



The Sustaining Arctic Observing Networks (SAON): Background

SAON was established following a series of resolutions from Ministerial Meetings of the Arctic Council. The SAON Initiating Group (SAON-IG) organized a series of workshops, which formed the basis for the creation of the SAON Steering Group (SAON-SG). This group drafted the SAON Implementation Plan which held details about the governance of SAON and held a proposal for the Terms of Reference of SAON.

1. The Arctic Council resolutions

In the Arctic Council's (AC) declaration from the Ministerial Meeting in Salekhard in 2006, the meeting "urge(s) all the Member countries to maintain and extend long term monitoring of change in all parts of the Arctic, and request AMAP to cooperate with other AC Working Groups, IASC and other partners in efforts to create a coordinated Arctic observing network, that meets identified societal needs"

In the Declaration from the AC Ministerial Meeting in Tromsø in 2009, the meeting "recognize(s) the valuable contribution of the Sustaining Arctic Observing Networks (SAON) process as an IPY legacy to enhance coordination of multidisciplinary Arctic data acquisition, management, access and dissemination, encourage the continuation of this work with emphasis on improving sustained long term observation, and welcome the participation of indigenous organizations in future work"

Finally, in the Declaration from the Nuuk AC Ministerial Meeting, the meeting "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 goal of developing an Arctic Observing Network as a legacy of IPY was endorsed by the WMO XV Congress in May 2007.

2. The SAON Workshops

In the period November 2007 to October 2008, the Initiating Group of the Sustaining Arctic Observing Networks (SAON-IG) organized three workshops in Stockholm, Edmonton and Helsinki. The workshops addressed these questions:

- What Arctic observing sites, systems and networks currently exist?
- What spatial, temporal and disciplinary gaps exist?

- How will gaps be filled and the observation effort sustained?
- How are these activities to be coordinated and integrated?
- How can free, open and timely access to data be achieved?

The reports from the workshops hold recommendations that break out groups at the workshops formulated. These recommendations laid the grounds for SAON.

In addition to the reports from the workshops, three other documents have been produced in the process of developing SAON:

- 'Observing the Arctic', written by the SAON-IG (December 2008)
- 'SAON Data Management' (June 2010)
- 'The SAON Implementation Plan', written by the SAON-SG (February 2011)

Additionally, two workshops were held in St. Petersburg, Russia (July 2008) and in Incheon, Korea (September 2008). These workshops confirmed Russian and Asian interest in SAON. Finally a 'SAON Agency Officials Meeting' was held in March 2009 in Miami, Florida.

2.1 The Stockholm workshop (November 2007)

The Stockholm workshop had the theme 'Are current Arctic observing and data and information management activities sufficient to meet users' needs?'. Five break-out groups were asked to:

- initiate a process to identify which Arctic observing sites, systems and networks currently exist
- initiate a process to identify spatial, temporal and disciplinary gaps
- identify opportunities for new observing networks to integrate into existing networks
- discuss opportunities for better coordination in order to make use of synergies and to avoid overlaps
- comment on the potential for long-term funding by better meeting user needs

The break-out groups were:

- Atmosphere
- Ocean & Sea Ice
- Hydrology/cryosphere
- Terrestrial Ecosystems
- Human Dimensions

The main outcome of the workshop was a synthesis of the user needs, of some of the scientific community, some of government agencies, and some of Arctic residents. Breakout groups also identified present observing sites, systems and networks, and compiled information on spatial, temporal and disciplinary gaps. The concept of 'Flagship observatories' and 'key sites' were discussed. The 'Terrestrial and Freshwater Group' noted that 'No list of monitoring variables is definitive because needs change. However, certain core variables and baseline information need to be obtained and sustained'.

The full report is found at <http://www.arcticobserving.org/background/stockholm-workshop->

2.2 The Edmonton workshop (April 2008)

At the Edmonton workshop, an opportunity was provided to suggest improvements to the Stockholm report and to address key questions under the theme: "How can Arctic observing and data and information management activities be coordinated and sustained over the long-term?"

In addition, these key questions were addressed:

- How will these activities be coordinated?
- How can free, open and timely access to data be achieved?

And

- What is the interplay between modeling and monitoring?
- What are the technology and R&D components required for sustaining Arctic observations and information systems?

The break-out groups were:

- Operational Community
- Terrestrial Observation Networks
- Coastal Group
- Human Health and Community Observation Networks
- New Technologies for Cold Climates
- Funding and Mission Agencies

The group on 'Operational Community' discussed communication, governance, and a Secretariat. The group also discussed the concept of a "data portal" as a key activity that would enable communication and eventually coordination. There was a comment that coordinating the data availability might be the only useful thing that could be done.

