

Report from workshop

On improving and expanding the
environmental monitoring efforts
of cruise ships in the Arctic

Cruise Expedition Monitoring Workshop and Dialogue-Seminar

March 7-8 2019,
Longyearbyen, Svalbard



Citation:

Poulsen, M.K., Iversen, L., Mikkelsen, N.E. and Danielsen, F. 2019. Cruise Expedition Monitoring Workshop and Dialogue-Seminar: On improving and expanding the environmental monitoring efforts of cruise ships in the Arctic. NORDECO, NERSC and INTAROS, Bergen.

Affiliations:

Michael Køie Poulsen, Nordic Foundation for Development and Ecology (NORDECO)
Lisbeth Iversen, Nansen Environment and Remote Sensing Centre (NERSC)
Naja Elisabeth Mikkelsen, International Arctic Science Committee (IASC)
Finn Danielsen, NORDECO

Layout: Opheim, F. Batfish

Photo front page by Tetyana Dotsenko

Funded by the European Union's Horizon 2020 Research and Innovation Programme under the Integrated Arctic Observing System (INTAROS) project, Grant 727890.





Dialogue-Seminar on 8 March.
Photo by Michael Køie Poulsen and Lisbeth Iversen



Workshop participants on 7 March.

Background

This INTAROS community-based monitoring (CBM) workshop was held in Svalbard at the University Center (UNIS) on March 7-8, 2019 (<https://intaros.nersc.no/content/cruise-expedition-monitoring-workshop>). The workshop offered an opportunity for cruise operators, citizen science programs, local government and scientists in the Arctic to come together to exchange experiences and perspectives. The environment in the Arctic region is changing fast. Better environmental monitoring and management is urgently needed. Cruise operators, guides and passengers may find it meaningful to participate in these efforts.

The objective of the Svalbard workshop was to jointly develop a cruise expedition Arctic environmental monitoring program comprising dedicated citizen science programs to be tested around Svalbard and in the Arctic during 2019. The INTAROS project and the Association of Expedition Cruise Operators (AECO) would like to facilitate a sharing of experience followed by improved and more widespread environmental monitoring efforts on the part of cruise ships.

The changes in the environment are due to increasing temperatures. Sea ice is decreasing, human activities are increasing, wildlife is affected, etc. Such changes have global and regional implications. Moreover, these changes have a severe impact on people's living conditions in the Arctic. To ensure sustainable development in the Arctic, we need to accumulate more knowledge on its climate and environment.

The large expanse of the Arctic and the many remote parts that are rarely visited by scientists or anybody at all is a challenge for environmental monitoring. Cruise ships are regularly reaching otherwise rarely visited places. Tour guides and passengers can contribute meaningfully to environmental monitoring in the Arctic. Some cruise operators are already participating in environmental monitoring. It may be possible to learn from existing efforts, build on these and extend the participatory monitoring to even more cruises. Cruise expeditions have the potential to support environmental protection efforts by obtaining information that can help scientists conduct conservation research and provide a better basis for management decisions.

Representatives from cruise operators, citizen science programs, local government, local scientists and INTAROS met to discuss and develop a Cruise Expeditions Monitoring Program. The main focus was on working towards agreeing on simple methods that can be used alongside the normal cruise activities at sea and on land, and which can be reported on, as far as possible, by using the same format. Such approaches can be meaningful to all involved and may make the cruises an even richer experience for both guides and guests.

The long term objective is the better management of climate challenges, wildlife and cultural sites. The guests and guides will see the importance of their observations and will feel that they are making a contribution to the environment. The cruise operators will get a say when it comes to selecting appropriate management interventions that do not harm their operations unnecessarily. The researchers will obtain data and information, and decision-makers will be able to enter into a dialogue with cruise operators and obtain stronger evidence for management decisions. The monitoring may include observations from guides and guests, photographs, or the taking of water, ice or soil samples for later analysis by scientists, etc. The cruise operators will own the monitoring program and the resulting data but this will be shared widely as long as ownership is recognized. The receivers of the data, samples and reports may include cruise guests, cruise guides, relevant databases, conservation organizations and research institutions, as well as the authorities responsible for recommending or deciding on management actions.

The workshop is the fifth INTAROS CBM Workshop. The earlier workshops were held in Fairbanks, Alaska (May 11, 2017), in the Russian communities of Komi and Zhigansk (September 2017 and 2018), and in Québec City, Québec, Canada (December 11-12, 2017).

