2020-2022 GEO Work Programme

Implementation Plan for GEO Community Activities

1. Executive Summary

This is the implementation Plan from the Sustaining Arctic Observing Networks (SAON) for ArcticGEOSS as a GEO Community Initiative.

SAON's Vision is a connected, collaborative, and comprehensive long-term pan-Arctic Observing System that serves societal needs. The Mission of SAON is to facilitate, coordinate, and advocate for coordinated international pan-Arctic observations and to mobilize the support needed to sustain them.

The Strategy for SAON (1) describes the following three goals:
1. Create a roadmap to a well-integrated Arctic Observing System;
2. Promote free and ethically open access to all Arctic observational data; and
3. Ensure sustainability of Arctic observing.

The SAON Implementation Plan (2) outlines the objectives for each of these goals and the plans for achieving these.

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2. Purpose

SAON is a joint initiative of the Arctic Council (AC) (3) and the International Arctic Science Committee (IASC) (4). The SAON process was established in 2011 via the AC Nuuk Declaration (5). This declaration recognizes the *importance of the Sustaining Arctic Observing Networks (SAON) process as a major legacy of the International Polar Year for enhancing scientific observations and data-sharing*.

The rapid on-going changes in the Arctic present an urgent need to better observe, characterize and quantify processes and properties of the Arctic system. The first goal of SAON is to *create a roadmap to a well-integrated Arctic Observing System*.

In various contexts, it has agreed that the key current challenges impeding the development of a globally connected, interoperable system are social and organizational rather than technical. The second goal of SAON is to *promote free and ethically open access to all Arctic observational data.*

3. Background and Previous Achievements

Create a roadmap to a well-integrated Arctic Observing System;

One of the prime drivers for SAON activities is the 12 Arctic Societal Benefit Areas (SBA) defined through the International *Arctic Observations Assessment Framework* process (with the IDA Science and Technology Policy Institute (STPI)) (6). The Framework identifies *value tree analysis* as a methodology for

identifying data and services that are required in order to support a specific SBA. The framework and the related *value tree analysis* approach have been followed up by the European Commission's IMOBAR project. The project is an assessment of the benefits of Arctic observations, compared to investment and management costs. Follow-up initiatives are ongoing in a number of SAON countries, including Finland, Japan and USA. Such assessments serve as one building block in the creation of the roadmap.

SAON maintains these inventories:
- SAON Inventory (7)
- SAON Data search facility (8)

In addition, and with AMAP, SAON has been responsible for these EU PolarNet deliverables:
- Inventory of existing monitoring and modelling programmes (September 2016) (9)
- Roadmap for optimisation of monitoring and modelling programmes (April 2019)

SAON was the co-organiser of the Arctic Observing Summit (AOS). The Arctic Observing Summit (AOS) is a high-level, biennial summit that aims to provide community-driven, science-based guidance for the design, implementation, coordination and sustained long-term (decades) operation of an international network of Arctic observing systems. AOS has been organised in 2013, 2014, 2016, and 2018. The theme of the 2018 AOS was *The businesss case for Arctic Observing* (10). The next AOS (2020) will be held in Akureyri, Iceland.

Promote free and ethically open access to all Arctic observational data.

The second goal for SAON is to promote free and ethically open access to all Arctic observational data. The work is coordinated by the Arctic Data Committee (ADC) (11).

Current and past activities of the ADC include:
- In 2018, ADC co-organised the *Polar Data Planning Summit* and the *Polar Data and Systems Architecture Workshop* (12). The focus of the Summit was to generate detailed plans on how best to mobilise existing and soon-to-be initiated funded activities to develop a particular international data sharing case study or scenario.

- The *Polar Data Forum (PDF)* focuses on improving how people and systems can share data in a meaningful way. The goal is to move towards open and connected systems based on a culture of trust and acknowledgement of data production and use. The ADC arranged the PDF in cooperation with partners in 2013 and 2015 (13). A third PDF is planned for 2019.