The group on 'Terrestrial Observation Networks' discussed existing networks and the relationship between research and operational networks. The group's recommendations were:

- Establish a Secretariat for developing and coordinating a network of networks that integrates existing site-based and theme-based networks and identifies gaps in the network that could be filled with additional funding. This Secretariat would likely be best situated within the auspices of the Arctic Council. The World Meteorological Organization and the Circumpolar Biodiversity Monitoring Program provide possible models for such an approach.
- Develop a core set of 'best monitoring' protocols. These protocols would facilitate a common, standardized and integrated pan-Arctic monitoring approach. This core set of standardized protocols should focus on simple, repeatable and inexpensive measures that can be implemented on a circumpolar basis. This project would include the development of an inventory of existing parameters and protocols in use.

The group also developed recommendations on data management.

The 'Coastal Group's recommendation was to study the Arctic Coastal Dynamics Project (ACD) and ACCOnet, the Arctic Circumpolar Coastal Observatory Network. In addition, the group raised the question 'How do we move forward to make something happen?' Several points were made:

- Building an inventory of existing stations, actors, and networks in the field is a clear step we need to take.

- Building awareness of the coast as a distinct and common entity can be supported by use of the term 'coastal' as a keyword in all relevant metadata.
- The existing ACD circum-Arctic coastal GIS provides a common mapping tool.
- Finding agencies that have a mandate to do these things is very important. This may be a challenge because the coast is often a jurisdictional grey area, but agency support will be critical to allocation of resources to support coastal monitoring.
- Where present, coastal communities represent an important source of demand and potential capacity to support monitoring efforts.

The group on 'Human Health and Community Observation Networks' formulated requirements on strengthening human health networks, support for integrative research and assessment, harmonizing health and social sciences indicators, and data availability

The group on 'New Technologies for Cold Climates' identified common issues and opportunities and reported on, among other things, robustness and flexibility of systems, power supplies and band width, and support and test by communities or institutions.

In general, there was substantial input from many different operational networks and agencies, and an initial discussion on coordination, funding, cyberinfrastructure, new technologies, community-based monitoring, health networks, and data management.

The full report is found at <http://www.arcticobserving.org/background/edmonton-workshop>

2.3 The Helsinki workshop (October 2008)

The main goal of the workshop was to finalize the SAON Recommendations, including proposed actions. Due to broad interest in the SAON process, the workshop was larger than originally anticipated and breakout groups were formed to discuss key issues for the implementation of a coordinated and sustained Arctic observing system. These were: Building Blocks, Funding, Data Management, and Organization. These breakout groups also provided feedback to the draft recommendations, and guidance on actions and next steps.

Building Blocks

Three types of building blocks, all of which are ultimately supported by governments, were identified by the Building Blocks breakout group:

1. Longstanding operational monitoring that is intergovernmentally agreed upon and supported (e.g. GOS/GAW, IABP).
2. Nascent operational monitoring with substantial gaps relative to agreements or insufficiently sustained support (e.g. ARGO, in situ and remote sea level monitoring).
3. Hypothesis driven, integrated observational campaigns that have community-based observations and local knowledge integrated within them (e.g. SEARCH at large scale, individual researcher at small scale).

In addition, they provided a list of recommendations for the next SAON phase that focus on establishing specific guidelines and requirements for research activities but also state a few funding and data management priorities. A few recommendations are:

- Recommend that governments support SAON in order to build on category (1), fill gaps and sustain category (2), ensure standards for comparison are adhered to in category (3).

- Recommend 'next SAON phase' formally adopt existing science plan(s) as its underpinning (e.g. SEARCH national science plan, DAMOCLES, ICARP II, ISAC, CliC, etc.).
- Recommend 'next SAON phase' produce a list of numerical milestones and timelines for platforms contributing to SAON (e.g. required number and density of platforms).
- Recommend that adding new elements to building blocks should follow existing rules and protocols and those additions should not jeopardize sustaining existing elements.
- Recommend data rescue efforts as an effective and important way to get long time series.

