Ecosystems Approach to Management of Arctic Ecosystems
Fairbanks, Alaska, USA
August 23 - 25, 2016

Harnessing the Global Observing and Data System to Support Ecosystem-based Fisheries Management in the Arctic: Current Status and Future Directions

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Chair, IASC-SAON Arctic Data Committee
Co-Chair, IARPC Arctic Data Coordination Team

Lisa Loseto, Phil Mundy, Jan Rene Larsen

ARCTIC / PAN-ARCTIC OPTIONS

National Snow and Ice Data Center
Supporting Cryospheric Research Since 1976

GROUP ON EARTH OBSERVATIONS

ELOKA

IARPC COLLABORATIONS

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FRAMSENTERET

ARCTICDATACOMMITTEE

IASC SAON

Overview

1. Ecosystem Approach
2. Ecosystem-Based Fishery Management (EBFM)
3. Global observing and data system
4. Overview of data opportunities and challenges
5. Observing and data as an ecosystem
6. The way forward

Ecosystem Approach

EA Key Points

From Session 1 (Hoel; Skjoldal; Mundy)

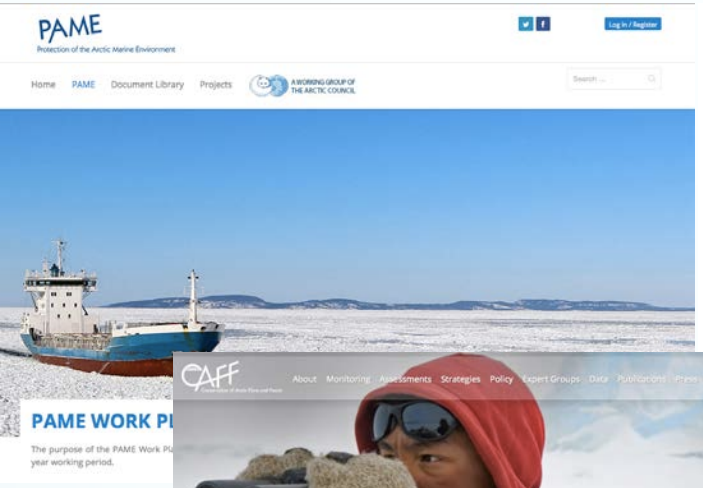
- Systems approach – dynamic, processes, functions, interactions, **interconnections**, sensitive to initial conditions
- Policy frameworks are integral
- Location and **scale** are important
- Based **on best available scientific and Indigenous knowledge** - – includes observations and data underlying information
- Need integrated ecosystem assessments -> **requires observations & data**
- Requires monitoring -> **sound data management and availability over time**

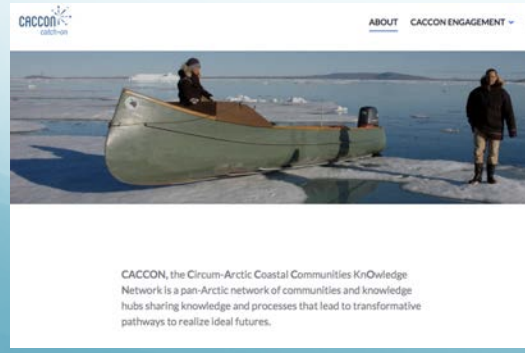
Ecosystem-Based Fisheries Management (EBFM)

EBFM Overview

- Recognize impacts on target species as well as environment and ecosystems
- Protect living resources
- Sustain fisheries
- Because of subsistence and economic function of fisheries, this is a socio-ecological issue
- **What roles do observations, data and information play in supporting and implementing EBFM?**

Many Relevant Initiatives





DECLARATION CONCERNING THE PREVENTION OF UNREGULATED HIGH SEAS FISHING IN THE CENTRAL ARCTIC OCEAN

Meeting in Oslo on 16 July 2015, Canada, the Kingdom of Denmark, the Kingdom of Norway, the Russian Federation and the United States of America continued discussions toward the implementation of interim measures to prevent unregulated fishing in the high seas portion of the central Arctic Ocean. They adopted the following Declaration:

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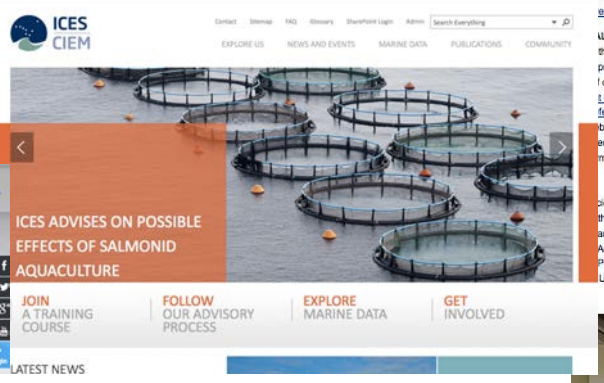
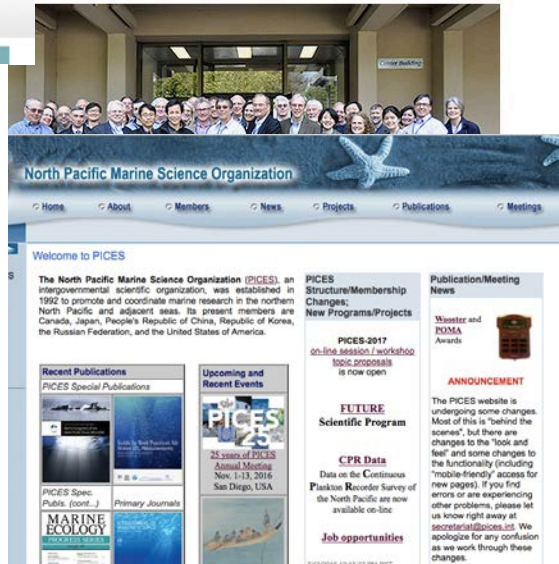
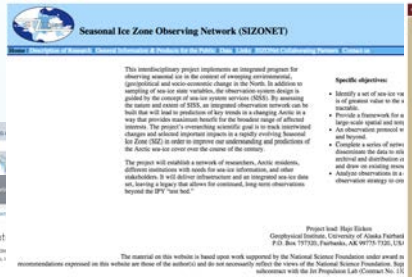


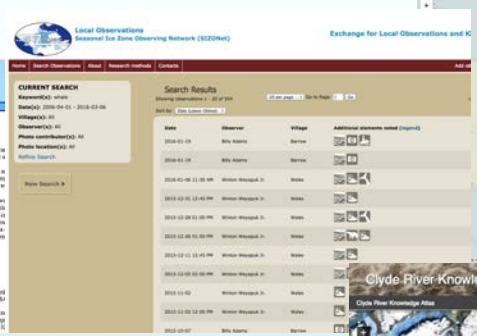


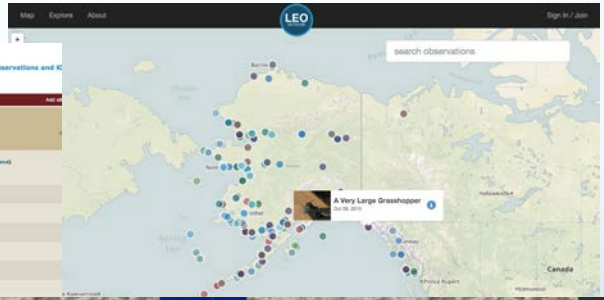
Global Observing and Data System

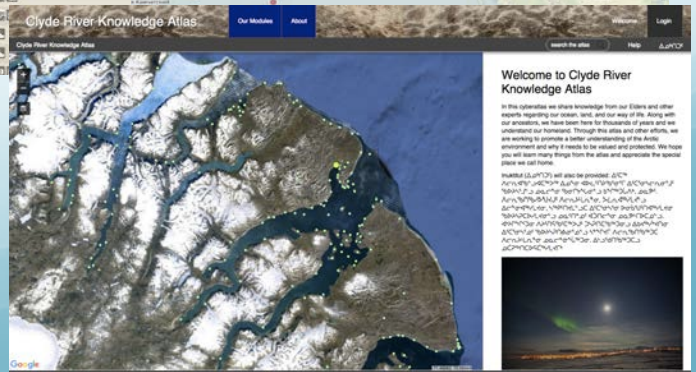
Emerging Observing and Data System

- Observing nodes exist
- Typically discipline-based
- Data management quickly becoming a priority









http://www.arctic.noaa.gov/dbo/
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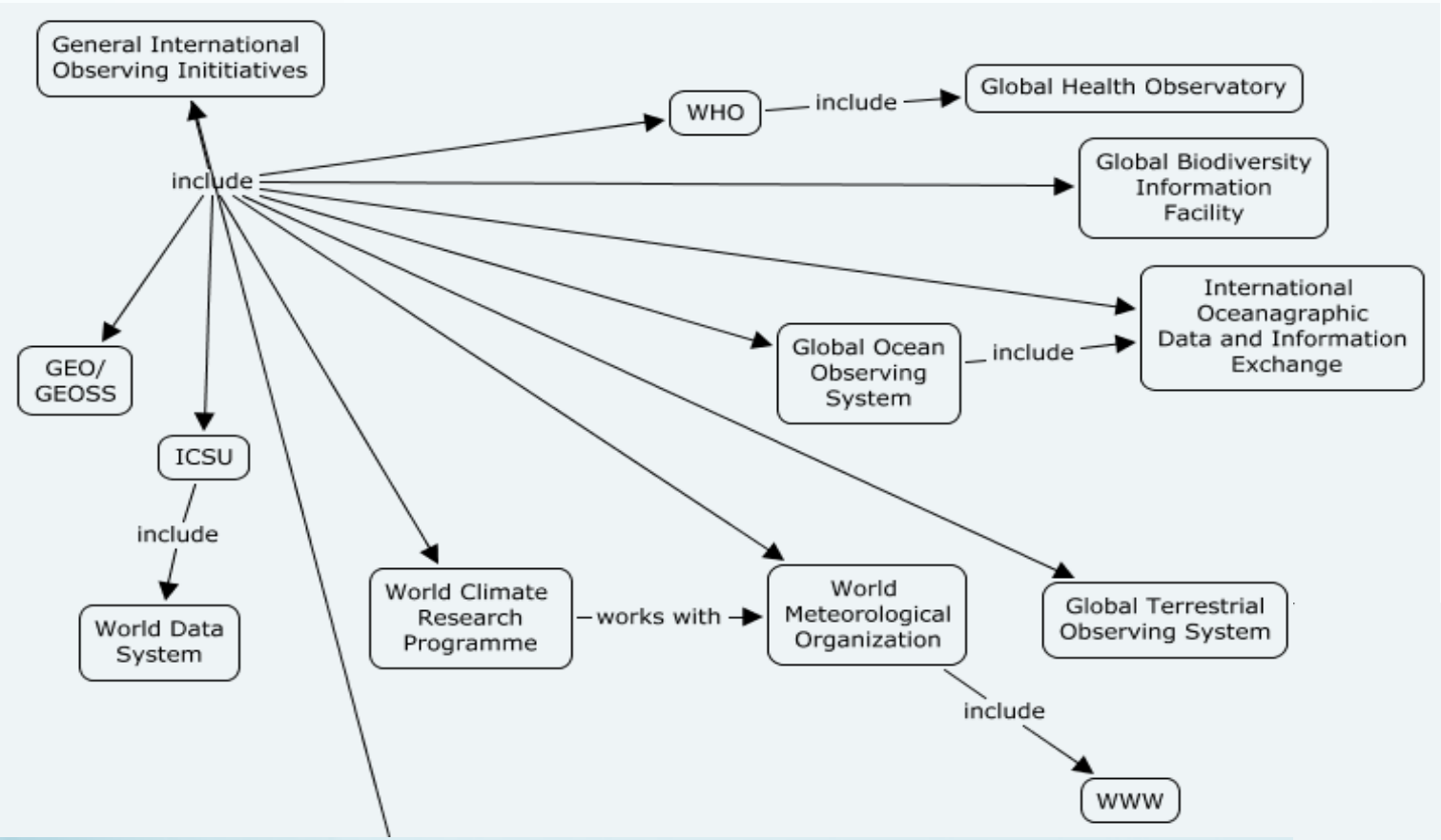
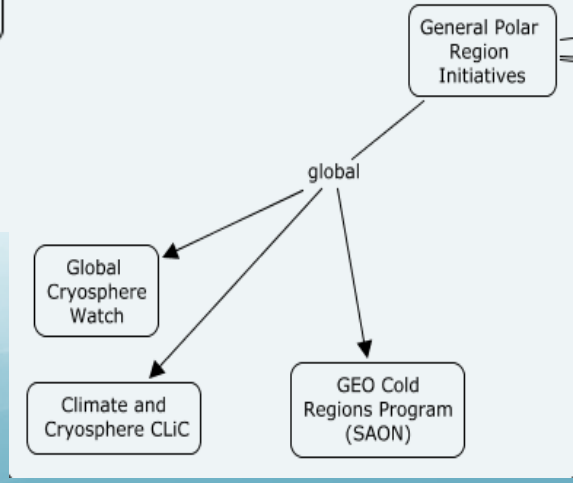
http://www.sios-svalbard.org/
http://www.sizonet.org/
http://www.eu-interact.org/
http://www.caff.is/
https://www.leonetwork.org/

