

Towards the Strengthening of European Coordination between Polar Environmental Observatories in the Arctic Region

Overview document

French Presidency of the Council of the European Union-Principality of Monaco
Ministerial Conference on Observing Environmental changes and facing their challenges.



Introduction

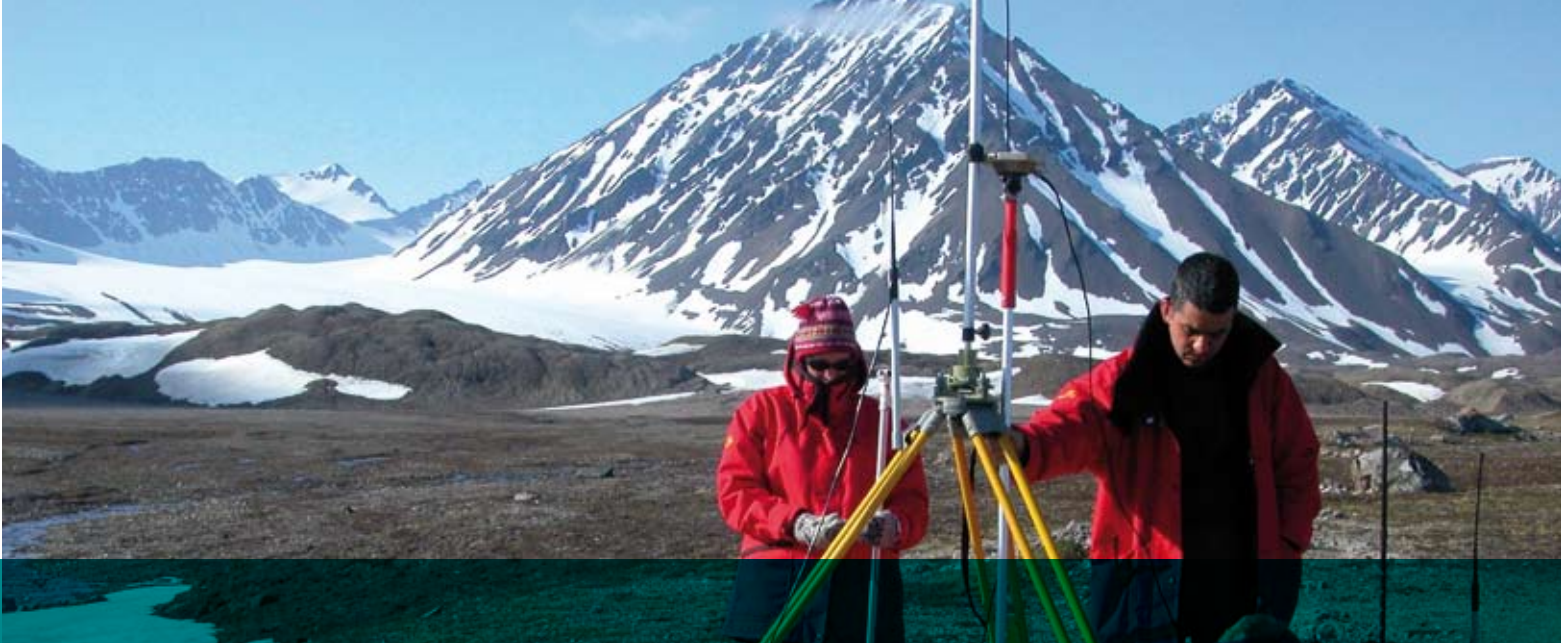
European countries and their international partners have a large number of pre-existing stations and environmental observatories that undertake research and monitoring around the Arctic region. However the coordination of these facilities is not optimised and the observations not sufficiently harmonised to provide a comprehensive picture of climate change and its effects on the populations around the Arctic and extending into the highly industrialised areas of the northern hemisphere.

This European initiative “towards the strengthening of coordination of polar environmental observatories in the Arctic region” will bring enhanced coordination of research assets in the Arctic operated by European countries. This connection of observatories will form a comprehensive backbone for climate and environmental monitoring and is therefore a major contribution to supporting international climate research and negotiations such as future (IPCC) assessments at the global level.

It will facilitate a major European component of an Arctic Climate Monitoring and Observing Network based on significant ongoing international planning processes such as Sustained Arctic Observing networks (SAON) involving major global science organizations.

