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Report of the Sustaining Arctic Observing Networks (SAON) Initiating Group

ARCTIC COUNCIL

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- Arctic Council, represented by the Arctic Monitoring and Assessment Program (AMAP)
- Arctic Ocean Sciences Board (AOSB)
- Climate and Cryosphere Project (CliC) – part of the World Climate Research Programme/World Meteorological Organization (WMO)
- Forum of Arctic Research Operators (FARO)
- Indigenous Peoples Secretariat (IPS)
- International Arctic Science Committee (IASC)
- International Arctic Social Science Association (IASSA)
- International Polar Year (represented by the IPY International Programme Office)
- International Study of Arctic Change (ISAC)
- National Science Foundation, USA (NSF)
- European Polar Board, European Science Foundation (EPB)
- Global Ocean Observing System (GOOS)
- International Permafrost Association (IPA)

Acknowledgements and thanks:

- Workshop organizers in Sweden, Canada and Finland.
- Workshop/meeting organizers in Russia and Korea.
- Workshop participants and supporting agencies, organizations and ministries.

Introduction

This report, prepared by the SAON Initiating Group (IG), summarizes the collective efforts of 350 Arctic researchers, representatives of inter-governmental, national and subnational government agencies, representatives of indigenous peoples organizations, and residents of the Arctic.

This report was drafted as a response to the request from Arctic Council ministers at their meeting in Salekhard, Russia in November 2006, but is also directed to other organizations, agencies, governments, networks and programs involved in all aspects of Arctic observing.

The foundations of SAON are the existing networks and programs that already provide high quality Arctic observations. During the SAON process, it was revealed that present Arctic observing sites did not adequately cover the Arctic region, observing data are fragmentary and not easily available, and only a part of the Arctic observing is funded on a long-term basis.

Participants in the SAON workshops identified many opportunities to enhance the value of observations through better coordination within and among existing networks. Some of the gaps (current and future) in Arctic observing were also identified.

The primary recommendation of the SAON-IG is the creation of an Arctic Observing Forum (AOF). While the precise structure and mandate of the AOF has not yet been determined, there is a clear need to have a means to continue the work initiated by the SAON-IG. Ultimately, it will be the responsibility of organizations participating in the AOF to decide how to implement the recommendations outlined in this report.

The full reports of the SAON breakout groups, the presentations at the SAON workshops (Stockholm, Edmonton, St. Petersburg, Incheon, Helsinki) and other related materials are available at www.arcticobserving.org.

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I: Executive Summary

In its 2006 Salekhard Declaration, the Arctic Council agreed to:

> **"Urge all Member countries to maintain and extend long term monitoring of change in all parts of the Arctic, and request the Arctic Monitoring and Assessment Program to cooperate with other Arctic Council Working Groups, the International Arctic Science Committee and other partners in efforts to create a coordinated Arctic observing network, that meets identified societal needs."**

Sustaining Arctic Observing Networks: the SAON Process

SAON is a process to further multinational engagement in developing sustained and coordinated pan-Arctic observing and data sharing systems that serve societal needs, particularly related to environmental, social, economic and cultural issues.

SAON is important and timely for several reasons.

Climate change, contamination, biodiversity loss and changes to the physical environment of the Arctic have serious impacts both inside and outside the Arctic. Trends indicate that the severity of the impacts are projected to increase in the near future. Natural capital and prospects for human development may be undermined.

Arctic countries and their people are faced with new environmental, economic and societal challenges. Global activities affect the Arctic environment while changes in the Arctic environment have global consequences. Hence, the broader global community must be engaged in improved monitoring of the Arctic to better understand the changes and their affects, and must address the social and human dimension in Arctic observation.

