Third Arctic Science Ministerial Webinar Series

Theme 1, Observe Webinar

20 January 2021

Transcription

Start Time: 16:00 UTC

1. Housekeeping Remarks: Lindsay Arthur: Hello to all of our participants. Alright, we'll just get started. I'm starting out with some housekeeping so more folks will join us as we go. But good afternoon, good evening, and good morning to all of you who are joining us. Welcome to the next installment in our ASM3 webinars series, focused on theme one, which is Observation, observing networks, data sharing towards implementation. My name is Lindsay Arthur, I'm part of the ASM3 organizing committee from the Icelandic Ministry of Education, Science and Culture. So, we'd like to begin this webinar with an Arctic lands acknowledgement. This is adapted from the IASC State of the Arctic Report for use in our webinar today.

> *The circumpolar Arctic is the contemporary home to many different Indigenous Peoples. Wherever you may be participating in this webinar, we honor and recognize the place based knowledge of Arctic indigenous peoples and their ancestral and contemporary stewardship of their homelands, and we welcome you to do the same.*

So just a few housekeeping notes as we go, this webinar is being recorded and it will be posted to the European Polar Board YouTube page (https://www.youtube.com/channel/UCBZM37l_50Hb0g2AYcgqAsg/feature) and will also share that link from the ASM3 website where you registered for this event. The microphones and cameras of the audience are automatically turned off. If you're having any trouble, please use the chat box and ask for assistance, or you can see the zoom website support page and we will share a link to that support page in the chat. The full program for today is available on the ASM3 website and we will share a link to that as well. As we go, if you have any questions, please type them directly into the Q&A box. That's the best way for us to keep track of them. We will address what questions we can in the short Q&A period at the end, but you should also feel free if we run out of time, you can follow up with the ASM3 organizing committee. For this webinar I ask has kindly agreed to let us use their code of conduct that they developed for ASSW 2020. The link to this is also posted in the chat. What's most important to remember is that we create a respectful atmosphere, and listen, and ask questions with an open mind. So just please note that abuse or harassment of any kind will not be tolerated. With that, let's get started, and I'd like to introduce our ASM 3 Science Advisory Board members from Iceland and Japan - we have Embla Eir Oddsdóttir and Hiroyuki Enomoto and they'll be giving an overview of the webinar series and giving our opening remarks. Thanks.

2. Introduction: Hiroyuki Enomoto (NIPR): OK, thank you Lindsay. I am Hiroyuki Enomoto from NIPR in Japan and I am Co-chair of the ASM3 Science Advisory Board together with Embla and we would like to welcome you

to the ASM3 webinars. As we know, some of you may not attended a past ASM3 webinar, we will give a brief summary of the ASM3 process. So, the third Arctic Science Ministerial will be held in Tokyo, Japan on 8 and 9 May 2021. It was originally scheduled for November 2020 but was delayed due to the pandemic. Next slide, please. So, the organising committee of the meeting members are from the Japanese Ministry of Education, Culture, Sports, Science and Technology, MEXT in short, the Japanese National Institute of Polar Research and the Icelandic Ministry of Education, Science and Culture. Next please. The Science Advisory Board, and so we called SAB is responsible for developing the Science Summary report by analyzing the input we have received from various sources. The board is made up of members representing Iceland, Japan, Arctic Observing Summit, APECS, the 1st and 2nd ASMs, IASC, IASSA, Indigenous knowledge holders, Indigenous scientist representatives, SAON and University of the Arctic. Ex-Officio on board we have, our science consultant, who also helped with ASM2, members from Japan and Iceland that are doing a lot of the heavy lifting to make sure that the meeting will be as successful as possible. Next slide. There are 28 countries or governments participating along with six Arctic Indigenous Peoples organizations and 16 international organization with interest in Arctic research and Education. Next slide please. These groups were asked to submit various pieces of information to help us understand the rest of the International Arctic Research and education activities. This information, plus online feedback forms and statements from various Arctic Science conferences all feed into the products from ASM 3. These products include a summary report with a science section and recommended actions. The joint statement, and various resources will be added to the ASM3 website and an update with the Japanese optical data service that will that will contain and display in such a manner all the information on projects submitted from the ASM 3. And now, I will turn it over to my Co chair Embla to tell you more about the webinar series so Embla please.

