

4th EMB Forum

ARCTIC 2050

Towards ecosystem-based management
in a changing Arctic Ocean

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European
MARINE BOARD
Advancing Seas & Oceans Science



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4th European Marine Board Forum addresses future Arctic stakeholder collaboration

On 12 March 2014, representatives of 64 organizations gathered at the 4th European Marine Board Forum in Brussels to discuss how to best manage the consequences of a changing Arctic Ocean. The forum delegates represented a wide range of stakeholders spanning industry (including Shell, GDF Suez, OGP and Total), policy (European Commission and national governments), and academia (research performing and research funding organizations) as well as NGOs and consultancies. The forum included sessions on 'Living with a Changing Arctic Ocean', 'Arctic Ocean Observation' and Utilizing and Managing Arctic Ocean Resources'. Forum participants stressed the need for industry and science to work together, with the main priorities requiring collaboration identified as concerted data collection and analysis, which would contribute to sustainable management of the Arctic Ocean by providing data for mitigating the impacts and addressing the opportunities posed by current environmental changes in the region.

"The Arctic Ocean is the world's least investigated ocean. We need to monitor before and after changes in the Arctic to see the footprint (of both natural and anthropogenic change)."

Paul Wassman, University of Tromsø, Norway

Key Messages of the 4th EMB Forum

- A strategic plan for data collection in the Arctic Ocean is urgently needed, along with new observation technologies .
- Developing a marine spatial plan for the Arctic is necessary for managing marine and maritime activities, e.g. shipping and resource extraction, as well as protecting biodiversity hotspots.
- More effective use must be made of local and traditional knowledge by engaging Indigenous communities in citizen science for data collection and ecological management.
- Arctic Ocean research investment requires multidisciplinary and cross-sector partnerships for securing long-term strategic funding.
- With the Arctic being perceived as a new market by the shipping industry, associated activities like maritime trade, tourism and transport are likely to emerge faster than the necessary infrastructures for safe, secure and reliable shipping in the Arctic Ocean. Therefore, it is critical to *anticipate* infrastructure changes in the Arctic rather than respond to them.

Opening statements of 4th EMB Forum highlight the challenges ahead



The challenges presented by a changing Arctic region and future directions for research and industry were the subject of the opening addresses of the 4th EMB forum which were given by Peter Haugan (European Marine Board vice-Chair, University of Bergen, Norway), Harald Loeng (European Polar Board Chair, Institute of Marine Research, Norway) and Naja Mikkelsen (ICARP III, Geological Survey of Denmark and Greenland).

“The Arctic is becoming more marine offering new opportunities for marine scientists to investigate this ever changing system”, said Peter Haugan, in his opening address which focused on the opportunity for increased marine research in the Arctic region as a result of receding ice.

Harald Loeng stayed with the theme of opportunity and challenge afforded by a changing Arctic with his statement, ***“The rapid changes observed in the Arctic are a clear indication of future impact to environment and industry that pose both challenges and opportunities.”*** He also pointed to Horizon 2020 as a suitable mechanism with which to address Arctic issues and highlighted the importance of trans-Atlantic cooperation to ensure that world-class research can be carried out in the Arctic region.



Naja Mikkelsen spoke about the importance of prioritising research in the Arctic and how the forum’s findings will be brought forward through ICARP III which ***“aims to show future directions of Arctic research in a global context.”***

The European Marine Board Open Forum series brings together a wide range of marine science stakeholders (scientists, European and national policymakers, pan-European and regional networks, etc.) to discuss and develop a common position on a marine science topic of common concern. The forum bridges the gap between the scientific community, policymakers and other stakeholders to advance the issue at hand. The 4th EMB Forum was organized in collaboration with the [European Polar Board](#) and was an official [ICARP III](#) event.



Session 1 tackled the Nature of Change in the Arctic Ocean

David Vaughan, British Antarctic Survey, explained that global sea level rise is the result of multiple contributors that require further understanding to enable more accurate projections. He explained that accurate sea level rise projections have important implications for European coastal sea defence, highlighting the substantial capital investments on our coastlines such as nuclear power stations that need to be protected from flooding.