World Meteorological Organization
Weather • Climate • Water

GROUP ON EARTH OBSERVATIONS

Global Initiatives

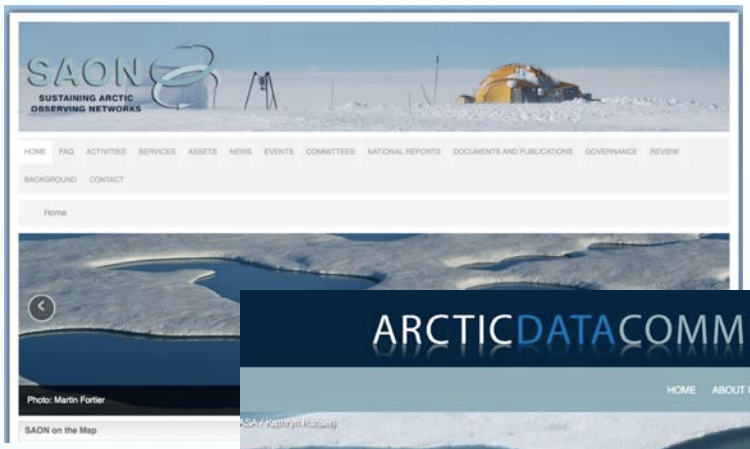


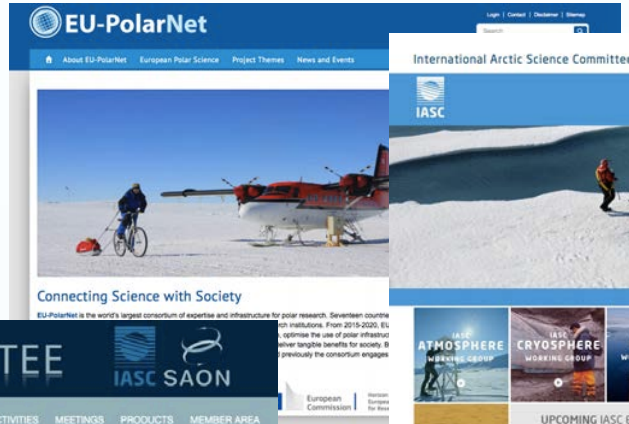


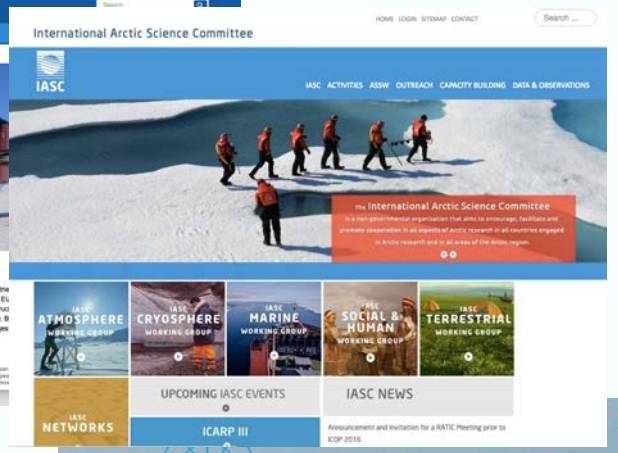
BELMONT FORUM

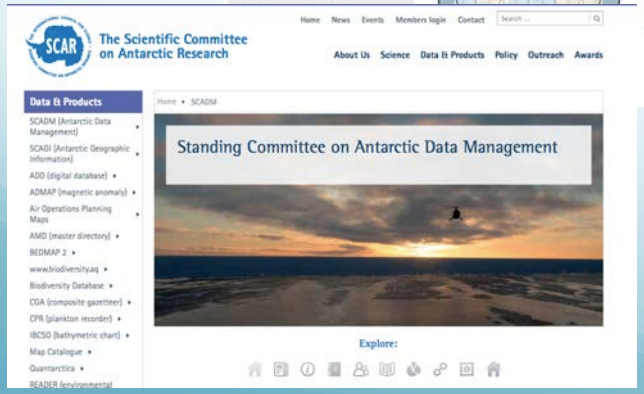
RDA RESEARCH DATA ALLIANCE
Research Data Sharing without barriers