Embla Eir Oddsdóttir: Thank you Enomoto, thank you to all of you for your interest in the ASM3 and our webinar series, which we're holding together with our partner, the European Polar Board. Thank you, EPB. The series was developed to help increase the transparency in the ASM 3 process and to provide additional opportunities for people to engage with the process. Next slide, please. Our first webinar was held in October 2020 and covered the history of the Arctic Science Ministerial meetings and introduced our ASM 3 process. Next slide. Next, we held an interactive workshop discussing the gaps and barriers in international research. Many of you participated in that workshop and we thank you again. We are pleased to let you know that the final report from that workshop is now on the ASM 3 website and the recording is on the EPB's YouTube channel. Next slide. In December 2020 we were pleased to have many Indigenous leaders share their perspectives on the importance of the inclusion of indigenous knowledge in Arctic research. The webinar provided important and essential information for the Arctic Science community. We think Lisa Mack, Eva Krummel, Anna Degteva and Lindsey Arthur for organizing this webinar and to the leaders who shared their insights and recommendations for the future. A transcript of this webinar is on the ASM 3 website and a recording is also on the EPB YouTube channel. The discussion from this webinar will be important in informing many of the recommended actions in the final report from the ASM3. Next slide. The next webinars in the series will focus on the four themes of the ASM 3 and the projects that have been submitted to help achieve

the ASM3 goals. Each webinar will have a similar structure with an overview of the theme, progress since ASM 2, project highlights, proposed actions, and a moderated discussion. Next slide. Just to provide a few teasers for these webinars, here's a bit of overview information. We received 174 project updates and 252 new projects in support of ASM 3. These projects were mostly international in nature and covered all fields of science. These word clouds represent data from all projects submitted. The word cloud on the left represents the number of times a country was listed as a contributor in all the projects submitted. The main cloud in the middle represents the keywords selected for all the projects submitted. You can see some main interest points of climate, observation, monitoring, modeling, change, and ecosystems coming through. The final small cloud represents the number of projects that involved arts and humanities, Indigenous knowledge, outreach efforts, and Natural and Social Sciences. If it was community driven, and if it involved education and or capacity building. While most projects focused on Natural Sciences, we were pleased to see that Social Sciences were also quite involved. Next slide. There is a lot of information to digest and we're pleased to share it with you through the next webinars. So mark your calendars. You can see the dates on this slide. Next slide. For our webinar today, Hajo Eicken, the Director of the International Arctic Research Center at the University of Alaska Fairbanks and the Arctic Observing Summit representative on the Science Advisory Board will provide an overview of the 141 project submitted to theme 1. This presentation will be followed by 5 project presentations that we felt showed the diversity of the efforts submitted to this theme. Sandy Starkweather from NOAA and the SAON representative on the Science Advisory Board will then present a summary of recommended actions to increase international observations and data sharing. We will then hopefully have some time for discussion. So, without further ado, Hajo.

3. Moderator: Hajo Eicken (AOK): Thanks, thank you Embla Eir. Welcome everybody. Good morning. Good afternoon, good evening. I'm Hajo Eicken, I'm speaking to you today from the traditional homelands of the lower Tanana Dené people here in Fairbanks, AK at the University of Alaska Fairbanks, and I wanted to give a brief overview, as shown on the next slide of both the broader setting of the Arctic Science Ministerial. I see there's a number of people on the call here who know quite a bit about that themselves. Before delving in and talking a bit about progress made since the last Arctic Science Ministerial 2 held in 2018 and then briefly review some of the submissions to the third Arctic Science Ministerial. And then of course, I'm excited to learn more about some of these outstanding submissions that have been made. We've highlighted and identified five that will be represented by our guest panelists here today. So, let's jump right in. If I could have the next slide please. So first let's briefly recap. What is the setting of the third Arctic Science Ministerial? What has happened in terms of the broader perspective of Arctic, and global environmental change since 2018? I'd like to illustrate that with four examples. Here's the first one. This is the Intergovernmental Panel on Climate Change Special Report #15. A lot of you I'm sure are aware of this. The figure here highlights one of the key findings of that report and that is recognizing the Arctic as a unique and threatened system that at a projected 1.5 degrees Centigrade, global warming is expected to experience widespread impacts and risks with significant potential for irreversible and persistent climate related hazards, with global repercussions. And of course, as we are aware, 1.5 degrees Centigrade global warming is under current situation, a very optimistic scenario. On

