# The Polar Data Landscape

Polar Data Activities, Models and Issues from Local to Global

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ArcticNet PPS%C%DF% DP7σd%Dr<sup>c</sup>



Natural Resources Canada

Ressources naturelles Canada



# **Objectives**

- Provide participants with an <u>overview</u> of polar data activities and initiatives at a <u>variety of scales</u>
- Present a number of <u>examples</u> of different models and considerations relevant to establishing a Canadian coordination model

# Architecture



- There are many ways to represent the same thing
- We observe a general move away from a centralized model towards systems of systems approach





### Samples of Existing Systems of Systems (ecosystems)









Events News











ture (GCI

dem of Systems' Common Infrastructure (GEOSS Common Infrastructure, or GCI) proactively links stems around the world and supports the development of new systems where there are gaps. The n technical standards so that data from thousands of different instruments can be combined into

le Internet access point to Earth observation pe from all over the world for users with I different disciplines. The Portal has an ---discover, access and use the ever-growing ---such the Portal, the GCI connects the users 1 1 10 10 10 elections of databases and other portals and and user friendly (current and historical) prk of decision/policy makers, planners and

About

What is GEO Cold Regions?

Organization & Contacts Tasks Documents & Publications

Coordinates global joint efforts for Earth observations and information services to provide societal benefits over a vast Cold Regions area including the North Pole, South Pole, Himalaya-Third Pole and Mountain areas.

# **Unique Characteristics**

- Conditions:
  - rapid change
  - climate
- Data economies of Scale
- Natural resources
- Desolate areas/small populations





ARCTIC COUNCIL



# **Principles**

- Leverage what already exists
- Recognizing that "the world" has different dimensions and scales
- Thinking in terms of of "we" instead of "I" to understand possibilities for collective effort

Challenge/Task for Individuals and Organizations

- Situating yourself within the (eco)system(s)
- Identifying "my role(s)"



# Terminology

- Cyberinfrastructure: Spatial Data Infrastructure (SDI)
  - Architecture: infrastructure
- Stakeholder: rights holder
- Data Landscape: data ecosystem
- Indigenous Knowledge: traditional knowledge : local knowledge
- Community based monitoring: community-driven monitoring

# Landscape: Global $\rightarrow$ Local

# **The Global Landscape**

- WMO
- GEO
- IHO
- GOOS/IODE
- RDA
- WDS
- CODATA
- ISO, OGC



# **The Polar Landscape**

- Arctic Data Committee
- SCADM
- SOOS
- Arctic SDI
- GCW
- GEO-CRI
- AC (WGs)
- EU-PolarNet
- OGC





# **National Landscapes**











The Canadian Landscape

# CCADI

- The Canadian Consortium for Arctic Data Interoperability (CCADI)
- Composed of private and public partners
  - national
  - international
- emphasis on:
  - (meta)data standards
  - interoperability
  - existing infrastructure



# **Federal Bodies**

•	ECCC Canadian Space Agency			Environment and Climate Change			Canadä					
•	POLAR			Explore the Topics 🗸 Acts and R	egulations v Resources v							
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•	NRCan	Newsletters Publications Space in my Daily Life What's New	Scien Polar Knowledge Canada (F Polar Knowledge Canada (F Vulnerability Experiment (AE boreal regions of western C	<b>FO's Real-Time</b> anging climate in Canada's Arctic d opportunities. There is a need to	Arctic Ocean presents both challenges promonitor the environment to	Newl DFO's Real Tim Observatory in the Strait o	ne Ocean If Canso. View	collective target for ontains a				
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Canadian leadership in polar science and technology

Indigenous and Northern Affairs Canada (INAC). The new organization is responsible for advancing Canada's knowledge of the Arctic and





#### **Federal Geospatial Platform**

- Supports the Open Government Action Plan
  - Internal portal: FGP
  - External portal: Open Maps
- Result of Federal Committee on Geomatics and Earth Observation and horizontal alignment with 21 departments/agencies
- Provides a range of data ranging from environmental to socioeconomic
- **Goal**: provide easier access to geospatial data
- More details to follow in presentation from Director David Harper

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# CGDI

#### **Canadian Geographic Data Infrastructure**

- Collaborative partners include:
  - Internal department/division
  - Provincial/Territorial agencies
  - Municipal agencies
  - Federal departments
  - International agencies



• **Goal**: enhance geospatial data in order to improve decisionmaking

# **CGDI: Partners/Initiatives**

- Open North
- NWT Centre for Geomatics
  - Lightning talk: "Northern Canada Geospatial Innovation Centre concept" presented by Kristine Hirschkorn
- Arctic SDI
- Spatineo



GEOSPATIAL DATA - A TOOL FOR BETTER INFORMATION DECISIONS AND MORE EFFICIENT ADMINISTRATION THE ARTIC







# **Spatineo** Web harvester

- NRCan wanted a new approach to manage the Canadian SDI
- Used a harvesting method in order to create a custom API that would:
  - automatically identify relevant Canadian Arctic services
  - collect existing data sources
- Output resulted in 1,618 services (43 968 data layers)
  - WMS, WFS, WMTS, and ESRI MapServer

