## Objective 1.3: Provide recommendations for a roadmap for future Arctic observational capacities

The document is a compilation of statements provided by the SAON countries during the spring of 2019.

Implementation document description: The purpose of this objective is to identify and provide recommendations on future needs for networks, observing activities, technology and infrastructures by:

1. Providing recommendations for closing gaps or extensions to the integrated Arctic-observing system
2. Engaging potential operators and funding agencies to respond to the gaps and to sustain a well-integrated long-term observing capacity

1. What specifically did you mean here?

Denmark (yellow):

We marked this as yellow/intermediate due to the fact that we are not yet in a position to provide recommendations for a roadmap. The aim is to investigate the potential of a national network of experts in the area who we will be able to collaborate with and draw upon with regards to i.e. advocating and creating awareness about future Arctic observational capacities.

Finland (colour)

FMI performed with SAON and AMAP a value tree analysis for physical atmosphere and ocean variables of the Arctic Observing System as a contribution to the Finnish presidency of the Arctic Council. This report is giving some concrete numbers as a starting point for the current observing system, which helps to scale the future expansion of the system. The report will be out in April 2019. The main message is that currently **177,6 m€ per year** are used for observations north of 60°N compared to **810 m€** between 30°N and 60°N according to WMO OSCAR information and cost estimates by FMI station managers. Doubling the efforts for the Arctic seems a reasonable request in the face of increasing human activity in the Arctic and a somewhat challenging environment compared to the 30-60N Earth.

France (colour)

In 2016 France has published a Science Plan in the context of the national Arctic Initiative but this would need to be updated. Concerning observation in the Arctic, the document identified the needs of the national research community and provided recommendations to meet these but it did not reach to the point of providing an actual roadmap.

Germany (yellow)

We marked this as yellow/intermediate because we are have a national strategy for Arctic Research, which does include all our research in the Arctic and not only research related to observations. Nevertheless, we have still problems to provide recommendations for a roadmap which is mainly a capacity problem. Germany has not yet identified the persons who shall contribute to such a development. If this has been done than we can mark this part in green.

Iceland (colour)

Rannis is discussing with the Icelandic Met Office to take a more active role in SAON activities. One of these tasks might be to provide recommendations for this roadmap.

Italy (colour)

Involving all relevant national actors for Arctic research, CSA Commission and ISP will represent the natural instruments through which to contribute as country/member to the discussion inside SAON and its committees on this matter, helping SAON to formulate common recommendations for a roadmap aiming to improve observational capacities in the Arctic. On the other direction, they will offer also the possibility that Italy could than contribute concretely to the implementation of this roadmap. CSA and ISP will also simplify dialogue with research Ministry (MIUR) and than coordination and synergy with our presence/participation on political tables/actions like Science Ministerial and Arctic Council. Presence of both Foreign and Research Ministry representatives inside CSA will be very effective from this point of view. ISP will also help to harmonize and integrate in this scheme our efforts and participation to coordination actions promoted be EU (EU-polarnet, Arctic Cluster, Arice)

Japan (green)

Submit documents to MEXT requesting on future needs for networks, observing activities, technology and infrastructures. It was done in Feb. 2019 by JCAR along with the request for new icebreaker for research and post-ArCS program.

Norway (yellow)

Norway has indicated a status “yellow” (intermediate capacity and capability) for these two issues. Rather than answering the 6 questions specifically, we chose to provide a more general reflection around our response.

Poland (yellow)

In the late 2017 the Polish Polar Consortium and the Committee on Polar Research jointly published the document ‘Strategy for Polish Polar Research – a concept for the years 2017–2027’ that indicates the main areas of future development of Polish polar activities. This document together with a wide community discussion that was behind its preparation could serve as a good starting point to identify national priorities, needs and recommendations for a roadmap for future Arctic observational capacities. Another important document, ‘Polish Polar Policy’ prepared by the Ministry of Foreign Affairs RP, is currently in the consultation phase and in future, recommendations for a roadmap to future Arctic observational capacities can also be worked out based on national focus for future Polish activities in the Arctic.