top of that of course, we know that amplification of global warming in the Arctic will increase those numbers significantly within the Arctic relevant stuff. The next slide gives you a brief summary of another important IPCC report that has appeared, most recently, that is the report on Oceans and Cryosphere which has a specific section on the polar regions and the Arctic. You see some of the projected impacts and intertwined changes in the Arctic highlighted in the figure on the right, but I would like to paraphrase from the key conclusions that the special report made specifically that response options in response to climate change and specifically response in the Arctic can lessen impacts of change, build resilience and provide for some time to put in place effective mitigation measures. But the finding of this special report also is that institutional barriers currently limit the efficacy or effectiveness of these responses, and even though some of the polar governance and specifically Arctic governance systems have recently been strengthened, they're not at present rapidly adapting or robust enough to address the challenges and risks posed by the expected changes. If I could have the next slide. This will illustrate this a bit further. Here's a figure from a synthesis compiled by US, Russian and Norwegian scientists for the Bering and Barents seas, showing the northward shift of commercially important fish species. Here the Pollock, Pacific Cod and Atlantic Cod over the past decade or so that is understood to be a result of substantial warming in these areas. In particular in the Bering Sea, you have a dramatic loss of the so called “cold pool” which is linked to sea ice formation and those changes are not just important from a commercial fishing perspective and a broader environmental perspective, but they also have very substantial impacts on indigenous and coastal communities in the region. The next slide gives you an example of this.

This is a summary of observations of the Alaska Arctic Observatory in Knowledge Hub or AOK. You have a number of Inupiat observers and ice experts who have been reporting over a number of years in a community based observing network changes in these coastal environments. In particular in the last few years they've highlighted an increase and acceleration of some of these changes in the Pacific Arctic sector with in particular strong intertwining and interconnectedness between sea ice loss, ocean warming, changing weather patterns and a range of impacts on coastal areas. I do want to highlight that on the Atlantic side and Svalbard, residents and small guard have been impacted by increased landslide risks in association with permafrost degradation and changes in precipitation patterns.

Regarding the Arctic Science Ministerial: what is the potential and relevance or significance of the Arctic Science Ministerial? This is my perspective as an advisor Science Advisory Board member. It's not the formal perspective, but it's clear that current conventional response, research and governance mechanisms are inadequate with the pace of change that we're seeing in the Arctic, and this includes of course responses and adaptation by Indigenous peoples at the Community level. Those communities have been taxed substantially by challenges, but also at the same time responded and build capacity, but clearly require significant support and international collaboration. The transboundary in global impacts of these changes in the Arctic clearly require internationally coordinated and collaborative approaches that are focused on the shared benefits and services the Arctic system provides at the global level and that all calls for executive level government attention and support that is focused into high priority themes and initiative. In particular, those that hinge on international collaboration and coordination. But at the same time also approaches that are iterative that can respond rapidly and help the broader community long. You see that represented very nicely in this cycle;

observing, understanding, responding, strengthening - that is a key element of the third Arctic Science Ministerial.

A brief summary of progress made more in the vein of observing itself, since the last Arctic Science Ministerial (see a timeline here from 2018 through 2021), we see substantial alignment and coordination and increased collaboration of activities that are central to observing.

The next slide focuses on increased collaboration between the Arctic Council, International Arctic Science Committees, Sustaining Arctic Observing Networks (SAON) on activities with those of the Arctic Observing Summit. The Observing Summit is more of a bottom up community driven effort to foster coordination collaboration. For the last summit in 2026, working groups put in quite a bit of effort, but I'm particularly encouraged by the fact that these working groups now are very well networked and linked to develop synergies between the SAON committee and observations networks in the SAON Arctic Data Committee and other groups. I'd like to highlight, in particular the indigenous food Security Working Group under the Arctic, Observing Summit, which has made tremendous progress over the past several years.

The next slide then gives you another important development, and that is that, SAON as an entity has led the definition of a road map for Arctic observing and data systems, or so-called roads and essential element to help bring different activities together onto the same page in a both combined bottom up and top down approach to help move things forward more rapidly. You see some of the key elements of the SAON road map and its focal areas highlighted here on the right.

The next slide gives you more of the perspective of the process where there has been substantial progress made in terms of inventories of observing activities. I'd like to highlight, in particular the European Union Horizon 2020 framework funded in INTAROS project. I see Stein Sandven and Hannah Sagan are on the on the call here. That project has made major progress collaborating with other observing regional and global observing efforts to give us a sense of what the current capacities and inventories are. This all feeds into SAON's committee and observations and networks. Under the say on roads process, those inventories are now being tied to societal benefit assessments or value tree analysis. And again there is a number of these that have recently appeared out of Finland: Mikko Stralendorff and colleagues, or most recently. As well, work by Shibata and Harada in Japan, linked to Japan's Arctic policy to broader observing related societal benefits and values, and ultimately these types of activities are then meant to lead into essential variable frameworks that allow the broader community to define the requirements for observations, and we'll hear more about one area with this has been very successful with the circumpolar Biodiversity Monitoring program on which Catherine Coon will present as one of the highlights in a few minutes.