- Data and system interoperability has been identified as one of the primary goals and challenges of interest to the broader polar and global community, and this was the topic of the ADC co-organised *Polar Connections Interoperability Workshop* in 2016 (14).

- ADC contributed to EU-PolarNet's report *Data management recommendations for polar research data systems and infrastructures in Europe* in 2017 (15).

- ADC was a member of the group that responded to the *Open Geospatial Consortium*'s *Request for Information on Arctic Spatial Data* (16) in 2016.

- In 2017 ADC and partners produced the document *Polar Data and Platform Interoperability Resource Requirements* (17). It outlines financial, technical, and human resources needed to move towards a new model for polar data management.

Ongoing projects of the Arctic Data Committee include:

- Establishing a map of the Arctic data management "ecosystem." This will be both a concept map indicating projects, services and relationships as well as a geographic map indicating location.
- The *Vocabularies and Semantics Working Group* is a joint expert group of ADC, the *Interagency Arctic Research Policy Committee* (IARPC) and the *Standing Committee on Antarctic Data Management* (SCADM). It coordinates vocabularies and semantics development activities across the polar information community.

4. Key Activities

Create a roadmap to a well-integrated Arctic Observing System;

The rapid on-going changes in the Arctic present an urgent need to better observe, characterize and quantify processes and properties of the Arctic system.

SAON is engaged in and facilitates connections among the producers and end-users of Arctic observations in order to create and sustain an Arctic Observing System. In order to achieve this goal, SAON believes that it is essential for participating parties to adopt a community-endorsed framework. The *International Arctic Observations Assessment Framework* (6), developed in partnership with SAON, provides such a starting point. SAON's role in further developing and implementing this framework will be to help to identify critical observations, products, and services that are relevant to the Arctic Observations *value tree*. A holistic benefit analysis can then be used to assess the responsiveness of current Observing System and identify potential expansions. The results of this analysis will be central to the creation of a roadmap to well-integrated Arctic observing that is responsive to Societal Benefit Areas. This roadmap will also be used to identify funding sources to support infrastructure required for sustaining or adding new observational capabilities as well as technological innovations to improve observation capacity.

Promote free and ethically open access to all Arctic observational data.

One of SAON's guiding principles is to promote ethically free and open access (18) to ethically-collected data. The approximately sixty international participants at the 2016 *Polar Connections Interoperability Workshop and Assessment Process* (14) agreed that the key current challenges impeding the development of a globally connected, interoperable system are social and organizational rather than technical: supporting human networks, promoting standards, and aligning policy with implementation.

A review of relevant Arctic data management efforts and results have guided the SAON vision for an open, interconnected, international system for sharing data across disciplines, domains, and cultures. Requirements and characteristics of such a system include but are not limited to:
- A distributed design that connects different data repositories and other resources. This implies and requires interoperability that supports sharing data among various information systems in a useful and meaningful manner;
- Many linked catalogues fostering 'single window' search;
- High quality, ethically open data sustainably preserved over time;
- Data as a responsive, "live" service rather than simple download approach;
- Inclusive of Indigenous and local perspectives and information;
- Access to "big data" and powerful analytical tools (e.g. cloud platforms); and
- Cost effective, maximizing the investments made to develop and maintain the system.

In recognizing the elements of the envisioned system and the key challenges identified by the community, SAON focuses on improving connections, and cooperation between actors. This is achieved by working with the global Arctic data community, including data providers, data scientists, funders, users and beneficiaries within society. This effort will provide the necessary collaborative foundation needed to achieve the desired system.

5. Relationship to GEO Engagement Priorities and to other Work Programme Activities

GEO's mission is to connect the demand for environmental information with the supply of data and information about the Earth. It is also to advocate for broad, open data policies that helps ensure that the data collected through national, regional and global observing systems is both made available and applied to decision-making for global priorities.

The GEO coordinates international efforts to build a Global Earth Observation System of Systems (GEOSS), and it links existing and planned Earth observation systems and supports the development of new ones in cases of perceived gaps in the supply of environment-related information. It aims to construct a global public infrastructure for Earth observations consisting in a flexible and distributed network of systems and content providers.