The need for comprehensive, sustained and interdisciplinary Arctic observations and data management has been identified previously in the Arctic Climate Impact Assessment (ACIA) and the report of the International Conference on Arctic Research Planning (ICARP II), among others. Although the International Polar Year 2007-2008 (IPY) has provided an opportunity to implement new observing activities in the Arctic, and even though there are a wide range of ongoing observing programs, networks and existing observational platforms, many Arctic observing activities are still fragmentary and exist in varying stages of development. From the present fragmentary state, there is a need to fill spatial, temporal and disciplinary gaps in observing records, to strengthen the sustainability of observing programs, and make data readily available.

The Sustaining Arctic Observing Networks Initiating Group (SAON-IG) was formed in January 2007, and today consists of 13 international organizations representing the Arctic Council, Arctic residents, the Arctic research community and operational and funding agencies. The group facilitated three international workshops and two regional meetings that were broadly attended by representatives of the science community, operational agencies and indigenous peoples.

The Recommendations derived from these discussions aim to significantly improve our knowledge about the Arctic system. Improved knowledge is of value to all stakeholders as it will enable the dissemination of timely, accurate and appropriate information necessary for developing projections of future change and for policy development and decision making at local, community, regional, national and global levels. To achieve this, the SAON-IG presents the following Recommendations.

Recommendations

1 The Arctic Council (including permanent participants and observers) should lead the facilitation of international collaboration among government agencies, researchers, and northern residents, especially indigenous people at the community level, to promote a sustainable pan-Arctic observing system.

To this end, the Arctic Council and partners are encouraged to establish an **Arctic Observing Forum** (AOF), with adequate resources and defined roles for the Arctic Indigenous Peoples, to facilitate Arctic observing, and related data and information management services. The AOF shall address issues that transcend individual Arctic observing systems and national capabilities.

2 The governments of the Arctic Council member states should commit to:

- Sustaining their current level of observing activities, and data and information services, and to making every reasonable effort to increase the scope of those activities in the future;
- Creating a data dissemination protocol to make data and information freely, openly and easily accessible in a timely fashion at minimal costs to users, taking into account relevant national legislation, and seek to ensure that relevant national organizations adhere to similar policies.

3 The Arctic states are urged to increase inter-governmental cooperation in coordinating and integrating Arctic observing activities, and associated data and information management. In order to facilitate this and the efficient operation of an Arctic Observing Forum, each of the Arctic states is encouraged to create a national inter-agency group to coordinate and integrate their Arctic observing activities, and resulting data and information services. These groups shall form the basis for increased inter-governmental communication and cooperation on Arctic observing.

4 Recognizing that the Arctic issues are of global common concern and that they are of scientific interest to all states, the Arctic Council member states are urged to 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 data and information services.

Non-Arctic states are therefore also encouraged to adopt, support and implement actions that are recommended to the Arctic states in 1-3 above.

II: The Report

The Charge

In its Salekhard Declaration in 2006, the Arctic Council agreed on several statements related to Arctic observing.

- *'Request the SAOs to direct the Arctic Monitoring and Assessment Program (AMAP) to cooperate with other AC working groups and relevant scientific bodies in continuously reviewing needs and gaps in climate monitoring in the Arctic so that coordinated action might be taken to ensure the full realization of a comprehensive Arctic observing network'* (Under Climate Change in the Arctic);

- '*Urge Member States and other entities to strengthen monitoring and research efforts needed to comprehensively address Arctic change and promote the establishment of a circumpolar observing network of monitoring stations with coordinated data handling and information exchange for scientific data, statistics and traditional knowledge as a lasting legacy of the IPY (and as the evolving component of the Global Earth Observing System of Systems, GEOSS)'* (Under IPY);

- *'Urge all 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'* (Under AMAP);

- *'Encourage AMAP to continue its ongoing contaminants monitoring and assessment activities, including long-term temporal trend monitoring, and monitoring of spatial trends, human health, and biological effects of contaminants in the Arctic, with a special emphasis on the collection of information on new contaminants, assessment of the combined effects on climate (and UV) and contaminants, emerging issues, and providing improved information on sources of contaminants (follow-up of 2002 assessment)'* (Under AMAP);

