

Statement from the Partnership for Observation of the Global Oceans (POGO) on the need for and challenges facing sustained Arctic observations and their international coordination

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The Partnership for Observation of the Global Oceans (POGO) was founded in 1999 by directors of oceanographic institutions around the world as a forum to promote and advance the observation of the global ocean. POGO's membership includes most of the world's leading ocean science and technology institutions, whose expertise, experience and infrastructure provide the unique and long term capability to design, build, operate and innovate the global ocean observing system.

POGO's vision is to have by 2030, world-wide cooperation for a sustainable, state-of-the-art global ocean observing system that serves the needs of science and society. POGO's mission is to:

1. Lead innovation and development of the crucial components of the ocean observing system.
2. Identify and contribute to the development of the key skills, capabilities and capacities needed to achieve the vision.
3. Work with governments, foundations and industry, to articulate the benefits to society and required funding to build and sustain the system.

Since 2016, POGO has been focussing at its annual meetings on the challenges (scientific, political and societal) facing sustained Arctic observations. The first workshop highlighted the degree of fragmentation in Arctic observations, caused by logistical and political problems, which are further complicated by the need to consider and work with the communities living in the Arctic. As a result, there is a lack of long-term observational data and, even where historical data sets exist, they are not easily accessible.

POGO members recognised the uniqueness of the Arctic in terms of its current geopolitical position (and, for example, the ongoing United Nations Convention on the Law of the Sea (UNCLOS) process) and the rapidity of change occurring there, as well as the relatively poor coverage of monitoring and observational data collected in the Arctic, due to logistical and transnational challenges to circumpolar monitoring activities, and the need for international coordination of observational efforts in the Arctic Ocean.

Organizations such as the International Arctic Science Committee (IASC) are working on improving coordination and also re-establishing monitoring programmes in the Arctic. It was highlighted that POGO has a role to play in this process but needs to liaise with organisations and programmes already active in the region to ensure that activities are complementary. POGO has strong connections to many other international organisations (including the Intergovernmental Oceanographic Commission and its Global Ocean Observing System (GOOS), and the Group on Earth Observations, within which POGO plays a lead role in the "Oceans and Society: Blue Planet" Initiative). POGO can therefore make a contribution towards enhancing communication and coordination among organisations and networks operating in the Arctic. Some first steps have been made through the participation of IASC and Sustaining Arctic Observing Networks (SAON) in the

2018 POGO Annual Meeting, initiating a dialogue that all parties are keen to pursue. The discussions also highlighted the need for an “Arctic GOOS”, which is currently lacking from the existing set of GOOS Regional Alliances.

In summary, POGO is keen to support ongoing Arctic efforts, such as the biennial Arctic Observing Summit (AOS), as well as their integration in global scale observing efforts (GOOS and GEOSS), in seeking to create a platform for coordination of monitoring and data collection.

The ocean is vital to the functioning of the whole Earth system, including life on Earth, and it is undergoing unprecedented and rapid change, most strikingly in the Arctic. The ocean plays a central role in shaping the Earth's climate and its variability through its fluid motions, its high heat capacity, and its ecosystems. Accordingly, it is vital to monitor and understand changes in the ocean, particularly in the polar regions, and their effects on weather and climate, and to improve the precision of climate models. Therefore, continuous, globally distributed ocean observations are essential to the scientific understanding of the changes underway, not least with the prospect of very rapid alterations of the system. Without a networked system of ocean observations, mitigation and adaptation strategies ensuring a sustainable human ocean future can be considered next to impossible.

By enabling a network of high quality, systematic, continuous global scale observations, we would acquire essential knowledge of the ocean's state and rates of change and variability. Such knowledge is needed to underpin:

- predictions and informed **responses to climate change and variability**, including major consequences such as sea level rise and changing weather patterns, IPCC 2013;
- the urgent demand for robust **ocean health and risk assessments**, and **data and information products**, on local, regional and global scales to support ecosystem based management, which is vital to sustaining the ocean's productive capacity especially in support of global food security through sustainable fisheries;
- the world's "blue economy" based on sustainable use of marine resources where, wisely managed, there are considerable opportunities not only for the world's advanced economies but also for sustainable development as recognized by the **United Nations Sustainable Development Goal (SDG) 14** to “conserve and sustainably use the oceans, seas and marine resources” as well as by other related SDGs. Such a future cannot be achieved without an improved knowledge of the environmental status of the oceans, which hinges on sustained, global ocean observations.

The challenge of building a sustained global ocean observing system is considerable. The concept is not new, and the building of the observational fundament for the oceans has been underway through international scientific and intergovernmental cooperation since the 1990s. However, the progress to completion of a sustained global ocean observation network is seriously encumbered by the lack of vital *in situ* measurements, especially in remote regions and under the ice-cover, as in the case of the Arctic Ocean,. It is now accepted that measurements need to span not only physical parameters but also biogeochemical, biological and ecosystem domains. The dearth of biological and biogeochemical measurements (carbon, acidity, biodiversity) for oceans, in general, and especially in the ice covered oceans, combined with the lack of high quality maps of the seafloor, currently make management of the oceans difficult.

Working with the Scientific Committee on Oceanic Research (SCOR) and the Scientific Committee on Antarctic Research (SCAR), POGO supported the establishment of the Southern Ocean Observing System (SOOS) in 2011. This has been very successful in bringing together the Southern Ocean observing community to work collectively to facilitate the collection and delivery of essential observations on dynamics and change of Southern Ocean systems to all international stakeholders (researchers, governments, industries), through design, advocacy and implementation of cost-effective observing and data delivery systems. Although there are additional challenges facing international coordination of Arctic observations, there are many lessons to be learnt from the experience of SOOS.