Day 1

First Stein Sandven, Director of the INTAROS project, welcomed the workshop participants on behalf of the INTAROS (Integrated Arctic Observing System) project. Stein gave a short presentation of the project. It will run for 5 years (2016-2021), comprises 50 partners, and is funded by the EU Horizon 2020 programme. INTAROS (www.intaros.eu) is an effort to extend and improve existing and evolving observing systems that encompass the land, air and sea in the Arctic.

Finn Danielsen, NORDECO (Nordisk Fond for Miljø og Udvikling), organized a round of introductions in which each workshop participant gave their name and organization. Finn is leading a component of INTAROS entitled WP4, focused on community-based monitoring (CBM).

Lisbeth Iversen, NERSC (Nansen Environmental and Remote Sensing Center), co-leader of INTAROS WP4, gave the participants basic practical information on the workshop and their stay in Longyearbyen.

Finn Danielsen gave a presentation on INTAROS WP4's community-based observing and how this workshop is part of the task of enhancing Arctic CBM practices. The overall objective of WP4 is to enhance community-based observing programs for participatory research and capacity building in the Arctic.

Specific objectives include:

- Surveying and analyzing existing community-based observing programs (including citizen science programs) in the Arctic in order to identify capabilities, best practices and challenges.
- Piloting community-based networks observing relevant parameters in Svalbard and Greenland, in order to support local and national decision-making processes.

One of the activities of WP4 are capacity exchange workshops. Some examples of documented experiences can be found at <http://www.intaros.eu/> and <http://eloka-arctic.org/content/reports>. A library of selected Arctic CBM programs can be found at <https://mkp28.wixsite.com/cbm-best-practice>.



Photo by Lisbeth Iversen

Lisbeth Iversen, WP4 co-chair, gave a presentation on the governance of Svalbard. Lisbeth explained the special status of Svalbard and how it is governed by the Svalbard Law and the Sysselmann. Lisbeth has worked with planners in Longyearbyen to ask them what data they need for planning. Avalanches and river run-off data were noted as important. Lisbeth wants to help bridge the gap between scientists and planners in order to ascertain what data is required with the challenges imposed by climate change in mind. Lisbeth hopes that WP4 of INTAROS can collaborate with and provide the local planners with the scientific data that is important for planning. This includes how to make cruise shipping more sustainable and how to get cruise expeditions to gather and share useful data.

Ilja Leo Lang, Assistant Director of AECO (Association of Arctic Expedition Cruise Operators) gave a presentation on AECO, experiences of Expedition Cruise Monitoring and the possibilities for its further development. Expedition cruises are self-contained and thus differ from conventional cruises, which are dependent on a great deal of land infrastructure (buses, etc.). AECO is managing responsible Arctic cruise tourism. AECO's overall objectives are to ensure environmentally-friendly, responsible and safe cruise tourism in the Arctic while advocating for the expedition cruise industry and AECO's members' interests.

AECO has more than 70 international members with a total of more than 42 operators/vessel owners, including 14 yachts/Non-SOLAS. Some 46 ships are operating around the Arctic, most around Svalbard and with about one third in Greenland. The expedition cruise industry grew after the breakdown of the Soviet Union, when many Russian ships became available at an affordable price. Since then, many 100 – 500 passenger vessels have been and are being built. There are no larger ships of 1000 – 2000 passengers. AECO have produced numerous guidelines to help ensure sustainable cruise expeditions. Tourism cannot take place without guidelines.

The different types of guidelines developed by AECO include:

- Operational guidelines
- Visitor guidelines
- Animated guidelines
- Clean-up guidelines
- Wildlife guidelines
- Bio-security guidelines
- Community guidelines
- Site specific guidelines

AECO has also made contributions to citizen science, beach cleaning and various forms of community engagement. An app (off-vessel risk assessment tool) on risk assessment for landing has been developed for use before landing by expedition leaders.

Ilja expressed skepticism at the idea of running the test monitoring scheme in 2019 as cruise planning had already been done. He advised not getting involved with too many citizen science programs that operators would have to report to. It becomes very complicated if you have to fill in many forms and send them to many different places. The cruise operators cannot handle this. Report backs from citizen science programs to the operators and data collectors must be included in the program. There needs to be an incentive to ensure this reporting takes place. Communication is needed, and a connection to science and the researchers is important. Otherwise no one will be involved in the long run. A permanent office or focal person is needed for future reporting and handling of data from the cruise ship operators. The tourist industry wants open data that is accessible. AECO is linked to many research activities. Fifty research projects are partnering with the tourist industry. The local government and 'Visit Svalbard' will in the future consider what projects will get a chance to be part of the program. This is being done so that researchers are not going directly to the ship operators.

