ARCTIC SDI
Arctic Spatial Data Infrastructure

➔ **Enabling Access to Arctic Spatial Data Across Borders, Across Time**
➔ **Governance and Multi-Jurisdictional Data Sharing**

Arctic Spatial Data Infrastructure - Update

Simon Riopel

Arctic SDI Data WG Lead

Peter Pouplier

Arctic SDI National Contact Point for Denmark, Operational Policy WG Lead

arctic-sdi.org

March 2021

Outline

- Arctic SDI and its components
- New 2020-2025 Arctic SDI Strategy
- Towards a Multidimensional Digital Arctic: marine, land and atmosphere
- Tools and guides
- Arctic SDI – ARMSDIWG joint activities
- Web services automated harvesting methodology

A Model of Effective Collaboration

ARCTIC SDI — Arctic Spatial Data Infrastructure

Arctic SDI is:

- endorsed by the Arctic Council in 2009
- a voluntary collaboration of the eight Arctic National Mapping Agencies
- governed by a Memorandum of Understanding (MOU) in 3 languages
- recognized by Senior Arctic Officials for improving data integration, sharing and analysis across the Arctic
- a domestic imperative in recognition of a shared circumpolar ecosystem that is changing rapidly with global impacts due to a warming climate

By facilitating and building a diverse infrastructure:

- Governance, Standards, Policy, Data, Science and Technologies
- With a 2020-2025 8 Arctic countries Strategy supporting a Digital Arctic
- Based on foundations of solid governance and standards
- Seamless sharing of geospatial data across jurisdictions to monitor and predict change
- Information Management Best Practices based on standards that drive an inclusive framework with circumpolar agencies

Introduction to the Arctic Spatial Data Infrastructure

https://youtu.be/tGS1rcaJRug

New Strategy

Strategic Plan 2020-2025 - Objectives

Objective	Title
1	Promote Data and Service Availability
2	Promote Interoperability
3	Strengthen Engagement
4	Amplify Communication Channels
5	Further Governance and Business Processes

- Strategic Plan: Anticipated **outcomes** are defined for each objectives
- The Roadmap & Implementation plan provides an approach to operationalize each of the five strategic objectives through the identified **actions**.

# *New* 2020-2025 Arctic SDI Strategy - Towards a Multidimensional Digital Arctic

- A Domestic imperative within a Pan-Arctic ecosystem reality due to climate change.

- Foundation of **_Governance_** and **_Standards_**.

- 2025 Arctic Spatial Data Infrastructure Strategy

  - Location (X,Y & DGGS)

  - Elevation from geology to atmosphere (Z)

  - Temporal (T)

  - Science and Information (S)

  - Vectors of direction and magnitude (V)

- Many stakeholders

- Automated and standardized broker services – modest level of effort for each stakeholder
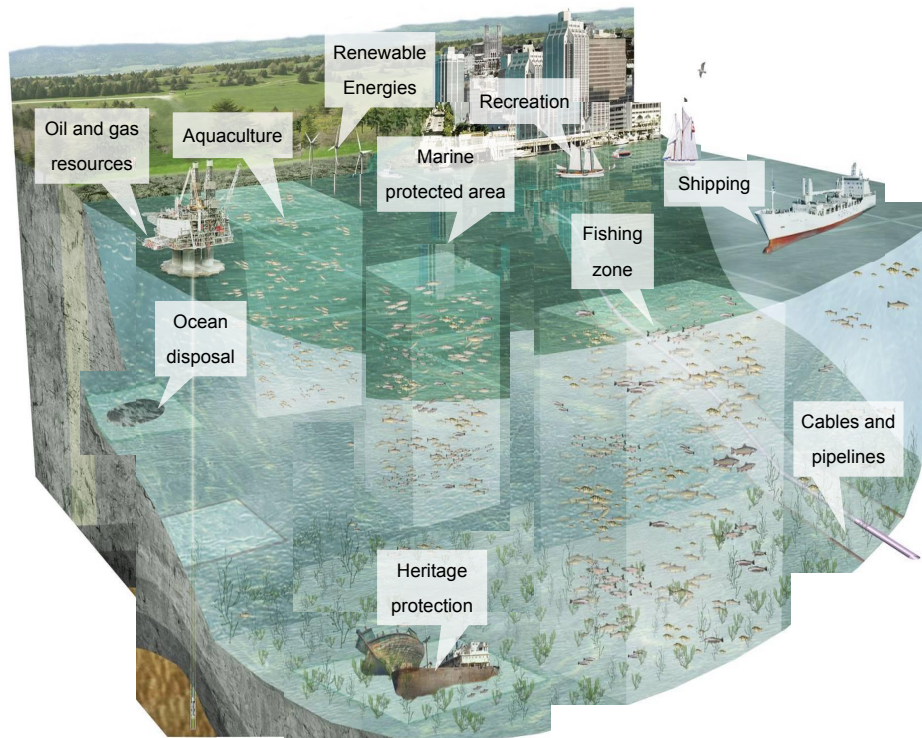
The Arctic SDI provides, via a Web platform, easy access to:

- A searchable metadata catalogue

- Authoritative Arctic topographic Basemap Service (scale 1:250,000)

- Standardised thematic data (birds, ice cover, ship routes, land cover change, flora etc.)

- Gazetteer database (3 million place names)

- A geoportal for spatial data viewing, discovery, integration and analysis
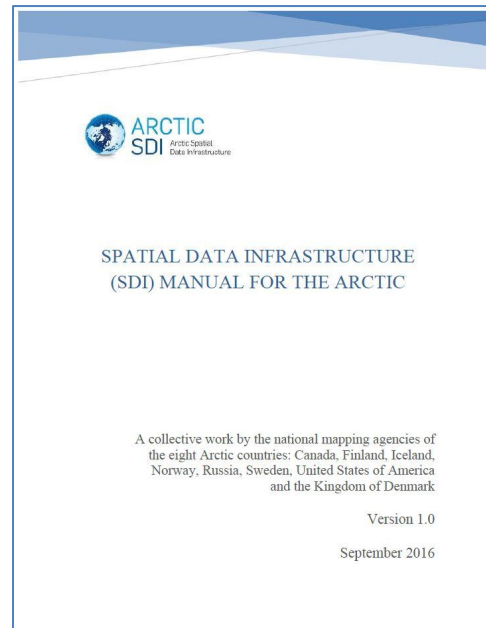
- Guidance documents
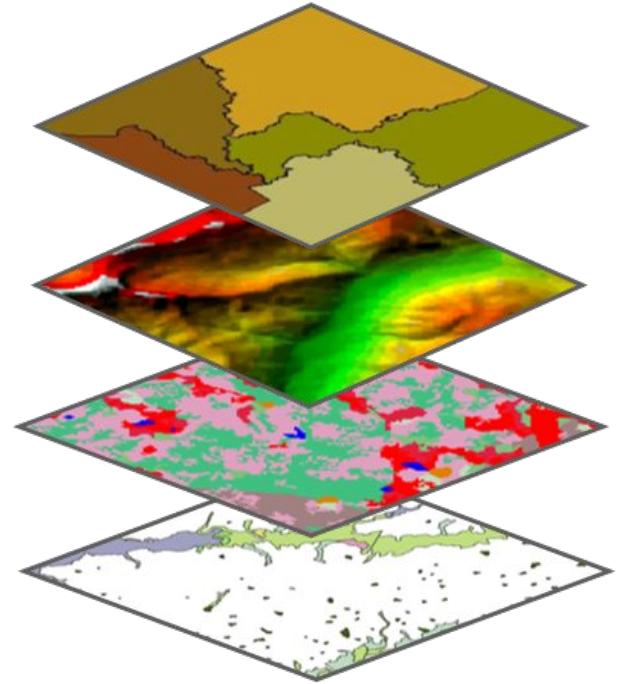
Arctic SDI Geoportal