- *'Endorse the continued development of the Circumpolar Biodiversity Monitoring Program (CBMP) as the cornerstone program of CAFF, and encourage countries to contribute actively to CBMP and expect CBMP to provide valuable data for increased knowledge and improvement of biodiversity in the Arctic'* (Under CAFF);

- *'Support the continued cooperation with indigenous peoples of the Arctic, welcome the contribution of their traditional knowledge of flora and fauna to scientific research, and encourage further cooperation in the development of community-based monitoring of the Arctic's living resources'* (Under CAFF);

- '*Recognizing that the conservation of biodiversity is a necessary condition for environmental protection and sustainable development, and the current and future well-being of the Arctic region and its habitants, endorse long-term monitoring of Arctic biodiversity to provide policymakers with the information needed to accurately assess the impacts from global environmental change, and increased human activities related to regional development and economic growth'* (Under CAFF);

- *'Approve the participation of the Arctic Council in the Group on Earth Observations and in GEO System of Systems to provide further input into coordination of monitoring and assessment activities in the Arctic'* (Under Other).

The Need for Sustaining Arctic Observation

The collection of observational information on the Arctic environment, its societies and economies is necessary if governments of Arctic nations, Arctic peoples and other stakeholders are to respond effectively to the rapid changes witnessed in the North today. The data derived from sustained observation of different parts of the Arctic system are used for many purposes. Importantly, they provide the basis for developing our understanding of the impacts of environmental change and human activities on the marine and terrestrial ecosystems of the Arctic so that ecosystems can be better managed and sustained to maintain and to improve the quality of life both for Arctic residents and all peoples who are connected to the Arctic.

Arctic observations are collected by a number of different entities and through different processes, each with its own purpose, but all ultimately feeding

data and information back to society. Through the SAON workshops many Arctic observation networks, programs and projects have been identified, helping to define a possible organizational structure for linking diverse observational programs and data archives (see Annex 2). These are the 'building blocks' of a sustained Arctic observing system.

The footprint of human activity will grow in the Arctic, and the extent of our knowledge of the Arctic's biophysical system will dictate its eventual nature. If we wish to tread lightly and act in such a way that sustains both the biophysical and human components, we need an approach that will help us understand and predict responses to internally and externally driven changes. This requires sustainable integrated research and monitoring programs that incorporate scientific and traditional and local knowledge, techniques and tools. These programs should meet clearly defined societal needs. Each program should be designed to engage the stakeholders and investigators that are necessary to answering the requirements that meet clearly defined societal needs. Those engaged in Arctic observing activities currently include northern residents (especially indigenous peoples), government agencies that support operational and research-driven observations, and the science community.

The SAON Process

Taking into account all of these statements, the AMAP initiated a dialogue with potential partners. This led, in January 2007, to the formation the *Sustaining Arctic Observing Networks Initiating Group (SAON-IG)*, today consisting of 13 international organizations. The SAON-IG aimed to engage all Arctic observing communities.

The SAON-IG agreed as its mission *to develop a set of recommendations on how to achieve long-term Arctic-wide observing activities that provide free, open and timely access to high quality data that will realize pan-Arctic and global added-value services and provide societal benefits.*

The first step towards achieving this mission was to solicit input from a broad community of stakeholders at three workshops:

- Stockholm, Sweden (November 2007)
- Edmonton, Canada (April 2008) and
- Helsinki, Finland (October 2008).

In addition, regional meetings were held in St. Petersburg, Russia (July 2008) and Incheon, Korea (September 2008) to increase awareness of the SAON-IG effort and engage Russian and Asian partners in the coordination and expansion of Arctic observing activities.

To develop the recommendations, the SAON-IG suggested that the initial workshops should address five key questions:

1: **What Arctic observing sites, systems and networks (activities) currently exist?**
2: **What spatial, temporal and disciplinary gaps exist?**
3: **How will gaps be filled and the entire effort sustained?**
4: **How are these activities coordinated and integrated?**
5: **How is free, open and timely access to be achieved?**

A summary of the outcome from these workshops are provided in Annex 1. Detailed workshop reports are available at: www.arcticobserving.org.