Børge Damsgaard, UNIS (University Centre of Svalbard) explained about a citizen science project established with the cruise operator Hurtigruten as well as his general experience of and views on citizen science. Børge explained that the trust in science and scientists is decreasing. Only 50 percent of people now believe in science. Perhaps citizen science can help to grow trust in science once more. However, citizen science generates a lot of questions. Can non-governmental organizations and private individuals make reliable data collectors? Not according to Børge. Børge believes that citizen science needs to be coordinated by research institutions. It is important that citizen scientists travel together with researchers. Authenticity is the keyword for the cruise participants. The participants need to feel connected to the science and to solving a problem. This is why picking plastics onshore is so popular.

As part of the research project with Hurtigruten water samples are taken by the ship. During the cruise, the guests are first given a theoretical grounding, and they then get a chance to participate in the sampling by the ship. Afterwards, the guests can see the samples that have been collected in an onboard laboratory. The theoretical research lectures are important and the cruise guests are happy to feel that they were a part of something important rather than just a cruise participant. It is cheaper for the scientists to use Hurtigruten's ships. Self-evaluation must be carried out afterwards – both by the researchers and the operators. This is often forgotten.

Børge concluded that on the positive side, expedition cruise operator based citizen science can be cheaper for science and it can mean less footprint from research vessels. Moreover, it can reduce public mistrust and, at the same time, help get people to reduce their environmental footprint. On the negative side, Børge questioned the quality of the data collected and whether the data are representative. If there is no scientific control of projects it can result in problems.

How can we start a citizen science initiative? We need to define the scientific problems, develop a protocol, recruit participants, train in the method, follow-up during sampling, and ensure follow-up and evaluation. Citizen science is an opportunity – sometimes, Børge said. It needs to be linked to a research institution, it needs careful consideration of methods and it needs to be linked to education. We need to grow trust in science and scientists.

Verena Meraldi, chief scientist for **Hurtigruten**, told the participants about Hurtigruten's experience of citizen science in relation to cruise expeditions. Hurtigruten owns and operates 15 vessels. It often works with the scientific community, including transporting tons of material for scientists to Antarctica. Presentations for the guests link up with hands-on programs on board the ships. Beach cleaning is an important part of the program. There is good cooperation between Hurtigruten and the governor of Svalbard. It is hoped this 'Svalbard model' can be implemented in other areas. Passengers are happy with the scientific programs on board, including taking part in data collection. Hurtigruten has agreed a three-year science program with UNIS and Børge Damsgård. The goal is to investigate the impact of the outflow of glacier ice water into the fjords on the oceanography of the fjords – and the impact on phyto-plankton. Automatic equipment known as ferry boxes are installed on the ships. The ferry boxes measure salinity, oxygen, chlorophyll content, etc. Hurtigruten wants to focus on a limited number of good citizen science programs that will interest and satisfy the cruise guests. Verena said that she thinks there is now too little time for any attempt at a common pilot scheme in 2019 but that Hurtigruten would be happy to participate next year.

Jørn Henriksen presented the cruise operator **Viking Cruises** and told the meeting about their plans for Arctic cruise expeditions. Viking Cruises was founded in 1997 and its core business has always been river cruising. Viking Cruises have 64 major ships for river cruising. The company expanded last year to become an ocean cruise company as well. Viking Cruises is not currently known for activities in the Arctic but they plan to go into the Arctic on a larger scale. They will also operate around Svalbard. Viking Cruises will take part in citizen science activities and this is even reflected in the design of the new ships.

Michael Køie Poulsen, NORDECO/INTAROS explained that there had been discussions between INTAROS and four more cruise operators in the run up to the workshop. Michael gave a short presentation on each of the four cruise operators that had participated in Skype discussions but could not attend the meeting today.

Mare Incognita is a small company with just one ship that takes 12 guests on board. Citizen science activities are the main activities. They participate in many research programs. e.g. a DNA sampling program, and have established contact with several research institutions. The ship goes on long cruises to Svalbard and East Greenland. Mare Incognita will not visit Svalbard in 2019 but will make five trips to East Greenland. Small ships have a big advantage for research as they can get deep into the shallow fjords.

Noble Caledonia operates four small ships all year round and all over the world. No Svalbard expeditions are planned for 2019. Noble Caledonia would like to get in touch with more researchers. They have experience with micro plastic sampling from the Indian Ocean.

Polar Quest has three small vessels in Svalbard and trips every three weeks. Polar Quest guides make a lot of observations. The company has a long tradition of collaboration with the Norwegian Polar Institute. A marine wildlife report is produced after every trip. The guides are enthusiastic and have been gathering data for 10 years. They are often wildlife nerds. They proposed repeated photographing of the same glaciers.