Spain (yellow)

Our infrastructure is not solid enough to compromise on that, our observatories are quite limited

Sweden (yellow)

This work is connected to the follow-up of the 2009 document as well as the work SPRS does within EU-PolarNet and ARICE and their communication and integration into national research programmes etc.

USA (yellow)

US AON

ARGOOS (AOOS+), DBO, GRIOOS, PCN, e.g

2. Who is leading that activity?

Denmark

As above, currently the responsibility for this area is with the Danish Agency for Science and Higher Education.

Finland

SAON and FMI

France

CNRS

Germany

AWI will be the leading institute and the national delegate will coordinate the input to the roadmap

Iceland

The Icelandic Met Office (not confirmed)

Italy

CNR at the moment through the Earth Environment Department and in the future mainly through ISP as well as representatives in organization like IASC

Japan

NIPR, JAMSTEC or Hokkaido Univ., which are the leading institutions of Japan’s Arctic research program (ArCS), can potentially lead the inventory. Unfortunately, Japan does not have little movement towards forming a National Committee of SAON

Norway

(See question 1)

Poland

The Board of the Committee on Polar Research PAS and the Polish Polar Consortium Board in collaboration with the national SAON representative. Contribution from the Polish Polar Task Force, the advisory body established by the Polish Ministry of Foreign Affairs.

Spain

Spanish Polar Program

Sweden

SPRS

USA

US AON: Sandy Starkweather, US Earth Science Agencies

ARGOOS (AOOS+), DBO, GRIOOS, PCN, e.g: Various

3. Is this well coordinated?

Denmark

As above, seeing as we are awaiting final deliberations with regards to establishing a national network group, the potential for wider coordination does indeed exist and is planned for the near future.

Finland

Yes, but without much communication capacities in SAON.

France

An update of what has been done in 2016 should be undertaken. The coordination for this does not exist today but CNRS is currently taking initiatives to build a polar working group which could support such activity.

Germany

Not yet, a coordination has to be implemented

Iceland

Remains to be seen

Italy

Considering remarks provide answering question 1, we can answer for sure positively, mainly in perspective. Ongoing developments at National level related to polar research infrastructures will also found a natural allocation in the above indicated scheme. The fact that CNR has also the commitment to plan and coordinate science activities of the Antarctic Programme (PNRA) in coordination with other bodies will provide the added value to create easily synergy and connections between plans, activities and national science communities at polar level.

Japan

Not yet. It is being discussed along with planning of post-ArCS program.

Norway

(See question 1)

Poland

(void)

Spain

No

Sweden

Roles and responsibilities will be discussed in the meeting between SPRS, SEPA and afterwards with third parties.

USA

US AON: It is a new effort that is still defining its role, so coordination is not the issue. Communication is behind.

ARGOOS (AOOS+), DBO, GRIOOS, PCN, e.g: Coordination is high “within” these thematic areas. Coordination is low across them.

4. What specifically are you doing that could be coordinated?

Denmark

(void)

Finland

Cost estimation for atmospheric composition observations and other non-metocean monitoring. Engaging CAFF and ECPHORS.

France

Generally, France only maintains few infrastructures in the Arctic. A coordinated access to internationally available polar infrastructures would be a major step forward for all scientific communities. As an example, due to lack of ice-going research vessel, access to the Arctic remains a big challenge for French scientists.

Germany

Joint way forward ion implementing the integrated observing system and interaction with fun

Iceland

(void)

Italy

For sure could ber important that SAON could promote coordination and dialogue among the various initiatives ongoing at european (EU-polarnet) and international level. And promote connection with ArcticGEOOS proposal. Also important to discuss and better understand the possibility to be connected and interact with the political leve at the moment represented by the follow up of the Second Science Ministerial.

Japan

It is key to add this function in themes of post-ArCS program.

Norway

(See question 1)

Poland

Operation of the Polish permanent research base and several seasonal stations, and the research vessels could benefit from better coordination/linkages within the international networks, also including large infrastructure projects and programs. A good example is the SIOS network/system where Poland is strongly involved. Such initiatives are instrumental for sustaining and strengthening the activities of non-Arctic countries as Poland that have a strong interest in and a long tradition of participating in Arctic observations but also struggle with serious limitations due to logistic challenges, access to infrastructure, funding issues and sometimes lower awareness of the Arctic research/observations among the national decisionmakers and funding agencies. SAON has a mandate to facilitate the international collaboration in Arctic observing and, based on the national inventories of networks and infrastructures, could play a role in initiating/supporting new initiatives.

