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INNSPILL TIL STRATEGI FOR FORSKNING OG HØYERE UTDANNING PÅ SVALBARD

Vi oversender herved vårt høringsinnspill i forbindelse med strategi for forskning og høyere utdanning på Svalbard. Formatet er i form av svar på oppsatt *Questionnaire*.

Vennlig hilsen,

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Havforskningsinstituttets høringsinnspill (i blått):

Questionnaire for dialogue meetings and written input

Background
As part of follow-up to the White Paper regarding Svalbard (Meld. St. 32 (2015-2016)), the Research Council of Norway has been asked to submit recommendations for an overall strategy for research and higher education in Svalbard. The University Centre in Svalbard (UNIS) is assisting the Research Council with regard to aspects related to higher education.

The Government's purpose in drawing up the strategy is to chart the course for further expansion of Svalbard as a platform for national and international research, higher education and environmental monitoring. The objective is to better take advantage of the archipelago's research infrastructure and unique research potential by enhancing quality, increasing cooperation and transparency, and making better use of resources across institutional boundaries and nationalities. Measures such as coordination of field activities and sharing of data and infrastructure will be implemented to achieve this.
The Research Council is seeking input from all interested parties, and is asking for responses to the following questions.

Research priorities for Svalbard

Svalbard is to be further developed as a platform for high-calibre international research with the objective of taking full advantage of the archipelago's unique natural conditions. All activity in Svalbard is required to comply with the established environmental standards. Research activities should be based in established local communities and research facilities whenever possible.

Question 1
Based on this, which scientific and thematic areas, either ongoing activities or potential new areas, are important and relevant to further develop in Svalbard? And which research facilities are suitable for these scientific and thematic areas?

Answer:

The future governance of Svalbard will face two main challenges, which should be addressed scientifically; 1) resource management and 2) nature management and conservation.

1. Resource management
   Warming of the Barents Sea and adjacent waters has entailed a situation where boreal and sub-arctic species have extended their distribution northeastwards in the Barents Sea, and this situation are expected to persist as the global warming increases. This result in a situation where many of the common commercial fish resources targeted by Norwegian fishermen enter the territorial waters of Svalbard (12 nm). It is even reasons to believe that relatively high abundances of fish species such as cod, haddock etc. will be found in the fjords of West-Spitsbergen. In addition, new and non-native

species such as the snow crab (see below) are likely to inhabit these areas within a few years.

Availability of abundant commercial species within the territorial borders of Svalbard will probably lead to an interest for commercial exploitation. An evolving new commercial fishery will need an assessment of the commercial stock within territorial waters, to be able to manage them in a sustainable way. Due to the disputed interpretation of the Svalbard Treaty such an inshore fishery may create significant challenges for the fishery management.

The appearance of new abundant predators in these ecosystems may highly affect the local marine food webs which may have consequences for local top predators such as seabirds and cetaceans. The ongoing research activities on the local coastal marine ecosystems and food webs should be intensified to establish better knowledge of how the entrance of new abundant predators will impact on these systems. An extended bottom fishery for shrimps and cod (particularly if established on Svalbard) will have an impact on the seabed, and mapping and monitoring of the seabed will be necessary. Coupling ocean monitoring (The Ecosystem Survey of the Barents Sea, see below) with Svalbard coastal monitoring will add an opportunity to predict possible coastal changes around Svalbard, and to understand the link between the ocean and the coast.

In addition, since the region west and north of the Svalbard archipelago (>80◦N) is the northernmost extension of the biological rich northern North Atlantic, it is of interest regarding the future biological production of the deeper Arctic Ocean. Atlantic Water carried northwards brings heat, thereby affecting thermal conditions as well as the sea ice cover. The Atlantic current also supplies the region with nutrients and drifting organisms like zooplankton and micronekton. This advective regime fuels life in the Arctic Ocean far beyond Svalbard itself. Predicting future changes in pelagic ecosystem of the deeper Arctic Ocean, is important regarding resource management in future ice free regions.

2. Nature management and conservation

New and non-native species are observed in coastal areas of Svalbard and it is highly probable that more non-native species will arrive both due to an increased propagule pressure (ballast water and ship fouling), and due to species extending their habitat (e.g. snow crab, blue mussels). It is therefore crucial that future research on Svalbard cover issues such as monitoring the appearance of new species and developing measures to model and understand the underlying drivers, to be able to choose appropriate actions to mitigate ecosystem impact and further spread. In these times with rapid changes, frequent monitoring of fragile and vulnerable arctic species should have high priority, to study before and after effects of both natural and anthropomorphic impacts, for better to be able to mitigate any unwanted anthropomorphic impact.