The SAON-IG agreed on a concept for 'Arctic Observing' (Annex 3, see page 12).

The SAON-IG wishes to thank the approximately 350 participants in these workshops and meetings for their constructive contributions, and also the workshop organizers for both resources provided and excellent hosting.

Justification for Recommendations

1 The Arctic Council (including permanent participants and observers) should lead the facilitation of international collaboration among government agencies, researchers, and northern residents, especially indigenous people at the community level, to promote a sustainable pan-Arctic observing system.

To this end, the Arctic Council and partners are encouraged to establish an **Arctic Observing Forum** (AOF), with adequate resources and defined roles for the Arctic Indigenous Peoples, to facilitate Arctic observing, and related data and information management services. The AOF shall address issues that transcend individual Arctic observing systems and national capabilities.

Comment:

Proposed Terms of Reference (ToR) for the Arctic Observing Forum are included separately. Suggested goals, membership, organization and tasks will be found in the ToR.

The Arctic Indigenous Peoples have raised the need to define their role in Arctic observing, including the role of traditional and local knowledge, the differences and similarities between knowledge systems, and restrictions on personal data and other related issues. Special attention should be paid to these issues, and the AOF should initiate a process that addresses indigenous peoples' participation in Arctic observing, the interaction with scientific observing, traditional knowledge data issues, community-based monitoring and any other issues deemed relevant to Arctic Indigenous Peoples. In addition, Terms of Reference for conducting research in the Arctic communities should be established, building upon many of the guidelines already in place in the different Arctic nations.

2 The governments of the Arctic Council member states should commit to:

- Sustaining their current level of observing activities, and data and information services, and to making every reasonable effort to increase the scope of those activities in the future;
- Creating a data dissemination protocol to make data and information freely, openly and easily accessible in a timely fashion at minimal costs to users, taking into account relevant national legislation, and seek to ensure that relevant national organizations adhere to similar policies.

Comment:

Recognizing that there are differences in observing and data cultures across nations, institutions, value systems and disciplines, the AOF should facilitate international cooperation, building on mutual interests and trust in achieving this recommendation.



3 The Arctic states are urged to increase inter-governmental cooperation in coordinating and integrating Arctic observing activities, and associated data and information management. In order to facilitate this and the efficient operation of an Arctic Observing Forum, each of the Arctic states is encouraged to create a national inter-agency group to coordinate and integrate their Arctic observing activities, and resulting data and information services. These groups shall form the basis for increased inter-governmental communication and cooperation on Arctic observing.

Comment:

This Recommendation aims to improve the coordination and integration of Arctic observation among national agencies and across national boundaries. The basis for efficient inter-governmental cooperation is that national activities are coordinated. National agencies frequently do not interact effectively across their observation programs and in the use of their observational data. Many also have long-term responsibilities for providing national level data to international programs based on their participation in international conventions and agreements.

Furthermore, because many critical Arctic phenomena are circumarctic in distribution, or because they may cross national borders, they cannot be adequately observed by a single nation. This reinforces the need for inter-governmental cooperation in sustaining and expanding observations and data sharing if such data are to be of use to those whose decisions will have regional if not global-scale impacts.

4 Recognizing that the Arctic issues are of global common concern and that they are of scientific interest to all states, the Arctic Council member states are urged to 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 data and information services.

Non-Arctic states are therefore also encouraged to adopt, support and implement actions that are recommended to the Arctic states in 1-3 above.

Comment:

This Recommendation reflects that some concerns are global and are shared by all nations (such as climate change, rising sea level, contaminants, etc.). As such some non-Arctic states are making significant contributions both to Arctic observing and to research dedicated to understanding Arctic change and to understanding linkages to global changes. Non-Arctic states are involved in collaborative international scientific work in the Arctic and in political decision-making at international levels. Consequently, there should be a sound basis for a positive cooperation between scientists and agencies from the Arctic and the non-Arctic countries.