Quark Expeditions operate with three vessels carrying 132, 110 and 77 guests. Quark Expeditions is already active in different citizen science programs, in collaboration with organizations such as Happy Whale, Polar Bears International and the University of Göttenborg. There are also internal trip reports of mammal sightings.

The workshop participants said that sometimes the smaller ships fall under the radar. Some do not register and some register as a research vessel in order to get access to fragile areas. It is important for the governor to know about them, in particular because it is easier to gain access to fragile areas when they call themselves a research ship. It is important to inform the local community what the ships are doing. There is also an increasing number of private yachts in the Arctic. This is an opportunity for citizen science but a challenge for search and rescue. It is difficult to inform the local communities what the ships are doing.



Photo by Polina Bublik

Michael Køie Poulsen from NORDECO/INTAROS explained that he thinks it is important to make sure that observations and results from citizen science programs reach decision-makers and lead to better management. Citizen science programs should give users a 'voice' to express how they see the challenges and, at the same time, be raising environmental awareness among users. Michael told the workshop about the PISUNA program, the most successful citizen science project in the other INTAROS WP4 area, Disko Bay, Greenland. Fishers and hunters from some of the small communities in Disko Bay and along the West Coast of Greenland have been involved in PISUNA for up to ten years. Local fishers and hunters will meet to discuss the status of the species that are their main interest on a quarterly basis. They will note, on a summary form, whether each species is more or less common than a year earlier. They will note what they think could be the reason for these changes and what they propose can be done to improve the situation. They will add basic information on effort and catch. The information presented on this summary form will be used by the community to decide on local management and it will be communicated to the municipality for them to consider management changes at municipal level. Most management changes can only be decided at national level by the Greenland Self-rule. The municipality and the hunters and fishers' organization KNAPK will help to communicate the data and recommendations from the local communities to the Self-rule Government. The PISUNA data can all be accessed from a common database at <https://eloka-arctic.org/pisuna-net/en/>. Some communities report only infrequently and explain that they do not trust that they are being heard as they rarely receive feedback. PISUNA received the Nordic Council's Environmental Prize in 2018 (link: <http://nordicway.org/article/local-hunters-fishermen-and-environmental-pioneers/>).

There are no similar communities of fishers and hunters in Svalbard. Here, it is the cruise expeditions that are getting into most places and can help to see what is happening to the environment. Ilja warned that some observations could lead to management decisions that are not favourable to the cruise operators. The cruise operators may thus sometimes be hesitant to report data to management. Stein said that there is a great deal of data collection going on and that many users would like to have the data but that there is a huge gap between the researchers and the data gatherers. This is a huge gap that INTAROS is trying to cover.

Penelope Wagner and **Trond Robertsen** were representing **Norwegian Meteorological Institute**. Penelope explained that it is difficult to get true data on ice in the polar ocean due to problems with what the satellites record. Radar images are best in winter. It is more difficult in summer when there is melt water on top of the ice. Higher resolution is needed to get more accurate information of the ice conditions in the polar ocean. Ground truthing is needed using information from buoys or information from ships to validate the satellite information. Information on sea ice gathered from ships needs to be standardized through a protocol for it to be useful. Sea ice observations are best done by people who have received some formal training. As previously mentioned, there is a need for a 'middle-man' between the data collector and those that have to use it. The middle-man needs to be able to read research and know how to use data – and to be able to report back to operators and passengers. Coordination is needed.

Kai Sørensen from the **Norwegian Institute for Water Research** (NIVA) talked about oceanography and ferry boxes, as already mentioned by Verena. Using ships offers opportunities to put ferry boxes to use. The ferry boxes measure salinity, oxygen, chlorophyll content, etc. The boxes are taking measurements continuously. Instruments on the deck show what the box is recording. There are touch screens on board the ship telling stories. The passengers are informed about what the box is recording. Some 400 people each day are looking at these data consoles. Ferry boxes are important for the future of collecting data.

Ted Cheeseman, Polar Citizen Science Collective, joined the workshop from California by Skype. Ted has been involved in cruise expeditions for 25 years. He was involved in founding the successful citizen science program Happywhale and has a keen interest in helping researchers obtain data that can be gathered during cruise expeditions. This is why he has taken an active part in founding the “Polar Citizen Science Collective”. Ted has seen that many people really want to learn more about the environment they are traveling to - i.e. engagement in science. Cloud observations from the cruise ships are popular. They are simple and yet passengers feel that they are doing something useful. Phytoplankton sampling is also popular. Passengers look at the plankton on the ship after collection. Photo documentation of mammal observations is another successful method. Happywhale uses photographs of the tails of humpback whales to identify and follow individual animals. Ted has seen how important it is that there is a report back to passengers who have contributed photos and data.