- A network of networks of data feeds from land, sea, & science communities
- OGC, ISO & IHO standards compliant data feeds
- Functionalities:
→ **Time series** data support
→ Circumpolar place names: Roman, **Syllabics** and Cyrillic characters
→ **6 polar projections**
→ Seamless topographic service
→ **Embedded Maps Wizard** (API)
→ Location Search
→ Metadata Search
→ Map Layers & Coordinate Tool
→ Your Own Maps
→ **Tabular data spatial join**
→ **GeoPortal application (Oskari) is standards based and code is open source**

MODIS Sea Surface Temperature Time Series "is a 4 km resolution global monthly composite based on 1 km daily imagery" (2002-2013)

https://youtu.be/Ytf3ahdvMms?t=111
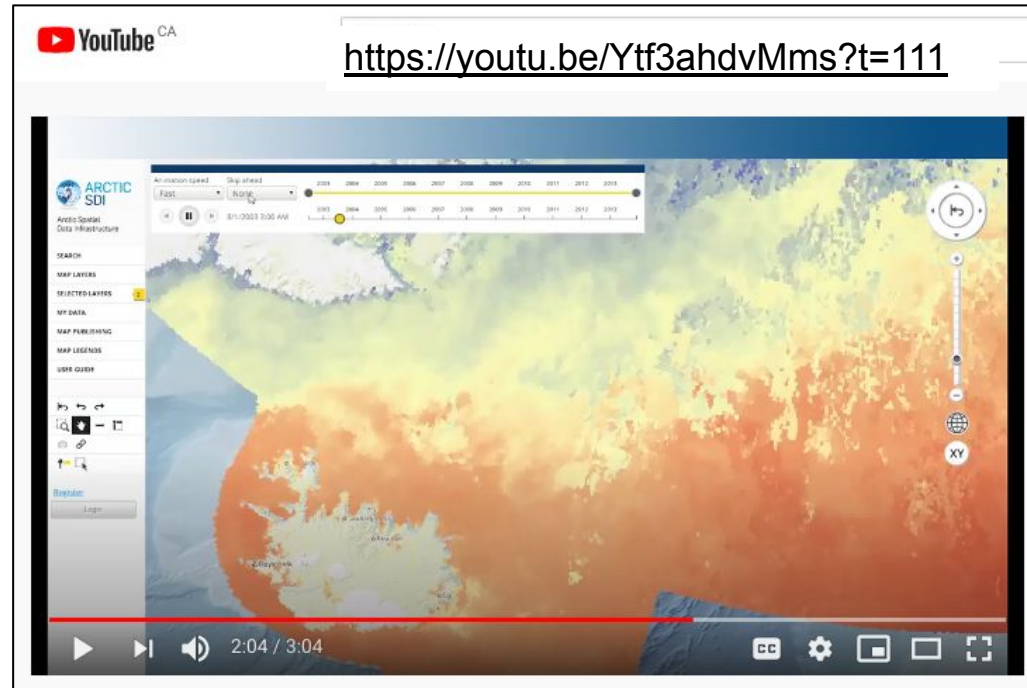
Policy Instruments

- Multilateral MoUs and agreements based voluntary contributions without legal implications
- **User Needs Analysis** rigor, publication, and client engagement
- SDI assessment framework supported by Key Performance Indicators
- Glossary of terms used to minimize multi-lingual, multi-cultural misunderstandings
- Excellent collegiality – agencies contribute based on their strengths and resources
- **Data Policy for the Arctic Council?**

SPATIAL DATA INFRASTRUCTURE (SDI) MANUAL FOR THE ARCTIC

A collective work by the national mapping agencies of the eight Arctic countries: Canada, Finland, Iceland, Norway, Russia, Sweden, United States of America and the Kingdom of Denmark

Version 1.0

September 2016

The SDI Manual for the Arctic describes data management practices and guidelines for efficient monitoring and decision making in the Arctic.