Arctic states will benefit from cooperation with other international partners involved in Arctic monitoring and research since this will lead to a better circumpolar observing network and access to data, and also ensure involvement of world class scientists from non-Arctic countries and sharing of costs. While the AOF should be established under the Arctic Council, it must operate in a way that allows all AOF members to decide for themselves how they wish to participate. This will be an opportunity for Arctic Council observing countries and organizations, and other countries and organizations interested in the Arctic, to make a substantive contribution to the work of the Arctic Council.

Timeline and Actions

1: The SAON Report to be delivered to the Arctic Council and partners in December 2008. Final response is expected in April 2009 (Arctic Council Ministerial Meeting).

2: AMAP, IASC and SAON-IG members to actively communicate SAON Recommendations to relevant people and agencies in the Arctic and non-Arctic countries. It would be desirable to have one SAON point of contact for each country.

3: The Helsinki breakout groups provided clear guidance as to next steps and actions. These include:

- An inventory of existing networks and programs that are the 'building blocks' of SAON,
- Support for the development of long-term data management systems,
- Encourage commitments for sustained coordination and funding of observations, and
- Establishment of an organization to continue the work of the SAON-IG.

Their reports are available on the website (www.arcticobserving.org), and should be acted as soon as feasible (see Annex 1 for more details).

4: The IPY committees in Canada and Sweden have offered resources for producing the SAON final report and outreach materials, including a printed version of the SAON report and recommendations, to maintain and update the website, and facilitate further development of an inventory of existing relevant data/meta-databases, data centres, etc. These activities are funded until May 2009.

ANNEX 1: **Summary of SAON Workshops**

This Summary provides a brief overview of the considerable information collected during the SAON workshops. Most of the material is available at: www.arcticobserving.org.

The Stockholm Workshop 12-14 Nov. 2007

The workshop was attended by 115 participants from 18 countries who were asked to address two key questions:

1: What Arctic observing sites, systems and networks currently exist?
2: What spatial, temporal and disciplinary gaps exist?

The main outcome was a synthesis of the user needs of some of the scientific community, some of government agencies and some Arctic residents. Breakout groups also identified present observing sites, systems and networks and compiled information on spatial, temporal and disciplinary gaps.

The Edmonton Workshop 9-11 April 2008

The second SAON workshop was attended by about 200 participants many of whom were new to the process. Opportunity was provided to suggest improvements to the Stockholm report and to address key questions under the theme: *How will Arctic observing and data and information management activities be coordinated and sustained over the long-term?*

There was substantial input from many different operational networks and agencies, and initial discussion on coordination, funding, cyber-infrastructure, new technologies, community-based monitoring, health networks, and data management.

St. Petersburg and Incheon workshops

There was limited Russian and Asian participation in the Stockholm and Edmonton workshops and so in order to broaden participation in the SAON process and to further collaboration in Arctic observing and monitoring activities with these countries, a one day workshop was held 7 July 2008 in St. Petersburg, Russia and a second on 23 September 2008 in Incheon, Korea.

The Russian SAON workshop demonstrated a strong Russian interest in participating in SAON, as well as the potential for significant Russian contributions. Russian collaboration in Arctic observation is critical as almost half of the Arctic falls within Russian borders.

Russia is currently building up a range of different observing platforms (land, ocean, satellite, etc.), systems and developing data management activities. The 17 presentations from the meeting, the agenda and list of participants are available at: www.ipyeaso.aari.ru and www.arcticobserving.org.

The Asian SAON meeting was held in concert with a meeting of the Asian Forum on Polar Sciences (AFoPS). This meeting provided an opportunity to introduce the SAON initiative to participants attending from China, South Korea, Japan, Malaysia, and India, as well as observers from the Philippines, Vietnam, Thailand and Indonesia. All of the nations involved in Arctic observing and research activities confirmed their interest in SAON.