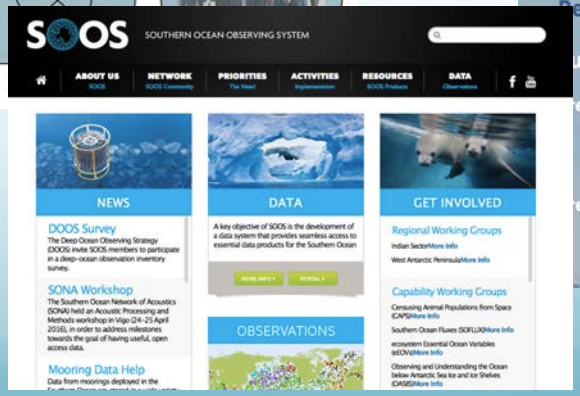
Broad Polar Initiatives



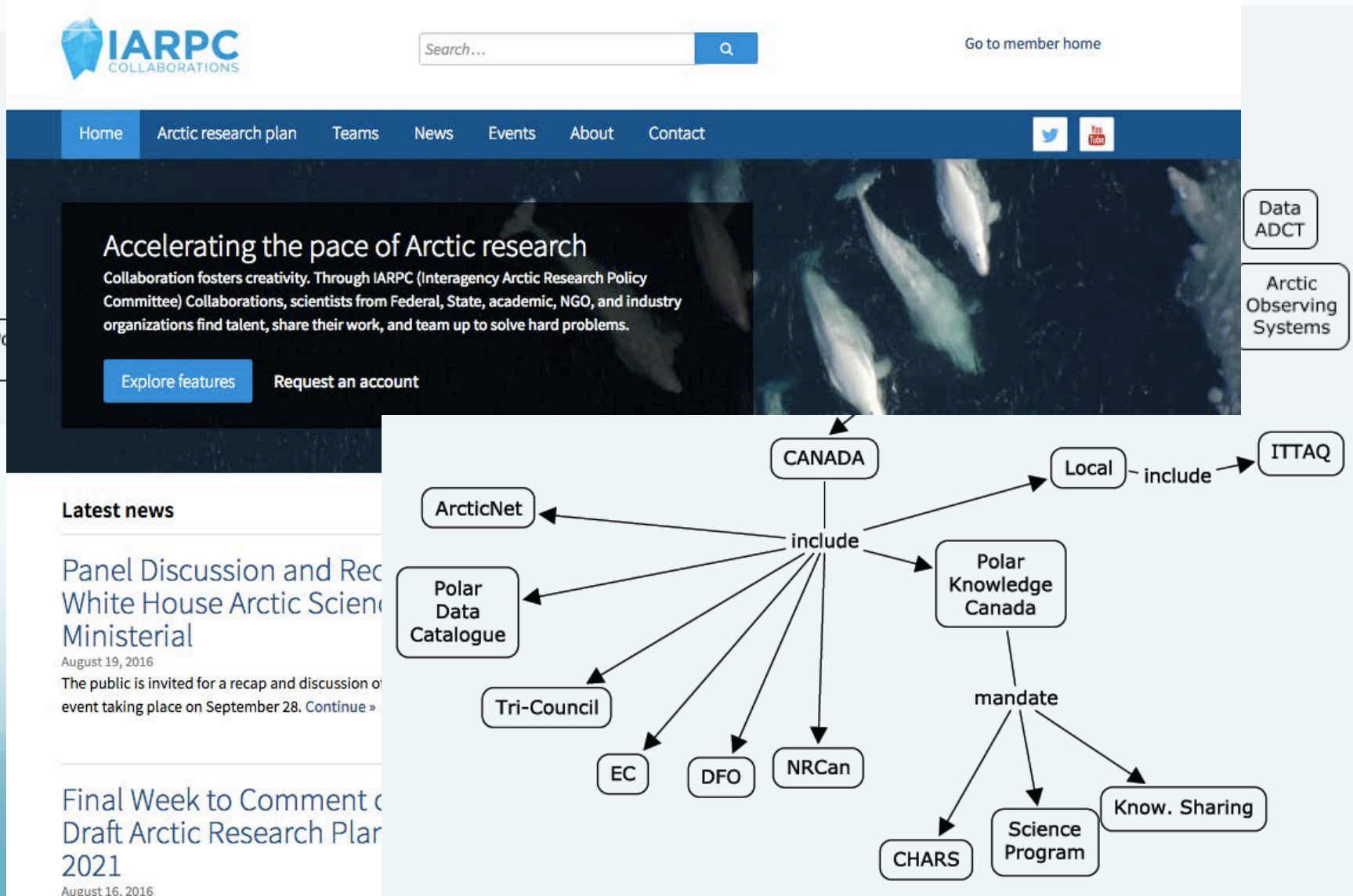




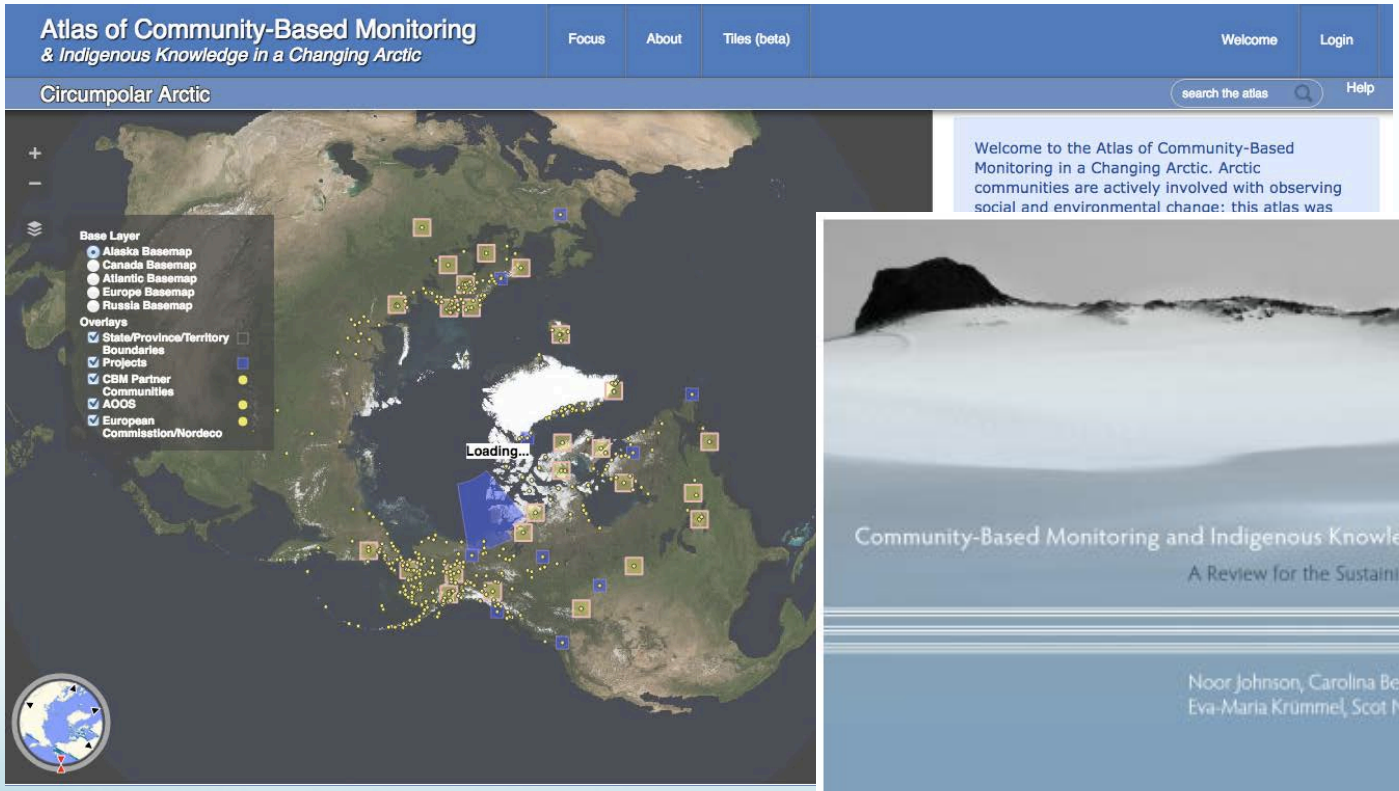




National Initiatives

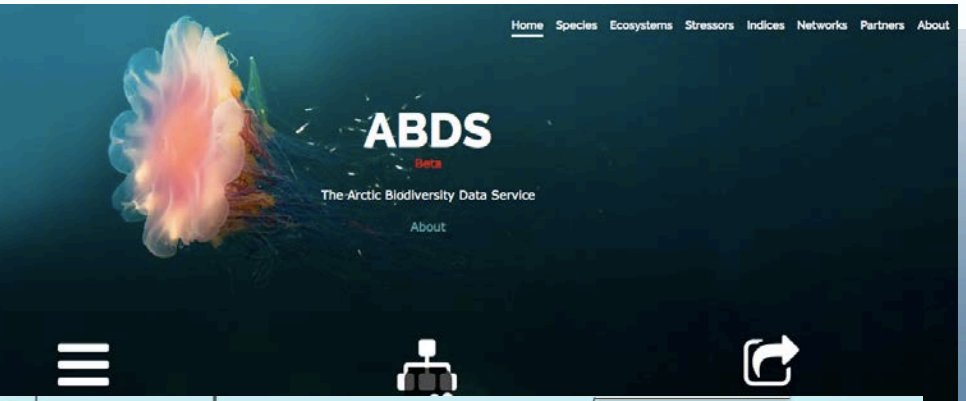


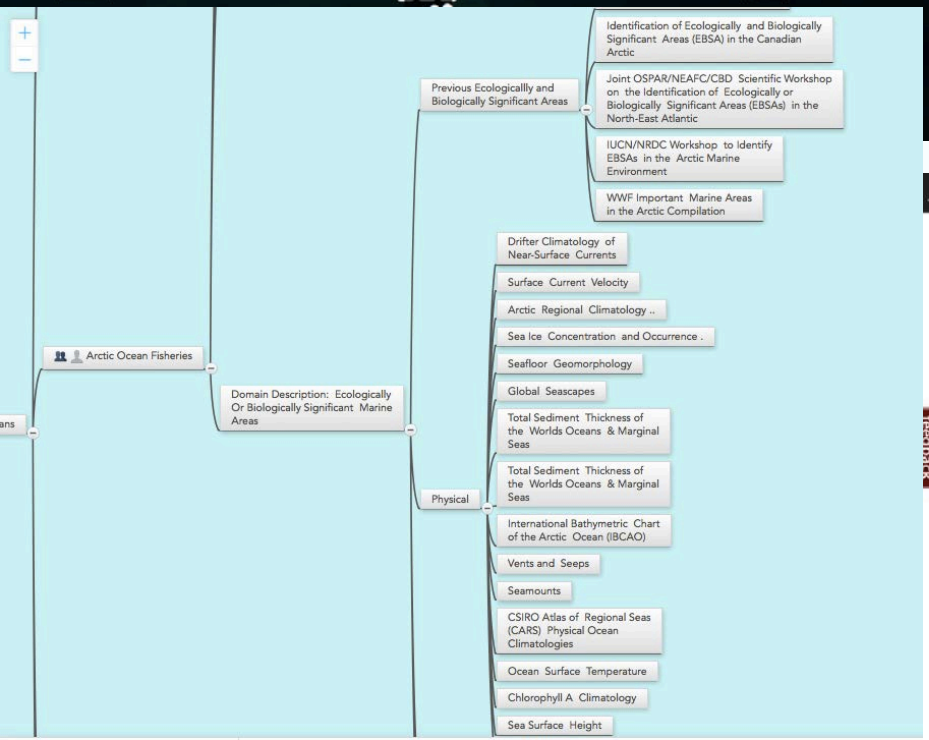
(G)Local Initiatives

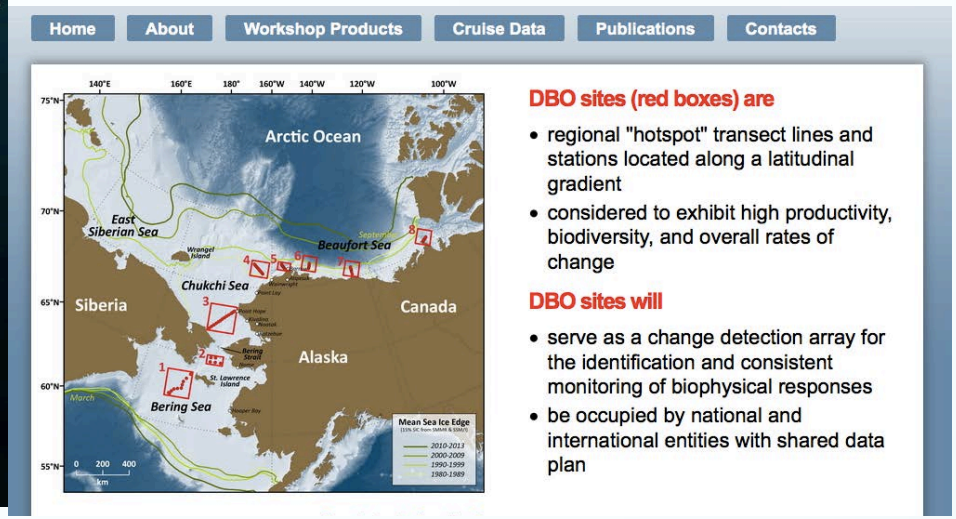


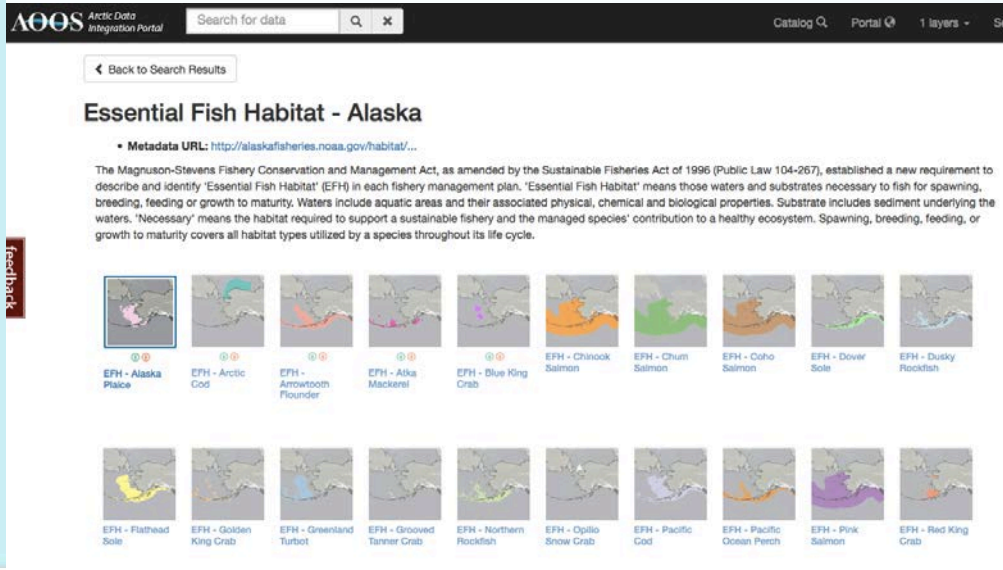
http://www.arcticcbm.org

Domain Specific









Overview of Data-Related Opportunities and Challenges

Minutes of the workshop of the

Arctic Data Coordination Network

IPY 2012, Palais des Congrès, Montréal, Quebéc, Cana

27 April 2012, 13:30-17:00

Sustaining Arctic Observing Network (SAON)

SAON Data Management Workshop Report

Developing a Strategic Approach

Prepared By:
Gillian B. Lichota, NOAA Arctic Research Program
Simon Wilson, AMAP

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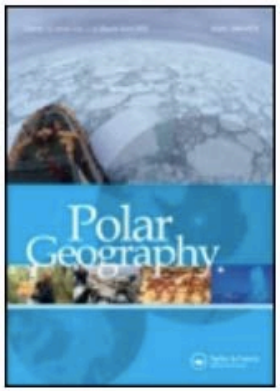

Polar Geography
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tpog20

Introduction: local and traditional knowledge and data management in the Arctic

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River, AK

quaculture,
Hobart,

SCAR · ICSU WORLD DATA SYSTEM · IASC

International Forum on
Polar Data Activities in Global Data Systems
Communiqué

Data Science Journal,

TOWARDS AN INTERNATIONAL POLAR DATA CC NETWORK

P L Pulsifer[1], L Yarmey[1], Ø Godøy[2], J Friddell[3], M Parsons[4], W F W Manley[7], A Gaylord[8], A Hayes[9], S Nickels[10], C Tweedie[11], J R La*

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Statement of Principles and Practices for Arctic Data Management
April 16, 2013

All IASC-endorsed scientific results shall be verifiable and reproducible through ethically open access to all data necessary to produce those results. Data shall be preserved, accessible, and used in accordance with scientific norms of fair attribution and use.