A brief overview of the five different areas or thrusts where we have seen major progress since the last ASM. And again these are just examples. I've already pointed out the progress made in terms of coordination frameworks and support. I do want to highlight as a very Arctic Science Ministerial linked outcome: the creation of a funders forum which is seen as critical in terms of coordinating research support internationally at various levels, so this is an important element. Then, of course, individual projects and initiatives I've mentioned INTTAROS. We have the MOSAIC field activity that has come to a successful conclusion. We have new observing infrastructure. Several countries are working on new Arctic research

vessels. China has launched Xuelong 2 as a research icebreaker and I note that Russia, one of their country highlights for the Arctic Science Ministerial 3 is a new planned, a terrestrial snowflake, international Arctic Station. Then of course we have the national Polar and Arctic institutes that are helping move things forward in a significant way because they are able to plan longer term at the national level, but increasingly are coordinating this internationally. One highlight is the National Institute of Polar researchers in Japan, Arctic data system. Korea's KOPRI has done quite a bit in terms of sustained observing, connected and nationally. As Germany's AWI in Svalbard integrated Earth observing system or science is a great example of how these efforts can come together. Then finally I do want to acknowledge major progress made in the food security and food sovereignty area with respect to observations, Inuit Circumpolar Council Alaska has been a major leader both thought leader and initiator of conversations around these topics. Then to just briefly give you a glimpse in the next slide of the submissions to the third Science Ministerial. Here are some word clouds and a reference to the total number of observing related submissions. These are a few more than the total number if you seen before – 158. The final slide breaks those down an analysis. The next slide gives you an overview of these submissions. From observing perspective, you're seeing that roughly a quarter of the total submissions is affiliated with actual existing observing networks. But note also here, item number C that not all of these provide truly ready access to data, so that's something to work on still. And also note that a significant number of submissions is not directly tied to structured observing approaches, so that's an area where, hopefully Sandy Starkweather in her remarks later can give us a better perspective on what are some of the things that we might want to move towards in the future. I also want to note that the, at least from my perspective, personally the representation of indigenous leadership participation that's been submitted here in the way of information that the nine projects here doesn't necessarily reflect the total engagement. I'm very interested in hearing more from Noor Johnson, as one of the highlights about their survey of activities. So let's jump right in then, and have a look at some of these highlights.

So here's the five submitted activities that we will be looking at a bit more detail. We will start with an overview of the Synoptic Arctic survey from Øyvind Paasche, Bjerknes Centre for Climate Research and NORCE, who is also the chair of the Synoptic Arctic Survey Scientific Steering Committee. So Øyvind please?

4. Panelists:

Øyvind Paasche (SAS): Thank you and greetings from Bergen, Norway. Thank you to the organizers for providing this opportunity to present the Synoptic Arctic Survey and the home page address you can find on the lower part of this page. So what is the Synoptic Arctic Survey? Well, it's a bottom up research driven initiative aiming at collecting empirical data in the Arctic Ocean that cannot be done in any other way than through cruises? SAS was already up and running in 2020 with two cruises and continue this and next year. It builds on involving the coordination of many research vessels. Although not all are Ice Breakers. Our goal is to further our understanding of how this wonderful and complex Arctic Ocean engine works, and in order to do so, we jointly need to generate a comprehensive data set that allows for a complete characterization of the Arctic Ocean. This would include a hydrography and circulation, carbon uptake and ocean acidification, trace the distribution and pollution and organism and ecosystem functioning and productivity. So the new SAS data

set will provide, I believe, a unique baseline, in lack of a better word, which will allow us to track climate change and its impacts as they continue to unfold in the Arctic. Many will surely benefit from such a coordinated data collection in the years to come, and I think it's also a reminder that by working closely together, we learn not just more about the natural systems that we study. But we also become friends, which I think is a key asset in a rapidly changing world. The Scientific Steering Committee have representatives from all countries presently engaged in SAS that are always open for newcomers.

So what is the overarching question that SAS poses? It is what are the present state and major ongoing transformations of the Arctic marine system? We think of the Arctic Ocean in terms of three segments. We have the physical oceanography in blue, in green, the marine ecosystems and in yellow, the carbon cycle and acidification.

Just to give you a few teasers from the different segments for physical oceanography, one of the research questions would be what are the changes in water mass source and transformations. This is obviously important for both marine ecosystems and carbon cycling acidification

For the marine ecosystems, we ask how does primary production an associated availability of nutrients vary between the different origin Arctic regions. What is the contribution of the Arctic Ocean to maintaining the global ocean carbon dioxide reservoir and uptake? So questions that are in part interlinked reflects the need for interdisciplinarity, but also the need for disciplinarity. So we have nine of these questions. Now you have seen three of them. More information about this can be found in our science and implementation plan, which is freely available on my web page. You also had a paper in EOS, which describes the Synoptic Arctic Survey.