Funding

The Funding breakout group presented four main conclusions related to the overseeing committee for the SAON process:

- Arctic Council and IASC establish a joint SAON secretariat that assumes responsibility for continuation of the SAON process for the near-term. The continued role of Arctic Council and IASC can be evaluated as needed. The secretariat should:
 - Develop a mechanism to engage all stakeholders, specifically interested non-Arctic countries, into the SAON process.
 - Engage relevant national agencies outside of the traditional foreign and environmental ones.
 - Coordinate with WMO.
- All SAON activities, including Arctic observations, should adhere to the main purpose of serving society by using a value-added approach. A primary task of SAON is to enhance observations, facilitate sharing of resources, and consider common interests and challenges.
- To ensure funding commitments from governments for SAON:
 - An implementation plan and supported business plan should be available.
 - Activities should have a strong scientific basis and be supported by expert groups.
 - An inter-governmental statement of principles or intent as well as cooperation agreement among agencies should be developed.
- Implementing SAON will be harder than proposing it since governments, the science community and all stakeholders will have to be convinced that it is worth the added cost and effort. As such, early projects that can demonstrate success within a 12-24 month timeframe should be selected through a formal and open process that employs defined criteria such as involvement of several countries, produce observations of good scientific quality that provide specific societal benefit, and have realistic costs.

Data Management

This breakout group provided information on:

1. The identification, assessment, and construction of 'data' building blocks:

- Use a proactive approach to derive a list of data centers and portals currently used by Arctic observing entities and carry out a review of their capabilities.
- Establish a framework for the development of a portal based upon user community, community needs and desired functionality.
- Develop incentive for archiving data and metadata (e.g. publishing of dataset and derived products via establishment of online refereed journals).
- Improve allocation of resources to data management, cyber-infrastructure and portal maintenance.

2. The formation of a Data Management Committee to be charged with near-term (6 months – 1 year) and medium-to-long term (1-5 years) priorities. A few of the recommendations are noted below:

- Near-Term: (1) Identify point person with the SAON secretariat to work on data management, (2) establish a structure for a SAON data management group (e.g. disciplines, countries, science, etc.), (3) identify management liaisons with other SAON groups, (4) carry out the identification and

assessment of existing data centers outlined above, (5) derive 'certification' requirements for data centers to partner with SAON.

- Medium-to-Long Term: (1) Develop and implement a SAON data policy that identifies standards and protocols for the data and metadata, (2) develop education outreach programs that help to shift mindset for data archiving (e.g. University of the Arctic online class in data management, use, archiving), and (3) design online journal-like capacity for publishing data sets and methods.

Organization

The Organization breakout group reinforced both the need to provide statements about why SAON is important to stakeholders and the desire to use existing infrastructure for the SAON secretariat. It also identified several near-term goals:

- A main task should be outreach and initial work on data inventories (e.g. databases for data and metadata). SAON-IG members should stay involved in this process and conduct outreach both within and outside their organizations.
- Sweden to maintain and update the website and initiate the inventorying of existing relevant data/metadatabases, data centres, etc.
- Canada to produce SAON outreach material, including a printed version of the SAON report and recommendations.
- Identify one SAON point-of-contact for each country and have AMAP and IASC and SAON-IG members actively communicate SAON to the relevant people and agencies in Arctic and non-Arctic networks.

(The text above is taken from the document 'Observing the Arctic', see next section)

The full report is found at <http://www.arcticobserving.org/background/helsinki-workshop>

2.4 'Observing the Arctic' (December 2008)

This document concluded the work by the SAON Initiating Group (SAON-IG). It summarized the outcome of the workshops and formulated these four recommendations:

- 1) The Arctic Council and partners should establish An Arctic Observing Forum
- 2) The Arctic countries should 1) Sustain their current level of observing activities, and data and information services 2) Create a data dissemination protocol to make data and information freely, openly and easily accessible in a timely fashion
- 3) The Arctic states should increase inter-governmental cooperation in coordinating and integrating Arctic observing activities, and associated data and information management.
- 4) The Arctic Council states should welcome non-Arctic states and international organizations as partners to the inter-governmental cooperation that will be necessary to sustain and improve Arctic observing capacity, and cooperation that will be necessary to sustain and improve Arctic observing capacity, and data and information services.

The full document is found at http://www.arcticobserving.org/images/stories/saon_report_final_web.pdf

2.5 'SAON Data Management' (June 2010)

The purpose of the Data Management Workshop Part I was to reach a common understanding on the goals and scope of the SAON data management activities; address the question of how to ensure relevant stakeholder input, identify key areas for further work, establish a work plan (if possible including responsibilities for implementing one or more demonstration projects on inter-network data collaboration, focusing on identified key issues), and finally establish a drafting group to continue the work during the Workshop Part II.

The purpose of the Workshop Part II was to prepare a white paper outlining the recommended approach for developing the SAON data strategy and related SAON data policy, and proposing concrete activities to address identified 'key issues'. This work was conducted by a small sub-group of participants (as agreed to in Part I).