To this end, IASC Council approves the following actions:

1. Endorsement of the Statement of Principles and Practices for Arctic Data Management;
2. Establishment of an IASC Data Standing Committee;
3. To undertake measures towards adoption of national data policies consistent with

The Importance of the Polar Regions for Humankind

The Polar Regions are experiencing dramatic change. Understanding their complex dimensions (environmental, climatic, social, economic, and geophysical) is critical to grasping the global system and defining our future. Data are an invaluable resource. The coordinated capture, analysis, storage, stewardship, and sharing of scientific data along with Indigenous knowledge helps society better understand the regional and global impacts of Polar changes. But these data management activities present considerable technical, social, policy and economic challenges.


Photo Credit: Marlen Tacoma

In October of 2015, more than 110 people gathered at the Second Polar Data Forum at the University of Waterloo, Canada (PDF II) to address these challenges. Data managers, scientists, funding program managers, Indigenous people and their representatives, students and others from more than ten nations shared their knowledge experience and ideas on how to make polar data more useful and valuable in solving global problems.

The Second Polar Data Forum

In 2013, at the First Polar Data Forum in Tokyo (PDF I), the community identified issues and made observations and recommendations on polar data management. PDF I focused on improving how people and systems can share data in a meaningful way. The goal was to move towards open and connected systems based on a culture of trust and acknowledgement of data production and use.

PDF II highlighted the significant progress in polar data management that has been made since PDF I and also identified priorities as we move forward. The community reconfirmed the themes of PDF I, identified key new themes that have evolved, and planned a set of action-oriented recommendations and activities.

Key Themes Emerging from PDF II

Including Arctic Indigenous Perspectives: In this time of change, Indigenous knowledge and the underlying observations of Arctic peoples are more important than ever. Increasingly, this knowledge is being documented and represented as digital data, but the nuances of these data are not well understood by the broader data management and science community. The perspectives of Indigenous people must be heard directly. This will enhance understanding of how their knowledge and observations can be used appropriately.

Community building: Improved polar data sharing that is part of a broader global system will require community building, collaboration, and coordination of efforts. To do this we need

PolarData · CCIN · NSIDC · Waterloo · Colorado Boulder · WORLD DATA SYSTEM · IASC · SAON · SCAR

Summary of Key Opportunities

- Improved sharing resulting in better science and decision making
- More complete view of the environment over space and time
- New kinds of integrative science and research
- Economic opportunities
- …

Summary of Key Challenges

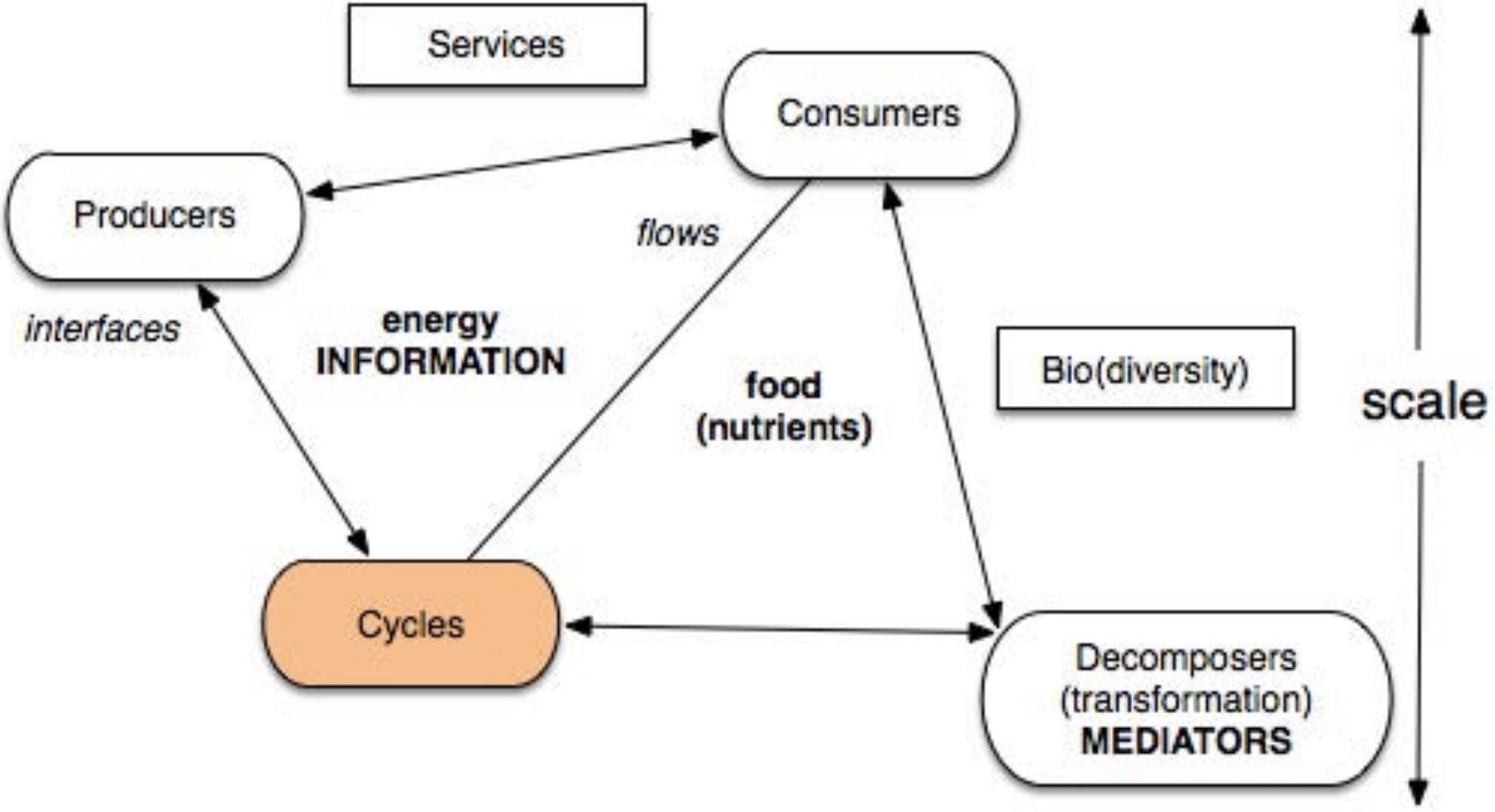
- Data rescue
- Data stewardship: discovery, access, preservation
- Attribution and reward
- Avoiding “silos” (science, operation, CBO)
- Interoperability

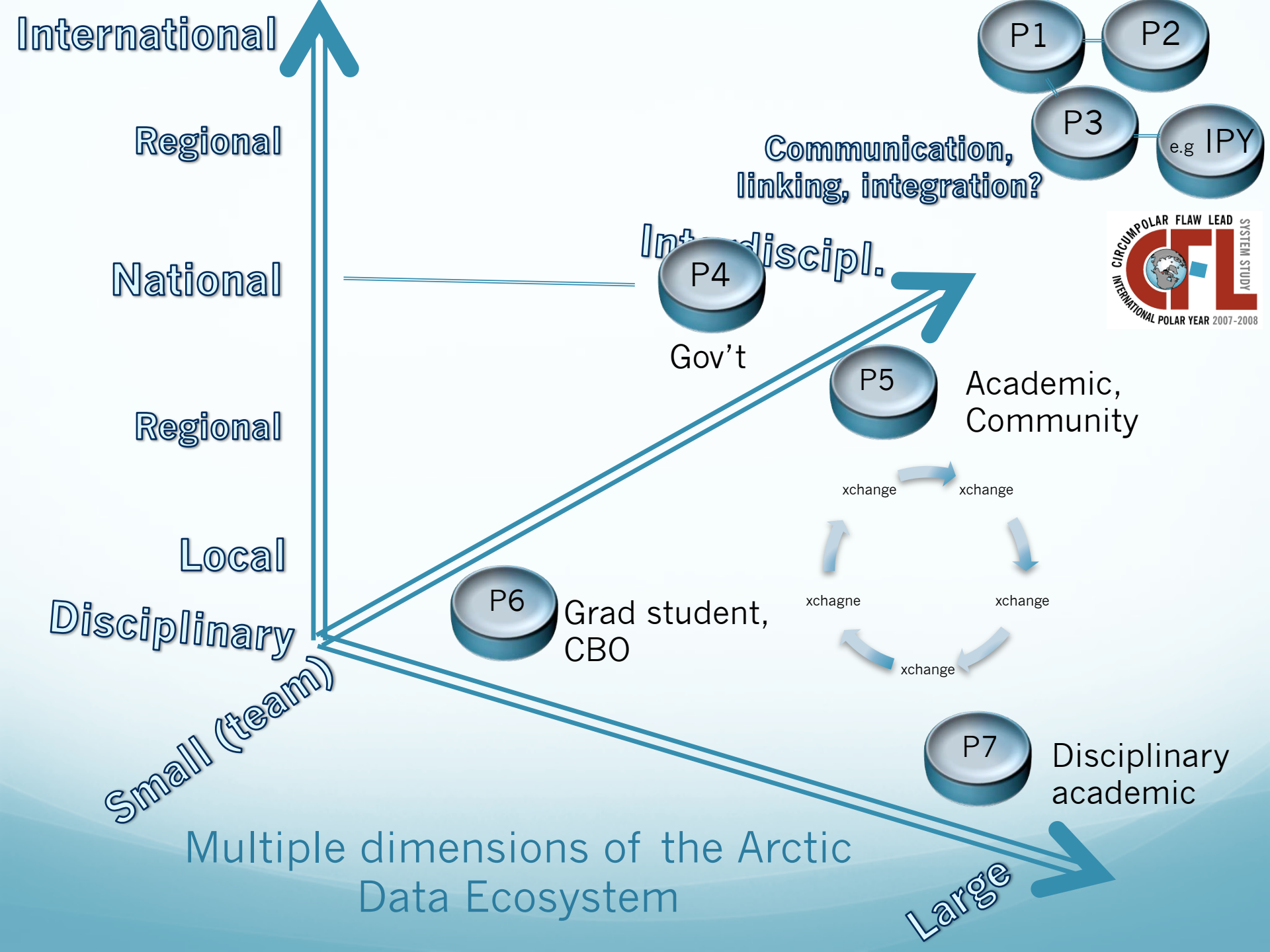
Where Are We Now?