We prefer to think about Svalbard as a pristine area where the footprint of man is negligible. However, recent research has revealed that there are significant levels of

pollutants in the marine environment, particularly microplastic and biotoxins. Both macro- and micro plastic pollution in the marine areas of Svalbard should be mapped as well as the potential ecosystem threats posed by plastic pollution. Part of the plastic at Svalbard originate from areas far from the archipelago, but much of the microplastic are released to the marine systems from populated areas as well as from shipping activity and this part is probably increasing. A mapping of the plastic abundance in waters around Svalbard is of importance both to establish a status of how affected this marine ecosystem are, and to reveal if plastic may cause any effect on local marine flora and fauna. Such a knowledge may entail enforcements to limit the use of plastic in this area.

Recent studies have shown progressing ocean acidification (OA) in Arctic Ocean and that other climatic changes such as increased glacial melt will likely enhance and increase the rate of change with regard to OA. Svalbard fjords are already low in pH with high dissolution potential for calcifying organisms. Progressing melting of glaciers and increased precipitation will enhance OA. Svalbard fjords of different environmental characteristics can be used to study the consequences of climate change such as freshening, OA, warming, and other pollutants.

Research infrastructure – buildings, instruments and observation systems

The research infrastructure in Svalbard is advanced and plays an important role in developing new knowledge. An overview of the use of Svalbard's Norwegian research infrastructure shows that there is room to improve utilisation. In this context, research infrastructure is interpreted as incorporating buildings, instruments as well as observation systems.

Question 2

How can research infrastructure (including infrastructure not owned by your institution) be better utilised and made more accessible?

Answer:

Due to the development in the marine ecosystems described above, there will be an increasing need for a research vessel to perform multidisciplinary research in near coastal and offshore waters off Svalbard throughout the year. Current experience show that there are constraints on access to vessels for scientific work during winter and spring. A medium sized research vessel, adequately equipped, should therefore be available with Longyearbyen as home port. If possible, UNIS may be closer connected to the marine monitoring, including monitoring surveys. That would increase the number of available staff, and at the same time give students invaluable experience to take along into their future carriers.

We suggest to:

- Equip the vessel with underway seawater intake for immediate surface water measurements of physical, chemical, and biological parameters.

- Improve existing seawater intake in LYR and NyÅ as to measure autonomously and improve laboratory facilities for incubation experiments and other science projects.
- Increase and expand on existing marine network for autonomous buoys, sensors, and air and water samplers. Data from the buoys should be quality controlled and be made public for the use of scientists in all disciplines and for education and outreach purpose.
- Pier for deployment and testing of new technology such as gliders, sensors and other instrumentation that require a water column in both LYR and NyÅ. This will enable testing without requirement of boat.
- Improved transportation to NyÅ that will also facilitate shipment of heavier equipment such as measuring instruments and samples (water, sediment, ice cores and more). Would it be possible with speed-boat? Airplane traffic is polluting so perhaps not a good idea to increase that too much.

Question 3
What kinds of quality requirements for use of infrastructure should be required?
Answer:

All new research vessels need to be equipped according to the needs for data and monitoring, and in ways that allow for new information to be integrated with already existing data.

Methods for surveys, sample analyses and data treatments need to be standardised and available for all participants, regardless the research institution, to allow for integration of new and existing data and knowledge.

Most important is to have personnel that handle large data streams and are capable of quality checks and format them to many types of users.

Infrastructure should be used extensively in courses.

Developing a standardised approach to science, mapping and monitoring within and between research institutions.

Cooperation on and coordination of research activities in Svalbard

There is widespread interest in carrying out research in Svalbard and the high number of research actors, increases the need for better cooperation and coordination. It is important to promote quality and efficiency in research, ensure access to data, and not least minimise the impact on fragile ecosystems.

Question 4
How can the research actors better increase their coordination related to data sampling, research projects etc.?

Answer:

A trans-institutional (international?) scientific coordination board for Svalbard and Svalbard-near project plans and proposals(?)

By standardisation of sampling,l all scientific platforms will have the potential to take samples for more than own use, and to circulate data. This will reduce the pressure on the scientific targets and cause less impact on fragile ecosystems. On the Pacific side of the Arctic, the establishment of Distributed Biological Observatories (DBO) which are coordinated observations system, has proven to be extremely useful and important. Given the numerous expeditions around Svalbard by different institutions and countries, a similar approach would be highly valuable for this region.

Question 5
What needs to be done to make information about research activities taking place in Svalbard, including field activities, more accessible?
Answer:

Info about ongoing research on Svalbard could be communicated to other scientists in regular digital newsletters from RIS.

Open sharing of knowledge and data

Better access to research data will enhance the quality of research in that results can be validated and verified in a more effective manner and datasets can be used in new ways and in combination with other datasets.