The group worked on the basis of a questionnaire that asked the participants for suggestions for what the SAON process might do in relation to data management that could help meet/serve their program/network needs. These were

- Enhancing and promoting standardization in data management operations (including calls for SAON metadata standards and initiatives relating to 'data policies').
- Enhancing shared use of data, including viewing SAON as a vehicle for publicizing and promoting awareness of existing data holdings;
- Promoting best practices, especially in relation to open and free data sharing;
- Use of SAON as a means of mobilizing funding for data management activities.

The group worked under the headings

- Free Access to Data
- Data Ownership vs. Data Stewardship
- Timely Access to Data
- Data Archiving
- Data Portals and Metadata

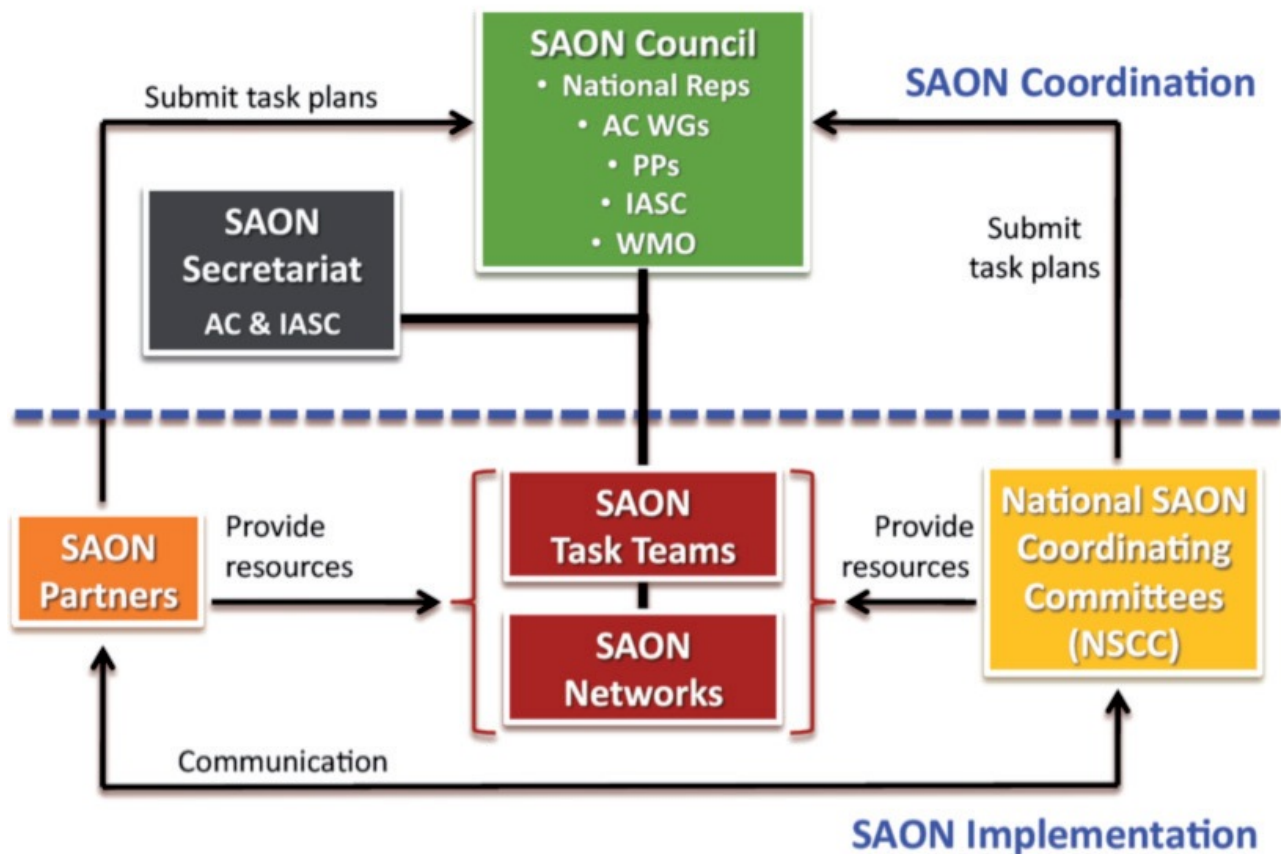
The full document is found at <http://www.arcticobserving.org/background/data-management-workshop>

2.6 'SAON Implementation Plan' (February 2011)

The document describes the implementation phase of SAON, including the proposed scope of activities, and a structure for implementing the activities. It suggests that SAON will be implemented through a number of Task Teams, with participation being voluntary and open to most organizations. It stresses that

any country may participate in SAON and in particular join the proposed SAON Council (This was later changed to SAON Board).

