Community-based observing systems

State-of-the-art and challenges: There are 4 million people living in the Arctic. Indigenous peoples make up about 10% of the population. Arctic community members often have in-depth knowledge of the natural resources. Most efforts to monitor natural resources in the Arctic have focused on scientist-executed methods and 'externally driven' approaches (Danielsen *et al.* 2009). In these approaches, professional researchers from outside the area set up, run and analyse the results from a monitoring scheme. Scientist-executed monitoring is often technically and logistically demanding.

Community-based observing is a supplementary approach whereby indigenous and local people are directly involved in data collection and sometimes data interpretation, and in which monitoring is often linked to the decisions of local stakeholders, using methods that are simple, cheap and require few resources (Johnson *et al.* 2015). Community-based observing can build relations between local stakeholders and the authorities, thereby stimulating local action and resulting in a dynamic and adaptive resource management.

The remarkable rise of mobile devices and social media opens up the possibility for thousands of community members to participate in scientific processes, and to gather information and obtain results that are both locally and globally relevant. A SAON review analysed a sample of 81 community-based observing programs, including 47 programs in Europe and 34 in North America (Johnson *et al., in press*). Sixty-nine percent of the programs engage 'indigenous knowledge' (Berkes 2012). Community-based observing has considerable potential to involve indigenous and local residents in the Arctic in support of a robust iAOS, but there are some challenges: 1) Scepticism about whether indigenous and local people can produce high quality data must be overcome; 2) Secondly, limited ability or political will, to listen to the 'voice' of indigenous and local people by some decision-makers and government staff must be addressed; 3) At a technical level, there is minimal knowledge of which of the community-based observing programs that potentially can plug gaps and improve available databases for global and regional assessments (such as IPCC); 4) Few mobile devices and digital technologies that enable access to web-based solutions like social media have been tested in the harsh Arctic environment; 5) Expanding the number of sites with observing programs while ensuring a high standard of sampling protocols without precluding programs from being responsive to local circumstances and needs and 6) Sustaining the programs, both financially and institutionally, and to maintain participation of residents, particularly among the youth and the private sector.

Expected progress beyond state-of-the-art:

- Demonstrate 'real world' examples of the benefits of cross-fertilizing indigenous and local observation systems with scientific observation systems to inform decision-makers about solutions to pertinent problems.
- Identify, for the first time, Arctic community-based programs that are possible and suitable to fill key gaps in available databases for global and regional assessments, and for community data to be reformatted, standardized and entered into these databases, for a sub-set of the Essential Climate Variables.
- Enhanced significantly the scientific quality of Arctic community-based observing programs through (i) improved understanding of the capabilities and challenges of the existing programs, (ii) a broadly disseminated library of 'best practice' manuals, and (iii) competence-building of practitioners; all planned and undertaken in close cooperation with indigenous and local civil society organisations.
- Test novel community-based data collection technologies for enhancing understanding of environmental parameters in Svalbard and Greenland, with the findings presented for decision-makers.