The Helsinki Workshop 15-17 October 2008

The Helsinki workshop was attended by about 75 participants. 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 extensive feedback to the draft recommendations, and clear 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 (see Annex 2):

1. Longstanding operational monitoring that is inter-governmentally 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, approach to Arctic observations, ensuring primary funding, and difficulty with implementing 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.

Full text versions of the reports are available at: www.arcticobserving.org.

In addition, Finnish experts gave presentations on observing activities in northern Finland.

Annex 2: **SAON Building Blocks**

The SAON initiative focused on facilitating the longevity of and collaboration among ongoing (and planned) observing networks, data and information systems. There are various inventories of these networks and several were presented at the SAON workshops, and more detailed listings of observing and monitoring networks, as well as listings of national programs, are available in the reports of SAON breakout groups. Many of these networks have observation activities strongly rooted in well-vetted science plans or agreed observing and monitoring plans. However, networks also require robust financial assistance to ensure longevity and many require assistance in establishing and/or maintaining circumarctic contacts.

The AOF will provide the platform for an extensive and ongoing dialogue with observing networks with a view to:

- Determining an effective structure for cooperation and collaboration.
- Identifying network and observing program problems and needs.
- Assist in avoiding overlaps, in filling spatial and temporal gaps in observing activities, and/or assistance with data management and sharing of knowledge or best practices.

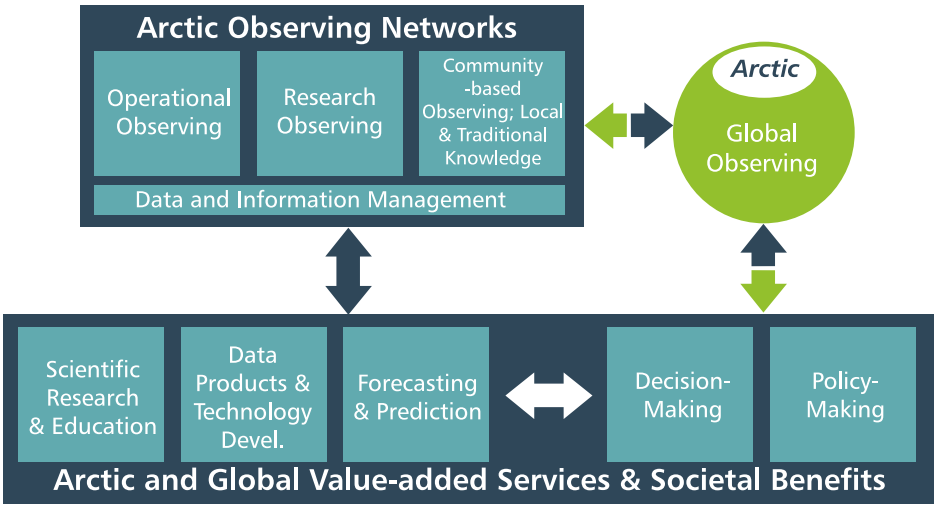
It should also be noted that satellite operators and space agencies provide observing capability of the Arctic environment and are considered to be part of the Arctic observing system.

The listing below provides some **examples** that illustrate potential building blocks (there are many more) for observations of the atmosphere, cryosphere, oceans, coasts, rivers, land, biodiversity, and human dimensions.