A recent report by the European Polar Consortium on the Landscape of European Polar infrastructures published in November 2007 www.europolar.org clearly indicates the requirement for enhanced European coordination and networking of terrestrial research stations in the Polar Regions to address the issue of Climate Change and its impacts on Society.

“ The framework for enhanced observations in the Arctic rely in large part on the requirement to connect together existing regional research facilities into a broad spatial coverage and securing agreements on the standardization of observations and ensuring access to the flow of information to the researchers the public and policy makers. ”



Identification of observation gaps of the Arctic Ocean and surrounding continents are very important for obtaining accurate picture of Climate Change and its impacts on European nations and Arctic countries. By establishing a framework for coordination at the European level between the Polar Environmental Observatories in the Arctic region it will drive political engagement by international par-

tners and result in significant action by the international community in relation to understanding and monitoring the Arctic environment. Long term records are crucial in helping to forecast climate changes and vulnerabilities along with upgrading and expanding systems that monitor snow and ice stability, oceanic parameters, river inputs, biodiversity and ecosystem processes



Dr Gérard Jugie
Chairman
European Polar Consortium



Dr Paul Egerton
Executive Director
European Polar Consortium
and European Polar Board



Prof Carlo Alberto Ricci
Chairman
European Polar Board



The Importance of providing coherence to the usage

There are currently no strategic agreements in place for facilitating European level coordination of Polar research observatories and stations—bringing together all regional scientific and logistical hubs in the Arctic Region. Taking into account the limited capacity for networking at the present time this European initiative offers a unique strategic opportunity to offer a strong contribution in supporting climate and environmental observations at the international level.

The Establishment of a coordinated and synchronized observation platform will offer the scientific community a higher level of research services and the public with open access to a broad range of climate and environmental information. A broad range of international partners involved in existing Arctic Programmes (Canada, China, India, Japan, Russian Federation, South Korea and United States). This initiative offers wide opportunities for researchers to access facilities not normally available and to build scientific networks where currently there are gaps in the existing observations. This is especially true for the Russian Arctic where

there is a great need for longer-term international coordinated access and observations on climate change.

“Access to these regions and coordination with adjacent regional observing hubs is currently not optimized and therefore an enhanced connection with terrestrial and ocean observatories will be critical to ensure wide coverage across the Arctic basin.”

Mobile Oceanic Observing platforms and fixed underwater observatories operating in the Arctic Basin also have a strong role to play in ensuring wide coverage of climate information from inaccessible areas.

The European Union Roadmap for research Infrastructures (ESFRI) has placed priority on the AURORA BOREALIS European research Ice-breaker as one of the key environmental facili-

ties for the Arctic that should be implemented by member states. In terms of investment this is the largest Arctic environmental initiative so far proposed and will have a significant impact on Arctic research into the next 35 years. The European initiative should provide the institutional frameworks for further implementation of new mobile and fixed observatories in the Arctic region. The existing suite of conventional and nuclear Ice-breaking vessels operated by Sweden, Russia, Germany and other European and international partners are additional assets for environmental observations throughout the Arctic oceanic and terrestrial area.

The recent Norwegian led SIAEOS (Svalbard Arctic Earth Observing System) European Strategic forum on research Infrastructures ESFRI initiative helps to build the wider arctic observing network by strengthening capacities at the local to regional level through the provision of knowledge centre and linking together in a common observing platform assets on Svalbard.

of Arctic Observatories for Europe

“Svalbard as an international research platform will be a central connecting point for European Arctic research and contribute to structuring it.”

The focus on developing climate and environmental Observatories in the Arctic is fully in line with the policy priorities identified under the European Unions Framework Programme 7 within the thematic priority of climate change and natural hazards. The Framework 7 Programme thematic priorities in climate change focus on integrated research addressing the functioning of climate and the earth system, including the Polar Regions. These themes are set to investigate the causes of changes in the past and to predict better their likely future evolution. This will enable the development of effective adaptation and mitigation measures to climate change and its current and future impacts.



A European initiative to enhance the coordination of Arctic environmental Observatories will fulfill the strategic targets of the European Union in relation to the thematic research areas.