The document contains a draft Terms of Reference for the SAON Board and a listing of the first set of proposed SAON Tasks. These Tasks show a diversity of participation with Task Leaders coming from Arctic Council Working Groups (AMAP, CAFF, SDWG), Arctic Council Permanent Participants (AIA, ICC), Arctic Council Member States (Canada, Norway, Sweden, US) and non-Arctic countries (Germany, Netherlands). In addition to the above, the document is formulated as a series of 'questions-and-answers' in an FAQ. The document proposes this structure for the SAON work:



The full document is found at <http://www.arcticobserving.org/implementation-plan>

3. SAON Governance

The SAON Terms of Reference outlines the governance structure of SAON: 1) Tasks (projects), 2) National SAON Coordinating Committees, 3) Board, 4) Executive Committee, and 5) Secretariat.

The second meeting of the Board was held in Potsdam, Germany in October 2012, and had attendance from the eight arctic AC countries, one AC Permanent Participant (Inuit Circumpolar Council), five non-arctic countries, nine Task Leads, AMAP, IASC, GEO, and WMO. AC holds the chairmanship of SAON, and IASC holds the vice-chairmanship. AMAP and IASC provide secretariat support to the Board.

The meeting was centered around

- 1) A brief reports by all of the SAON tasks on their progress to date in achieving their goals
- 2) Establishment of a high-level SAON strategy for setting overarching goals and objectives over the entire SAON portfolio.
- 3) Provide an overview of the status of the SAON Terms of Reference (ToR) and Rules of Procedure (RoP). The SAON Terms of Reference can be found here:
http://www.arcticobserving.org/images/stories/Board_Meeting_Potsdam/Meeting_documents/34_saon%20terms%20of%20reference.doc.

4. Activities and Achievements

SAON now has 23 different Tasks, and they are in different stages of progress. In its review of the Tasks at the second meeting of the Board, the Board noted that most Tasks are in a good shape, with good progress, and mostly are well funded.

One of the Tasks is convening the first Arctic Observing Summit (AOS) in April/May 2013 and the second AOS in conjunction with IASC's Annual Science Summit Week (ASSW) 2014 in Finland.

The National SAON Committees report to the Board, and the reports have been digitized and are accessible at <http://www.arcticobserving.org/networks>.



The Sustaining Arctic Observing Networks (SAON): The National Reporting and Survey

Background

In the early phase of the preparatory work for SAON, the SAON Steering Group organized a survey which was presented to a group of countries and networks. The objective of the survey was to get an overview of existing arctic observation activities and networks. Several countries used the survey to structure their National Reporting to SAON, while some reports were structured differently. The full inventory of the SAON National Reporting can be found at <http://www.arcticobserving.org/national-reports>.

The headings in the survey questionnaire were:

- Name/acronym/contact person/web site
- Main objective of network
- Member of or connected to a global network
- Type of activity
 - Theme
 - Location
 - Community based
 - Coordination
- Main variables
- When operational (year)
- Geographical coverage (countries)
- Data archive/centre, including Web site
- Data availability: Metadata only/All data/Charge or no charge for data

In 2012, the SAON National Reports were digitized into a database. 20 national reports from 13 countries (Canada, Denmark, Greenland, Finland, Iceland, Italy, Japan, Norway, Poland, Russia, Spain, Sweden, and USA) for the period 2008-2012 were processed, as were three international organisation reports (Hausgarten, ICES, WMO). The database and the questionnaire can be found at <http://www.arcticobserving.org/networks>.

Some statistics

The database holds information from 20 countries and 127 organisations. A total of 267 activities/projects from 196 networks, covering 603 positions/sites/stations were identified and recorded. 40 different

themes were covered (Aerosols, Air-sea interaction, Atmosphere, Climate, Coastal, Conservation..., see figure 1) and the activities were divided by human inspection into these scales: Local, national, regional, arctic, and global, see figure 2.

