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Geo-Information Management

Arctic SDI Evaluation and Benchmarking

(2015-2016)

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Prepared for: Natural Resources Canada

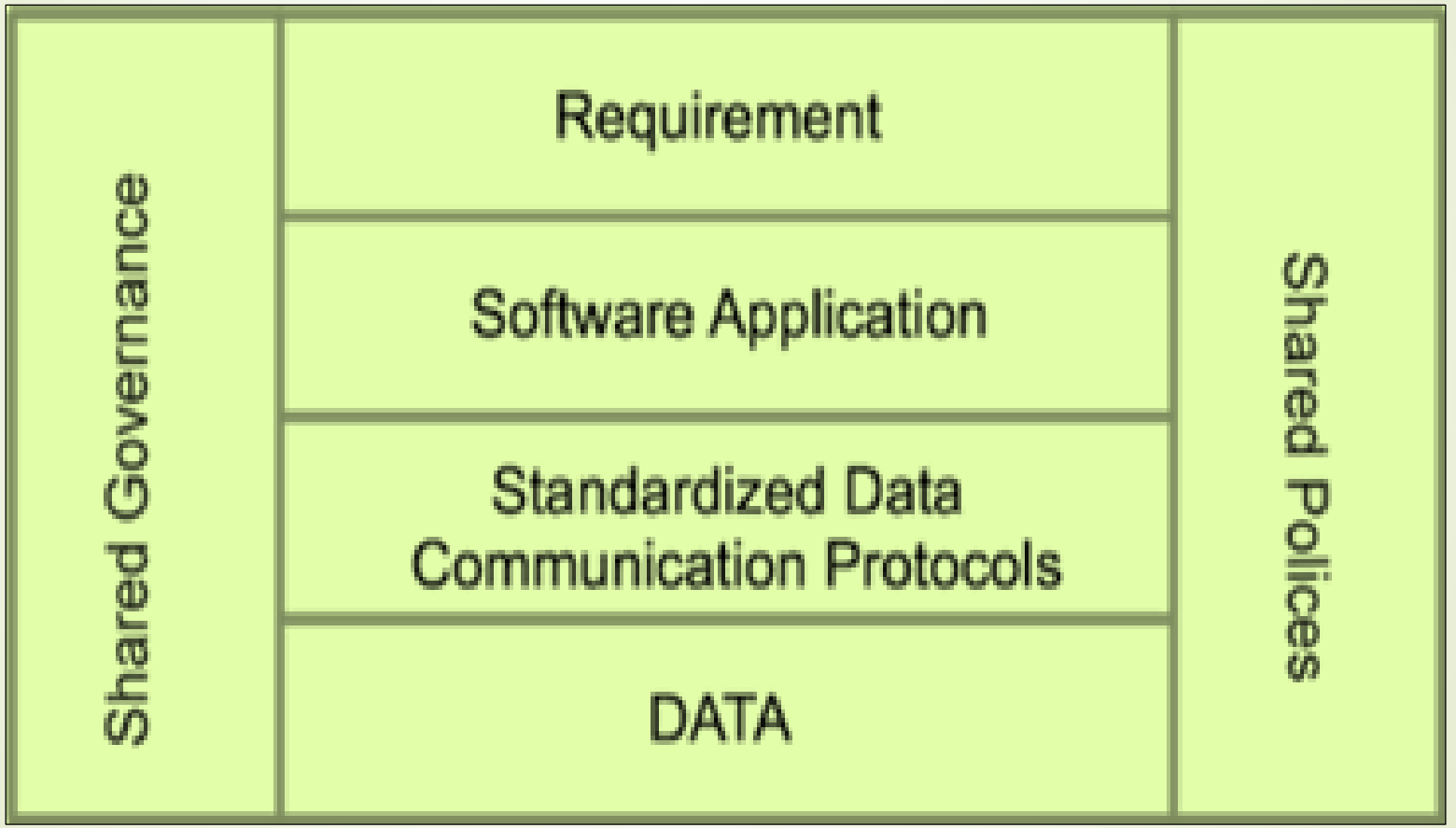
Presentation Outline

- Introduction to the concept of an SDI
- The Arctic SDI
- The need for SDI evaluation
- The Arctic SDI Evaluation
- The Arctic SDI Evaluation Framework
- Results of the Arctic SDI Evaluation
- Implementation Priority Areas
- Bench-marking the Arctic SDI
- Summary

Spatial Data infrastructure (SDI)

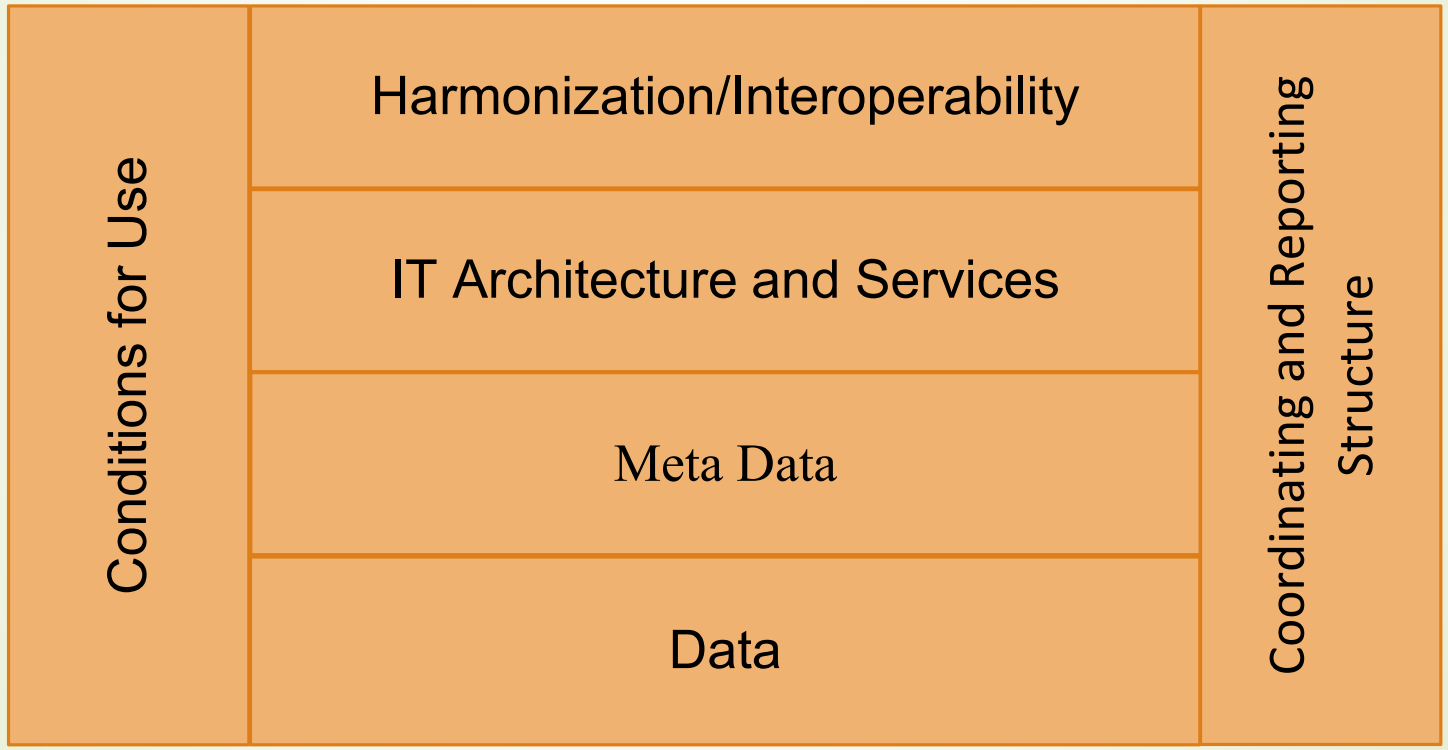
A dynamic, multi-dimensional integration of **Data, Standards, Policies, Technology** and **Human Resources** aimed at creating an environment to support the ***discovery, assessment, access, dissemination, sharing, and re-use of Geospatial Information.***