“In addition to thermal expansion of the oceans, ice melt in the Arctic will become an increasingly dominant factor in sea level rise into the future... our projections need to be accurate as they will be applicable over a long time.”

David Vaughan, British Antarctic Survey, UK.



Although ice sheet models are still in their infancy, significant progress has been made by combining data on physical *in-situ* processes with satellite data. David Vaughan identified the need to focus on the development of regionally specific projections for European ports that will enable predictions of how the one in 50 year storm surge will increase in the future.



Carlo Barbante of CNR, Italy, highlighted another implication of sea level rise, explaining that sea level rise in Europe can lead to a rapid release of persistent organic pollutants (POPs) from secondary sources which accumulate in the Arctic. The relatively high concentrations of POPs found in the Arctic region can be explained by the efficient transport of light volatile compounds in the gaseous phase and their condensation at higher latitudes. The bioaccumulation of these compounds is well known in Arctic fauna.

“Most of the pollutants produced in lower latitudes are transported through the Pacific and Atlantic and accumulate in the Arctic region... Ice melt will result in a blast from the past with the release of high concentrations of chemicals from previous decades of human impact.” Carlo Barbante, CNR, Italy

Carlo Barbante explained that the pollution record can be reconstructed by looking at ice cores. He called for an improvement in our ability to observe the system and carry out long-term monitoring in the Arctic region, also highlighting that indigenous Arctic communities are particularly vulnerable to these pollutants.

Paul Wassman, University of Tromsø, Norway, talked about the importance of longterm time series data for predicting tipping points. Tipping points refer to the critical point at which the future state of the system is qualitatively altered.

“Climatic changes are accompanied by new infrastructure, new industries, new pollution sources: cumulative effects are notoriously difficult to predict...You cannot manage an ecosystem that you do not measure and understand.” Paul Wassman, University of Tromsø, Norway

Paul Wassman explained that with an increase of 4°C entire ecosystems can approach or go past tipping points. The ability to predict tipping points in the Arctic region can be used to guide managers. However, in order to achieve this knowledge, Arctic ecosystem research needs to change its *modus operandi* to incorporate more holistic and ecosystem-based initiatives rather than fragmented and indicator-based programmes.



Session 2 highlighted that Observation is Key for Sustainable Management of the Arctic Ocean



Stein Sandven of the European Space Agency, spoke of the importance of satellite observations as well as *in situ* monitoring, for example, the use of buoys, to track the extent of sea ice. Using such data, Stein Sandven showed how the extent of summer sea ice has decreased significantly in several regions, with the Arctic now being dominated by first year ice.

“By 2050 most models show that ice in the Arctic will be less than a million km² but many other models show later ice free conditions... The questions to be asked of climate models are always, how good and how realistic are the models.” Stein Sandven, ESA, Norway

Stein Sandven highlighted the IPCC figures of a decrease of 3.8% of ice extent per decade and an increased melt season of 5.7 days per decade. He stressed the importance of accounting for error sources in satellite data and highlighted the lack of data available for some Arctic regions as well as the lack of time series data. Stein Sandven also highlighted the impact of decreasing sea ice to Arctic shipping, with the recent extensive increases in shipping activity in the northern sea route.

Kári Fannar Lárusson of the Arctic Council also spoke of the implications of sea ice loss, this time in relation to Arctic biodiversity. More generally, he spoke about the unprecedented recent changes observed in the Arctic, including invasive alien species, pollution and industrial development.

“Estimates of reduction in sea ice indicate that as early as 2030 we can expect to see a big reduction in the diversity of fauna that are directly dependent on sea ice, for example, algae, amphipods, ring seals and polar bears.” Kári Fannar Lárusson, Arctic Council, Iceland



Drawing from the findings of the recently published Arctic Biodiversity Assessment, Kári Fannar Lárusson also highlighted the current lack of Arctic monitoring and how the monitoring that exists at present is uncoordinated between nations. Recommendations of the Arctic Biodiversity Assessment are being implemented, with the aim of having significant indigenous involvement, industry involvement and incorporating an ecosystem based management approach.