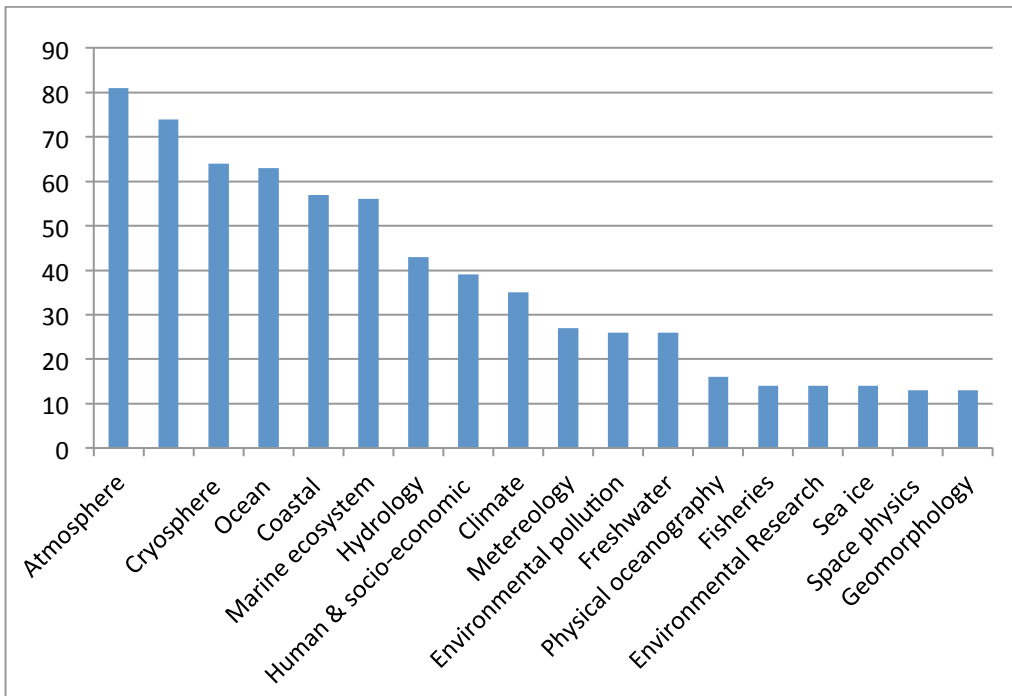


Figure 1: The SAON national reporting, broken down on themes

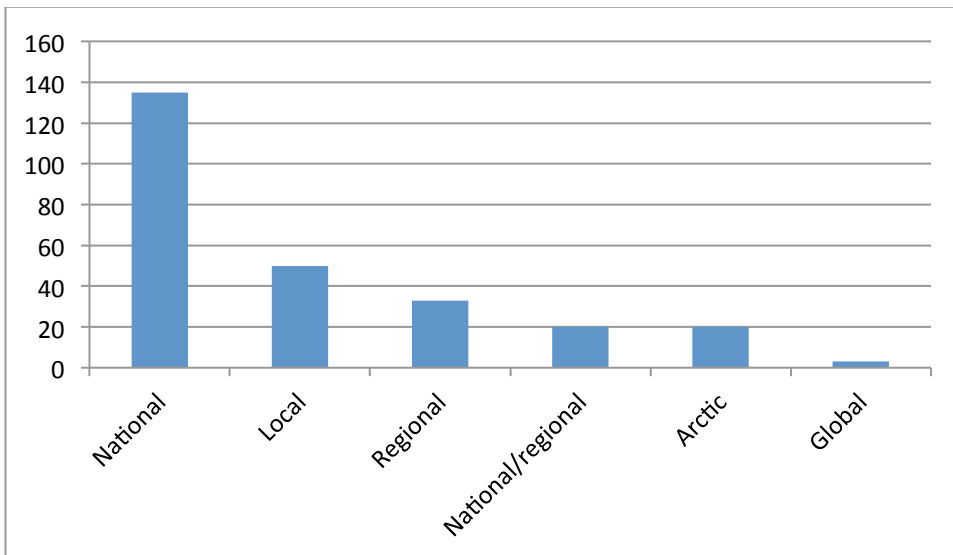


Figure 2: The SAON national reporting, broken down on scales

The questionnaire

The questionnaire also asked the respondents to consider these questions:

- How can the SAON Steering Group best assist you?
- What do you see as the role of the SAON SG?
- What are the critical issues facing your observing program or data and information management program?

The responses can be seen in figure 3, 4, and 5.