- Parts of the system are in place
- We are making real progress in establishing important new parts of the system (data, centers, access points etc.)
- Key challenges are known
- **Integrated** observing and supporting data system has not yet emerged
- Part of the issue is that we are not understanding and managing as a “system”

Observing and Data as an Ecosystem

The Data Ecosystem





Multiple dimensions of the Arctic Data Ecosystem

Elements of EA

(From Day 1, Talk 2, Skjodal)

- **Define ecosystem**
- **Describe ecosytem**
- Set ecological objectives
- Assess the ecosystem
- Value the ecosystem
- Manage human activities

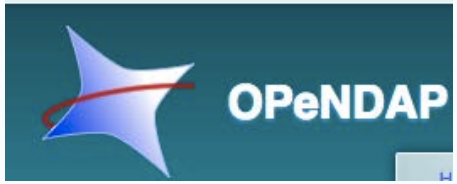
BEST AVAILABLE SCIENTIFIC INFORMATION

The Way Forward

Practical Foundations

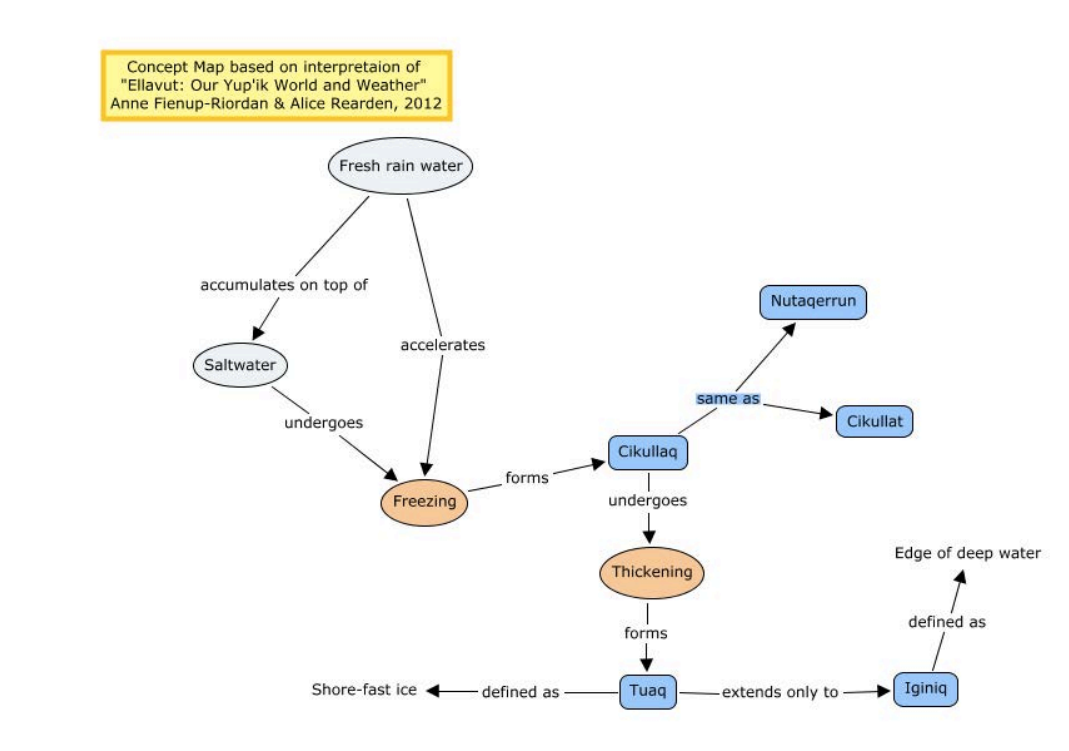
Standards & Services

- Many data sharing standards - *interfaces*
- Adoption occurring *within* disciplines/domains, but not necessarily *between*
- 'Data as a Service' emerging as a way to create interfaces



many more ...

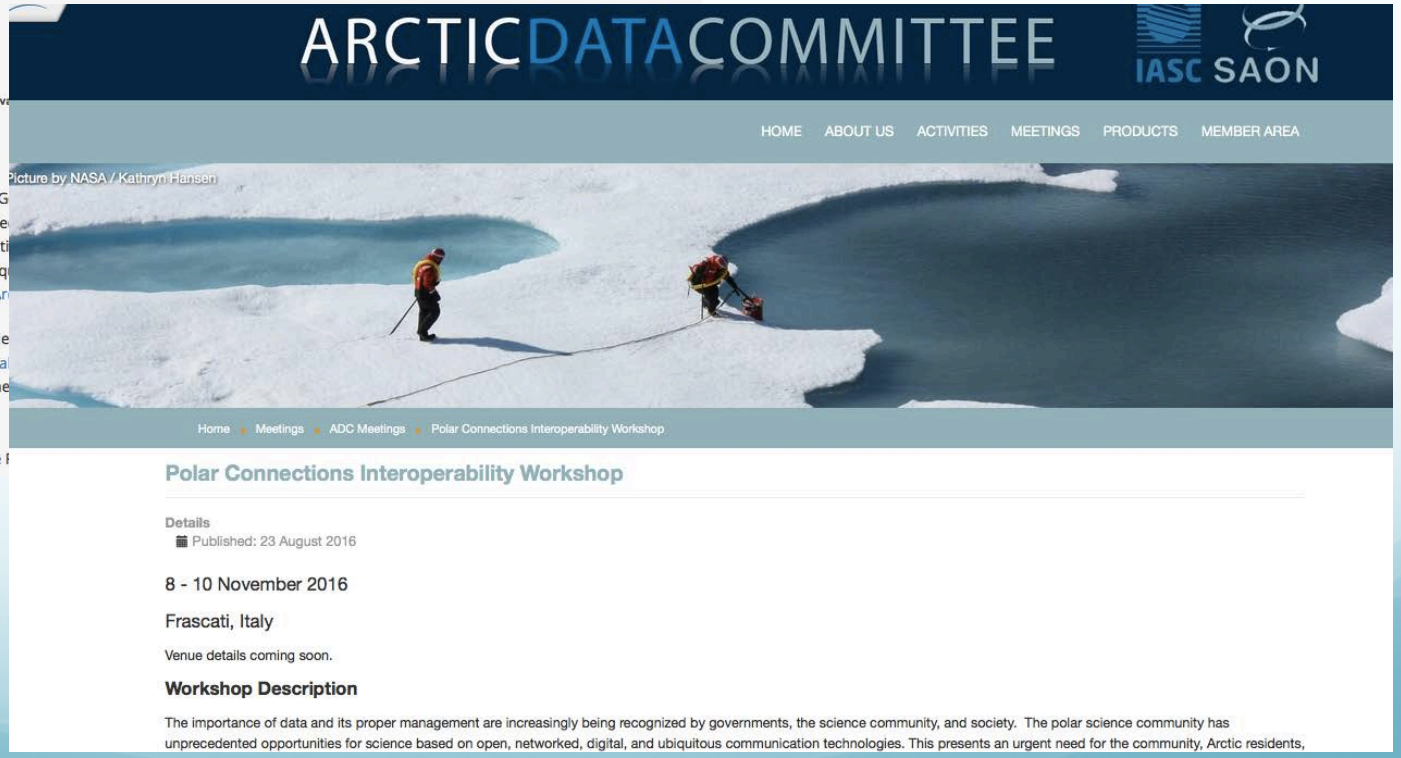
Terminology Models



SEMANTIC INTEROPERABILITY = ‘‘LINGUISTIC (UN)CERTAINTY’’

Activities under partnership with Alaskan Indigenous Knowledge holders,
ELOKA & Semantic Sea Ice Interoperability Initiative (SSIII)