Which areas to recover? This is our pre-pandemic planned SAS Cruises and so this is not something which is in concrete, but two of the cruises that occur this fall was the Japanese cruise with Mirai and the Korean cruise with ARAON both in the Beaufort Sea. This year we're looking very much forward to the ground plans of the Swedish icebreaker Oden, which will go in the Canadian whole because there's thick sea-ice there and not all that much data. There will also be other cruises. Some are still developing, but some of the cruises are at least the set and this also for instance, includes the Norwegian one. It also includes their Russian, German and Swiss cruise, so I think there is a great enthusiasm in the community. We look very much forward to working together in in the years to come. I want to end on the note that SAS started as an idea in Tokyo in 2014. We had our first workshop in 2015. Now it's 2020 and what we see where more and more beginning to think of SAS as a pilot for a second, SAS two. So far we were thinking that this should occur in 2030, so it would overlap coincidently with the end of the decade of the oceans so working towards that which would secure progress and continuity in Arctic research. Thank you so much for your kind attention.

Hajo Eicken: Great thank you! Next up is Ashley Chappell who's the lead for NOAA, the National Oceanic Atmospheric Administration, to produce an integrated ocean and coastal map. She will share with us some of the work that's focused on filling gaps in mapping of the Arctic Ocean and supportive research and sustainability.

Ashley Chappell (ARHC): Thank you. I am here speaking on behalf of some of the Arctic Regional Hydrographic Commission members and associates that signed on to this proposal with us. I really appreciate the opportunity to talk to you all about this. I am going to have to drop off before the end of the meeting and so I've included my contact information here on the slide in case there are any questions afterwards that are lingering just feel free to shoot me an email.

I'd like to talk with you about the proposal and this concept this proposal really recognizes that mapping ocean and coastal waters for all the different things that people are interested in, there is really foundational to science. Lots of different sciences. We are pretty safe, and saying that the Arctic is in many ways unsurveyed or poorly mapped, especially as more and more water is appearing with the loss of sea ice. So these areas have never been mapped or were mapped many, many, many years ago. Geospatial mapping is really important for things that we all recognize both in a very timely operational way and in a in a scientific way. But I would say that science is actually involved in all of them, whether it's operational, safe navigation, dealing with oil spill responses with trajectory modeling, and an oil and ice climate adaptation strategies, coastal community resilience, coastal erosion, permafrost on the impacts of that. Know how to help communities plan and then many, many other Arctic science efforts that are all focused on helping to understand and sustainably manage Arctic ecosystems and the living marine resources there, making sure that people's lives and livelihoods that have existed for eons can be sustained. So this ocean and coastal mapping may seem really basic, but it's actually a very critical component to the Sciences that happen in the Arctic. We created this proposal, sort of in the realm of mapping – mapping is having a moment right now, with Seabed 2030, which is very exciting, the UN decade, we have international hydrographic organization and another state goals for mapping, including the USA with our recent National Ocean mapping exploration Characterization strategy. So I think mapping is having a moment and I'm excited to be talking about it. I did want to say again that that a number of our Arctic Regional Hydrographic Commission members have joined in this proposal: Canada, Denmark and Greenland, Norway, Italy and more welcome. Obviously there's plenty of room to be mapping in the Arctic. We don't need to eliminate anyone who wants to participate. Other interesting aspects of this are increasing diversity in the mapping. It's obviously related to many different stem disciplines, and it's an opportunity to increase the diversity of people participating and then something that excites a lot of people, of course, is the technology, the research and development angles of un-crewed platforms, or how can we more efficiently collect mapping data of different types in the Arctic using un-crewed systems and other technologies that eliminate the need to just send a ship up there every time force multipliers you know using more. Un-crewed systems as ancillary and all of that. So just to wrap up, I don't know if this has happened on your slide - it seems to be a little bit cutoff on mine, but just some notes on how to participate: first, and really key and this is something that if you followed along with Seabed 2030 or any of the other major global international mapping efforts that is to share existing mapping data that there may be data already that exists. That can be brought in to help fill gaps and sent to global datacenters like the DCDB, to be to be stored and shared. Next is to identify gaps.

Where we need to map and then. Obviously, you know a big theme here coordinating and collaborating on that mapping. Getting out to do that mapping together and using our scientific cruises to

collect mapping data where we can using ships of opportunity, scheduling, mapping all of that. Transit surveys, crowdsourced data, just encourage all those different ways that we can participate in mapping and so the proposal goes into that. I'm happy to talk about it in more. I think that my time is up though, so any questions please just follow up with me later. Thank you. Thank you Ashley.