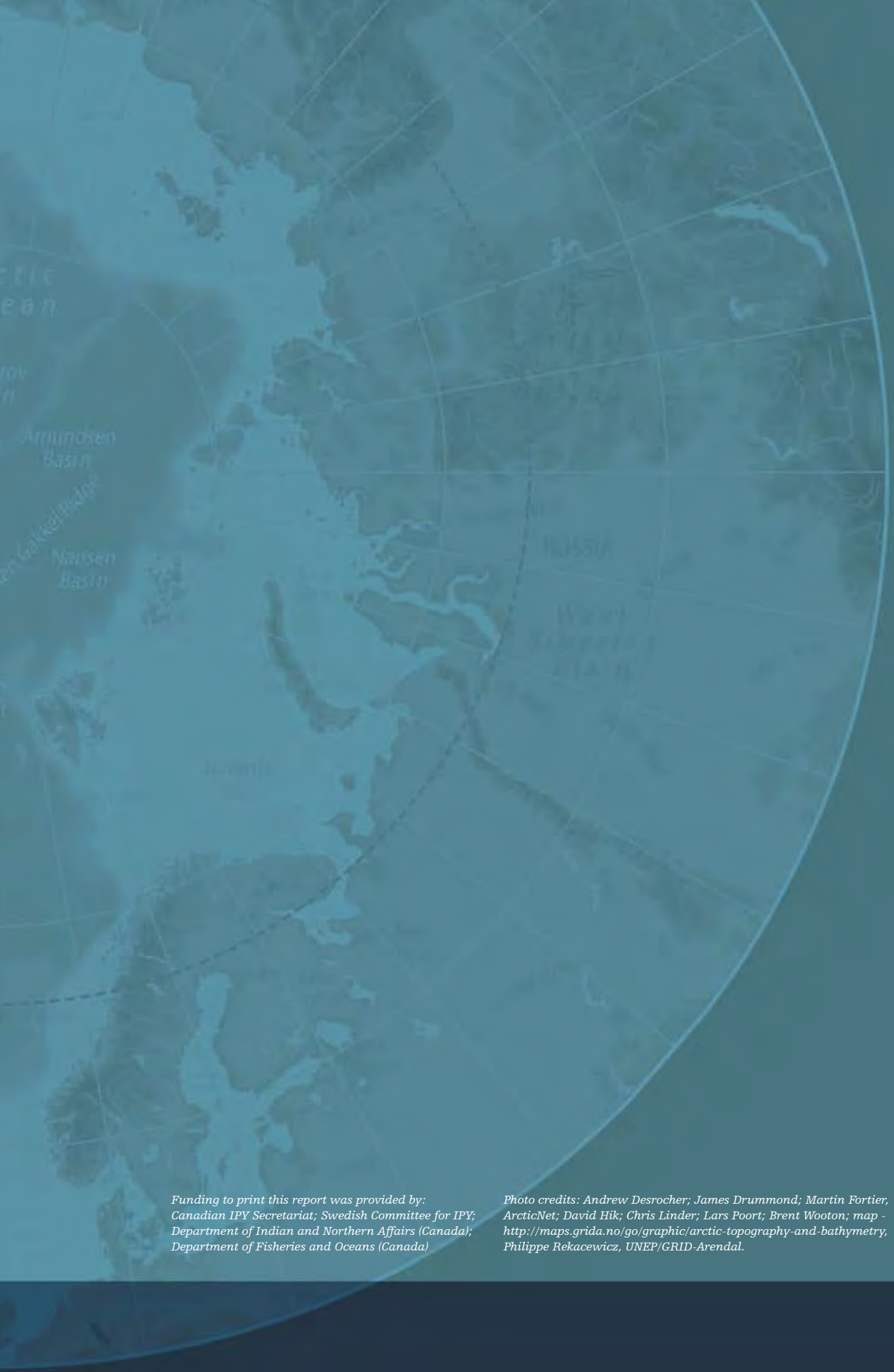
ACRONYM	TITLE	WEBSITE
ACCO-Net	Arctic Circum-polar Coastal Observatory Network	http://www.arcticportal.org/acd/acconet
AHHI	Arctic Human Health Initiative	http://www.arctichealth.org/ahhi
AMAP	Arctic Monitoring and Assessment Programme	http://www.amap.no
Arctic ROOS	Arctic Regional Ocean Observing System	http://arctic-roos.org
ArcticNet	Network of Centres of Excellence (Canada)	http://www.arcticnet-ulaval.ca
ASI	Arctic Social Indicators Project	http://www.svs.is/ASI/ASI.htm
CAFF	Conservation of Arctic Flora and Fauna	http://arcticportal.org/en/caff
CALM	Circumpolar Active Layer Monitoring	http://www.udel.edu/Geography/calm
CARMA	Circum Arctic Rangifer Monitoring and Assessment Network	http://www.rangifer.net/carma
CBMP	Circumpolar Biodiversity Monitoring Program	http://arcticportal.org/en/caff/cbmp
CEON	Circumarctic Environmental Observatories Network	www.ceon.utep.edu
CryOS-IGOS	Cryosphere Observing System – Integrated Global Observing Strategy	http://www.igospartners.org
DAMOCLES	Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies	http://www.damocles-eu.org
ECONOR	Economy of the North	http://portal.sdwg.org
EMEP	European Monitoring and Evaluation Programme	http://www.emep.int
GlobGlacier	GlobGlacier Project	http://globglacier.ch
GlobIce	Sea Ice Dynamics for Climate Research	http://globice.mssl.ucl.ac.uk
GlobSnow	Global Snow Monitoring Service	http://earth.esa.int
GOOS	Global Ocean Observing System	http://www.ioc-goos.org
GTN-G	Global Terrestrial Network – Glaciers	http://www.fao.org/gtos/gt-netGLA.html
GTN-H	Global Terrestrial Network – Hydrology	http://www.fao.org/gtos/gt-netHYD.html
GTN-P	Global Terrestrial Network – Permafrost	http://www.fao.org/gtos/gt-netPER.html
GTOS	Global Terrestrial Observing System	www.fao.org/gtos
IABP	International Arctic Buoy Programme	http://iabp.apl.washington.edu