There is an important and major benefit if we can all work on the same programs that we are asking the cruise operators to focus on i.e. we have to define specific programs so that all expedition staff know what they will be doing on the ship. This will also prevent researchers going by themselves to just one tour operator with their specific program. Polar Citizen Science Collective can help bridge the gap between the researchers and the data gatherers.

Agnieszka Tatarek, representing the **Institute of Oceanology of the Polish Academy of Sciences** (IOPAN), gave a presentation entitled “Citizen science: examples of projects in Svalbard”.

The **Glaere Project** focuses on the use of glacier fronts by predators. This project will help us understand which glaciers are used by birds as a feeding ground and how often. The equipment needed includes a camera, a GPS device and a Secchi disk. Ships sailing to tidal glacier bays take photographs of the ice cliffs from a distance of about 200m. It is then be possible to identify the number of birds from the photographs.

The **Svalbard Intertidal Project** is for Copepod data collection through water sampling by citizens. Water samples are taken together with notes on localization and habitat of sampling sites. The study will help us understand the influence of the Atlantic water in the Svalbard region on copepods (*Gammarus oceanicus* and *G. setosus*).

The **Plastic Debris on Arctic Shores** project will show whether the European Arctic is collecting the vast amounts of plastic that are drifting with the Atlantic Water Current. The project will assess the scale of the problem and show how much and what kind of plastic is involved. Agnieszka highlighted that methodology must be simple with minimal room for error. There should be one common methodology for all participants. Results should be delivered to a professional open-access repository. Data providers must see their own effort and final outcome. The aim should be for better access for all those interested including decision-makers, guest users and other people. It will be important with repetition of data sampling and to obtain a large amount of data.

Naja Mikkelsen, International Arctic Science Committee (IASC), gave a presentation about onshore, cultural and historical sites monitoring in the Arctic. Naja hope passengers will take relevant photographs during all landings. She recommended taking pictures to document the changes that the historical and cultural sites are subjected to due to the changing climate (sea ice reduction, temperature increase, sea level increase) or human activities. In addition, Naja told the participants about the possibility of cruise ships taking sediment cores. Tourists would like working with ‘mud’ and researchers would be happy to obtain theses cores for climate change studies. Naja also mentioned that passengers could keep an eye on the depth echo-sounder to spot gas flares.

Michael Brubaker, Local Environment Observer (LEO) was unable to attend but sent a document to the workshop participants. This included an open invitation to all cruise operators to join LEO. The LEO Network is made up of local observers and topic experts who share knowledge about unusual animal, environment, and weather events. With LEO, you can connect with others in your community, share observations, raise awareness, and find answers to significant environmental events. You can also engage with topic experts in many different organizations and become part of a broader observer community.

LEO has explored how to apply the platform to support cruise expedition vessels as observation platforms. Conceptually, LEO would offer the following to a possible pilot project:

- LEO would develop a system presence and page for each ship.
- LEO would develop a system presence for each company.
- Crew would be invited to set up personal LEO profiles.
- All crew in the system could be linked to their corresponding ship page.
- Crew would be trained on LEO platform use.
- Crew would be invited to post archive observations, pictures etc. to the system.
- As the cruise season begins, crew would be encouraged to post new observations.
- Crew could also invite passengers to post, or collaborate (co-author) with them by sharing video or photographs (e.g. rare bird).
- All contributions would roll up into a ship page.
- All contributions would roll up into a personal observer page.
- Other on board monitoring data e.g. weather observations, could also be rolled into posts as appropriate, e.g. the weather conditions on the day we observed the bloom was....
- All observations viewable and geo-referenced.

Ian Davis, eBird Project Coordinator from the Cornell Lab of Ornithology, told those present about the eBird program. eBird is a global citizen science project started in 2002. Many people are interested in birds and the citizen have thus far contributed 6,620,000,000 bird observations. The data include 20,000 observations from Svalbard. This figure could increase substantially.

eBird's start-up was rather slow but then the number of observations began to grow faster and faster. The users do not lose interest because they are rewarded with lists of birds they have recorded in different countries and so on. eBird is also important for travel planning by birders. It can be used to understand the ecology of the birds and to document changes in the amount of birds. The 2019 pilot project from this workshop could use eBird by having cruise ships use the eBird app. This could be one of a few apps used for the pilot test. There should not be too many apps covering too many items. People would lose interest and it would get confusing. It would be good if all data could be collected under one umbrella such as the Global Biodiversity Information Facility (GBIF).