Antje Boetius, AWI, Germany, spoke of the importance of using different methods of synchronous data collection and integration of this data. Antje Boetius acknowledged that satellite observations have changed how we see the world, while stressing that autonomous data collection is not the complete answer to observation, by illustration of the fact that ***“satellites cannot see through ice”*** and explaining that satellite data requires calibration and validation by ground truthing.

“The big question is are we doing the right thing to document what’s happening, even if we cannot change it?... We need calibrated, standardised data and we need people on the ground to get it.” Antje Boetius, AWI, Germany

Antje Boetius suggested that by working together on an international scale, we can improve the observations needed for establishing baseline information for assessing good ecosystem status in the Arctic region. Internationally, we can agree to measure the same essential variables in a standardised way and use a combination of available methods such as ship-based observations and autonomously collected data. However, this international approach, including the work of Arctic observatories currently in operation, needs continued support and a strategy for longterm data collection.

Session 3 focused on the Use and Management of Arctic Ocean Resources



Paul Connolly, ICES, Ireland, opened the session on utilizing and managing Arctic Ocean resources with a presentation on Arctic fisheries. Paul Connolly explained that 59 fish species are currently harvested by industrial fisheries in the Arctic region, with the Barents Sea being the area of most exploitation at present. Paul Connolly highlighted that, while many species have shown distribution shifts in recent times, with resulting implications for Arctic fisheries, currently we are unable to predict the effects of climate change on fish stocks with any certainty due to a lack of data on many species together with a lack of understanding of ecosystem dynamics.

“The key criteria for establishing fish stocks in the Arctic Ocean are bottom topography, climate conditions, food conditions and distance to spawning grounds...At present we have a poor knowledge of the spatial and temporal distribution of many fish species along with a lack of growth and life history traits data.” Paul Connolly, ICES, Ireland

Paul Connolly highlighted that Arctic fisheries management plans, such as that launched by ICES covering the period 2014 – 2018, creates the need for more international data collection as well as providing a great opportunity for ecosystem based management.

Robert Blauuw, Shell and OGP, Netherlands, spoke about the oil and gas industry in the Arctic region. He stressed that ***“industry cannot afford mistakes in the Arctic”*** and that in this regard, the prevention of oil spills are a top priority. He also spoke of the existing challenges to oil production in the Arctic region, particularly that of production under ice and highlighted that the industry takes no shortcuts in terms of their environmental obligations.

“Industry in the Arctic isn’t new – it’s been there for over 500 years...Contrary to popular belief, there’s no gold rush for oil in the Arctic.” Robert Blauuw, Shell and International Association of Oil and Gas Producers, Netherlands.

Robert Blauuw spoke of the oil and gas industry’s contribution to independent peer-reviewed science to contribute to understanding the effects of industry on marine life so that they can reduce the impact of their operations. He highlighted that wherever industry goes, there’s a wealth of information that is gathered to understand the environment for decision making, and that the need for collaboration with all stakeholders in the Arctic is vital.



Paul Berkman, University of California, USA gave a talk about Arctic shipping. He referred to the current changes in the Arctic as unprecedented, with resulting political, economic, cultural, and environmental risks. Paul Berkman explained that economics is the driving factor when it comes to Arctic shipping, and that ship building companies like Hyundai view the Arctic as a new market.

“Trans Arctic shipping has increased from 1 crossing in 2009 to 71 in 2013, transporting millions of tons of cargo along the northern sea route....Maritime trade is likely to emerge faster than the necessary infrastructures for safe, secure and reliable shipping in the Arctic.....The challenge is in balancing national interests and common interests in the Arctic.” Paul Berkman, University of California, USA

Paul Berkman also stressed that stakeholders consider sea ice from strikingly different perspectives and that if we are building observing systems we need to think about what stakeholders need. He also highlighted the potential for collaboration in data collection between stakeholders, with for example, ships crossing the Arctic collecting information to supplement bathymetric charts.