ACRONYM	TITLE	WEBSITE
iAOOS	Integrated Arctic Ocean Observing System	http://www.iaoos.no
IASOA	International Arctic Systems for Observing the Atmosphere	http://www.iasoa.org
ICES	International Council for the Exploration of the Sea	http://www.ices.dk
IICWG	International Ice Charting Working Group	http://nsidc.org/noaa/iicwg
ISAC	International Study of Arctic Change	http://www.aosb.org/isac.html http://arcticportal.org/iasc/science-development/isac
ITEX	International Tundra Experiment	http://www.geog.ubc.ca/itex
SCANNET	Circumarctic Network of Terrestrial Field Bases	http://www.scannet.nu
SDWG	Sustainable Development Working Group	http://portal.sdwg.org
SEARCH	Study of Environmental Arctic Change	http://www.arcus.org/SEARCH
SLiCA	Survey of Living Conditions in the Arctic	http://www.arcticlivingconditions.org
WCRP/CliC	World Climate Research Programme/Climate and Cryosphere	http://clic.npolar.no
WCRP/SPARC	World Climate Research Programme/Stratospheric Processes And their Role in Climate	http://www.wmo.int/pages/prog/wcrp/AP_SPARC.html
WGMS	World Glacier Monitoring Service	http://www.wgms.ch
WIGOS	WMO Integrated Global Observing Systems	www.wmo.int/pages/prog/www/wigos
WMO	World Meteorological Organization	www.wmo.int
WMO/Arctic-HYDRA	WMO/The Arctic Hydrological Cycle Monitoring, Modelling and Assessment Program	http://arcticportal.org/arctichydra
WMO/GAW	WMO/Global Atmosphere Watch	http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html
WMO/GCOS	WMO/Global Climate Observing System	www.wmo.ch/web/gcos
WMO/GOS	WMO/Global Observing System	http://www.wmo.int/pages/prog/www/OSY/GOS.html
WMO/WIS	WMO/WMO Information System	www.wmo.int/pages/prog/www/WIS-Web/home.html

Annex 3: **Arctic Observing Networks**



Arctic Observing Networks are maintained for a variety of purposes, but in each case provide valuable information that can be used to support Arctic and global value-added services and societal benefits. The SAON initiative is intended to strengthen the linkages between research and observing activities and associated data/information management services, and the societal benefits and needs from Arctic observing.



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