Question 6
What are the barriers to data sharing in Svalbard, and what measures could be implemented to remedy this?
Answer:

Links to different open access databases should be available at the RIS website.

Quality in research

A bibliometric survey (NIFU 2015:37) indicates that Svalbard-related articles are cited less frequently than the world average for polar research articles.

Question 7
What are possible explanations for this and what is needed to enhance the quality and visibility of Svalbard-related research?
Answer:

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Research-based higher education in Svalbard

Svalbard is an important platform for research-based higher education, and there is potential to expand this even further. Education is offered in a number of Arctic thematic areas and is based on the geographic location.

Question 8

Does your institution have any existing higher education activity on Svalbard? If so, please describe (e.g. level, thematic area, location, etc.).

Answer:

IMR is along with the University in Bergen and UNIS part of the Centre for Excellence in Biology Education (BioCEED https://scholar.uib.no/bioceed). IMR is involved as a partner to provide practical experience for Bachelor and Master students. IMR also supervise PhD students. IMR has several adjunct positions that have developed courses in chemical and physical oceanography, ocean acidification and fisheries management at MSc and PhD level. Also supervisor for PhD students.

Question 9

Does your institution have specific plans for future higher education activity on Svalbard? If so, please describe (e.g. level, thematic area, location, etc.).

Answer:

Continued collaboration with UNIS

Yes, continue with chemical oceanography course. We also perform field studies in NyÅ bringing students to be part of the field project.

Education would be much improved if there were some existing data from for example sensors on buoys for seasonal studies to start work on science questions immediately. Field work on new research vessel would improve the possibilities to perform multidisciplinary courses that require water sampling at several depths, plankton tows and other larger equipment and at other times of year than summer. Now there is a large constraint to this and courses compete with regular “toktplan” which is very expensive for the course and is often limiting.

Question 10

If yes to the above, is UNIS relevant for any existing or planned higher education activities?

Answer:

Yes

Other comments

Answer:

Large IMR ongoing projects around Svalbard

Name of project: SI_ARCTIC **The Arctic Ocean Ecosystem**
Project type: IMR project Strategisk instituttprogram (SI)
Funding type/source, amount and period: Strategic Initiative funded by the Norwegian Ministry of Trade, Industry and Fisheries (channelled through the Norwegian Research Council), 37 mill NOK (~4.2 mill €) over 5 years (2014-2018).
Objective: Understand what happens in the marine ecosystem in the Arctic Ocean north of Svalbard when the sea ice retreat. Will commercial fish species expand into the deeper Arctic Ocean?
Description: Baseline information – Arctic Ocean ecosystem – to develop a knowledge base on the state and variability of the present and future Arctic Ocean ecosystem – commercial fish are moving north – fisheries might follow. Annual surveys into the ice: 2014-2018.

Name of project: TIBIA **Trophic interactions in the Barents Sea - steps towards an Integrated Ecosystem Assessment**
Project type: IMR project Strategisk instituttprogram (SI)
Funding type/source, amount and period: Strategic Initiative funded by the Norwegian Ministry of Trade, Industry and Fisheries (channelled through the Norwegian Research Council), 21.5 mill NOK (~2.5 mill €) over 5 years (2014-2018).
Objective: Improve our understanding of the trophic interactions, food web structure and functionality, and energy flow in the Barents Sea ecosystem.
Description: Focus on i) Food webs in the Barents Sea and how they change from south (Atlantic, boreal) to north (Arctic), ii) Carrying capacity, from primary production (phytoplankton) via zooplankton to pelagic fish (capelin, herring, polar cod) and demersal fish (cod, haddock) and iii) Effects of climate variability and change. Uses information from the Joint IMR-PINRO ecosystem (autumn) surveys. Supplementary sampling for diet analyses of fish (stomachs) and use of stable isotopes (C and N) to quantify trophic level (number of steps from primary production by plants).

Name of project: **The Ecosystem Survey in the Barents Sea**
Project type: IMR project – in collaboration with PINRO
Funding type/source, amount and period: Using baseline funding to IMR from the Norwegian Ministry of Trade, Industry and Fisheries, annually approx. 42 mill. NOK (~4.8 mill €) (since 2004-ongoing)
Objective: The aim of the ecosystem survey is to monitor the status and changes of the Barents Sea Ecosystem to support scientific research and management advice.
Description: Yearly monitoring of the complete pelagic and benthic ecosystem and its living resources. 1.5 months in Aug-Sept (Arctic summer). Conducted together with PINRO, Russian sister institution. 3 Norwegian and 1 Russian research vessels. IMR effort: 90 ship days, 17.000 hours labor (ca 10 man year). Results used by status reporting, ICES workgroups, management plans, scientific community and much more. A long range of research projects has evolved from these data.

