivering Authoritative, Harmonized Data

Topographic basemap

The Arctic SDI has produced a harmonized topographic reference basemap that provides a unified topographic view over the entire Arctic with details such as elevation, rivers and lakes and other geographic features. It is a Web Map Til Service using data from the 8 National Mapping Agencies of the Arctic states. The basemap enables professional users to display their data in client applications such as websites, GIS and increasingly mobile devices and background data for other types of applications. The service is available in six rotations of the North Pole Lambert Equal Area Projection and provides cached images with high performance to any client supporting the Open Geospatial Consortium (OGC) WMTS 1.0 standard. .

Arctic SDI aims to make more datasets available to allow mashups and development of applications that are limited only by the imagination of the stakeholders and scientists using the data.

Arctic SDI Geoportal

The Arctic SDI Geoportal allows users to browse, visualize, analyse, and share maps and geospatial information in all six Arctic projections. Users can combine map layers to visualize the phenomena of their choice and it is available free of charge to anyone. It contains a harmonized base map that provides a unified topographic view and a Circumpolar Gazetteer (place name service) both of which use data from the Mapping Agencies. The Gazetteer allows users to search place names to find and discover locations throughout the Arctic and a Time Series Tool allows viewing data across time. Recently, a new service to display statistical data has been added and users can also create dynamic interactive maps, known as embedded maps, for delivery via any website without any coding and just a few quick steps. The Geoportal is already sharing 45 datasets from CAFF.

The Arctic SDI Geoportal is based on Oskari open source software developed and maintained by the National Land Survey of Finland. The Geoportal is operational and kept up to date with the latest Oskari version, following the normal release cycle of the software. Since June 2020, there have been four major new releases with new functionality and stability updates. Some functionality has been specifically developed for Arctic SDI, while some have been adopted from developments in other Oskari implementations.

Arctic SDI Guidelines

The SDI Manual for the Arctic provides stakeholders with information and guidance on the planning, management, development and maintenance of the Arctic SDI. It provides good data management practices, identifies policy and guideline requirements and demonstrates the value and benefits an SDI provides to enhance efficient monitoring and decision making in the Arctic. The manual addresses the needs of three audiences: (1) high-level strategic decision makers, (2) Arctic data providers and distributors, and (3) the end users of Arctic data.
 The Arctic SDI Guidelines for Data Providers web page is designed to help organizations to publish their data. The guidelines provide recommendations on how to facilitate access to and reuse of data assets. Open data sharing gives access to a wealth of interoperable data and information from diverse sources. This allows spatial integration and analysis that help gain knowledge and answer complex societal questions.

The guidelines do also include a list of questions to ask when contracting the creation of a report and associated data, while ensuring that the new data is standardised and accessible for future reuse.

Arctic SDI Digital Elevation Model

The ArcticDEM is a public-private initiative of the US Arctic Council Chairmanship 2015 - 2017 to automatically produce a high-resolution digital surface model (DSM) of the Arctic using optical stereo imagery, high-performance computing, and open source photogrammetry software. It was developed through the University of Minnesota Polar Geospatial Center and funded by the US National Science Foundation with support from national elevation experts through the Arctic SDI.

The Arctic DEM is a huge first step offering a significant advancement in the availability of coherent Arctic elevation data to serve the Arctic science community.

On the basis of Arctic DEM, the Arctic SDI is developing the Arctic SDI DEM which is a product based on the Arctic DEM but enhanced with national elevation data to improve quality and conformity.

Glancing into the Future of Arctic SDI

As Russia takes over the chairmanship in the Arctic Council and Arctic Spatial Data Infrastructure (Arctic SDI) in 2021, it will continue to foster its partnerships, promote the Arctic as a territory of peace, stability and mutually beneficial cooperation. The major priorities set for the Chairmanship will be:
1) the population of the Arctic, including indigenous minorities;
2) environmental protection and climate change mitigation:
3) socio-economic development, and
4) strengthening the Arctic Council as a key multilateral cooperation mechanism in the high latitudes.

With regard to the Arctic SDI, Russia will continue to support activities, specified in the Arctic SDI Strategic Plan 2020-2025 and its Roadmap and Implementation Plan 2020-2025, including provision access to reliable geospatial data and services to facilitate efficient monitoring, management and decision-making in the areas of sustainable development, climate change, emergency preparedness, etc. that will contribute to building of a digital Arctic. Russian will also carry out communication and outreach activities on the national level and within Arctic Council Working Groups to raise awareness and create value of the Arctic SDI. Finally, Russia will strive to ensure the status for the Arctic SDI of a main official platform within the Arctic Council for geospatial data exchange in the Arctic.

People and Communities of the Arctic recognize that adequately responding to rapid changes in the Arctic environment requires access to sustained observational networks and reliable data to facilitate understanding and informed decision making, welcome progress on implementing guiding principles on management of and access to data and facilitate that data, generated by the Council, is findable, accessible, interoperable, reusable, and widely shared.

REYKJAVIK DECLARATION 2021, On the occasion of the Twelfth Ministerial meeting of the Arctic Council

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arctic-sdi.org
https://geoportal.arctic-sdi.org/