Examples of the integration of the components by Arctic SDI Stakeholder Nations



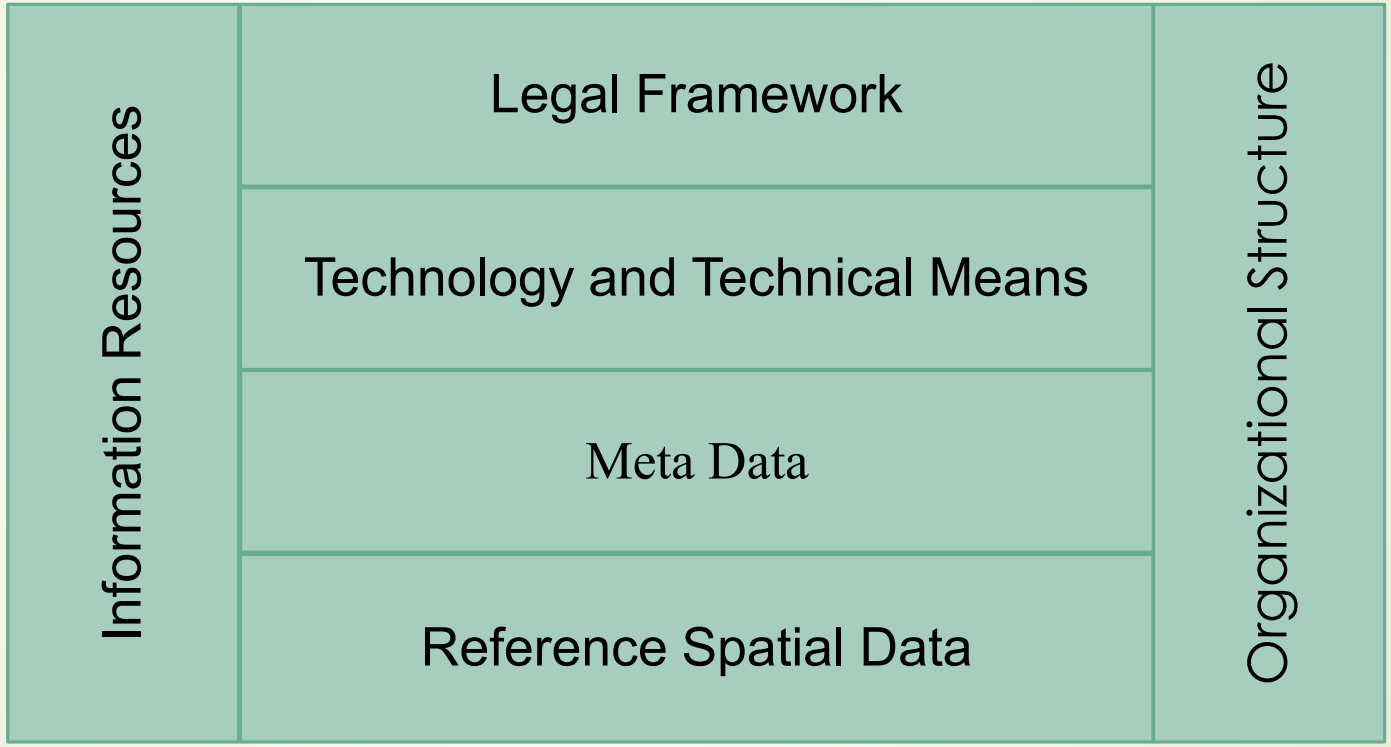
Canada:

Examples of the integration of the components by Arctic SDI Stakeholder Nations



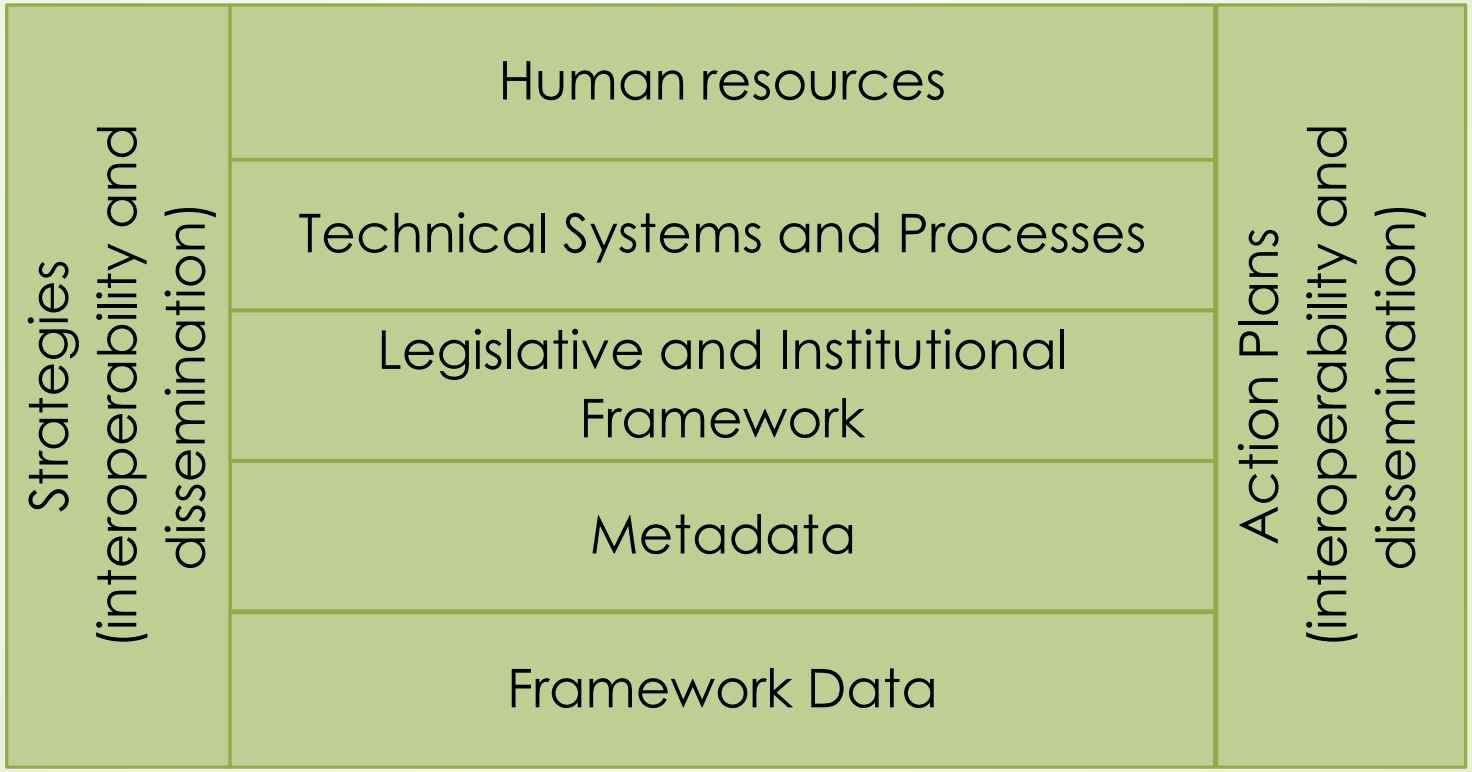
Denmark: http://www.ddl.org/thedanishway/spatial_09.pdf