Panel Discussion on Future Arctic Collaboration

A lively panel discussion followed the speakers talks where the key messages of the forum featured prominently. With regard to a **strategic plan for data collection and observation technology in the Arctic Ocean**, all panelists agreed with Peter Pissierssens statement that the **“Arctic region is vastly undersampled in terms of physical, chemical and biological data”** and his suggestion that this could be improved by working with industry as partners in collecting and managing data. As summed up by Paul Berkman, **“More data points equals less uncertainty”**, which has knock-on effects for taking actions and making decisions. Karin Lochte pointed to the need to develop **international data collection standards and protocols** to achieve efficient data collection and highlighted the need for agreement on a **longterm strategy and funding** considering that longterm monitoring is both expensive and time consuming. Kári Fannar Lárusson of the Arctic Council seconded the call for longterm data collection and funding, stressing that this is needed for valuable data collection which can be lost when funding is reprioritized from programmes. On the issue of observation technology, David Vaughan spoke about the use of autonomous vehicles that can be used for data collection in the Arctic Ocean and stated that, **“Revolutions come at different times in different areas. We are on the verge of being able to collect enormous amounts of data.”**



Participants of the 4th European Marine Board Forum Panel Discussion (left to right): Paul Berkman, (University of California, USA), Martha McConnell (International Union for Conservation of Nature, USA), Peter Pissierssens (Intergovernmental Oceanographic Commission of UNESCO), Karin Lochte (Alfred Wegener Institute for Marine and Polar Research, Germany), Kurt Vandenberghe (DG Research and Innovation, European Commission), Robert Blauuw (Shell and International Association of Oil and Gas Producers) and David Vaughan (British Antarctic Survey, UK)



The subject of **developing a marine spatial plan for the Arctic for managing resources and protecting biodiversity hotspots** came to the fore during a discussion on how well we can predict changes that will occur in the Arctic region. Karin Lochte stated that we simply do not have enough data for Marine Protected Areas, and posed the questions, **“Which areas should we protect? Do we have areas that are so biologically important that we do not exploit them?”** Robert Blauuw stressed that Marine Protected Areas can be designed to fulfil multiple functions at the same time, such as conservation and shipping, and that industry can be restricted from working in natural heritage sites for example. Martha McConnell pointed out the fact that at present, **“only 5% of the Arctic is mapped”** and that the issue of sovereignty is important to take into account when planning for Marine Protected Areas.



The use of **local and traditional knowledge in data collection and in ecological management** was discussed as an important consideration for future work. Martha McConnell pointed out that amongst the multiple uses that are made of the Arctic region, it is first of all **“a homeland to 4 million indigenous people”**, as well as being a homeland to species and vast natural resources, and that we must work to **forge partnerships and relationships** among all the different stakeholders. Kári Fannar Lárusson spoke of plans for significant indigenous involvement as a result of the Arctic Biodiversity Assessment. However, more work in this area is needed.

There was comprehensive discussion on the nature of **future Arctic Ocean research investment, and the need for multidisciplinary and partnerships for multisectoral and multisource funding**. Karin Lochte and Martha McConnell started the discussion by speaking about public perception of science-industry collaborations, and existing concerns about the lack of transparency and the credibility of industry-funded research. Antje Boetius suggested that a solution to these issues would be to have a credible international foundation managing money provided by industry. The panelists agreed that future investment requires a concerted and all-inclusive approach. This was summed up by Kurt Vandenberghe when he stated **“The agenda is so huge on where the money comes from, that we have to take a multifaceted approach, including all stakeholders.”**



The term **‘gold rush’** was a feature of the discussion that centred around **industry interests in the Arctic, such as shipping and associated infrastructure changes**. Paul Berkman stated that, **“Economic opportunity is vast in terms of building infrastructure in the Arctic”** and that the resources needed to support the building of infrastructure is a vast industry in itself. Paul Berkman also spoke about how governments are currently staking their claims in the Arctic as a prelude to creating opportunities for industry. Robert Blauuw rejected the idea of a gold rush in terms of the oil and gas industry, explaining the lengthy process that the industry follows in terms of obtaining permits, undertaking drilling exploration and environmental impact assessments and pointing out that these processes can take up to a decade. However, Kurt Vandenberghe expressed the opinion, **“We are talking about 2 rushes, a gold rush and a data rush... Science wants to understand before acting while industry wants to act before understanding”**, and that therefore, the right architecture is needed for science and industry to work together.