Interoperability Activities

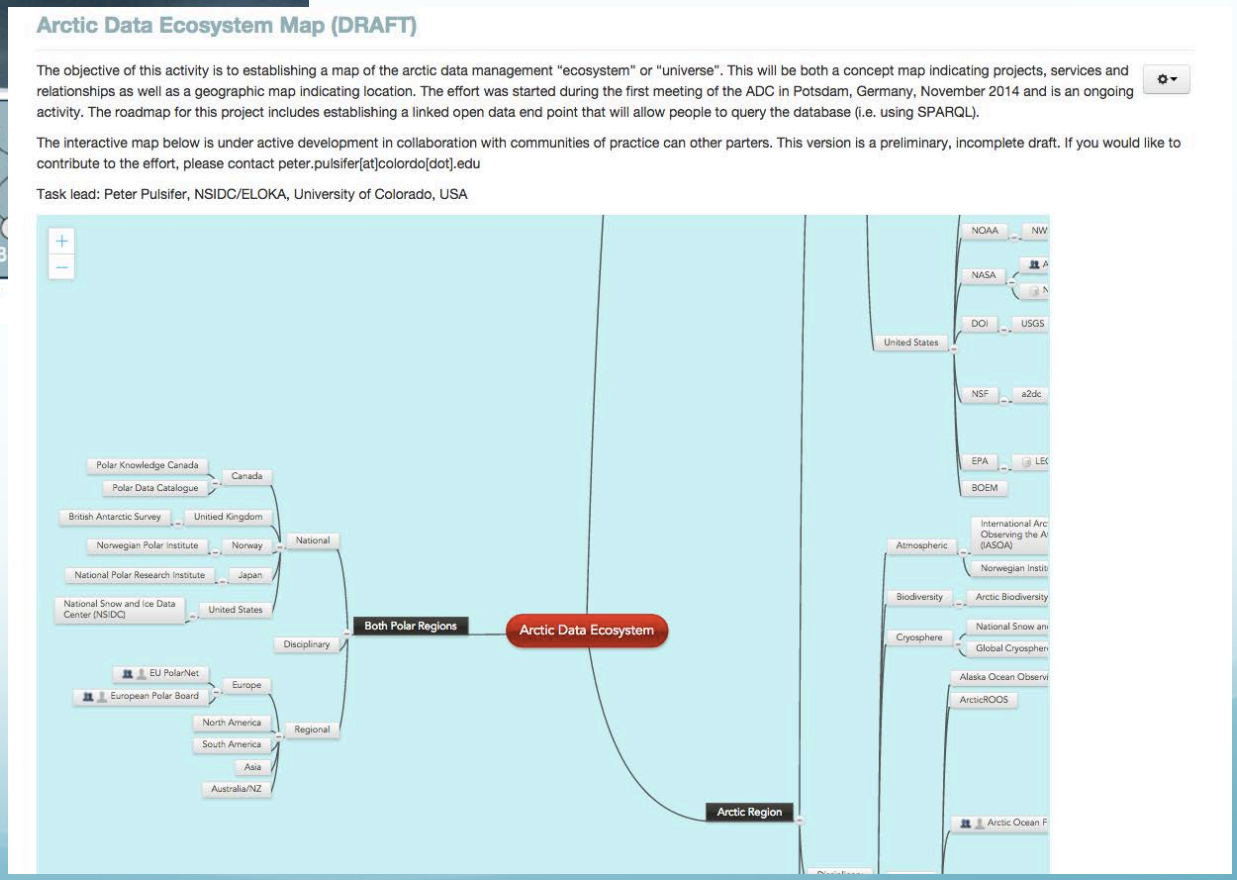


Defining, Describing and Understanding the Data Ecosystem

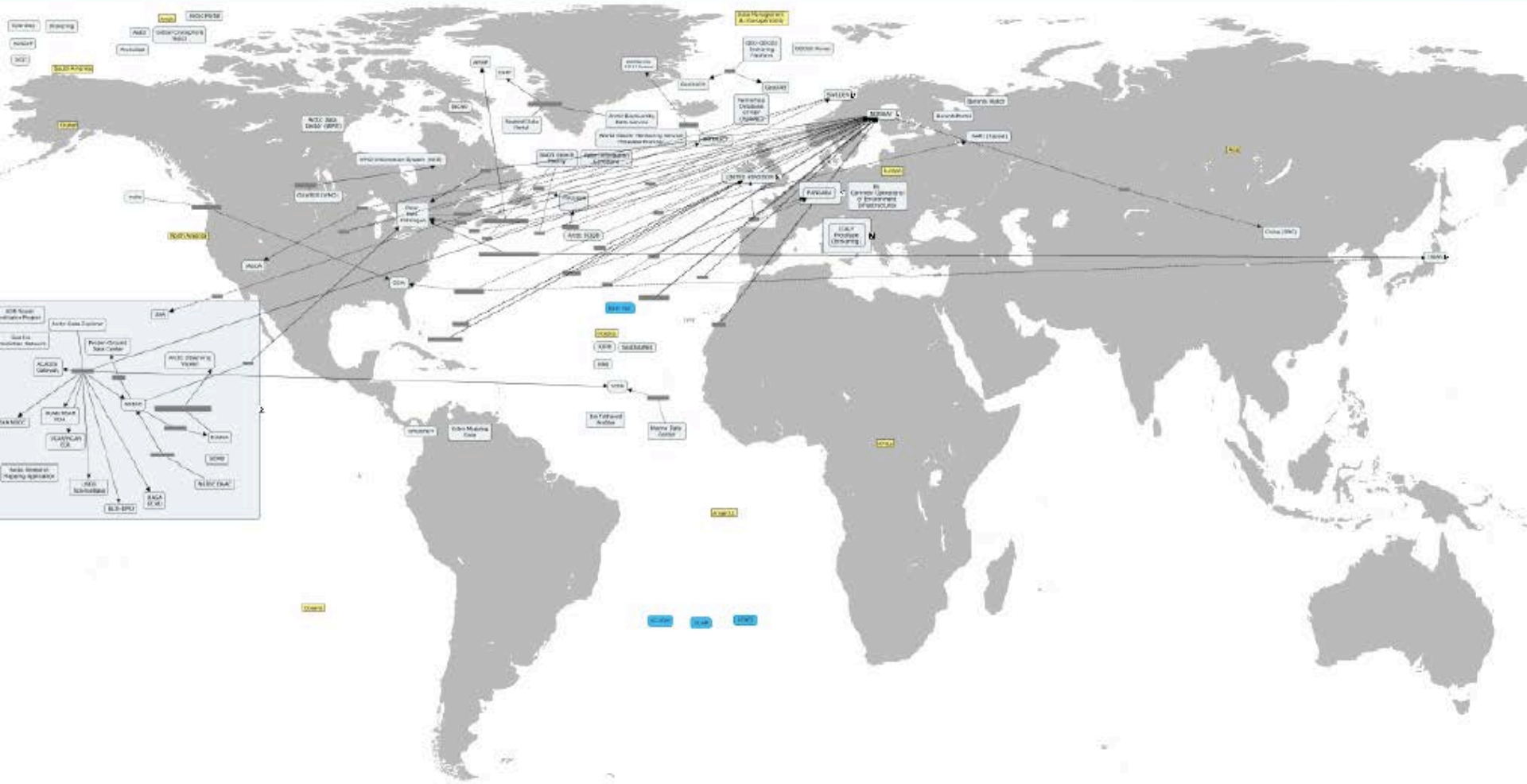
Mapping the Arctic Data Ecosystem

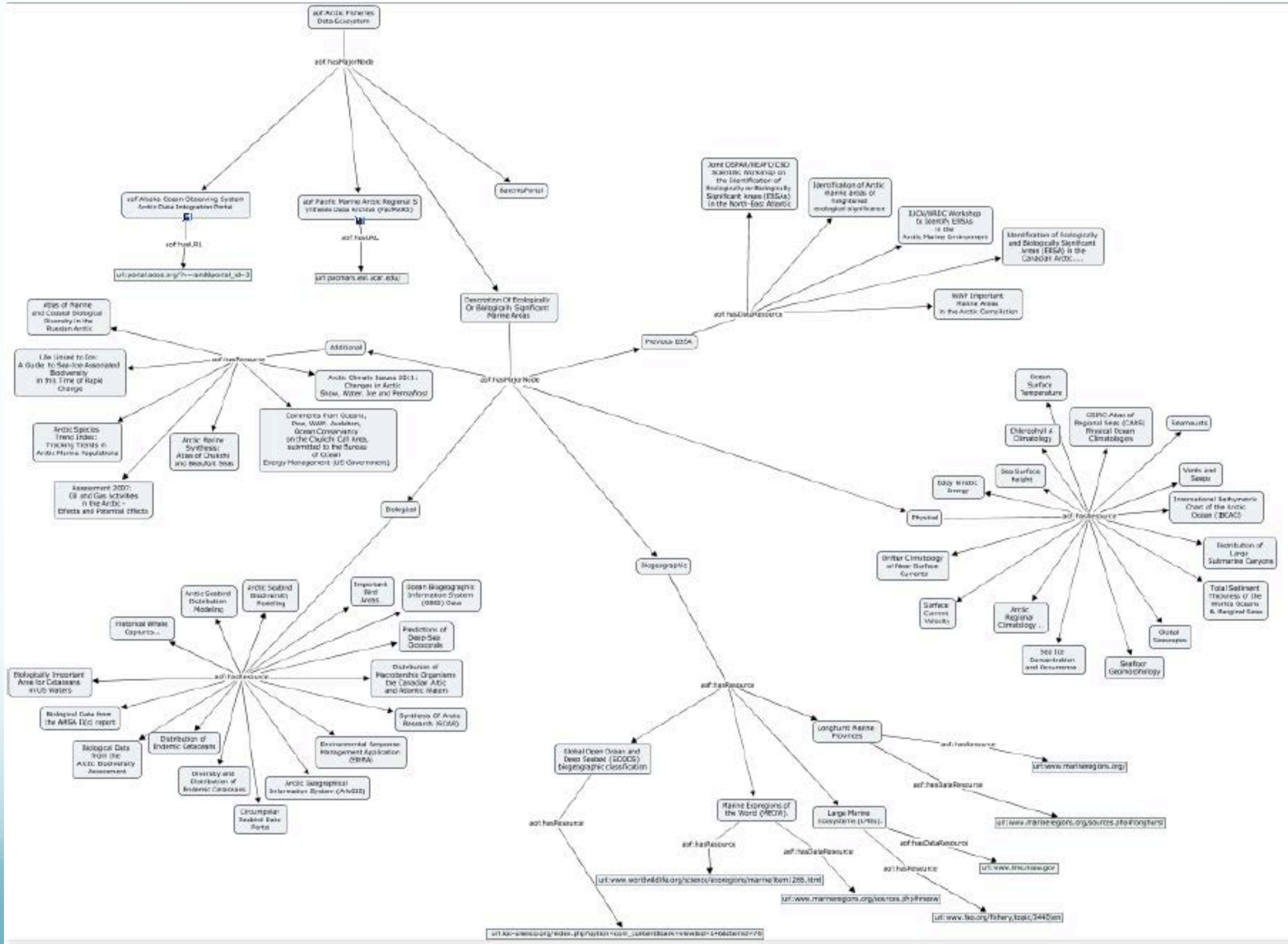
http://arcticdc.org

Database + Mapping + Visualization



ARCTIC / PAN-ARCTIC OPTIONS





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aof:Alaska Ocean Observing System Arctic Data Integration Portal
aof:hasURL
aof:Pacific Marine Arctic Regional Synthesis Data Archive (PacMARS)
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url:pacmars.eol.ucar.edu/
BarentsPortal
Description Of Ecologically Or Biologically Significant Marine Areas
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Additional
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Atlas of Marine and Coastal Biological Diversity in the Russian Arctic
Life Linked to Ice: A Guide to Sea-Ice Associated Biodiversity in this Time of Rapid Change
Arctic Climate Issues 2011: Changes in Arctic Snow, Water, Ice and Permafrost
Arctic Species Trend Index: Tracking Trends in Arctic Marine Populations
Arctic Marine Synthesis: Atlas of Chukchi and Beaufort Seas
Comments from Oceana, Pew, WWF, Audubon, Ocean Conservancy on the Chukchi Call Area, submitted to the Bureau of Ocean Energy Management (US Government)
Assessment 2007: Oil and Gas Activities in the Arctic - Effects and Potential Effects
Previous EBSA
aof:hasDataResource
Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Areas (EBSAs) in the North-East Atlantic
Identification of Arctic marine areas of heightened ecological significance
IUCN/NRDC Workshop to Identify EBSAs in the Arctic Marine Environment
Identification of Ecologically and Biologically Significant Areas (EBSA) in the Canadian Arctic.....
WWF Important Marine Areas in the Arctic Compilation
Physical
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Ocean Surface Temperature
Chlorophyll A Climatology
CIRNC Atlas of Regional Seas (CARS) Physical Ocean Climatologies
Seamounts
Sea Surface Height
Eddy Kinetic Energy
Vents and Seeps
International Bathymetric Chart of the Arctic Ocean (IBCAO)
Drifter Climatology of Near Surface Currents
Distribution of Large Submarine Canyons
Surface Current Velocity
Arctic Regional Climatology .
Total Sediment Thickness of the Worlds Oceans & Marginal Seas
Global Seascapes
Sea Ice Concentration and Occurrence
Seafloor Geomorphology
Biological
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Historical Whale Captures...
Arctic Seabird Distribution Modeling
Arctic Seabird Biodiversity Modeling
Important Bird Areas
Ocean Biogeographic Information System (OBIS) Data
Predictions of Deep Sea Octocorals
Biologically Important Area for Cetaceans in US Waters
Distribution of Macrobenthic Organisms the Canadian Arctic and Atlantic Waters
Biological Data from the ARGA II(c) report
Synthesis Of Arctic Research (SOAR)
Biological Data from the Arctic Biodiversity Assessment
Distribution of Endemic Cetaceans
Environmental Response Management Application (ERMA)
Diversity and Distribution of Endemic Cetaceans