Examples of the integration of the components by Arctic SDI Stakeholder Nations



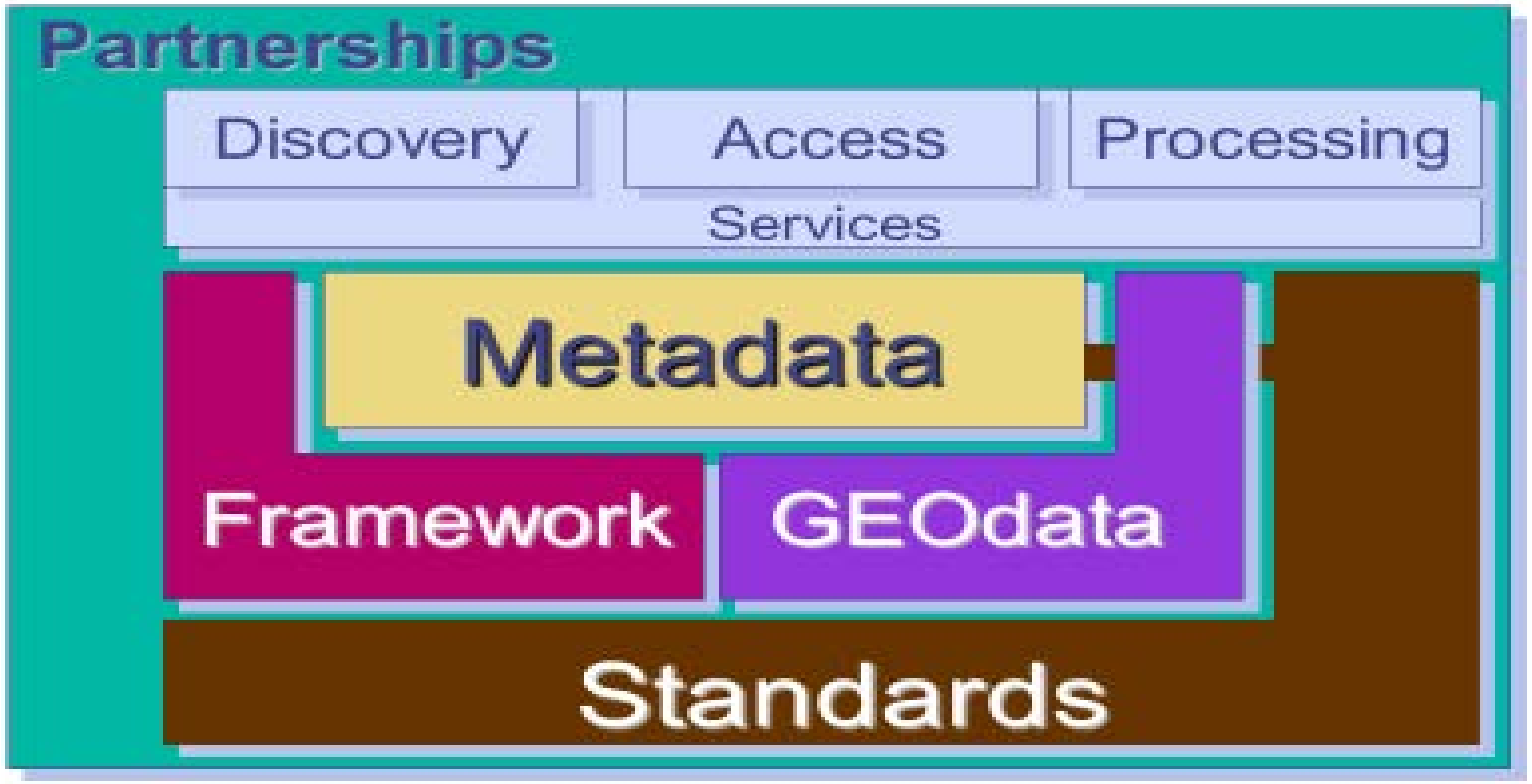
Russia: www.gisa.ru/file/file820.doc

Examples of the integration of the components by Arctic SDI Stakeholder Nations



Sweden: http://inspire.ec.europa.eu/reports/stateofplay2010/rcr09SEv111.pdf

Examples of the integration of the components by Arctic SDI Stakeholder Nations



USA：https://www.fgdc.gov/library/presentations/documents/NSDI09.ppt

The Arctic SDI

Facilitating monitoring and decision making across the Arctic Community

Arctic SDI

The Arctic SDI

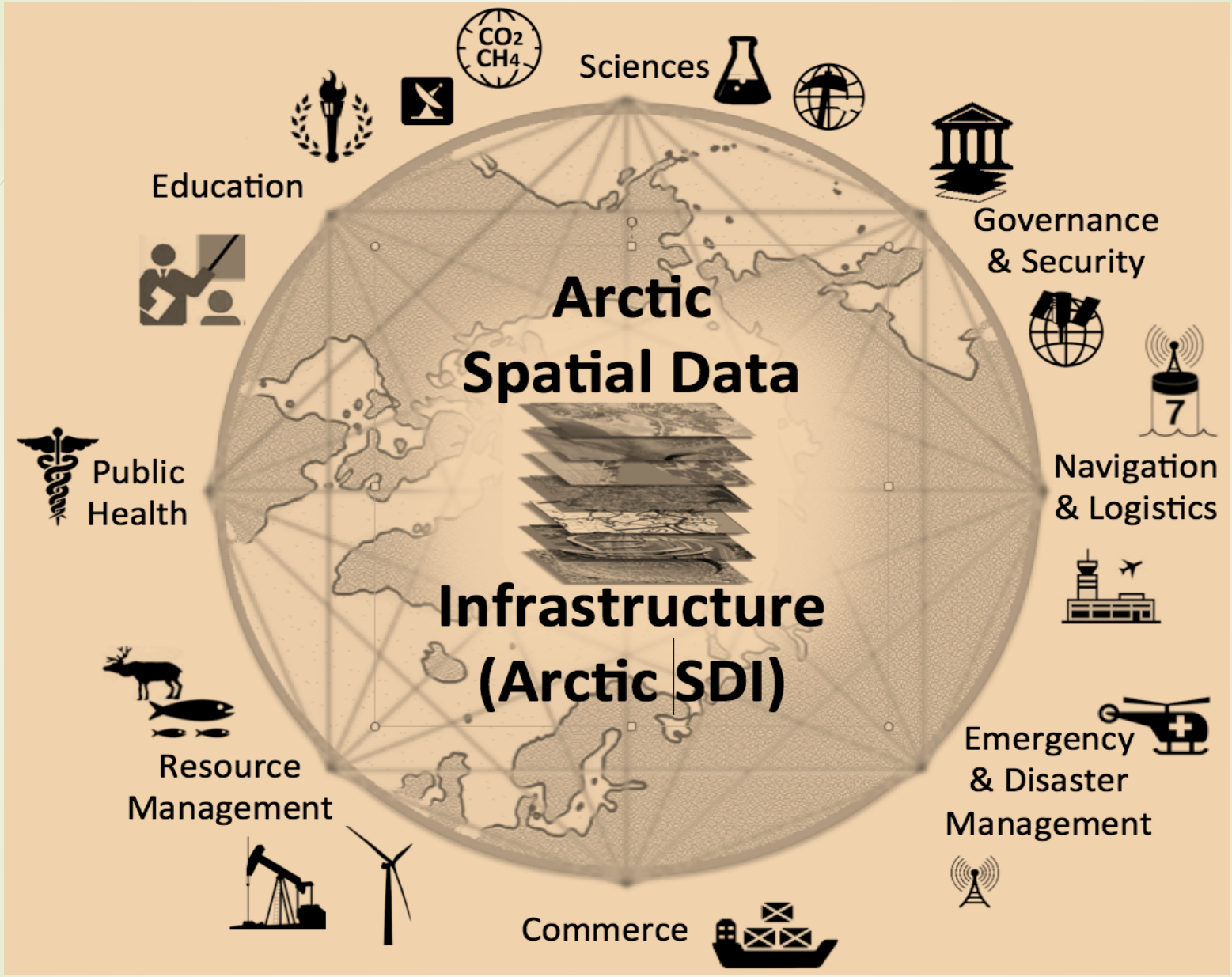
- A voluntary Collaboration amongst the mapping agencies of the Arctic Stakeholders' Countries and the Arctic community
- Officially launched in 2011 after years of discussion and planning

The Arctic SDI

- **Aim**:

"***To provide*** politicians, governments, policy makers, scientists, private enterprises and citizens in the Arctic ***access to geographically related Arctic data***, digital maps and tools to facilitate monitoring and decision making."

http://arctic-sdi.org/index.php/about-arctic-sdi/



Arctic SDI Providing the Community with Access to Reliable Arctic Geospatial Information