SAON through its Mission, Vision and Goals is in agreement with this. The IDA Science and Technology Policy Institute (STPI) and SAON have published the *International Arctic Observations Assessment Framework* (6). The Framework defines 12 Social Benefit Areas (SBAs) that rely on Arctic observations. In the report, the Arctic SBAs are mapped to the GEO SBAs.

SAON is a Participating Organisation to GEO.

Relationship to SDG Targets and Indicators Relevant to Earth Observations

SAON addresses these SDG Targets: 12.8, 13.2, 14.1, 14.3, 14.4, 15.1 and 15.2.

Relationship to Five Pillars of Earth Observations Support to the Paris Agreement

SAON addresses *Adaptation* and *Mitigation*.

Relationship to GEO Cold Region Initiative (GEOCRI)

Some of the activities under GEOCRI are SAON contributions to GEOCRI. These GEOCRI Work Plan activities make reference to SAON (10):
- **2.8** Analyze and report on alignment between GEO/GEOCRI data principles and policies and the data principles and policies established by SCAR, IASC and SAON.
- **6.1** Support SAON to develop and maintain an inventory of existing cold region Earth observations initiatives including organizations, programs, projects, networks and systems, particularly those which are active or have impact internationally and regionally.
- **6.2** Leverage GEO's international position to align other initiatives with Arctic Observing System efforts and SAON where this is not already the case (…).
- **6.3** Support SAON as the lead organization in establishing an Arctic Observing System. Support their existing efforts, share expertise. Explore the case for establishing SAON as a Regional GEO (i.e. GEO / Arctic) that would contribute to GEOCRI.

6. Governance

The SAON Leadership Team, responsible for programmatic implementation and overall strategic development, consists of two bodies:

- The SAON Board, responsible for providing guidance and direction on programmatic operations, including science priorities, and project approval and integration, and
- The SAON Executive Committee, responsible for overall governance issues, including alignment of SAON strategic direction with the goals and objectives of both the AC and IASC.

The Arctic Council provides the Chair of SAON and IASC provides the Vice-Chair.

Each AC member country has a seat on the Board, and each of the AC Permanent Participants (Arctic indigenous peoples' organizations) and each of the AC Working Groups are also entitled to one seat on the Board. Non AC countries and international organization are invited to have a seat on the Board as long as they contribute actively to SAON activities.

The SAON Secretariat is hosted by Secretariat of the Arctic Monitoring and Assessment Programme (AMAP) (20). The secretariat function for SAON is a joint effort of AMAP and IASC.

SAON works through two Committees:

- The Committee on Observations and Networks (CON)
- The Arctic Data Committee (ADC, joint with IASC) (11)

7. Data Policy

At minimum, SAON adheres to and promotes the IASC *Statement of Principles and Practices for Arctic Data Management* (18). This statement is consistent with a number of international data policies including those developed by WMO and ICSU bodies such as the World Data System. The GEO Data Sharing Principles have been developed under the leadership of CODATA and ICSU, and thus are generally consistent with the IASC Statement. The IASC statement uses the concept of "ethically open data" which does provide some well accepted exceptions to fully open data. A primary role of the Arctic Data Committee is to promote the IASC Principles, long-term preservation of data, norms of attribution and citation, and open data in general.