Hajo Eicken: Next up we will hear on an autonomous observing system. Presenter will be Salve Dahle, who just stepped down as director of Akvaplan-niva, in Norway, has been working in the Arctic since the 80s as Marine biologist and also is one of the founders of the Arctic Frontiers Conference.

Salve Dahle: Thank you and hello everybody. And thanks for the opportunity to speak at this important event. We all know that carry out to carry out observations in the Arctic is expensive. The use of the state of the art technology may help reduce these costs.

We have in recent years recent 10 years, been working with autonomous vehicles. Gliders, marine lighters, which are piloted from a computer and data transfers back to your computer. We think this may be part of the future, although it definitely is a challenge still to operate in waters with much ice. These marine lighters have no engine. They take advantage of waves, wind, solar energy, and gravity for the movement and energy production. They have no disturbance to the environment and can thus observe the nature as close to reality as possible, even from the very surface of the water, which always is a challenge with a research ship. They are flexible. You accept your waypoints and you may adjust your waypoints while their expedition is ongoing. They can stay two to three months at sea. They acquire a lot of data in a very cheap way. They also worked very easily alongside a research ship. They have extremely rapid development of sensors.

So what is possible to observe? Today, much more than yesterday. We've been using them for metrology, wind, air pressure and temperature for oceanography, temperature, salinity, oxygen, ocean currents and particles – and also biology for plankton, fish, marine algae and marine mammals, and also in chemistry for marine pollution, including mapping off plastics.

We see there are different sensors already available for very much of the ecosystem.
From the marine mammals to plankton and all the way to phytoplankton using different kind of state-of-the-art sensors which are commercial sensors. And, as I said earlier, is a rapid development of these, so we are presently operating surface colliders. Favorite with wind and waves and with a solar panel which are constantly recharging the battery. And also diving lighters that can do down dive down 2000 meters. As important as the observations itself is to have a data management system. We are piloting the gliders from your computer. But also, we received data back to a computer, either through their mobile phone system or through satellite. Then you have to have a system to handle data and this is a problem we are really would like to work with others to develop a professional data mining system so we can address and have data to have the right format to enter to existing databases or to help solve specific applications. I'll be happy to discuss this if times alone now or later. Thank you.

Hajo Eicken: Great, thanks very much, Salve. Next, we'll hear from Noor Johnson, who is one of the co-producers in collaboration with the Inuit Circumpolar Council of an atlas of community-based monitoring indigenous knowledge. Noor is a cultural anthropologist working on environmental knowledge and equity at the National Snow and Ice data center at the University of Colorado Boulder.

Noor Johnson (National Snow and Ice Data Center): Great, thank you. I just want to briefly introduce you to this atlas-project. This is a project that as Hajo mentioned, was led by the Inuit Circumpolar Council, with a number of collaborators and supporters, including the exchange for local observations and knowledge of the Arctic, which is a program that I lead out of NSCDC, and the atlas was really developed as a tool to raise the profile and visibility of these community based efforts within the broader observing system. It was part of a larger effort where we developed a survey. We did outreach to identify programs and invited them to fill out the survey and return it to us, and then we did some analysis of this and developed a report which you can find on our website as well as a Journal article. And then finally we developed the atlas infrastructure, which I'm going to briefly show you now.

This is the landing page of the Atlas. You can see some of our partners here. One of the things that we like to mention is that we have different views depending on which region of the Arctic you would like to look at an investigate. So, this is the Alaska view and it centers the Alaska projects. The blue squares are the projects that are part of the Atlas and we currently have 112 projects listed as part of the inventory. Some of the projects are clustered together, so there's some communities that have a number of different community-based monitoring and observing projects taking place in that that location co-located. So, in that case it displays as a cluster.

I have clicked on a cluster of three projects that are taking place on northern Baffin Island and the community is Clyde River. You can see there's three projects in the atlas from Clyde. If I were to click on the middle project, it would load up some information submitted from that project. That would tell you as the reader or visitor about who initiated the project, how to get in touch with the point of contact, what phenomena is being observed by this project. What are the issues of concern that really motivated the communities to establish the project - whether it's completed or ongoing, information about data collection, and use, and whether and how indigenous knowledge is involved.

You could also add media to the outlets, so here's a picture of community members helping to install a mobile weather station. As part of that project, record that I was just showing on the previous slide. You can also load videos into the atlas as well. There are a couple of different ways to query the atlas and using the search function you can look for specific communities which display as the little yellow dots in the atlas. You can look up projects by name or you can search for themes. Hajo mentioned that since the last ASM2, there have been a number of local observing efforts and community led and indigenous lead observing projects that are just now sort of being developed and coming online. This atlas was an infrastructure that we built and was intended to be continuously updated and we would like to take that on. That's something that we're looking for resources right now to include some of these newer projects that have been developed over the last five years. We also have goals to enhance some of the information an enhance some of the querying functions so that you can look and compare across projects to see you know projects that have similar goals or collecting

similar data. The overall goal has always been and is still to support network building so that we can coordinate observations and really connect these programs with one another and with regional pan-Arctic efforts. Please feel free to get in touch with me if you have suggestions of programs or any questions about the atlas. Thank you.