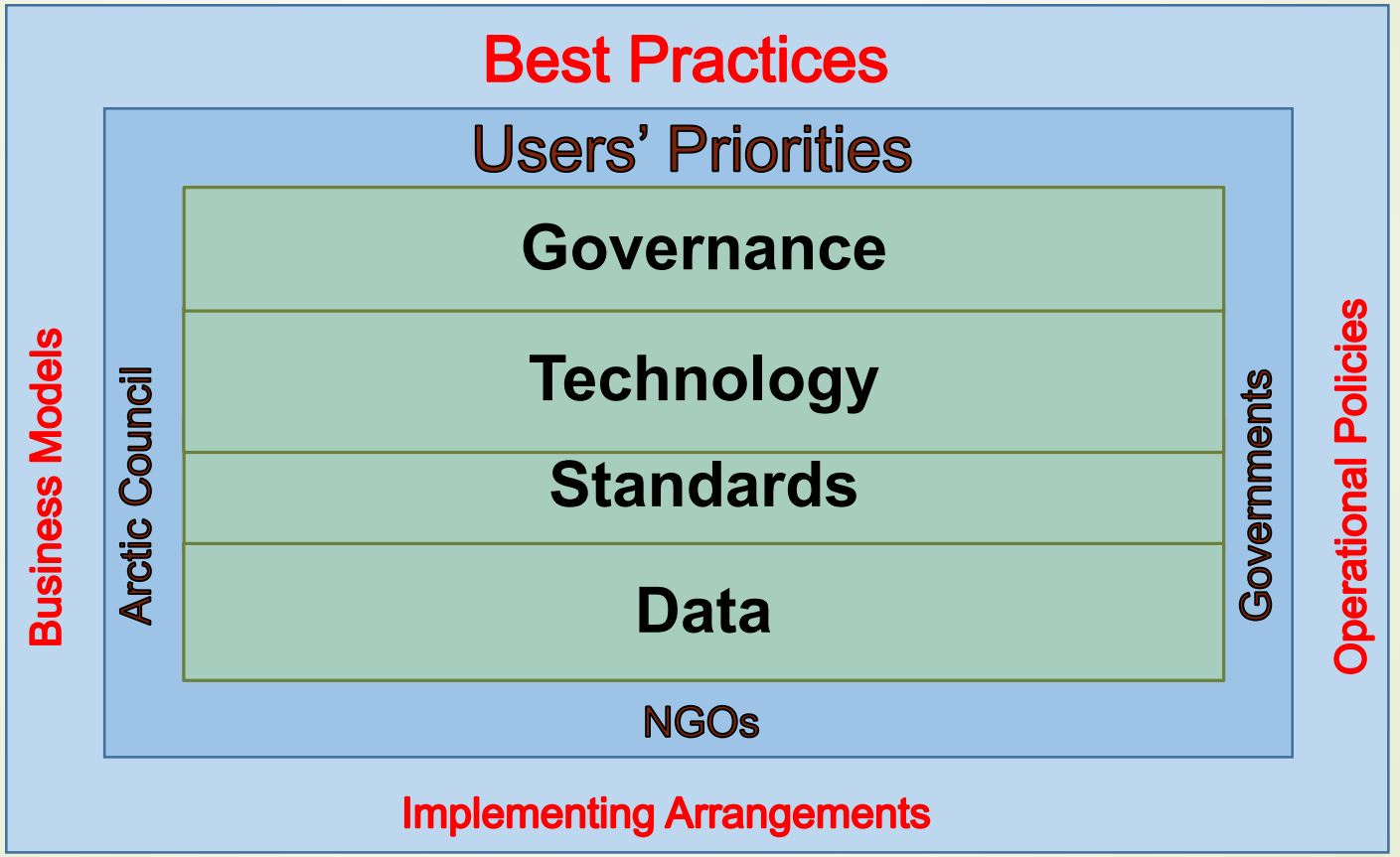
(From: OGC, 2016)

The Arctic SDI Cont'd

- **Vision**: "…facilitate access to geospatial information in support of social, economic, environmental, monitoring, decision-making and other needs in the Arctic." **(Arctic SDI WGS, 2015)**

- **Mission**: "…to promote cooperation and development of a Spatial Data Infrastructure that enables discovery, visualization, access, integration and sharing of Arctic geospatial data, while pursuing best data management practices." **(Arctic SDI WGS, 2015)**

Aim will be achieve through the Integration of the following key components



Arctic SDI Reference Model

The Need for SDI Evaluation

You can't manage what you don't measure

SDI Evaluation Brief History

- Tremendous growth since 2006 in the number and different types of SDI evaluations used across the World
- Evolved through the need to measure, justify and report on the status of SDIs
- Evaluation generates key information on the current status of an SDI and whether or not an SDI is achieving its goals and objectives

You can't manage what you don't measure

Key Benefits of an SDI Evaluation

Pros	Cons
▪ Assist in the identification of key components of the SDI	▪ Can be costly to develop and implement the evaluation framework
▪ Provide implementation information (e.g., what exist and where gaps are)	
▪ Provide information on areas that are working and those that need improvement	▪ Require knowledge of assessment in particular SDI evaluation
▪ Provide benchmarking information	
▪ Provide information to demonstrate accountability	▪ Additional time demand on SDI coordinators and stakeholders
▪ Provide information on whether or not the SDI is achieving its goals and objectives	
▪ Provide information to support capacity building	
▪ Provide information to support future development of the SDI	▪ Evaluation information are sometimes ignored or misinterpret
▪ Provide performance information from both the stakeholders and users perspective	
▪ Provide information to assist in demonstrating the benefits the outcomes and impacts of an SDI is having on the society	
▪ Provide information that can assist in the development of best practices" and "lessons learned	

SDI Evaluation Methodologies

Three Distinct Methodologies Evolved

- ***Readiness Assessment:*** a fact-gathering exercise carried out to determine the as-is status of an SDI;
- ***Performance Assessment:*** goes beyond identifying whether or not key components or desired components are in place; seek to determine the level to which selected/key components are performing;
- ***Multi-view Assessment:*** consists of nine SDI assessment methodologies from which an SDI practitioner can select the best methodology(s) that will facilitate the most effective evaluation of the SDI from the required viewpoint.

Examples of countries who have used and benefited from SDI Evaluation

- **Canada:** *Evaluated the performance of the Canadian Geospatial Data Infrastructure;*

  2015 Assessment of the Canadian Geospatial Data Infrastructure:

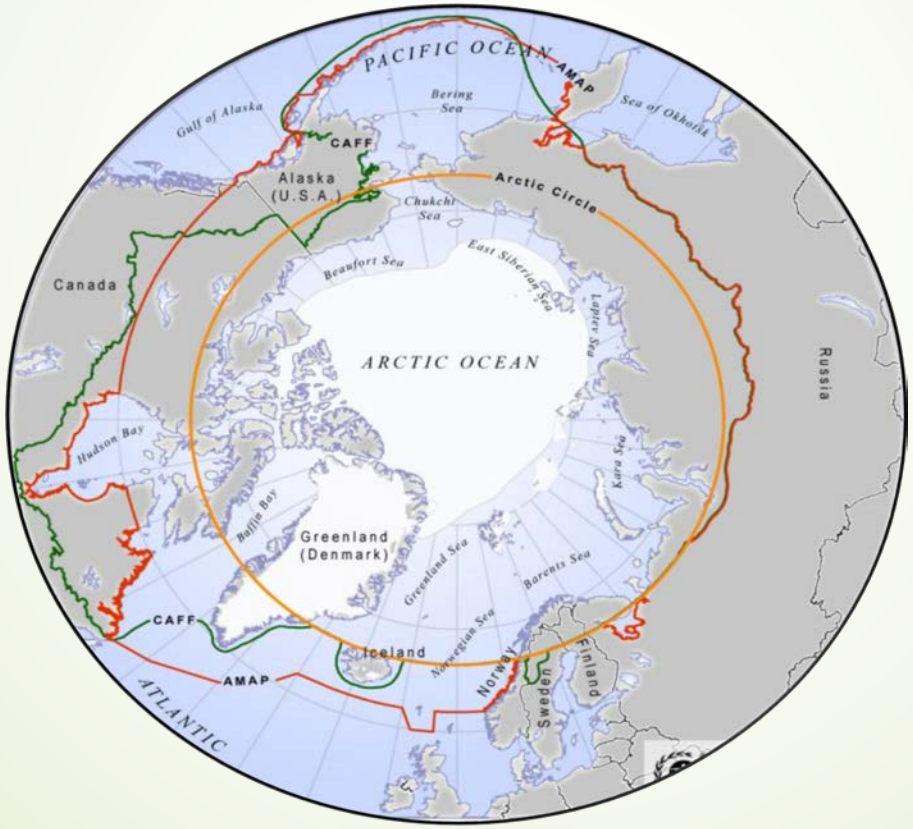
  http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=297880