Spain

(void)

Sweden

Integration of SAON suggestions into the national funding scheme, e.g. into a proposal for strategic infrastructure by the National Science Council (VR): https://www.vr.se/utlysningar-och-beslut/soka-bidrag/sa-finansieras-forskningsinfrastruktur.html

USA

US AON: Room to improve interagency contributions (largely NSF); room to expand international contributions or at least align for interoperability & harvest

ARGOOS (AOOS+), DBO, GRIOOS, PCN, e.g: The broad, thematically driven observing system elements listed above are need a better system that transcends their individual outlooks in order to contribute to a ”roadmap”

6. What would be a useful working definition of this Roadmap. What should the Roadmap include from the standpoint of your national funding body?

Denmark

(void)

Finland

The working definition needs a relationship to roadmaps like European Science Foundation Research Infrastructure or Earth Observation programs like Copernicus have. We need to highlight the Arctic parts of many different networks and bring in their proposals into the pool of proposals that we would shape in SAON. Finnish investments are roadmap-based as to be compared with ESFRI roadmaps. SAON should achieve similar alignment, but not target research activities, operational actions are more important albeit being born from research institutions.

The holistic picture is needed for most Societal Benefits as identified in the Arctic Observations assessment frameworks first value tree. Most key objectives for SBAs depend on more than one information service. Expansions need to be targeted broadly to achieve the benefits.

France

From the national standpoint, it would be useful if the Roadmap addresses questions such as how national initiatives could optimally contribute to the development and coordination of joint Arctic infrastructures and observing networks.

Beyond the national priorities in Arctic observation that France will identify in the context of the CNRS polar research initiative, France observational capacities are largely organized so as to contribute to the European programming in terms of observation networks and infrastructures. A SAON action towards the European Arctic roadmap would certainly provide to France an opportunity to contribute to the SAON roadmap.

Germany

Investments which are expected from them, for e.g. research infrastructures, instrumentation or large campaigns, need to be included with a time-line and the approximate amount of contribution.

Iceland

Rannis would follow the framework of SAON Implementation Plan 1) Inventory of national observational capacities. 2) Assessment of adequacy of Arctic observational capacity in support of Arctic Societal Benefit Areas. 3) Recommendations for a roadmap for future Arctic observational capacities. 4) Create opportunities to develop and implement observations in support of Arctic Societal Benefit Areas.

Italy

* clarify the respective role and function of SAON with respect different coordination initiatives active at International level (for Europe at least EU-polarnet and Arctic Cluster)
* Discuss the possible role of Research Infrastructures (RIs) in the improvement of future Arctic observational capacities
* Since all consider very important for a sustaining Arctic Observing Network technology, also shoud be discussed which actgions include in the Roadmap to promote developments of observation systems

Japan

(void)

Norway

(See question 1)

Poland

(void)

Spain

International opportunities, clear perspectives and facilitation of access to both data and technicalities of the monitoring programs

Sweden

Every two years, the Swedish Research Council makes an inventory of needs of research infrastructure in Sweden. The purpose of the inventory is to capture proposals for new national needs for research infrastructure. The proposals they are looking for shall relate to:

* Needs for entirely new research infrastructure.
* Needs to gather together and significantly develop smaller resources that already exist today, so that they together can form a national research infrastructure.
* Needs for major upgrades of existing research infrastructure in operation. The aim shall be to create a significant change to the scientific production or the technical approach. Routine maintenance or gradual improvements shall not be included.
* Needs for new international research infrastructure – both needs for Swedish participation in the construction of new international research infrastructure and for Swedish membership of existing research infrastructure.

USA

Observations that “pay multiple dividends” across research communities (system science view)Mechanisms for engagement and collaboration with Indigenous Knowledge and communities.Pathways to improve “Readiness” of the observing system, technology developmentModel-informed implementation –what/where/how will highest impact observations be ID’d