Stein asked how eBird is funded and managed. Ian explained that the project is open to all, open source and with no commercial involvement. NSF has supported eBird and the new management committee has raised USD 2.6 million for the operation. The money comes from grants, private donors, foundations and public money.

Inger Jennings gave a presentation on the **Svalbard Integrated Earth Observing System** entitled SIOS - a regional observing system for long-term measurements. SIOS is a consortium of institutions with research infrastructure in and around Svalbard. It has seven staff members located at UNIS and headed by Kim Holmen. SIOS is making data visible and accessible through the data portal: www.sios-svalbard.org/metadata_search. SIOS is not involved in citizen science programs at present but may be in the future. It is a data management service related to remote sensing, science optimization, access and logistics, including a training program, communication and outreach services.

Group Work.

After the presentations, it was time for work in groups. Finn introduced the group discussions. He asked each group to discuss the following:

1. Which attributes (or topics) do you suggest are recorded?
2. Reporting format and lines of communication – How to report?
3. What kind of feedback is needed - and how fast?
4. Can we agree on a pilot monitoring program in 2019? What role could you play? What could you get out of it?

Three groups were established:

Group 1: Jørn Henriksen, Penelope Wagner, Kai Sørensen, Zdenka Sokolíčková, Finn Danielsen

Group 2: Veranda Meraldi, Børge Damgård, Trond Robertson, Naja Elisabeth Mikkelsen
Michael Køie Poulsen

Group 3: Hilde Fåln Strøm, Ilja Leo Lang, Agnieszka Tatarek, Ian Davis, Stein Sandven, Lisbeth Iversen

1. Which attributes do you suggest are recorded?

The groups responded:

- Wildlife observations.
- Cultural heritage. Take photos and describe – then scientists can see the evolution of degradation.
- Landslides and avalanches. For instance, sea cliffs are falling down.
- Thickness of the ice.
- Secchi disc observations.
- Meteorological data. Temperature and wind. People are more interested in the weather than in climate.
- Plastics – shoreline garbage. Pollution in the sea.

It was discussed what the local community's needs are. A question on e.g. the presence of polar bear occurrence. Maybe this should not be distributed to the community as some would then go there to find them. There needs to be a data delay.

2. Reporting format and lines of communication – How to report?

The groups responded:

- Get local key stakeholders together, define the area and what has to be investigated, what type of research that should be reported on. There is a need for outcome dissemination. If people are not involved from the very beginning then they lose interest.
- If you engage in citizen science then all of a sudden lots of people get involved. Industry is contributing quite a lot. Cruise companies are contributing to the Svalbard community by buying fuel, food etc. and each cruise participant leaves on average 1,050 Nkr per capita per day in Svalbard.
- Voluntary hours and input need to be evaluated.
- Social responsibilities. New permits need to incorporate this item – and this is a new way of running the big ships.
- Immediate feedback are needed to guests who are contributing on the ships. Transparency as to where your contribution goes and what it will be used for is important.
- Training and understanding of a project before it is undertaken on a ship, so they understand the bigger picture.
- Happy Whale is a good example where the feedback mechanism is working well.
- The easiest way to report will be to have apps that gather everything under one umbrella and in which all data is collected and goes directly to the scientist that is working on a project.
- Gap between the scientist and the end user. We may need a science hub that is gathering all data.
- Data should be open source, available for all.

3. What kind of feedback is needed - and how fast?

The groups responded:

- Before passengers leave the ship there should be a wrap-up with the names of those who have contributed. Everybody is happy to see their name mentioned – i.e. to be recognized.
- Articles in local papers with pictures and names of those who have contributed are important. Perhaps one could appoint a 'volunteer of the year'.
- Two-way communication: negative feedback is good so you can see what needs to be changed.
- Immediate almost real time response is needed to reinforce the behavior we want. Positive response is important.

4. Can we agree on a pilot monitoring program in 2019?

The groups responded:

- There are already many valuable citizen science projects that could be used. There is a need for finding out which citizen science programs in the different spheres are ready to be tested. These could be applied to cruises in 2019. Cannot start from scratch.
- What ideas do we have to show cost – benefit for this pilot initiative? It takes a lot of resources to implement a program on a ship. Separate funding may be needed. There is also a need for an effort to establish and track simple indicators of success.
- It was suggested that we need to quantify how much money is saved by engaging volunteers in data collection. Money and value need to be discussed. Some is voluntarism and some is work.
- Perhaps an iPad could be installed on all ships.
- The cruise operators say it is important for their observations that there are projects that are of interest to the passengers. This may be different from what the community and researchers want.
- Photo documentation is important, e.g. historical and cultural sites.
- The Polish science community would like to take part in the cruise based monitoring programme.