Hajo Eicken: Alright thank you Nora. Next we'll hear from Catherine Coon, who is the Chief of Environmental Sciences Management with the Bureau of Ocean Energy Management in Anchorage, AK, but is also co-chair of the Circumpolar Biodiversity Monitoring Program, and she'll provide a highlight on that topic, Catherine.

Catherine Coon (CBMP): Yes, good morning from Alaska. As Hajo mentioned my name is Kathy Kuhn. I work for the US Department of Interior Bureau of Ocean Energy Management and I am presenting today on behalf of the CBMP program. My other co-chair is Tom Christiansen from the Kingdom of Denmark. As the Arctic continues to experience a period of intense and accelerating change, it is become increasingly important to have better information on status and trends of Arctic biodiversity. However, current monitoring practices in the Arctic or fragmented and incomplete. The Arctic Council has recommended that long-term monitoring efforts and inventories should be increased and focused to address key gaps in knowledge to better facilitate the development and implementation of conservation and management strategies. CAFF working group for the Arctic Council has developed the Circumpolar Biodiversity Monitoring program in response. The overall goal of the CBMP is to facilitate more rapid detection, understanding, prediction, communication and response to the significant biodiversity related trends and pressures in the Arctic. The resulting information is designed to be used to assist policy and decision making at a global, national, regional, and local levels. The CBMP utilizes existing monitoring capacities in the Arctic through enhanced coordination and integration of already established monitoring resources. Through the enhanced coordination of existing monitoring resources, there is an improved ability to identify priority gaps in current capacity and improves comprehensive and cost-effective monitoring. To this end, the CBMP is leveraging monitoring activities to establish linkages to the global biodiversity initiatives.

The CBMP is an international network of scientists, governments, indigenous organizations, conservation groups, working to harmonize and integrate efforts to monitor the Arctic's living resources. It organizes its efforts around the major ecosystems in the Arctic, including the marine freshwater, terrestrial, and coastal. The CBMP emphasizes data management through the Arctic Biodiversity Data Service, also known as ABDS. It also emphasizes capacity building, reporting, coordination, an integration of Arctic monitoring through its communications, educations an outreach, and you'll see the CAFF website on the slide to the right. Arctic biodiversity monitoring plans are being implemented for each of those four ecosystems I mentioned to improve the ability to detect and understand changes. The approach adopted in the four Arctic biodiversity monitoring plans follows the steps required for an adaptive and ecosystem-based monitoring program. It includes a consideration of what future priority questions and user needs the program should address. This ecosystem-based approach integrates information across ecosystems, species and their interactions and lends itself to monitoring key aspects of ecosystems, called focal ecosystem components, or also known as FEC's. This

approach considers the integrity of the entire ecosystem and their interactions with other ecosystems. Each Arctic Biodiversity monitoring plan describes expected outcomes and reporting, including the development of the state of the Arctic Biodiversity reports as a major output. The first CBMP state of the Arctic Biodiversity Report was issued in 2017 by the Marine Working Group. The Freshwater Group completed theirs in 2019 and we're very pleased to announce the recently released report from the Trust Real Group this month in 2021. Enhanced monitoring and sustained observations are critical to improving a fundamental understanding of how Arctic systems function and information how the Arctic is changed or likely to change in the future.

Data management is critical activity for international cooperation in the Arctic research. Working with international partners to implement common standards and practices will make data more available for Arctic partners and it will improve Arctic research. Continued international cooperation, learning, innovation and sharing in all aspects of data management, including the collection, curation, sharing, discover ability, integration, access, and usability is integral to and will continue to facilitate Arctic research. This Arctic biodiversity Data Service is the data management framework for managing data generated via the CAFF board and the CBMP program. Knowledge of many species, ecosystems and their stressors are fragmentary. The ABDS tool has developed more refined tools for data sharing, so data collected by all these networks can be more easily accessible and improves access to information.

Hajo Eicken: Great thank you, Catherine, for that nice overview. For the final contribution, will hear from Sandy Starkweather, who has a background in engineering and Earth Sciences. She's executive director of the US Arctic Observing Network and is currently serving as the chair of the SEAN Board.