  2012 Assessment Report for the Canadian Geospatial Data Infrastructure - Executive Summary and Case Studies:

  http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=295667

- ***European Member States:*** Use the INSPIRE State of Play monitor and report on the status of their SDIs; http://inspire.ec.europa.eu/index.cfm/pageid/6/list/4
- ***Sweden:*** Used the Balanced Score Card to evaluate and monitor three components of their SDI; www.ijsdir.jrc.ec.europa.eu/index.php/ijsdir/article/download/192/292
- ***The USA***: Used COGO Assessment Framework to evaluate the status of the Framework dataset of their SDI;
  http://www.cogo.pro/uploads/COGO-Report_Card_on_NSDI.pdf

Why an Arctic SDI Evaluation?



Arctic SDI

Purpose of the Cursory Arctic SDI Evaluation

- Provide a snapshot of the current status of the Arctic SDI;
- Inform Arctic Executives and stakeholders on the implementation levels of the key components and sub-components of the Arctic SDI;
- To identify areas that are functioning and areas that require additional attention;

Purpose of the Cursory Arctic SDI Evaluation

- Identify whether or not the Arctic SDI is achieving its main goals and objectives;
- Benchmark the Arctic SDI development against other SDI development; and
- NRCan's contribution to SDI development (inclusive of the Arctic SDI)

The Arctic SDI Evaluation

A **Cursory** review of the components of the Arctic SDI

The Evaluation Methodology

- The Arctic SDI Evaluation was carried out over two phases
- Both phases will involve stakeholders participation
- **Phase 1**: The Development of an Evaluation Framework
- **Phase 2**: The Performance of a Cursory Evaluation

Arctic SDI Evaluation Phase 1

The Development of the Evaluation Framework

- Project Mobilization and Kick-off
- Analysis of SDI Assessment Methodologies:
  - Literature and Desk-top Review
  - Comparison of the Methodologies
  - Report on SDI Assessment Methodologies

Arctic SDI Evaluation Phase 1 Cont'd

The Evaluation Framework

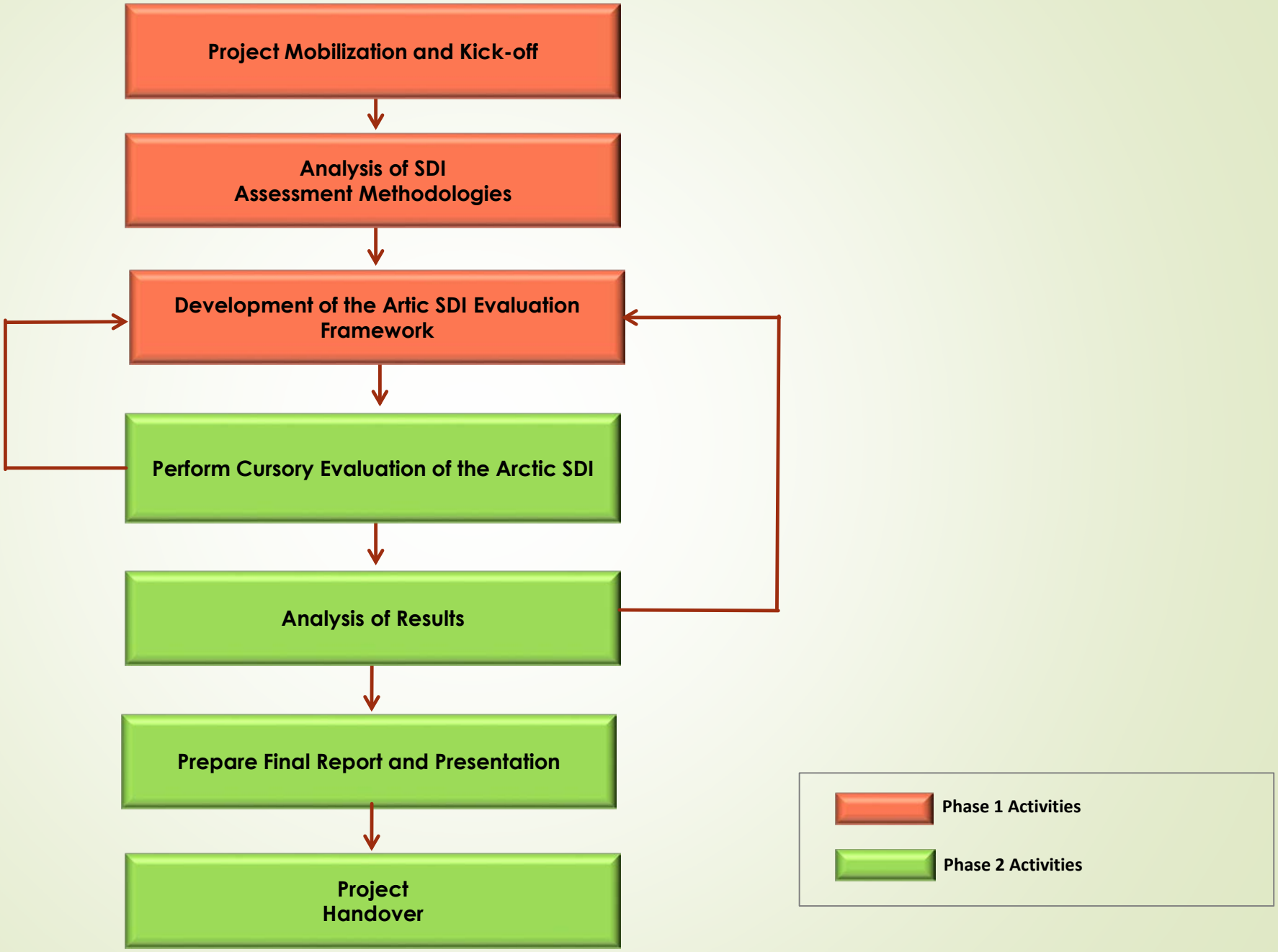
- Development of the Artic SDI Evaluation Framework:
  - Literature and Desk-top Review
  - Interview with key stakeholders
  - Iterative Development of the Evaluation Framework
  - Review of the Evaluation Framework by key Stakeholders
  - Finalize the Evaluation Framework

Arctic SDI Evaluation Phase 2

Application of the Evaluation Framework

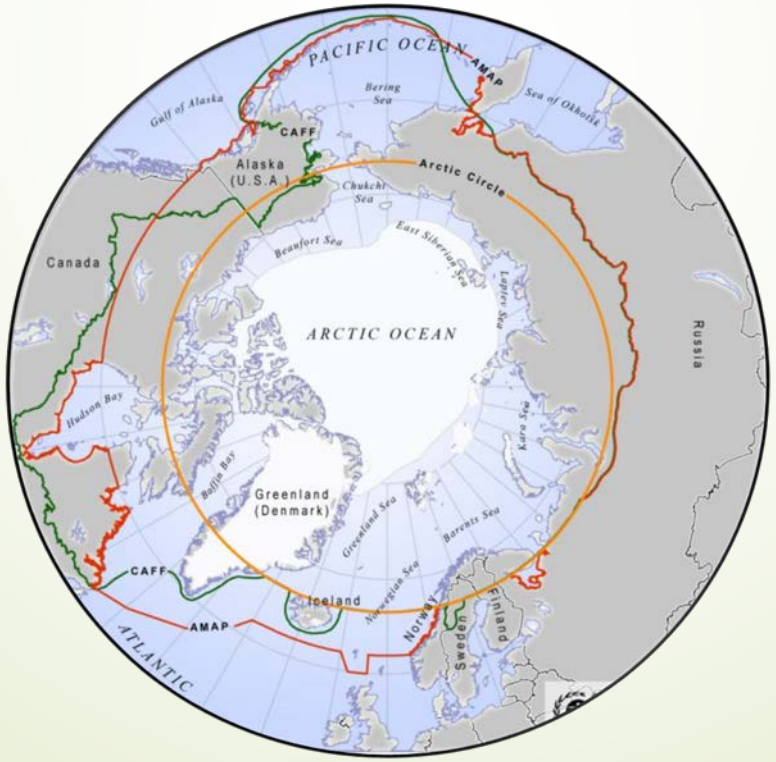
- Cursory Evaluation of the Arctic SDI:
  - Literature and Desk-top Review
  - Interview with key stakeholders
  - Review of the Arctic Geoportal
- Analysis of Evaluation Results
- Prepare Reports and Presentations on the Evaluation