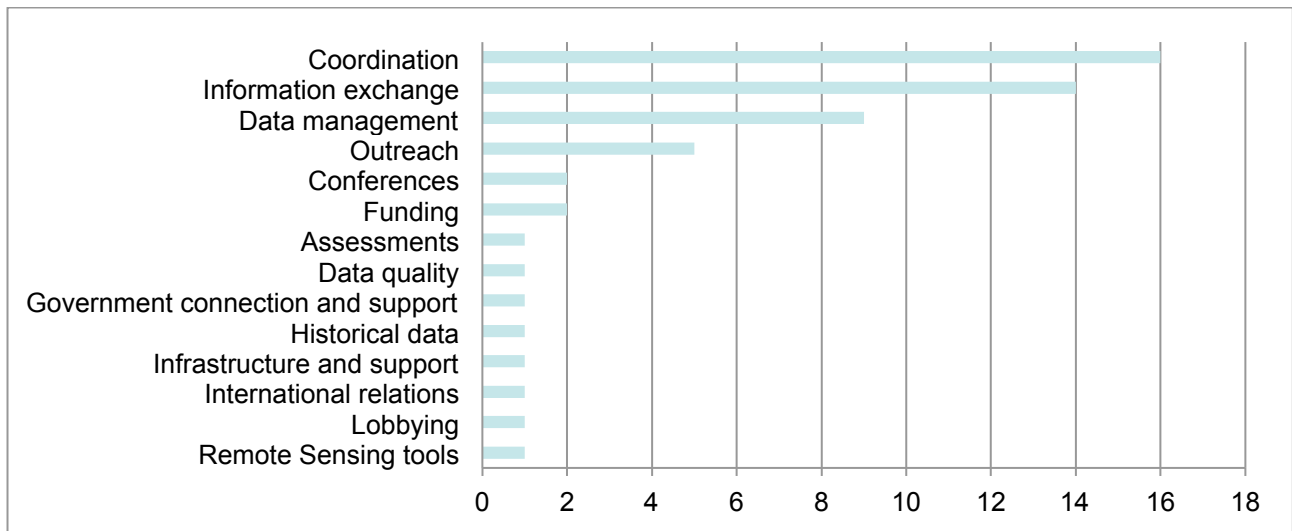


Figure 3: How can the SAON Steering Group best assist you?

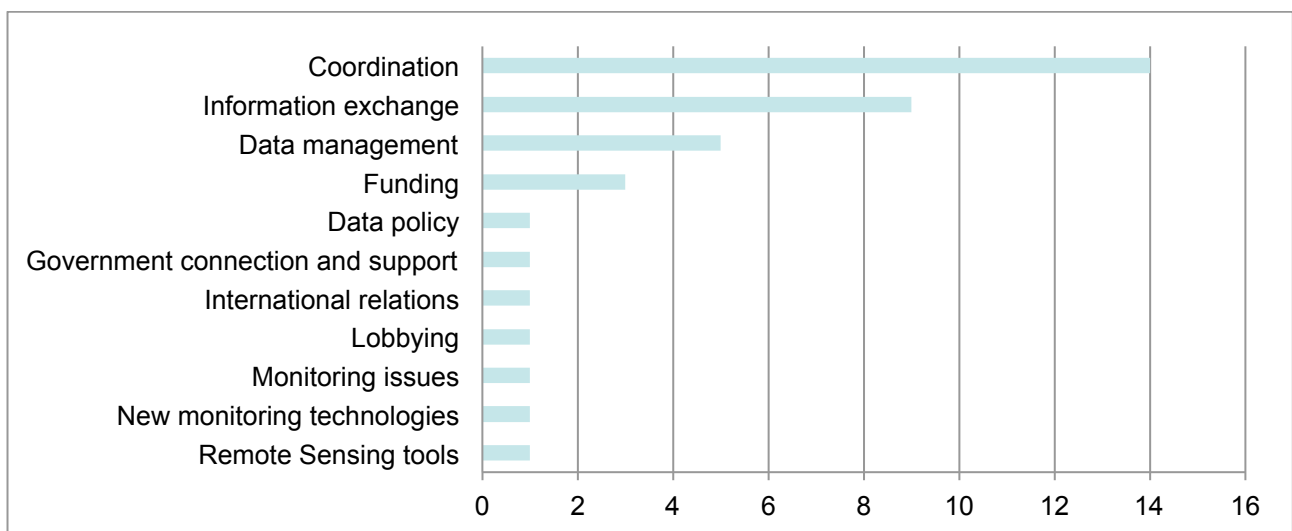


Figure 4: What do you see as the role of the SAON Steering Group?