The Context for Climate Policy



Climate Change is of growing public concern and an important political priority of the European Union and the international community. Climate change is one of the main policy priorities of the current European Commission. Research is needed at EU level to understand the causes, consequences and to predict future evolution of climate change, ozone depletion and other environmental stress factors and to guide and support the implementation of international commitments such as UN Framework Convention on Climate Change (UNFCCC), Kyoto and Montreal protocols, and post-2012 Climate change policy initiatives.

“...Observable changes, many of which have regional and global implications, are under way in the arctic atmosphere, hydrosphere, biosphere, cryosphere, and human sphere...”

Although the Arctic is not the only region on Earth affected by environmental change, it poses special problems and concerns. It is a region with a limited record of observations—low density, and with limited duration and coordination—and yet, despite these constraints, rapid and systemic changes have clearly been identified. The interconnectedness of physical, biological, chemical, and human components, together with the high amplitude of projected changes, make a compelling argument for an improved observation infrastructure that delivers a coherent set of pan-arctic, long-term, multidisciplinary observations. Without such observations, it is very difficult to describe current conditions in the Arctic, let alone understand the changes that are under way or their connections to the rest of the Earth system. The Arctic Climate Impact Assessment (ACIA, 2004) notes that.

“The Arctic is a region of large natural variability and regional differences and it is important more uniform coverage be obtained to clarify past changes. In order for the quantitative detection of change to be more specific in the future, it is essential that steps be taken now to fill in observational gaps across the Arctic, including the oceans, land, ice and atmosphere...”





The European initiative on Arctic observatories will interact closely with the partnerships already developed within the European Polar Board's INFRAPOLAR project and also in the context of a memorandum of understand between the operators of the research observatories currently under development by the European Polar Consortium.

Recent examples of effective Arctic trans-national cooperation in the context of infrastructures can be demonstrated by the European research platform 'Arctic Facility' the ARCFAC V (based at Ny-Ålesund Svalbard). The European Commission funded project and previous ARCFAC EC contracts has offered trans-national access at the level of a local scale scientific Hub. The AWI-IPEV (Alfred Wegener institute & Institute Polaire Francais Paul Emile Victor) facilities platform on Svalbard brings together the German

and French station facilities offering researchers from both countries to propose joint projects under a jointly agreed scientific strategy.

The Concept of a well-coordinated and internationally engaged Arctic Observing Network (AON) has been originally proposed in a publication and recommendations by the National Academy of Sciences US Polar Research Board www.nap.edu. 'Toward an Integrated Arctic Observing Network based on the work of a special Committee on Designing an Arctic Observing Network. This report focused on the potential scope, composition, and implementation strategy for an Arctic Observing Network (AON). Such a network would build on and enhance existing national and international efforts and deliver easily accessible, complete, reliable, timely, long-term, pan-arctic observations.

The Arctic Council ministerial meeting of October 2006 urged all member states to maintain and extend long-term of change in all parts of the Arctic and has supported the idea of the creation of Sustained Arctic Observing Networks (SAON). SAON will evolve through consultation between 13 stakeholder organizations.

www.arcticobserving.org

Enhanced Arctic Ocean observations have been achieved through recent projects such as the EC Framework Programme 6 integrated research project Developing Arctic Modeling and observing capabilities for long term environmental studies (DAMOCLES ERC FP6) and International Polar Year (IPY) Integrated Arctic Ocean Observing System initiatives (IaooS).

Arctic Research Infrastructures

Supporting internationally coordinated Observations

The recommendations of the Second International conference on Arctic research planning ICARP II (November 2005) www.icarp.dk have highlighted a set of overarching research themes that need to be addressed through dedicated internationally coordinated research and observations over the coming years.

- 1.** Understanding climate change and major environmental regime shifts.
- 2.** Understanding processes that govern changes in the Arctic terrestrial and marine ecological systems.
- 3.** Understanding the character and cumulative changes to Societal-Environmental interactions.
- 4.** Understanding the Geological History of the Central Arctic Ocean Basin.
- 5.** Documenting and Understanding the importance of knowledge and communicating science that addresses the challenges of change.

These overarching research themes have been identified through extensive consultation with the international Arctic scientific community and are important areas that should be addressed in planning a European Arctic Observatories framework.