Proposed Work Plan for the Arctic SDI Evaluation



The Arctic SDI Evaluation Framework

Developed specifically for the Arctic SDI environment



Arctic SDI

The Arctic SDI Evaluation Framework

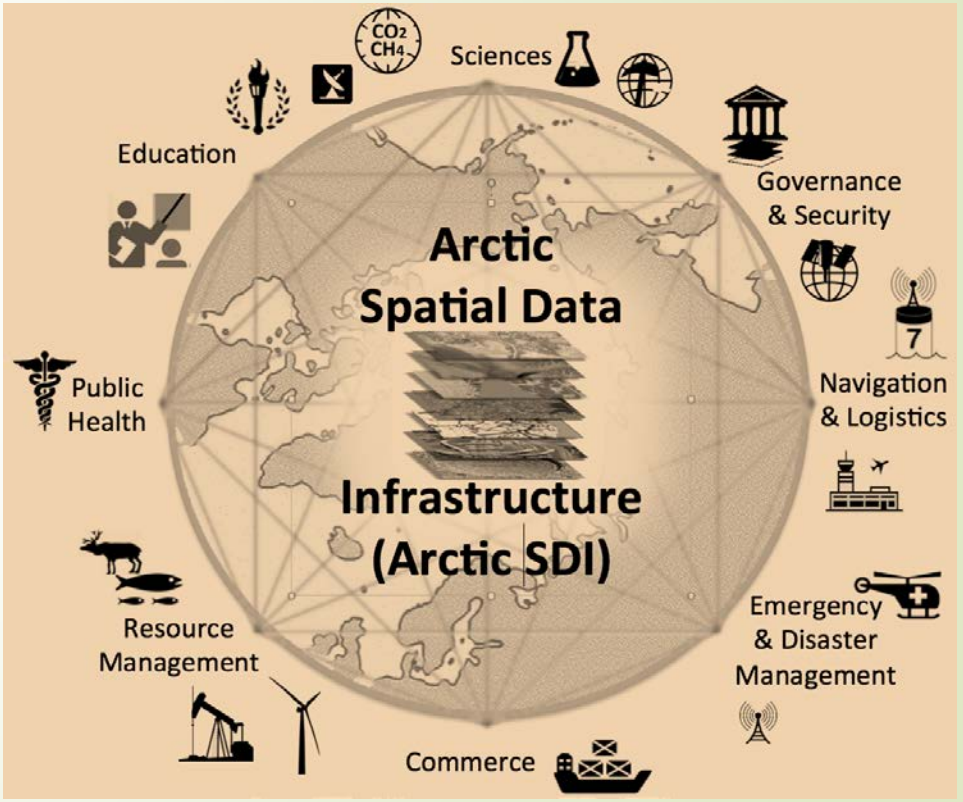
Designed to collect the information necessary to evaluate:

- The Readiness of the Arctic SDI
  - The current status of the SDI
  - The components implemented
  - The components being implemented
  - The next steps in the implementation of key components

The Arctic SDI Evaluation Framework Cont'd

Identified seven key components of the Arctic SDI to be evaluate :

- Organizational Readiness
- Capacity Building Environment
- Information Infrastructure
- Arctic SDI Geoportal
- Arctic Circle Geoportals
- Data and Information Environment
- Standards



The Arctic SDI Evaluation Framework Cont'd

Key sub-components of Organizational Readiness:

- Governance
- Strategy
- Human Resources
- Community Development
- Performance Management
- Authoritative Framework
- Funding Arrangements
- Management

The Arctic SDI Evaluation Framework Cont'd

Key sub-components of the Capacity Building Environment:

- Outreach
- Capacity Strengthening

The Arctic SDI Evaluation Framework Cont'd

Key sub-components of the Information Infrastructure Environment:

- Reliable Infrastructure
- Technical Infrastructure Transfer Environment

The Arctic SDI Evaluation Framework Cont'd

Key sub-components of the Arctic SDI Geoportal:

- Access
- Data Transmission
- Services
- Geoportal development

The Arctic SDI Evaluation Framework Cont'd

Key sub-components of the Arctic Circle Geoportal:

- National Geoportals
- Community Geoportals

The Arctic SDI Evaluation Framework Cont'd

Key sub-components of the Data and Information Environment:

- Reference Datasets
- Relevant Thematic Datasets
- Non-spatial Information
- Community Geoportals

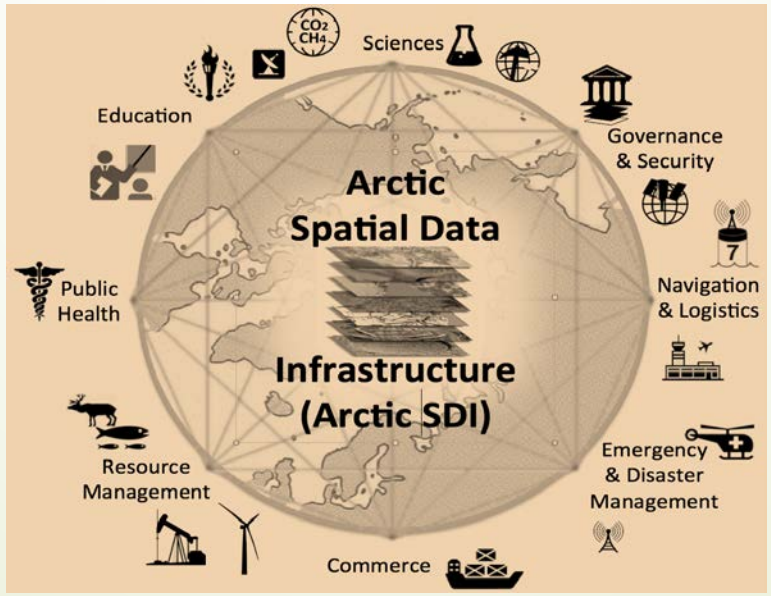
The Arctic SDI Evaluation Framework Cont'd

Key sub-components of the Standards Environment:

- Data Standards
- Web Services Standards
- Data Exchange Standards
- Technology Standards

Framework Outline

Snapshots of key areas of the Framework used to evaluate the Arctic SDI



		Arctic SDI Evaluation Framework: SDI Readiness				
		This Framework will assist in establishing the level to which the Arctic SDI is providing an enabling environment that facilitates discovery, access, dissemination, integration, reuse and interoperability of Geospatial Information to the Arctic Community and the wider society				
Environment	**Component**	**Sub-Component**	**Output/Outcome**	**Intent of the indicator**	**Indicator/Metric**	**Evaluation Methodology**
Readiness	**Organizational Readiness**	Governance				
		Strategy				
		Human Resources				
		Community Development				
		Performance Management				
		Authoritative Framework				
		Funding Arrangements				
		Management				
	Capacity Building	An environment exist to support the growth of the concept of data sharing, the usage of the SDI, and the application of geospatial information to informed decision-making				
		Outreach				
		Capacity Strengthening				
	Information Infrastructure	Adequate Infrastructure exist to facilitate efficient access and dissemination of geospatial information				
		Reliable Infrastructure				
		Technical Infrastructure Transfer Environment				