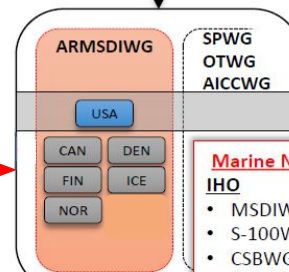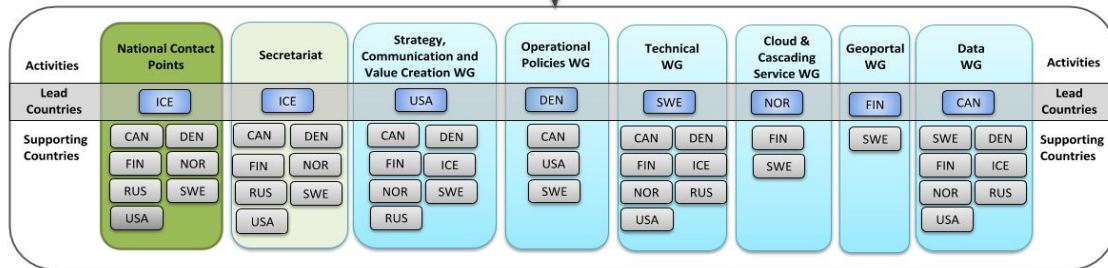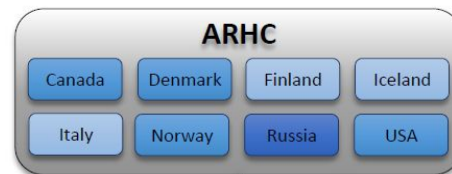GUIDELINES FOR DATA PROVIDERS

From creating to publishing your data – find the answers

Guide

Guidelines >>

for terrestrial/marine data interoperability

Arctic SDI and ARHC Joint Statement of Intent (June 2020)

"The Arctic National Mapping Agencies of the Arctic SDI Board and the Member State Representatives of the Arctic Regional Hydrographic Commission (ARHC) are committed to maintain **a collaborative partnership in order to provide both the terrestrial and marine foundations** in a regional SDI. The collaboration will facilitate bringing land and marine data together in an infrastructure that connects users across domains to the spatial data valued **to support research, planning, and decision making in the Arctic**."

Data WG Activities - *Data and Services*

- Collaborating with International Hydrographic Organization - Arctic Regional Marine Spatial Data Infrastructures Working Group (ARMSDIWG) to Identify and evaluate **marine data** for ingest by Arctic SDI:

  ➢ **Arctic SDI - ARHC Joint Statement of Intent**

  ➢ **Marine ice cover data** to be included in the Geoportal: started.

  ➢ **Prioritised marine services** to be included in the Metadata Catalogue and Geoportal: started.

  ➢ **Marine Gazetteer** was identified and included in the Geoportal: completed.

  ➢ **OGC Marine SDI Pilot**: under development.

… OGC Multidimensional Digital Arctic Pilot? 11

Arctic Spatial Data Pilot – Climate Change Scenarios

- The Arctic Spatial Data Pilot defined **land and sea** climate change scenarios to break down _information management silos_ with technical piloting activities:

  - Videos showcase how standards are deployed for analysis (e.g. wildlife migration patterns, new shipping routes, food security, sea ice age evolution, search and rescue) and predictive modeling (e.g. permafrost loss and slope stabilisation).

  - http://www.opengeospatial.org/projects/initiatives/arcticsdp

- Addressed technology issues to meet the realities of Arctic frontier economies, such as in zero/low bandwidth Internet.

- Socialised Indigenous communities' spatial data needs.

- Standards agencies include governance, processes and networks of highly qualified people.

- Open standards + Open data = Open Science

Automated Arctic Web Services Harvester

The end goal is to maintain a catalogue of data and services relevant to Arctic stakeholders in a manner that is highly cost efficient and automatic.

- Spatineo Inc. has developed a GeoNetwork catalogue that was successfully harvested by the Arctic SDI Metadata Catalogue.
- A new contract was awarded (fall 2019) to Spatineo Inc. to refine the automated harvesting methodology to include relevant Arctic services (filtering) and accurately rank the results.