Name of project: MAREANO **Marine Areal database for Norwegian waters**
Project type: National project - IMR, the Geological Survey of Norway and the Norwegian Mapping Authority comprise the executive group of MAREANO, and lead the day-to-day activities of the program.
Funding type/source, amount and period: Allocation in the national state budget from the Norwegian Ministry of Trade, Industry and Fisheries, annually approx. 105.7 mill. NOK (~12 mill €). Allocations to IMR: 39 mill. NOK (~4.3 mill €).
Objective: MAREANO mapping activities are focused on: the distribution of natural resources; biodiversity; the physical environment supporting bottom communities; vulnerable habitats; impacts from fishing; sediment types; and chemical contaminants. Findings provide the background information needed to support future management decisions made to safeguard marine benthic organisms and protect vulnerable habitats.
Description: MAREANO maps depth and topography, sediment composition, contaminants, biotopes and habitats in Norwegian waters. MAREANO has been working in the Barents Sea for several years now and will also to so in the years to come (at least until 2019-2020). This includes areas both in the central and the eastern part (the so-called *new Norwegian area* facing the Russian border) and areas around Svalbard. Information collected from the Barents Sea and areas around Svalbard will serve as status data for the coming revision of the management plan Barents Sea and Lofoten area (to be finished within 2020). The program aims to provide answers to questions such as: How is the seascape of the Norwegian continental shelf? What does the seabed consist of? How is the biodiversity distributed on the seabed? How are habitats and biotopes distributed on the seabed? What is the relationship between the physical environment, biodiversity and biological resources? How much contaminants are stored in the bottom sediments?

Name of project: INTAROS **Integrated Arctic Observation System**
Project type: EC-H2020-BG-09- NERSC (Lead), IMR, along with 47 partners from 13 other countries
Funding type/source, amount and period: Allocation in the Horizon 2020, annually approx. 15.5 mill. Euro (~140 mill NOK). Allocations to IMR: ~1.4 mill. NOK (~0.5 mill €).
Objective:
The overall objective is to build an efficient integrated Arctic Observation System (iAOS) by extending, improving and unifying existing systems in the different regions of the Arctic.

- Specific objective 1: Establish a Pan-Arctic forum to support formulation of agreements and collaboration between organization involved in developing Arctic observing systems across EU member states, non-EU countries and transnational organizations.
- Specific objective 2: Develop a Roadmap for future implementation of a Sustainable Arctic Observing System.
- Specific objective 3: Exploit existing observing systems and databases of atmosphere, ocean, cryosphere, geosphere and terrestrial data as the backbone of an integrated Arctic Observing System (iAOS) platform.
- Specific objective 4: Contribute to fill gaps of the in situ observing system by use of robust technologies suitable for the Arctic.

- Specific objective 5: Add value to observations through assimilation into models.
- Specific objective 6: Enhance community-based observing programmes by building capacity of scientists and community members to participate in community based research.
- Specific objective 7: Develop and implement the iAOS platform for integration and analysis of multidisciplinary with distributed data repositories.
- Specific objective 8: Demonstrate benefit of the iAOS functionality to selected stakeholders.
- Specific objective 9: Develop professional skills in using the iAOS platform and new data products within industry, education and science.

Description: INTAROS will develop an integrated Arctic Observation System (iAOS) by extending, improving and unifying existing systems in the different regions of the Arctic. INTAROS will have a strong multidisciplinary focus, with tools for integration of data from atmosphere, ocean, cryosphere and terrestrial sciences, provided by institutions in Europe, North America and Asia. Satellite earth observation (EO) data plays an increasingly important role in such observing systems, because the amount of EO data for observing the global climate and environment grows year by year. EO data will therefore be integrated into iAOS based on existing products and databases. In situ observing systems are much more limited due to logistical constraints and cost limitations. The sparseness of in situ data is therefore the largest gap in the overall observing system. INTAROS will assess strengths and weaknesses of existing observing systems and contribute with innovative solutions to fill some of the critical gaps in the in situ observing network. INTAROS will develop a platform, iAOS, to search for and access data from distributed databases. The evolution into a sustainable Arctic observing system requires coordination, mobilization and cooperation between the existing European and international infrastructures (in-situ and remote including space-based), the modeling communities and relevant stakeholder groups. INTAROS will include development of community-based observing systems, where local knowledge is merged with scientific data. An integrated Arctic Observation System will enable better-informed decisions and better-documented processes within key sectors (e.g. local communities, shipping, tourism, fishing), in order to strengthen the societal and economic role of the Arctic region and support the EU strategy for the Arctic and related maritime and environmental policies.