		Arctic SDI Evaluation Framework: SDI Readiness				
		This Framework will assist in establishing the level to which the Arctic SDI is providing an enabling environment that facilitates discovery, access, dissemination, integration, reuse and interoperability of Geospatial Information to the Arctic Community and the wider society				
Environment	**Component**	**Sub-Component**	**Output/Outcome**	**Intent of the indicators**	**Indicator/Metric**	**Evaluation Methodology**
Readiness	**Arctic SDI Geoportal**	The Arctic Geoportal facilitates the discovery, viewing, assessing, analysing, and downloading of geospatial information				
		Access				
		Data Transmission				
		Services				
		Geoportal development				
	Arctic Circle Geoportals	National Geoportals				
		Community Geoportals				
	Data and Information Environment	The Arctic SDI facilitates access to current, reliable and relevant data				
		Reference Datasets				
		Relevant Thematic Datasets				
		Non-spatial Information				
	Standards	Standards are in place and promoted to support geospatial interoperability				
		Data Standards				
		Web Services Standards				
		Data Exchange Standards				
		Technology Standards				

An Example of a Completed Row of the Framework

Environment	Component	Sub-Component	Output/Outcome	Intent of the indicators	Indicator/Metric	Evaluation Methodology
Readiness	**Organizational Readiness**	**Strategy**	An Arctic SDI Strategic Plan developed and maintained in alignment with the vision and priorities of the stakeholders and interest groups.	To identify if a strategic plan was developed for the Arctic SDI and the extent to which such a strategic plan reflects the vision of all involved. The indicator should also identify whether or not the strategic plan will be reviewed in a timely manner.	1. Is there a strategic plan for the Arctic SDI? 2. The strategic plan provides a clear vision and direction for the SDI; 3. The strategy is in alignment with the long-term vision and priorities of the stakeholders and interest groups; 4. There is a mandated timeline for the review of the strategic plan; 5. The strategic plan clearly articulates the need for an implementation plan and program design based on users and stakeholders needs; 6. The strategy is in alignment with the strategy of the Arctic Council.	1. Literature review of SDI documents; 2. Review and analysis of the strategic plan; 3. Literature review and interviews with stakeholders; 4. Literature review of SDI documents; 5. Review and analysis of the strategic plan; 6. Review of the SDI's strategic plan and the Arctic Council's strategic plan.

Environment	Component	Sub-Component	Output/Outcome	Intent of the indicator	Indicator/Metric	Evaluation Methodology
Readiness	Organizational Readiness	Governance				
		Strategy				
		Human Resources				
		Community Development				
		Performance Management				
		Authoritative Framework				
		Funding Arrangements				
		Management				
	Capacity Building	An environment exist to support the growth of the concept of data sharing, the usage of the SDI, and the application of geospatial information to informed decision-making				
		Outreach				
		Capacity Strengthening				
	Information Infrastructure	Adequate Infrastructure exist to facilitate efficient access and dissemination of geospatial information				
		Reliable Infrastructure				
		Technical Infrastructure Transfer Environment				
	Arctic SDI Geoportal	The Arctic Geoportal facilitates the discovery, viewing, assessing, analysing, and downloading of geospatial information				
		Access				
		Data Transmission				
		Services				
		Geoportal development				
	Arctic Circle Geoportals	National Geoportals				
		Community Geoportals				
	Data and Information Environment	The Arctic SDI facilitates access to current, reliable and relevant data				
		Reference Datasets				
		Relevant Thematic Datasets				
		Non-spatial Information				
	Standards	Standards are in place and promoted to support geospatial interoperability				
		Data Standards				
		Web Services Standards				
		Data Exchange Standards				
		Technology Standards				

Results of the Evaluation

An overview of some of the key finding to date

Key Results

- In general, the key components expected for the operational phase of an SDI development are in place;
- Some components require additional work to improve on the basic frameworks that were implemented;
- As expected the implementation of some components are more advanced than others;
- For the Arctic SDI to grow and mature to meet the needs of the users a number of issues associated with the implementation of the key components will have to be addressed.

Organizational Readiness Results

Component	Sub-Component	Implementation Level
Organizational Readiness	Governance	Major implementation completed
	Strategy	Implementation completed
	Human Resources	Component actively being implemented
	Community Development	Component actively being implemented
	Performance Management	Early phase of implementation
	Authoritative Framework	Early phase of implementation
	Funding Arrangements	Component actively being implemented
	Management	Early phase of implementation
Current Implementation Status of the Organizational Readiness Component		***Component actively being implemented***

Capacity Building Results

Component	Sub-Component	Implementation Activities	Implementation Level
Capacity Building	Communication and Outreach	A communication and outreach program is currently being design by the Communication Working Group. A key communication and outreach tool implemented to-date is the Arctic SDI website.	Early phase of implementation
	Capacity Strengthening	No capacity strengthening program developed. However, the Arctic SDI has worked with CAFF on structuring their data collection techniques to support data sharing.	Early phase of implementation
Current Implementation Status of the Capacity Building Component			***Early phase of implementation***

Information Infrastructure

Component	Sub-Component	Implementation Activities	Implementation Level
Information Infrastructure	Reliable Infrastructure	Reliable infrastructures that meets international standards are in place to support the functions of the Arctic SDI. The Arctic SDI utilizes the infrastructure of the key stakeholders.	Implementation completed
	Technical Infrastructure Transfer Environment	Within the Arctic SDI a security sound technical environment exist for the management of geospatial information. That is, all technology platforms and processes are compliant with security best practice.	Implementation completed
Current Implementation Status of the Information Infrastructure Component			***Implementation completed***

Arctic SDI Geoportal

Component	Sub-Component	Implementation Activities	Implementation Level
Arctic SDI Geoportal	Access	The access sub-component of the geoportal is well developed. Five of the six indicators used to evaluate this sub-component were achieved.	Implementation completed
	Data Transmission	Currently the geoportal does not transmit (download or upload) geospatial data. That is, shape files cannot be downloaded. Other files e.g., CSWs can be transmitted.	Early phase of implementation
	Services	The Oskari software implemented on the geoportal consist of a number of tools capable of performing the services normally required of a geoportal. In the case of the Arctic SDI a number of these tools are functional. An example is the map publishing tool which facilitates the making of embedded maps. The decision to make other tools functional will be dependent on the results of the users' needs survey.	Implementation completed
	Geoportal development	An environment exist for the development of the geoportal that follows best practice and encapsulate the feed-back of stakeholders. A test area has been created where stakeholders can go to test the latest addition to the geoportal and provide feedback before these additions are permanently implemented.	Implementation completed
Current Implementation Status of the Arctic Geoportal			***Major implementation completed***

Arctic Circle Geoportals

Component	Sub-Component	Implementation Activities	Implementation Level
Arctic Circle Geoportals	National Geoportals	Currently there are eight national geoportal within the Arctic Community. These geoportals are not directly linked to the Arctic SDI geoportal. However, data are used from these portal to create the Arctic SDI Background Map.	Early phase of implementation
	Community Geoportals	There are a number of community geoportal across the Arctic. These geoportals are not directly linked to the Arctic SDI geoportal. However, the Arctic SDI does provide access to selected data from CAFF's geoportal.	Early phase of implementation
Current Implementation Status of the Arctic Circle Geoportals			***Early phase of implementation***

Data and Information Environment

Component	Sub-Component	Implementation Activities	Implementation Level
Data and Information Environment	Reference Datasets	The Technical Working group is currently working with the stakeholders to define the reference datasets for the Arctic SDI. An output of this work is the Arctic Thematic/Background Map. Still a lot of work to be done on this component.	Component actively being implemented
	Relevant Thematic Datasets	The community is yet to define the relevant thematic datasets. The users' need survey when completed will greatly assist in defining the relevant datasets. Some CAFF thematic dataset currently accessible through the Arctic SDI.	Early phase of implementation
	Non-spatial Information	The community is yet to define the categories or types of non-spatial information which will be accessible through the Arctic SDI.	Early phase of implementation
Current Implementation Status of the Data and Information Environment			***Early phase of implementation***