At the International intergovernmental level specific observations such as temperature and precipitation changes has been coordinated through the UN system WMO world weather watch and global atmospheric watch sites around the world and GCOS (Global Climate Observing System) part of the ICSU-WMO sponsored World Climate Research Programme (WCRP). These networks essentially bring data points in a wider international network for the purposes of operational meteorology or longer term climate monitoring.

Building on the legacy of IPY-enhanced observational networks will be complementary to the implementation of WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) designed to efficiently enhance the capability of Members to provide a wide

range of operational services and better meet research programme requirements. Science plays a key role in supporting policy decisions aimed at minimizing climate change and its impacts. A precondition for sound science and understanding of global climate variation and change is the work undertaken in the areas of Global Climate Observing Systems (GCOS) and systematic observation.

The intergovernmental Group on Earth Observations (GEO) was established as an independent intergovernmental body to oversee the fulfilment of a 10- year implementation plan to create a Global Earth Observation System of Systems (GEOSS). The global initiatives GEOSS (Global Earth Observation System of Systems) (<http://earthobservations.org/docs/>) and GCOS, both with important implementation plans, are expected to experience mutual benefit through the coordinated effort to address capacity building needs related to Earth observations. For GCOS and GEOSS the International Polar Year is an important injection in order to establish enhanced long-term measurements in the Polar Regions.

A proposed Framework for Coordinating European Arctic Observatories



The launching of a European initiative on Arctic Observatories in cooperation with the European Polar Board and European Polar Consortium would result in a powerful strategic mechanism for implementing the science planning processes already carried out by the scientific community. It would provide a robust governmental agency framework for ensuring sustained engagement with European countries and owners of the facilities and ensuring continuity of national investments and alignment with ongoing and newly funded polar research programmes.

“ An institutional level agreement or memorandum of understanding aimed at working on harmonizing and optimizing Arctic environmental observations between the European countries. ”

The driving strategy is to develop sustainable and robust Arctic climate observing network through implementing agreements. Opportunities will be taken to engage in dialogue with national polar programmes across the world

to explore in a systematic and sensitive way a new direction in Infrastructure cooperation. By planning together and standardizing observation standards and protocols, deploying capacities and engaging in dialogue on harmonizing transportation corridors into the Polar Regions will ensure big steps forward will be made and cost effectiveness of investments will be demonstrated.



Russian North Pole Drifting Station



There is a broad range of terrestrial and Oceanic research facilities, environmental observatories and weather stations around the Arctic Basin with numerous stations in the Russian federation. Clusters of nations are cooperating at the regional level including a number of scientific and logistical Hubs such as (Svalbard, Northern Fennoscandia, Greenland, Canada, Alaska and the Russian sector. The SCANNET Sites for terrestrial field ecology are a very valuable collection of facilities investigating the impacts of climate on ecosystems. The Tiksi environmental Observatory on the Lena delta in Northern Siberia has attracted multinational cooperation and investment between Russia, the United States and Europe. The Ny Ålesund research base on

Svalbard currently has 20 European and non-European nations cooperating on various scientific themes. The European Polar Board initiative connects together the regional Hubs of activity and would facilitate trans-national access to research stations through agreements with the participating countries. The Summit station and the Greenland/Danish Zackenbug research stations are also major hubs for environmental monitoring. The Russian drifting ice camps are important facilities for monitoring climate. The data base of European stations (inclusive of Russia) in the Arctic assembled in 2006 is held on the www.europolar.org web site of the European Polar Consortium together with the descriptions of the individual research facilities.



Tiksi Environmental Observatory

Existing coverage of Arctic Environmental Observatories

Monitoring Arctic Changes

Arctic environmental changes are likely to have global influence, primarily through coupling in the atmosphere and oceans. An example is the connection between runoff into the Arctic Ocean and the North Atlantic thermohaline circulation. Increases in freshwater runoff are expected to affect ocean stratification, circulation, and global climate processes because of the potential of freshwater to reduce vertical thermohaline circulation. Melting glaciers, ice caps, and the Greenland Ice Sheet also contribute to global sea level rise. Based on the already existing collaborations, observatories such as on the ecological effects of climate change in the Polar-Regions could be developed further.

Temperature Across the Arctic

Last decade (1990s) in the Northern Hemisphere is likely to have been the warmest in the last 1000 years, with the greatest changes observed at high latitudes (IPCC, 2000, 2007).