Annex 1: References

(1) The Vision, Mission, Guiding Principles and Goals of SAON are described in the document *Sustaining Arctic Observing Networks Strategy: 2018-2028*: https://www.arcticobserving.org/images/pdf/Strategy_and_Implementation/SAON_Strategy_2018-2028_version_16MAY2018.pdf

(2) *SAON Implementation Plan:* https://www.arcticobserving.org/images/pdf/Strategy_and_Implementation/SAON_Implementation_Plan_version_17JUL2018_Status_approved.pdf

(3) Arctic Council web site: https://arctic-council.org

(4) IASC web site: https://iasc.info

(5) *Nuuk Declaration. On the occasion of the Seventh Ministerial Meeting of the Arctic Council, 12th May 2011, Nuuk, Greenland*: https://www.arcticobserving.org/images/pdf/Board_meetings/5th_tromso/nuuk_declaration_final.pdf

(6) The IDA Science and Technology Policy Institute (STPI) and SAON (2017): *The International Arctic Observations Assessment Framework*: https://www.arcticobserving.org/news/268-international-arctic-observations-assessment-framework-released

(7) *SAON Inventory*: http://projects.amap.no/directory/saon/

(8) *SAON Data search facility*: https://saon.met.no/

(9) *Inventory of existing monitoring and modelling programmes* (EU-PolarNet deliverable): http://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/Members_documents/Deliverables/WP2/D2_3_Inventory_of_existing_monitoring_and_modelling_programmes.pdf

(10) Arctic Observing Summit web site: http://www.arcticobservingsummit.org/

(11) ADC web site: https://arcticdc.org/

(12) *Polar Data and Systems Architecture Workshop* web site: https://arcticdc.org/meetings/conferences/polar-data-architecture-workshop

(13) Polar Data Forum web site: http://www.polar-data-forum.org/

(14) *Polar Connections. Interoperability Workshop and Assessment Process*: https://arcticdc.org/meetings/adc-meetings/9-adc-meetings/36-polar-connections-interoperability-workshop

(15) EU PolarNet: *Data management recommendations for polar research data systems and infrastructures in Europe*: http://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/Members_documents/Deliverables/WP3/EU-PolarNet_D3.5_Data_management_recommendations.pdf

(16) *Response to the Open Geospatial Consortium Request for Information on Arctic Spatial Data by the Polar Data Community*: https://arcticdc.org/images/download/Polar-Community-OGC-ASDP-RFI-Response.pdf

(17) *Polar Data and Platform Interoperability Resource Requirements:* https://arcticdc.org/images/download/Polar_Data_Interoperability_Resource_Requirements_Submission_NO_COST.pdf

 (18) IASC *Statement of Principles and Practices for Arctic Data Management*: https://iasc.info/images/data/IASC_data_statement.pdf

(19) *GEOCRI Work Plan 2017-2019*: http://www.earthobservations.org/documents/2017_coldregions_geocri_wp.pdf

(20) AMAP web site: www.amap.no

Annex 2: Acronyms

AC: Arctic Council
ADC: Arctic Data Committee
AMAP: Arctic Monitoring and Assessment Programme
AOS: Arctic Observing Summit
ASSW: Arctic Science Summit Week
CODATA: Committee on Data for Science and Technology
CON: Committee on Observations and Networks
GEO: Group on Earth Observations
GEOCRI: GEO Cold Regions Initiative
IASC: International Arctic Science Committee
ICSU: International Council for Science
IDA: Institute for Defense Analyses
NSIDC: National Snow and Ice Data Center
OGC: Open Geospatial Consortium
PDF: Polar Data Forum
PP: Permanent Participant (Arctic Council indigenous peoples' organizations)
SAON: Sustaining Arctic Observing Networks
SBA: Societal Benefit Areas
STPI: IDA Science and Technology Policy Institute
WMO: World Meteorological Organization

Annex 3: Brief CV of Project Leader

<u>Jan Rene Larsen:</u>

- Since 2011 Deputy Executive Secretary at the Arctic Monitoring and Assessment Programme (AMAP). AMAP is a working group of the Arctic Council. Secretary of the Sustaining Arctic Observing Networks (SAON).
- Involved in organising international conferences with an Arctic Perspective, including the Polar Data Forum and the Arctic Observing Summit.
- Involved in EU Horizon2020 projects (*EU-PolarNet* and *INTERACT*) and ESA's *Arctic Mission System Study* as task lead.
- Biologist (environmental) from University of Copenhagen, Denmark, with additional background in biostatistics and computer science.