Research and tourism are considered 'the future' for Svalbard. This is described in the business plan for Svalbard which is coming soon.

Ilja told the workshop that AECO has 10 different guidelines. In the future, they ought to be brought together under one umbrella as a citizen science program. But one should remember that all decisions have to be made by the AECO members.

Hilde from Hurtigruten said that she would be living in a small hut in Svalbard for three months doing citizen science. Her work would include ocean observation, data collection for Norwegian Polar Institute, cloud observations, sampling of toxin in the ocean and of microplankton. She wants to get more people involved in the citizen science projects.



Photo by "Axily", Shutterstock

Day 2

The discussions were continued the 2nd day. Here the focus was, through dialogue between key actors, to discuss opportunities for a better use of “citizen science” for sustainable development in Svalbard, and to make socially relevant information available and ensure the best possible development of the community, business and tourism. The discussions were mainly for local stakeholders from Svalbard. Some of the participants were new compared to the previous day.

The central question raised in the morning was: “How can we contribute to sustainable management and development in Svalbard and in the region?” Through group work and discussions in plenum, the participants looked at opportunities and needs across sectors and actors.

The workshop session started with information about the program by Lisbeth Iversen, INTAROS/NERSC. This was followed by a short introduction to the previous day’s discussions by Finn Danielsen, INTAROS/NORDECO and Lisbeth.

They summarized the discussions so far. Some citizen science is already being undertaken by the expedition cruise operators but there is huge unexplored potential. Key areas include geo-physical, biological, environmental, and cultural topics. It can help build trust between scientists and people. Immediate feedback to the contributors is needed. Careful design and proper evaluations are important. Local ownership is key. There are already good projects that could be applied, and it is important to build on that for further work. Local decision-makers, scientists, operators should decide on what is needed together. It could contribute to new ways of working together. The next step would be to assess the existing initiatives, prioritize e.g. five citizen science programs, test a ‘one stop’ approach in 2019, evaluate and document experiences, and try to quantify impact.

Annlaug Kjelstad, leader of the Planning and Development Department in the local council in Longyearbyen, presented the latest news from the local council concerning safety, development, opportunities and needs.

She described eight key issues for the local council:

- Local democracy
- Work and business
- Nature and environment
- Urban development in the Arctic – safe and attractive
- Public services
- Infrastructure and logistics – inc. energy production
- Culture and leisure – access to nature, culture and sports
- Our organization (Longyearbyen Lokaltstyre).

The main issue in 2017-2019 is planning for new safe homes and plans to secure or demolish 140 homes as well as better school service, and developments for tourism and business in general.

Robert Nilsen, representing the local **Business Association in Svalbard**, presented examples of collaboration on research and development projects, and shared challenges and visions for further efforts.

Robert told the participants that he could not recall any collaboration between researchers and local businesses. Five years ago, Longyearbyen was a thriving town with minor tourist activities and a stable Norwegian community. The community became more unstable in 2015 and a decision was taken that the tourist sector should grow. This has resulted in an increasing number of non-Norwegians. The number of non-Norwegians in schools and kindergartens has increased to 50% and the turnover is rather high. Research is needed to monitor and understand the changing local society.

Zdenka Sokolíčková, **Department of Anthropology, University of Oslo (UiO)**, will be staying in Longyearbyen for two years to conduct a social science project, Borealife, during which she will be conducting many interviews. She explained that climate change should not be seen in isolation. It has to be seen in a broader perspective involving cultural traditions and human activity. Her study will also cover the Thai population in Longyearbyen, which is almost invisible.

Ann Christin Auestad, leader of **UNIS Safety Center**, summarized the status of cooperation with local actors, research, business and tourism. The objective of the Arctic Safety Center is to contribute to a safe and sustainable human presence in the high Arctic. The ambition is that the center should share knowledge and build competence through education and research, tailor-made courses and guidance to academia, industry and Arctic settlements. UNIS Safety Center undertakes research and sells safety training to the industry. They will continue to work with courses for cruise tourism.

The Svalbard Portal is aimed at being an e-learning platform that provides up-to-date knowledge on the natural environment in Svalbard and information on how we can have a safe presence in the natural environment. It is funded by the Svalbard Environmental Protection Fund. The partners behind the portal are Longyearbyen Lokalstyre, Sysselmannen, Visit Svalbard, and Norsk Polarinstitutt.