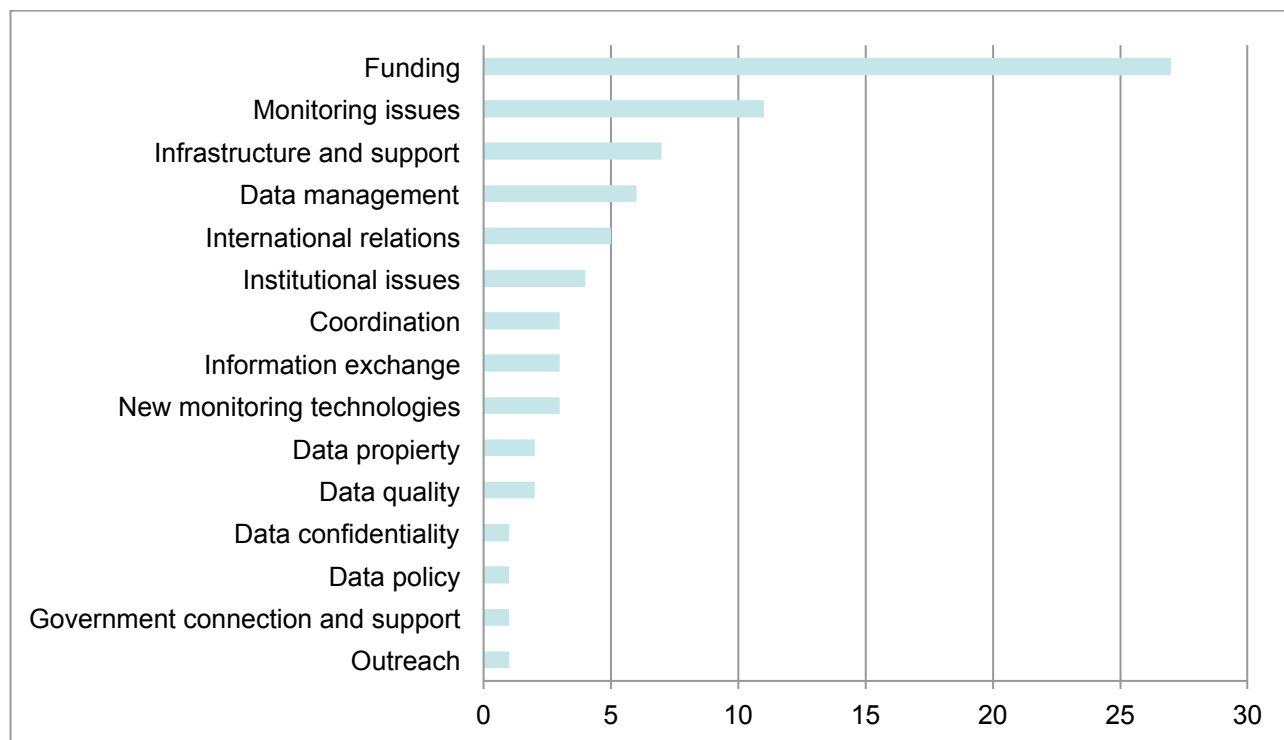


Figure 5: What are the critical issues facing your observing program or data and information management program?

Challenges and future work

The process of digitizing the National Reports revealed some problems that must be addressed. Among these are:

- Some countries have submitted several reports, which contain internal contradictions. There have been problems updating old reporting with newer reporting
- Additional classification may have to be introduced, for instance to cover: national monitoring networks, field stations, research plots
- Proposals for improvements have been suggested: Introduce periodicity/frequency: annual/monthly/continuous/seasonal etc.
- Sites' are not always one position, but may be plots (e.g. sampling plots) or study areas (e.g. a glacier)



The Sustaining Arctic Observing Networks (SAON): Status

Background and Governance

SAON was endorsed by the Ministerial Meeting of the Arctic Council in Nuuk 2011 and by the International Arctic Science Committee (IASC). The SAON Terms of Reference outlines the governance structure of SAON: 1) Tasks (projects), 2) National SAON Coordinating Committees, 3) Board, 4) Executive Committee 5), and 6) Secretariat

Tasks

SAON now has 23 different Tasks. These are in different stages of progress, and a summary can be found in the Appendix. In its review of the Tasks at the second meeting of the Board, the Board noted that most Tasks are in a good shape, with good progress, and mostly are well funded.

National SAON Coordinating Committees

The National Committees report to the Board, and the reports have been digitized and are accessible at <http://www.arcticobserving.org/networks>

Board

The SAON Board held its second meeting in Potsdam, Germany, 1-2 October 2012.

The first order of business centered around brief reports by all of the SAON tasks on their progress to date in achieving their goals, related to either observation assets coordination or integrated data delivery, or both.

The second order of business was on the establishment of a high-level SAON strategy for setting overarching goals and objectives over the entire SAON portfolio. This will provide SAON with a short and concise strategic plan that aligns high-level network product generation with the various SAON tasks and ultimately allow for the evaluation of tasks in the context of SAON's strategic goals.

The third and final order of business was to provide an overview of the status of the SAON Terms of Reference (ToR) and Rules of Procedure (RoP). This involved the evoking of an 'adaptive management' process in which the existing ToR/RoP would be open for comments and change during each two-year SAON program review, the first of which is slated to start during the late summer or early autumn of 2013.

Executive Committee

The SAON Executive Committee has been established with a composition as described in the RoP. Sweden represents the Arctic countries, while ICC is the member for the AC Permanent Participants.

Secretariat

The AMAP and IASC Secretariats contribute resources to the SAON Secretariat.