Arctic Geographical Information System (ArcGIS)
Circumpolar Seabird Data Portal
Biogeographic
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Global Open Ocean and Deep Seabed (GOODS) biogeographic classification
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url:www.marineregions.org/sources.php#longhurst
Marine Ecoregions of the World (MEOW).
Large Marine Ecosystems (LMEs).
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url:www.lme.noaa.gov
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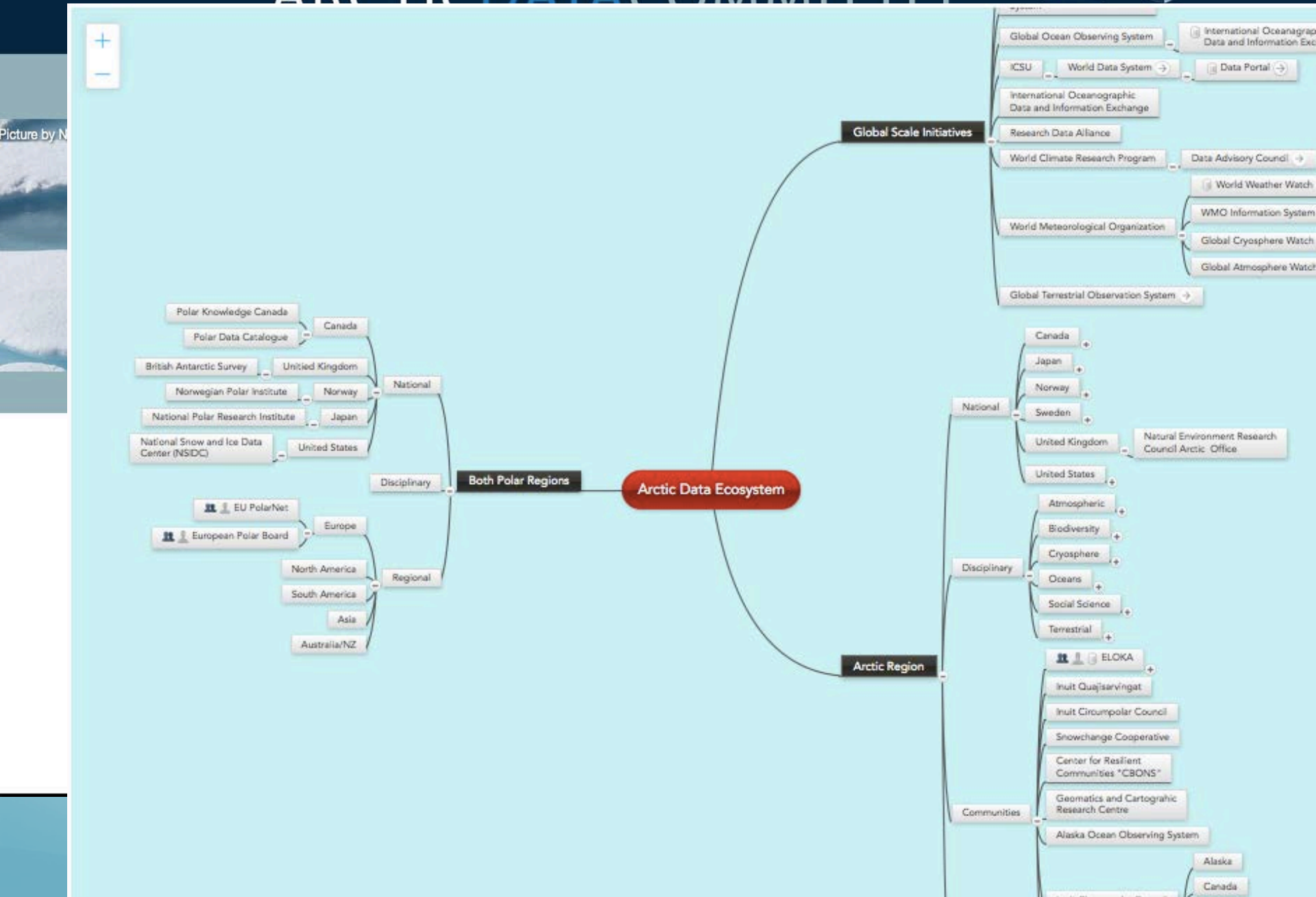
url:www.worldwildlife.org/science/ecoregions/marine/item1266.html
url:www.marineregions.org/sources.php#meow
url:www.fao.org/fishery/topic/3440/en

ARCTIC DATA COMMITTEE



Why? Planning, strategy and interoperability

- Support analysis for supporting sciences, identifying gaps etc.
- Policy development
- Academic discourse
- Interoperability: *Property of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, without any restricted access or implementation.*
- *Task of building coherent services for users when the individual components are technically different and managed by different organizations* (Wikipedia)
- "Map" will be used to promote interoperability in a strategic and efficient way

Recent Developments

- Working with ADC, Scientific Experts on Fish Stocks in the CAO, SCADM, ELOKA & partners, EU-PolarNet
- Establishment of new partners and resources
- *Pan-Arctic Options Project*: Research capacity in the area of oceans expertise and systems thinking – in partnership with *International Institute for Applied Systems Analysis*
- University of Tromsø/Fram Center, Norway – Barents Sea fisheries
- Establishing relationships with IARPC (U.S.), GEOCRI
- Exploring Global Linkages through RDA – meeting during IDW, September 2016

RDA Research Data Sharing without barriers
RESEARCH DATA ALLIANCE

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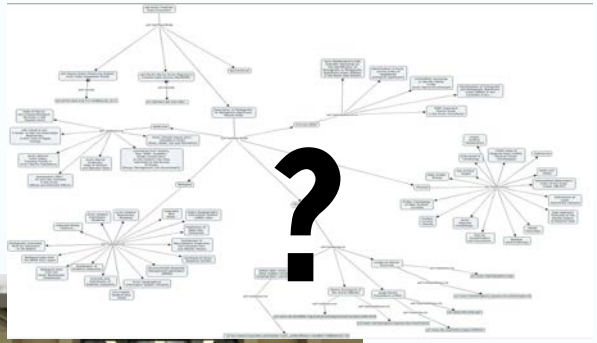
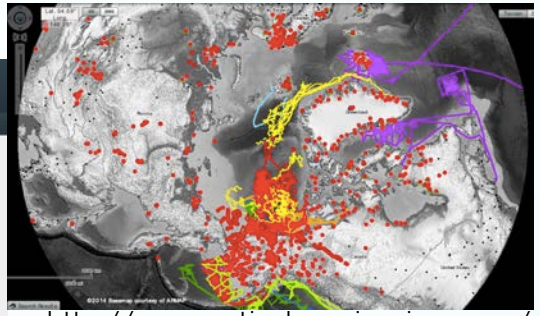
Followed by Expanding Partnerships with Communities of Practice

Arctic Fisheries Science



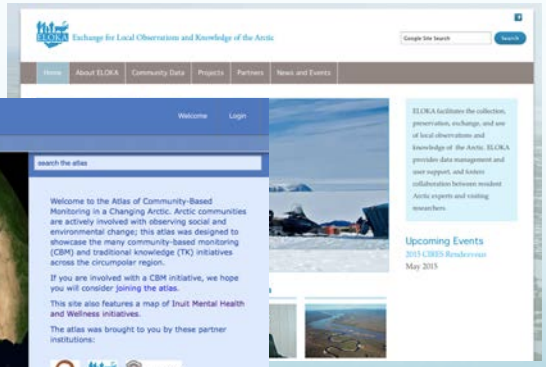
Integrative Projects

Arctic Observing



http://www.arcticobservingviewer.org/

Regional Initiatives



TK & CBM

http://arcticdc.org

pulsifer@nsidc.org

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Thank You

Acknowledgements

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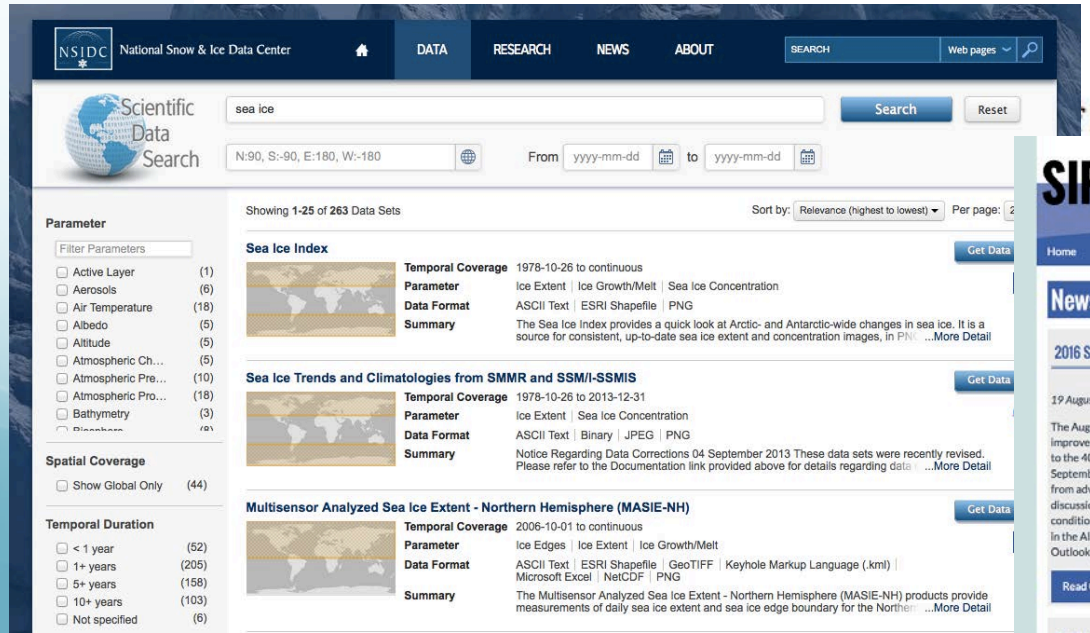
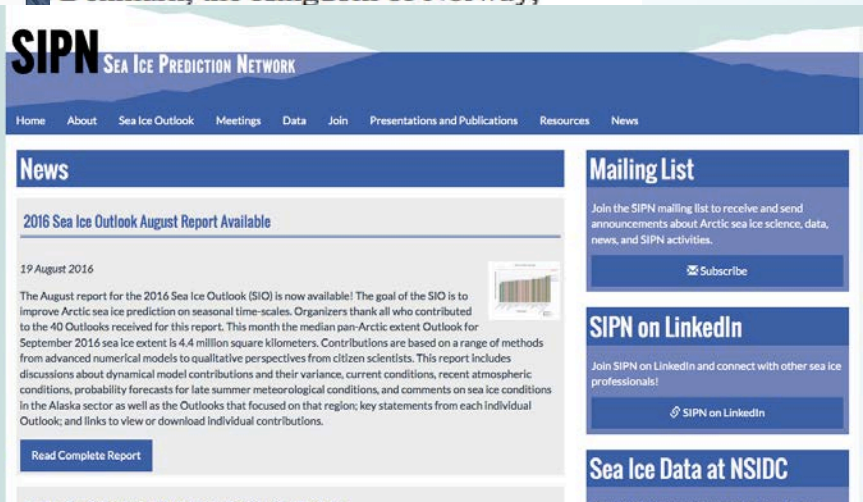
Interconnections

We recognize that until recently ice has generally covered the high seas portion of the central Arctic Ocean on a year-round basis, which has made fishing in those waters impossible to conduct. We acknowledge that, due to climate change resulting in changes in ice distribution and related environmental phenomena, the marine ecosystems of the Arctic Ocean are evolving and that the effects of these changes are poorly understood. We note that the Arctic Ocean ecosystems until now have been relatively unexposed to human activities.