Catalogues are essential for SDIs

Aggregating information about services and data is essential:

- Reduce duplicated effort, in both data collection and distribution
- Understand what information is available and what needs further collecting / research
- Discovery of relevant data provided outside of the SDI

Without a catalogue, an SDI cannot reach its full potential

Catalogue Maintenance

A catalogue not only needs to be built, but it needs to be maintained. The question of quality & sustainability arises:

- Records need to be added, updated, removed per request
- However not all changes are reported: active maintenance
- Assessment of other factors: QoS, relevancy to the SDI

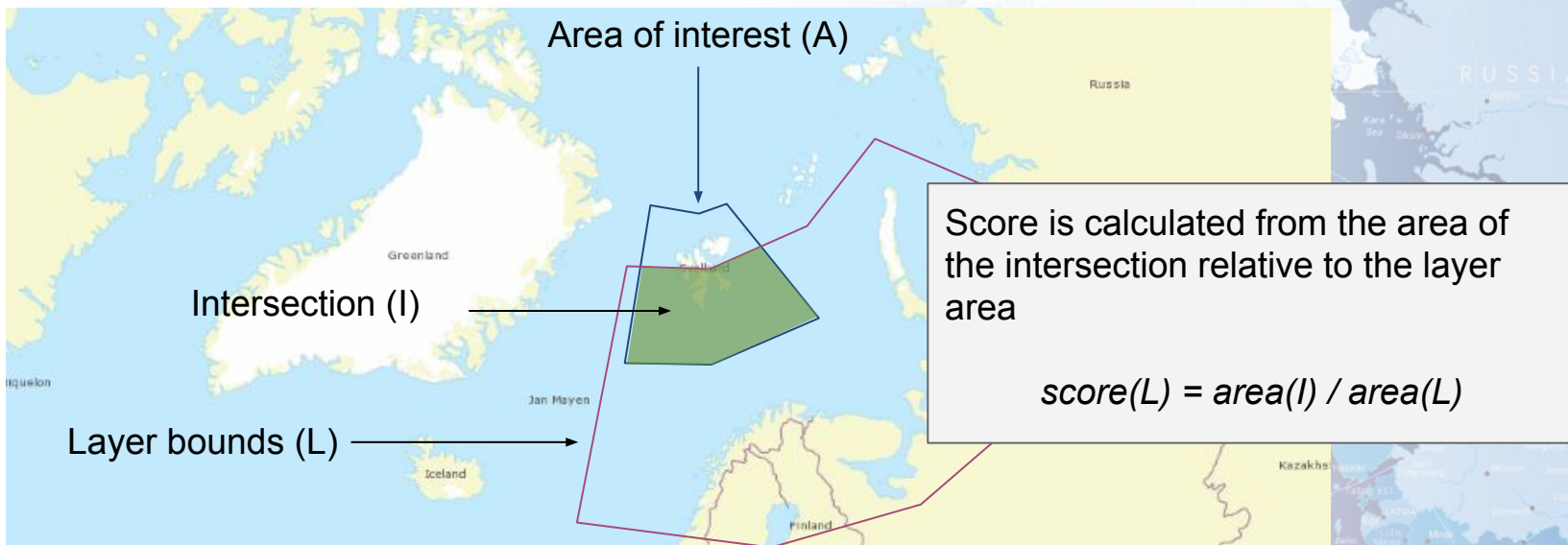This task is better suited for automation instead of humans