Data and Information Environment

Component	Sub-Component	Implementation Activities	Implementation Level
Standards	Data Standards	The technical Working Group is currently working on standards for the harmonization of data. Metadata standards have been agreed upon but not yet published.	Component actively being implemented
	Web Services Standards	Web services standards developed (based on international standards) and agreed upon by the key stakeholders. The standards are yet to be published, however, most key stakeholders have adopted the standards.	Major implementation completed
	Data Exchange Standards	Data exchange standards developed and adopted by most of the key stakeholders. Others are still working on implementing these standards.	Major implementation completed
	Technology Standards	Technology standards based on international standards have been implemented.	Implementation completed
Current Implementation Status of the Standards Component			***Major implementation completed***

Summary of the Results

Component	Implementation level
Organizational Readiness Component	Component actively being implemented
Capacity Building	Early phase of implementation
Information Infrastructure	Implementation completed
Arctic Geoportal	Major implementation completed
Arctic Circle Geoportals	Early phase of implementation
Data and Information Environment	Early phase of implementation
Standards	Major implementations completed

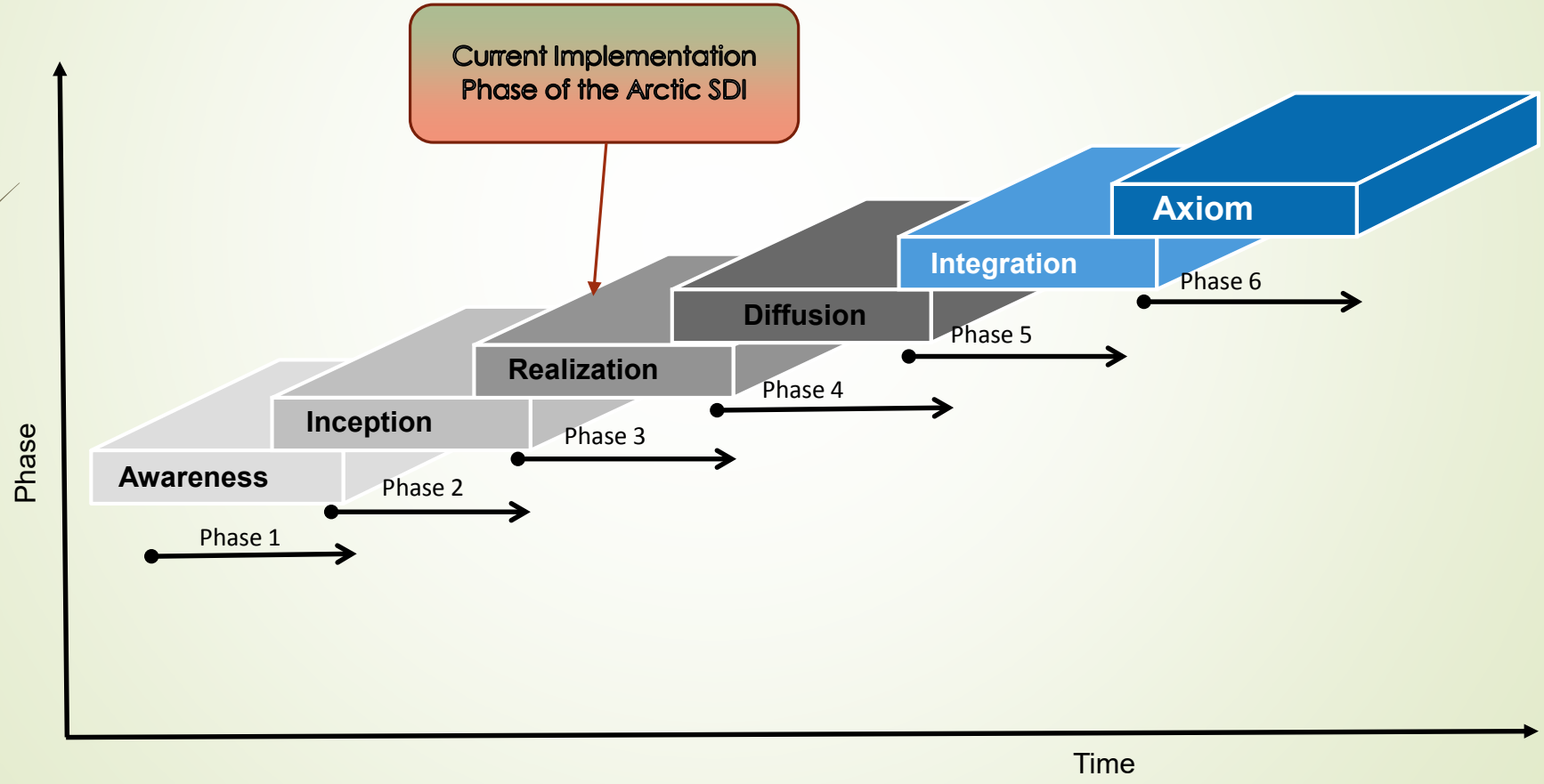
Recommended Priority Implementation Areas for the Arctic SDI

Component	Implementation Status	Priority Areas
Organizational Readiness	*Component actively being implemented*	• The development and implementation of a performance management framework; • The development and implementation of an authoritative framework that includes polices, directives or regulations to guide the implementation, usage, and operation of the SDI ; • Deployment of a full time management team to drive the implementation and manage the day-to-day operations.
Capacity Building	*Early phase of implementation*	• The development and publication of an Arctic SDI Manual; • The development and publication of a Geoportal Users' Guide; • The development and publication of a document to guide the collection of interoperable data across the Arctic.
Information Infrastructure	*Implementation completed*	• The implementation of infrastructure (hardware and software) to support the linking of the Arctic geoportal to key Arctic Circle Geoportals and to facilitate automated data transfer.
Arctic Geoportal	*Major implementation completed*	• The implementation of download and upload services for geospatial data; • The linking of the geoportal to other Arctic Community geoportal; • The implementation of a helpdesk to assist the users; • The development and implementation of indicators to measure the performance of the portal.

Recommended Priority Implementation Areas for the Arctic SDI Cont'd

Component	Implementation Status	Priority Areas
Arctic Circle Geoportals	*Early phase of implementation*	• Perform a more detailed investigation on the Arctic related geoportals; • Prioritize the national geoportals for linking to the Arctic geoportal; • Prioritize the community geoportals for linking to the Arctic geoportal.
Data and Information Environment	*Early phase of implementation*	• The definition of reference datasets; • Policies for the sharing of data that will results in more datasets being made available to the SDI by custodians; • Definition of data and metadata policies to support interoperability; • The definition of relevant thematic datasets (inclusive of hydrographic data).
Standards	*Major implementations completed*	• Document and publish all standards that have been agreed upon; • Develop a standard document for the Arctic SDI.

Bench-marking the Arctic SDI



Summary

- Based on the multi-cultural and multi-dimensional aspects of the Arctic SDI and the unique implementation arrangement, stakeholders should be congratulated on the current implementation status of the Arctic SDI;
- The main components of an SDI have been implemented;
- Foundation established to grow the SDI to meet the users' and stakeholders' needs;

Summary

- The implementation status of a number of the selected priority areas and other sub-components of the Arctic SDI will be significantly improved upon the achievement of the six strategic objectives of the Arctic SDI;

- The next step in the evaluation process:
  - Measure the performance of the SDI prior to the development of the next strategic plan as stated in the Arctic SDI Roadmap; and
  - Implement regular measuring and monitoring processes.

Thank you!

References

- Arctic SDI Working Group on Strategy (WGS), 2015. Arctic Spatial Data Infrastructure Strategic Plan 2015-2020. Available at: http://arctic-sdi.org/wp-content/uploads/2014/08/20151119-Arctic-SDI-Strategic-Plan-2015-2020_FINAL.pdf

- OGC, 2016. OGC requests information to guide Arctic Spatial Data Pilot. Available at: http://www.opengeospatial.org/standards/requests/149