Increases in positive departures from mean surface temperature have been observed in most areas of the Arctic over the past decade.

Biosphere

Climatic variability has a huge impact on the marine ecosystems of polar regions. Since the variations of seabird populations integrate the climate induced changes in their prey, the long-term monitoring of seabirds provides a good indication of these changes and therefore a useful way to anticipate the effect of climate warming on marine resources (Widespread ecological changes are being observed in arctic lakes that are related to climate warming).

Growing season length has increased by 4 to 12 days since 1900 in Scandinavia (Carter, 1998) and appears to be increasing throughout the Arctic.

The average acreage burned annually by wildfires in northern Canada and Alaska has more than doubled since 1970, and there has been a greater than doubling of burned acreage in the Russian boreal forest since the 1990s (ACIA, 2004). Alaska and the Yukon experienced the single largest recorded spruce bark beetle infestation in the 1990s, resulting in partial or total spruce mortality in more than 1 million hectares in the Kenai Peninsula and Copper River Valley alone (Ross et al., 2001; Burnside, 2005).

Cryosphere

Sea ice extent and thickness have been at historic minima for the satellite record in the last 5 years (Serreze et al., 2003; Stroeve et al., 2005). Sept 2007 lowest ever record extent.

Annual snow-cover extent in the Northern Hemisphere has decreased 10 percent since the advent of satellite observations in 1966 (IPCC, 2001, 2007).

Decreases in snow-cover in the Arctic and other groundcover changes, both due to warming temperatures, are having a positive feedback that leads to additional warming (Chapin et al., 2005).

Widespread permafrost warming, including thaw and degradation, is under way (Osterkamp and Romanovsky, 1999; Isaksen et al., 2001; Jorgenson et al., 2001; Camill, 2005; Smith et al., 2005).

Coastal outlets of the Greenland Ice Sheet have begun to thin rapidly (Krabill et al., 2000; Rignot and Thomas, 2002; Thomas et al., 2003).

Rates of glacial thinning in 67 Alaskan glaciers accelerated in the 1990s (Arendt et al., 2002).

Source: US National Academies Report
« Towards an Arctic Observing Network (AON) »
www.nap.edu

The Arctic countries have receding shorelines, increased coastal erosion is commonplace because of more frequent and severe storms and decreased protection by sea ice, with subsequent ecological and economic costs. Communities and industries (e.g., oil and natural gas extractors) that depend on winter ice roads are losing transportation flexibility as the length of the winter season shrinks (NRC, 2003). Thawing permafrost will damage roads and buildings over wide areas (Nelson et al., 2001, 2002).

Existing observation networks such as the Arctic Monitoring and Assessment Programme (AMAP) under the Arctic Council have documented other needs, such as those created by unexpected and potentially dangerous long-distance dispersal and bio-magnification of contaminants to high latitudes, including their effects on indigenous food resources (AMAP, 1998). In some cases, the highest human exposures on Earth for specific contaminants occur in the Arctic (AMAP, 2004).



Social Human and Economic impacts

Inter hemispheric comparisons

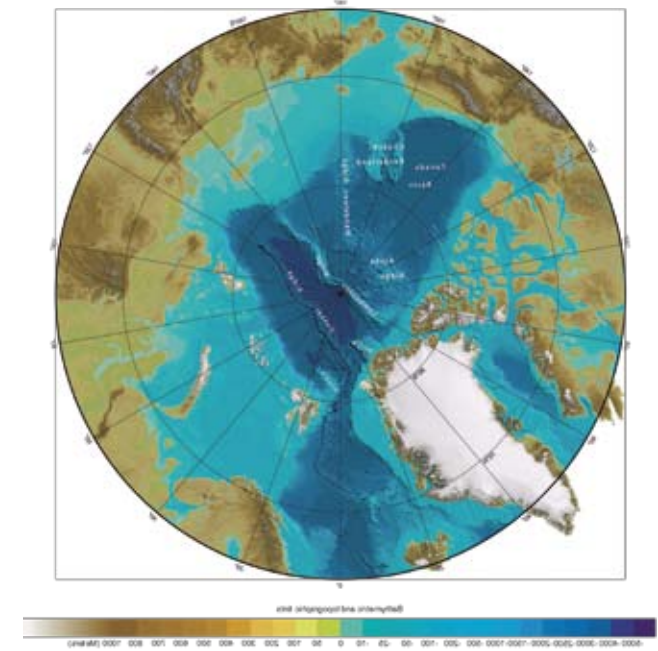


“Climate-related changes in the Arctic that are arguably attracting the most attention are occurring in the context of changes to government and economic structures, concerns about pollutant transport and the long-term health of arctic peoples, and viability of subsistence food resources.”