=> **Today we are working on making this automation for Arctic SDI**
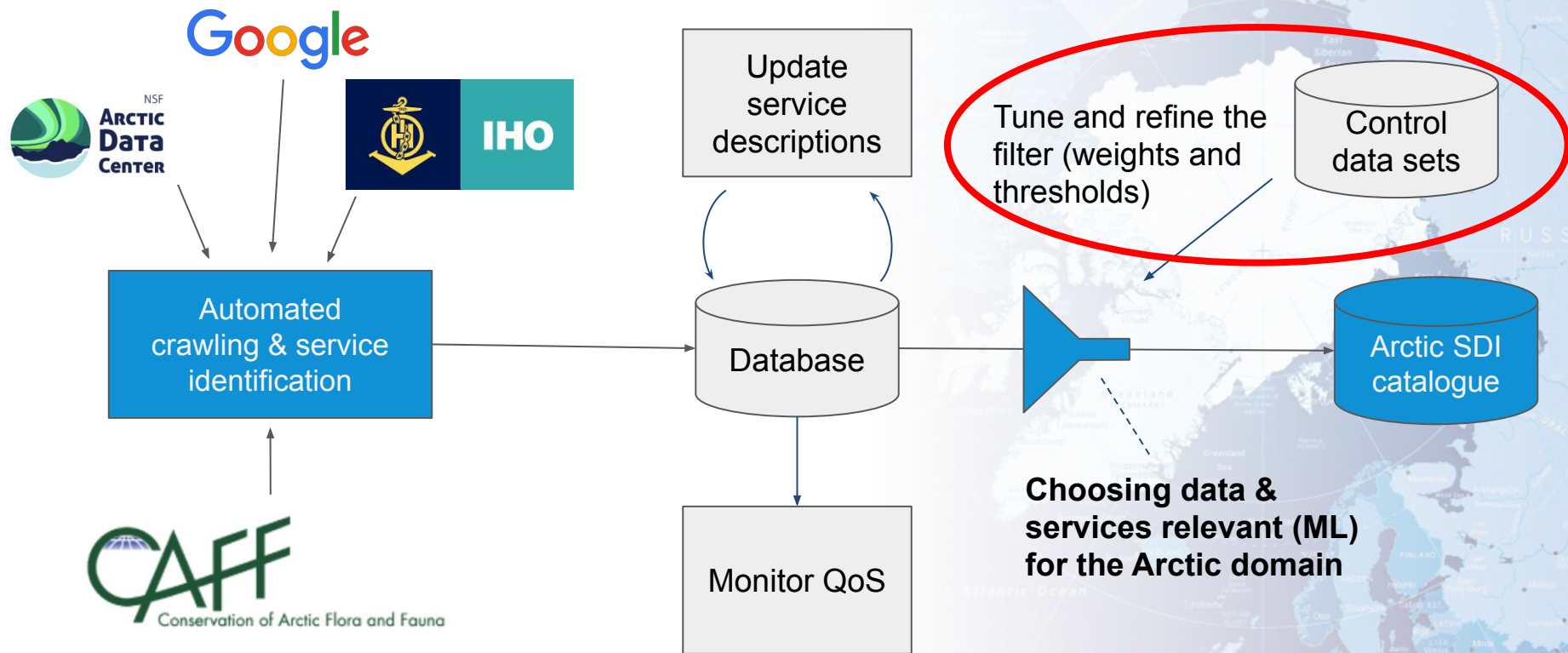
Choosing Relevant Services

Using a combination of textual cues (keywords), API properties (Arctic polar projection support) and spatial extent:

Area of interest (A)

Intersection (I)

Layer bounds (L)

Score is calculated from the area of the intersection relative to the layer area

$$score(L) = area(I) \: / \: area(L)$$

Arctic SDI Harvested Spatineo's Arctic Catalogue
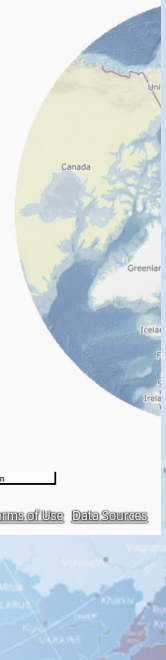
Automated Harvesting - Prototype V.0.1 Results

Spatineo Catalogue - Arctic Services Automatically Harvested	
Services	Layers
7,049	316,086

Existing Arctic SDI Metadata Catalogue Services (Manually Harvested): **4,064**

Examples of Newly Discovered Services:

- World Ozone and Ultraviolet Radiation Data Centre (WOUDC)
http://geo.woudc.org/ows?SERVICE=WMS&REQUEST=GetCapabilities

- Global Biodiversity Information Facility (taxon occurrence data) http://ogc.gbif.org:80/wms

In Summary

We Are All Stakeholders

- Arctic SDI brings together trusted location data and geospatial data expertise.

- Important datasets over the Arctic are produced and distributed by many stakeholders.

Source: blogs.vmware.com

- The glue of successful regional SDI implementation is governance and standards, which enables:

- Ecosystem-based analysis with seamless sharing of data across jurisdictions and organizations.

- Arctic SDI is providing shared tools and information management practices to Arctic Council WGs to break down silos.