5. Closing Remarks: Sandy Starkweather (US Arctic Observing Network): Hi everyone. Thanks to all the great foundational talks we just had and for including these comments. To highlight just some of the big themes that come out of what's been submitted and the observations that have been collected in the process: surely the one at the top of the list should be increasing the partnership and linkages between indigenous led efforts and scientifically driven efforts under co-production of knowledge frameworks.

How do we do this? We've heard a lot about how we have to address the myriad gaps in the Arctic. And how we get there strategically in an internationally coordinated way I think are the things that the science ministerial can really help to support. Many contributions related to data management, data stewardship. But as Hajo pointed out, most of the current contributions are still falling short of what we would consider full accessibility. Certainly short of what we would consider adherence to fair and care data management principles, there are many great needs to continue to leverage our Arctic infrastructure to develop new technologies and to develop the kind of funding we need for data management activities. On the next slide I'm going to talk about how we might generate these actions through the science ministerial process in a way that kind of partitions the actions into two different collections as I see them. The 1st I'm going to call scaling out actions. What are these? As Hajo noted also in his summary, these are the kind of parallel efforts that are being funded at national levels to fill critical gaps. Whether these are geographic gaps, system specific gaps, temporal gaps, these are the engine of observations that that we need to continue to increase and build upon. Some

examples from the deliverables for this section: here we heard about mapping the sea floor, things related to system studies, new technology deployments. I put under scaling out actions. The glider we heard about, but also there's other things like gliders coming online. Campaigns fit into this group and as Noor pointed out that all those different docs of the indigenous observer efforts, these are what I would call parallel efforts and we need each nation to step up and an increase the number of parallel efforts that are happening. While I say that these happen via national priorities and funding, we also know that even in this space, there's a tremendous amount of soft coordination that is ongoing and should be on going in order to optimally leverage what's being put forward. If you hit forward once more - I think with the science ministerial can really develop uniquely in a way that other types of flora can have difficulties developing is what I would call scaling up actions, and these are the things that when we say no Nation can go it alone in the Arctic. These are the kinds of things we're talking about, the things where we have to unify merge capacities to expand what's possible and to accelerate our responses. Here under the examples I would point to the deliverables that are related to things like frameworks. Indigenous led frameworks or other kinds of multinational frameworks like the SAON Roads process which I'm most familiar with from the list. These help us address planning in a shared and strategic way and make sure that everyone at the table has equitable access to the to the planning process. There are many great examples also of infrastructure sharing and coordinated campaign protocols. Synoptic Arctic survey falls into this category. Then things like interoperability efforts - putting forward the individual national data sharing platforms, the Japanese data system, these types of things, that's the needed underlayment. But working on the stitching together an interoperability, this is a scaling up action. And then also, as I said, new technology deployments, that's a scaling out action, new technology development, generating the kinds of public private partnerships and clear understanding of what the observing needs are. This is a scaling up action, and so how is this kind of action developed? Of course, multinational funding is critically important, everybody pooling resources where and how they can. But I also want to underscore the importance of each country who's participating having their own strong national Arctic coordinating bodies - National committees to support Arctic work so that the fragmentation is addressed at the national level to strengthen what needs to happen internationally. The last piece I wanted to say is these bodies and leadership from these bodies can generate clear national mandates to cooperate in these large framework processes. Amongst these I underlined the Arctic Funders Forum, so I'm aware that we're past time. I hope I didn't exacerbate that, and thanks for your attention.

Hajo Eicken: Thank you very much Sandy, that that was a great way to closeout this part of the meeting. I'd like to thank all the panelists and contributors for a really nice, well rounded, healthy set of presentations. I look to the organizers here whether we have time to take a few more questions, I see some of them have been answered in the Q&A box. If there's any additional ones, I think we can take a minute or two, to see whether anybody else has any pressing question they would like to raise. I would encourage people to get in touch with the presenters directly. You've seen many of the emails or otherwise, through the organizers of this meeting. The presentations will be accessible as well, as PDF files, and with that I'll hand it back to Lindsey.

Lindsay Arthur: Great thanks so much, Hajo, and thank you to all of our panelists. That was really helpful. I just want to thank everyone for attending today and to remind you that the next web and are in the series which will focus on Theme 2 for ASM3. So that's ‘understand’, which is enhanced understanding and prediction capability on Arctic environmental social systems and its global impact. So that will be on February 17th at 1:00 o'clock GMT. And the registration for that is now open on the ASM3 website and the link to that is in the chat so you can go there. Again if there's any lingering questions after today's presentation, please feel free to get in touch with the ASM3 organizing Committee or directly with any of the panelists here, but we are always happy to hear from all of you. So, thank you so much and thank you. Hajo, for being our steady moderate are we really appreciate it.