Driva Project is about deploying snow sensors in the terrain to obtain data for practical use. The information provided by the stations can help provide a better and more fact-based picture of snow drift in selected areas and of avalanches. It is not a citizen science project. This information in combination with avalanche warnings and other observations will help to provide a better basis for decisions relating to traffic in the terrain.

Renate Pedersen, **BaseCamp Explorer Foundation**, shared information from her work in the field of "Travel and Adventure", and opportunities for collaboration and shared knowledge, important to this field. Basecamp Explorer Foundation is operating through sustainable tourism. The Foundation helps with strategic fundraising for relevant projects in the region in which they are running their tourism business. They always seek a broader approach that also invites their guests, partners in tourism and institutions to join in.

Group Work

Through group and plenum discussions, we looked more specifically at opportunities and needs across sectors and actors, today and in the future.

The answers discussed included:

- At the Svalbard Science Conference, it would be valuable to arrange a social science side event, to present what was discussed at this workshop and to network with others.
 - It was proposed to use the field staff from the Governor's office to gather further information, share data, ask for more detailed data, photos, etc.
 - Tighter criteria on what constitutes a research cruise would be useful.
 - It is important with better cooperation with all local industries/businesses and local authorities involved.
 - It was proposed that there is a need for support to the cruise industry to give better information to tourists and local communities on environmental, social and cultural matters.
 - There is a need for better infrastructure in the local communities such as walking paths, pavements for resident safety, and to provide for the visiting tourists. Need for further knowledge on where it is safe to walk, where to protect areas etc.
 - Local information – environmental protection, suggested routes, safety "suggestions" for 2, 3, 5 and 10-hour stays.
 - Ideas were raised about more local power to impose restrictions on the tour operators. For instance one could require compulsory AECO membership or maximum numbers of tourists.
 - For monitoring, there may be need for further vessel tracking, and monitoring visitor numbers. It was pointed out that overcrowding will damage the environment.
 - There is a need for more knowledge-based arguments for business development.
 - More research is needed on the limitations and possibilities for development and business. Likewise on the values of tourists coming to Svalbard. Many come to experience the emptiness and pristine untouched nature.
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List of Participants

Aud Andersen, Reiseliv, 7-8 March, aud.andersen@sysselmannen.no

Ann Christin Auestad, 8 March, annchristin.auestad@unis.no

Børge Damgård, CSAC/UNIS, 7 March, borge.Damsgard@unis.no

Finn Danielsen, INTAROS/NORDECO, 7-8 March, fd@nordeco.dk

Ian Davis, eBird, 7 March, ian.davies@cornell.edu

Jørn Henriksen, Viking Cruises, 7-8 March, jorn.henriksen@vikingcruises.com

Per Gunnar Hettervik, Visit Svalbard, 8 March, pergunnar@visitsvalbard.com

Kjersti Olsen Ingerø, Longyerbyen Lokalstyre, 8 March, kjersti.olsen.ingero@lokalstyre.no

Lisbeth Iversen, INTAROS/NERSC, 7-8 March, lisbeth.iversen@nersc.no

Inger Jennings, IAEOS, 7 March, logistics@sios-svalbard.org

Annlaug Kjelstad, UNIS Safety Center, 8 March, annlaug.Kjelstad@lokalstyre.no

Ilja Leo Lang, AECO, 7 March, Ilja@aeco.no

Verena Meraldi, Hurtigruten, 7-8 March, verena.meraldi@hurtigruten.com

Naja Elisabeth Mikkelsen, IASC, 7-8 March, nm@geus.dk

Robert Nilsen, Svalbard Næringsforening, 8 March, robert@nilsen.sh

Renate Pedersen, BaseCamp Explorer Foundation, 8 March, manager@basecampexplorer.com

Michael Køie Poulsen, INTAROS/NORDECO, 7-8 March, mkp@nordeco.dk

Trond Robertson, IceWatch/NMI, 7-8 March, trondr@met.no

Stein Sandven, INTAROS/NERSC, 7-8 March, stein.Sandven@nersc.no

Zdenka Sokolíčková, UiO, 7-8 March, zdenka.sokolka@gmail.com

Hilde Fålun Strøm, Hurtigruten, 7-8 March, hilde.falunstrom@hurtigrutensvalbard.com

Kai Sørensen, FerryBox – NifV, 7 March, kai.sorensen@niva.no

Agnieszka Tatarek, IOPAS, 7-8 March, derianna@iopan.gda.pl

Penelope Wagner, IceWatch/NMI, 7-8 March, penelopew@met.no