It must be recognized that in incorporation of the human and social dimension the Indigenous people in Arctic is of special importance. Looking ahead to the great challenges to be faced in the Arctic – such as adaptation to climate change, conservation of resources, oil and gas exploitation – it is clear that the empowerment and awareness-raising of indigenous peoples are crucial to their ability to effectively participate in decision-making processes, which will directly affect them.

The Arctic basin cannot be considered in isolation from the southern Polar Regions it is therefore important when building and sustaining an Arctic Observatories framework to ensure comparative observations and data exchange with the Antarctic observatories. Comparative biological, ecological, and climatological processes can only be understood in a broader context. European nations and international partners have significant research activities in the Antarctic regions and there are increasingly interconnected research activities in both Polar Regions especially during the current international Polar Year and in the continuing years as a legacy of the IPY. A number of major research issues have been identified, such as:

- Biodiversity comparisons of both Polar Regions.
- Inter-hemispheric comparisons of climate in both Polar Regions.
- Life in extreme Environments and comparative adaptive processes in the Arctic and Antarctic.



Enhanced European Policy formulation

The Arctic and sub-Arctic Regions have been identified by the European Union as a major area of concentration in the context of the Northern Dimension Policy and more recently through a communication on the Arctic due to be published by the European Commission in November 2008. The European initiative on Arctic Observatories will directly contribute to enhancing policies and enforcing and monitoring environmental commitments in these regions. There is a strong impetus for a reinforcement of connections with the global polar research communities in the US, Canada, Asia-Pacific countries and their funding agen-

cies, and international intergovernmental organizations such as WMO, IPCC, and the Arctic Council. The impact of the initiative will be very significant in terms of integrating and structuring the coordinated usage of research observatories at not just a European level but also at a 'global' level.

Building the European Arctic Observatories framework will require international cooperation and support especially in relation to the ongoing Sustaining Arctic Observing Networks (SAON) Process. Because some areas of the Arctic have more developed monitoring and in-

formation systems than others, it will be critical to engage all arctic nations, European countries with Arctic programmes and international partners from the outset.

“Because many potential components of the network already exist or are being planned, and because of the surge of activity during the International Polar Year, there is an immediate opportunity for major progress.”



The European Science Foundation (ESF) provides a platform for its Member Organisations to advance European research and explore new directions for research at the European level. Established in 1974 as an independent non-governmental organisation, the ESF currently serves 77 Member Organisations across 30 countries.

www.esf.org

EUROPOLAR is supported by the European Commission under Framework Programme 6. Contract ERAC 517842

www.europolar.org



European Polar Board
 European Science Foundation
 1 quai Lezay-Marnésia | BP 90015
 67080 Strasbourg Cedex I France
 Tel. +33 (0)3 88 76 21 65 | Fax +33 (0)3 88 76 71 81
 Email: epb@esf.org



Print: un. 400 - October 2008 - Conception: Latitude - Texts: Paul Egerton, Carlo Alberto Ricci, Cs and Jule - Photos credits: cover page: Eric Lammanou/PEV, p. 2-3-5: Franck Debarat/PEV, graphic credit: p. 3: University of Illinois Dept of Atmospheric Sciences, p. 6: IPEV, p. 7: Peter Lemke/AWI, p. 8 left: NPI, p. 8 right: AWI/Mariaa Ship Design Germany GmbH (formerly: SchiffFHO GmbH) visited by quote / print and taken, Hamburg, p. 10 left: copyright: Remy Maron, p. 10 right: AAI, p. 11 left: Franck Debarat/PEV, p. 11 right and middle page: AAI, p. 13: Eric Lammanou/PEV, p. 14: DFC, p. 15 left: Franck Debarat/PEV, back page left: Peter Lemke/AWI, back page right: Franck Debarat/PEV.