# **Arctic SDI**



- Collaboration between 8 national mapping agencies
- Goal: standards-based infrastructure that provides geospatial data about the Arctic
- Implementation through portal and pilots

The Local Landscape



### Highlight Slide: Inuit Qaujisarvingat



# Highlight: ISR Traditional and Local Knowledge Catalogue



#### Catalogue Organisation

The Catalogue provides detailed information on any publications that reference Inuvialuit traditional knowledge. In addition, to provide reference information such as title, author, year, etc., the type of traditional knowledge contained in each material is also described. As per Beaufort Sea Partnership's definition of traditional knowledge, this includes **Traditional Environmental Knowledge**, **Traditional Land Use** and **Traditional Practices**.

#### The Catalogue also includes Knowledge.

Additionally, there are many materials that discuss traditional knowledge and how to incorporate it with science, but do not contain traditional knowledge in the form of oral histories or interviews. These materials are included in the database under another category: Integration of TK with Western Science.

http://isrtlk.com/

The following information is catalogued for these five categories:

- 1. Traditional Environmental Knowledge:
- Climate and Weather
- Ocean (sea ice, currents, etc.)
- Freshwater (Rivers and Lakes)
- Permafrost activity
- Land Erosion
- Contaminated Sites
- Terrestrial Habitat
- Ecology (species specific):
  - Population distribution
  - Population density
  - Feeding areas
  - Mating/Denning/Rearing
     Migration route
- Habitat use
  - Invasive species

- 2. Traditional Land Use:
  - Place Names
  - Travel Routes
  - Camps
  - Cabins
  - Burial sites
  - · Culturally significant sites
- Landmarks
- Historical sites
- Hunting Areas
- Trapping Areas
- Fishing Areas
  Gathering Areas

- 3. Traditional Practices:
  - Art
  - · Dietary preferences and culinary practices
  - Fishing
  - Gathering
  - Housing
  - Hunting
  - Natural Resource Management
- Recreation
- · Religious spiritual practices and beliefs
- Trade
- Trapping

### Highlight Slide: Inuvialuit Settlement Region Platform



ntegrated Ocean Management

Initiatives





Discover, Access & Store +200 Spatial Data Files • Mapping, Application, Analysis & Work Spaces • Best Practices & Training Materials. Contact the BSP Secretariat if you are interested in accessing the Inuvialuit Settlement Region Online Platform.



#### INUVIALUIT SETTLEMENT REGION ONLINE PLATFORM

The Beaufort Sea Partnership (BSP) is the primary forum for stakeholder engagement and integrated ocean management of the Beaufort Sea region. Consisting of over 54 organizations, the BSP provides a forum for all groups who have an interest in the Beaufort Sea Large Ocean Management Area (LOMA) to share information about their activities/interests. Given the volume of participants and breadth of data, a web-based platform for central storage and enhanced visualization of spatial and non-spatial information has been

Tarium Niryutait Marine Protected Area Anguniaqvia niqiqyuam Marine Protected Area Anguniaqvia niqiqyuam Activity

Initiatives

Plan



# **Changing Landscape**



- Indigenous peoples and their organizations and local communities are increasingly focusing on self-determination and data sovereignty moving away from the "pull model"
- History and context matter
- New models are emerging and this will continue to have major implications for polar data activities

# **Frameworks for Collaboration**

# Interoperability

- "The ability of computer systems or software to exchange and make use of information"
  - Oxford dictionary definition
- **Technical:** "focuses on technical aspects data exchange formats, transmission protocols, etc."
  - SDI Manual for the Arctic
- Human: "focuses on the processes of inter-relations to establish a shared understanding"
  - University of Defence definition

# Interoperability

- Technical may be achieved through standards
- allows for ease of:
  - Access
  - Data management
  - Dissemination
- Idea of centralization for:
  - Cloud to Cloud
  - API to API
  - Service to Service



# **Technical Mediators**

- Full standardization across communities is difficult
- Mediators can aggregate, transform, re-distribute
- Mediators use infrastructure and can be developed and funded separately
- For example, brokering is emerging as a potential solution to some interoperability issues





# Governance

- Frascati workshop result:
  - "Key current challenges are social and organizational rather than technical : supporting human networks, promoting standards, and aligning policy with implementation"
- Scale: a continuum from no coordination to "command and control"
- local vs. scientific vs. government
  - funding
  - drivers/influences
  - hierarchical; hub and spoke; peer-to-peer



# Looking into the Future

- Field of data analytics is leading to machine learning in various forms:
  - Ontology driven neuro-linguistic program
  - Artificial intelligence
  - Cloud computing
  - web harvesting





# Options

- Governance
  - Grass roots to command and control
  - Actors including providers, users, funders tec.
  - Hub and spoke vs. peer to peer
- Architecture/frameworks [Peter add ? graphic]
  - Standards
  - Document and download
  - Service Oriented Architecture
  - Virtual Research Environments

#### Thank You!

Questions welcome

Peter Cameron Martha



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