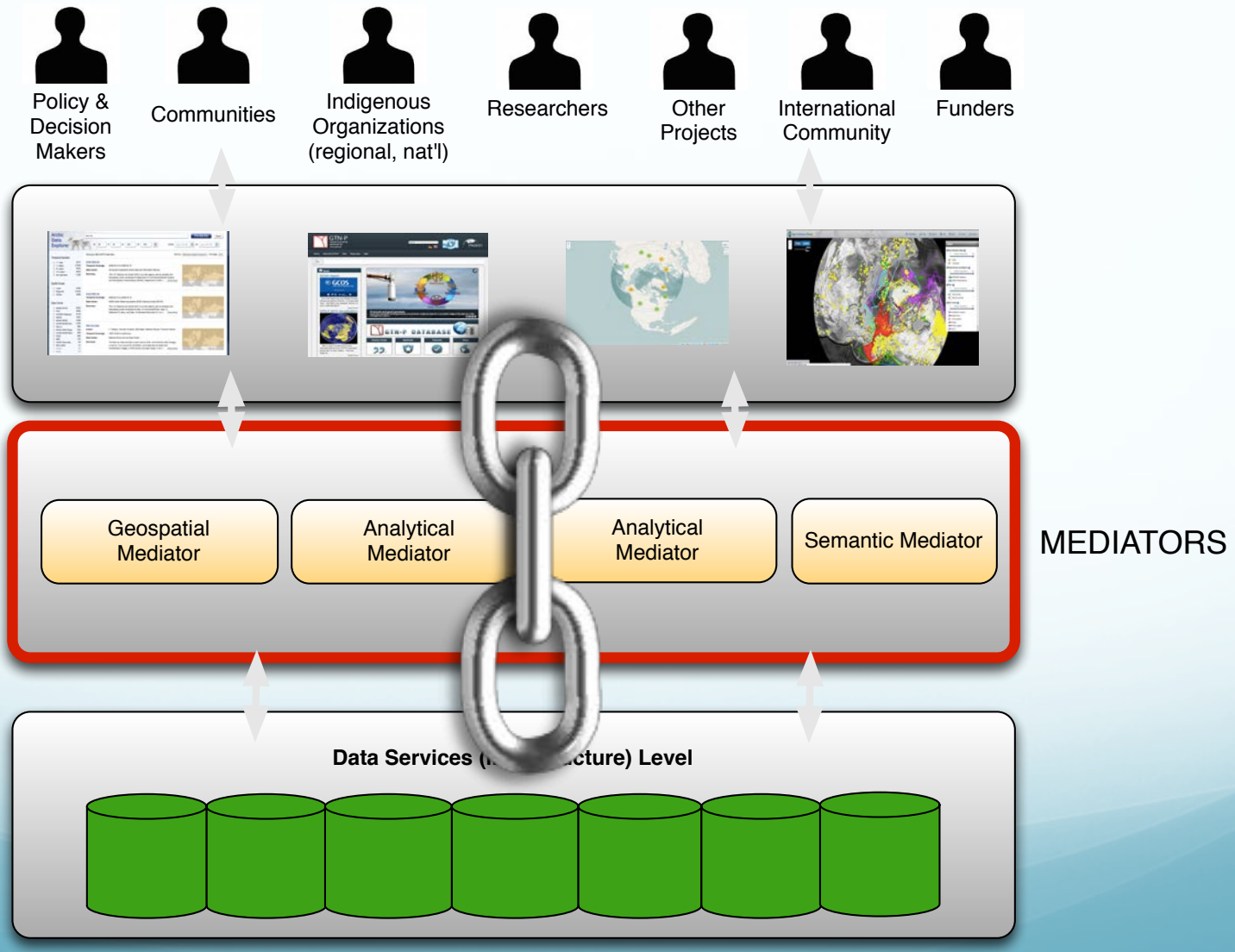
DECLARATION CONCERNING THE PREVENTION OF UNREGULATED HIGH SEAS FISHING IN THE CENTRAL ARCTIC OCEAN



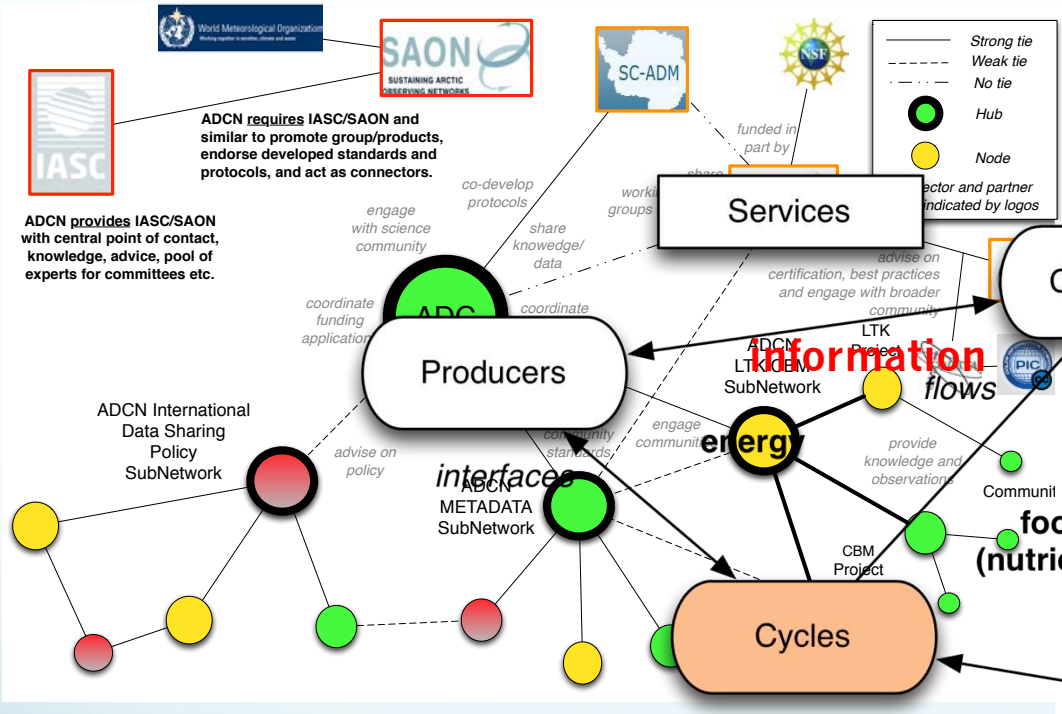
Denmark, the Kingdom of Norway,

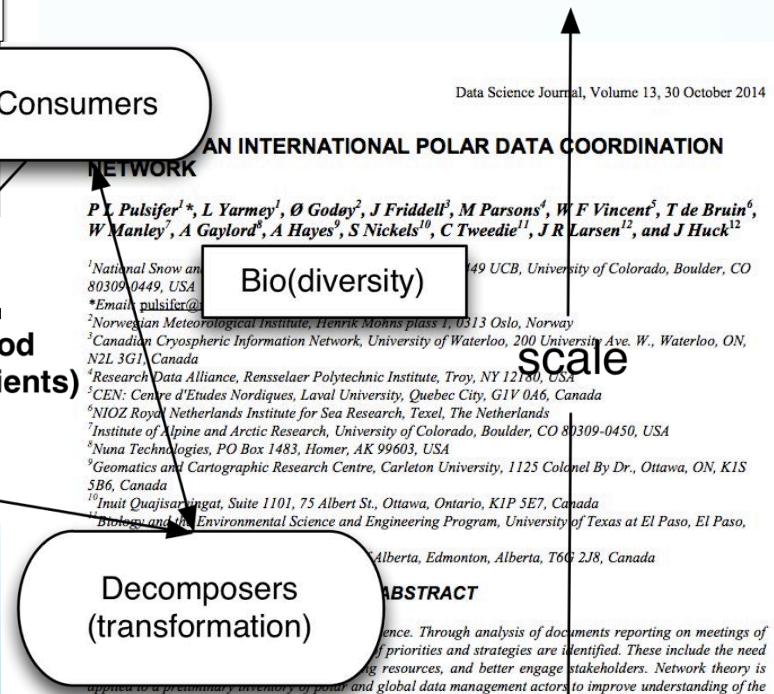


Mediators are Links



Data Ecosystem





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AN INTERNATIONAL POLAR DATA COORDINATION NETWORK

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ABSTRACT

…ence. Through analysis of documents reporting on meetings of … priorities and strategies are identified. These include the need … resources, and better engage stakeholders. Network theory is … and global data management actors to improve understanding of the emerging community of practice. Under the name the Arctic Data Coordination Network, we propose a model network that can support the community in achieving their goals through improving connectivity between existing actors.

Keywords: Data management, Network, Arctic, Antarctic, International Polar Year, Interoperability, Data sharing

1 INTRODUCTION

Well defined, efficient, and sustainable data management is a prerequisite to moving Arctic observing initiatives from a loose collection of individual projects and missions to a unified observing system advancing a common

Ecosystem = Network

(i) Only a small number of links per node are needed to create a highly interconnected and robust network (the idea of a 'it's a small world' or 'six degrees of separation').

(ii) 'Weak ties' involving rare or occasional contact, i.e., individuals who are not necessarily part of the same organization and have a limited personal relationship, are important. Although the establishment of weak ties is not difficult or resource intensive, these ties provide the connectivity necessary to establish a robust network.

(iii) Robust networks are those able to withstand or overcome adverse conditions such as removal of a major node or hub (e.g., loss of funding for a major programme) and include multiple, highly connected hubs as well as less connected nodes.

(iv) 'Connectors' are vital. In a social setting, these are the 'people who know people' whereas in an organizational situation, they are organizations that are highly connected but may or may not engage in the practical activities of the community. Connectors may also act as mediators, where they do more than simply connect but also actively engage in the subject matter, perform acts of synthesis, abstraction, transformation, and so on that enable disparate actors to better communicate.