Minimising the footprint of Arctic research

Arctic Circle Assembly 2018 Breakout session co-convened by the European Polar Board (EPB) and INTERACT

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Compiled by Joseph Nolan

Panellists:

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- Birgit Njåstad (Norwegian Polar Institute)
- Hannele Savela (INTERACT/Thule Institute, University of Oulu)
- Annette Scheepstra (Arctic Centre, University of Groningen)
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Polar research is an essential component of global efforts to address the big issues of the 21st century for planet Earth. However, polar environments are among the most sensitive and remote on the planet. It is therefore imperative that efforts are made to minimise the negative impacts of all activities in the polar regions, including those relating to research. Hundreds of field campaigns are conducted throughout the circumpolar Arctic at various scales each year, with diverse levels of environmental impact from region to region depending on type and intensity of activities.

While the footprint of individual field campaigns may be small, the cumulative environmental impacts of research activities across the Arctic are significant. Field campaigns generate waste, which can pollute if not correctly dealt with, potentially introduce invasive species to Arctic environments, and possibly disturb sensitive flora, fauna, and fragile ecosystems and landscape features. Furthermore, the social impacts of research activities on small, remote communities, particularly in the peak Arctic summer field season, are not insignificant. This breakout session explored ways in which these impacts can be minimised and properly managed with the help of best practice guidelines, communication with local communities, environmental and cultural sensitivities, new technologies, avoiding duplications of effort, and utilisation existing observations, all without compromising research quality.

Best practices for scientific research vessels operating near indigenous communities – Brenda Konar

The changing Arctic attracts a lot of research interest, leading to an increase in interactions between research vessels and coastal communities. To minimise the impacts of vessel operations on coastal

communities and their traditional practices, it is important to follow and continually develop best-practice guidelines in full collaboration with Arctic communities. Best practice guidelines have been developed for the R/V Sikuliaq, a US research vessel owned by the National Science Foundation and operated by the University of Alaska Fairbanks, and its operations along the Alaskan coast, where indigenous communities live and hunt. These guidelines centre around communication between the Sikuliaq's operators, researchers, and communities, allowing communities to understand the vessel's planned operations in their area, and for the communities and vessel operators to coordinate to avoid conflicting interactions in a manner that respects indigenous rights and traditional activities. For example, by maintaining good communication, subsistence hunting crews can inform the Sikuliaq when in it is appropriate or not for the vessel to move into certain areas. By respecting the indigenous communities and the rights of subsistence hunters in areas where research operations are planned, and maintaining good communication between all parties, negative interactions between the Sikuliaq and communities are reduced.

The best practice guidelines were developed in close collaboration with the Arctic Safety Waterway Committee, hunter groups, researchers, funding agencies, and Alaskan coastal communities and, through a process of review, consultation and feedback, will be further strengthened and improved. This is essential as ongoing environmental change exacerbates existing pressures and possible tensions. A detailed summary of the R/V Sikuliaq best practices for research operations and their development is available in the publication here: https://www.sciencedirect.com/science/article/pii/S0308597X17305043

Environmental protection and management, lessons from Antarctica – Birgit Njåstad

There are fundamental similarities between the Antarctic and Arctic environments, along with essential differences. Many of the challenges of minimising the environmental impacts of research operations are recognisable between the poles, but due to differing governance systems, the tools and instruments available for management are not always transferable.

Article 3 of the Protocol on Environmental Protection to the Antarctic Treaty sets forth basic principles applicable to human activities in Antarctica. The Environment Protocol established the Committee for Environmental Protection (CEP) as an expert advisory body to provide advice and formulate recommendations to the Antarctic Treaty Consultative Meeting in connection with the implementation of the Environment Protocol.[1]

Research activity in Antarctica has four prominent areas of impact or risk to the environment:

(1) Impacts on flora and fauna – as the full understanding of Antarctic ecosystems is incomplete, the impacts of changes and disturbance due to human activity is not fully known. Many species compete for the same, very limited, ice-free spaces, which are further under pressure from human presence. Great focus in Antarctica is on preventing the introduction of invasive species and biosecurity. Research shows that scientists are more likely to introduce invasive species to Antarctica than tourists or other groups in the region.
(2) Large-scale pollution events – Antarctic research is highly dependent on fossil fuels. While extensive precautions and strict protocols are in place, and continually under review, the risk of

[1] The Protocol on Environmental Protection to the Antarctic Treaty https://www.ats.aq/e/ep.htm

a major fuel spill remains. Such a pollution event could have devastating consequences for the Antarctic environment, and thus efforts are rightly focused on minimising this risk.

(3) Impacts on non-tangible aspects of Antarctica – these include notions of wilderness and pristine environments, Antarctica's inherent and intrinsic value for its own sake, and natural and cultural Antarctic heritage. These are also to be protected from the impacts of activities, including research operations.

(4) The accumulation of human impacts – while the impacts of individual campaigns in Antarctica may be small, the cumulative impacts of activities are significant, particularly in ice-free areas. Without managing activity in the context of cumulative impacts, seemingly small disturbances or changes may cause significant impacts. Concern for cumulative impacts in Antarctica is particularly acute where environmental systems may be approaching unknown critical tipping points or thresholds.

Proper management of all activities in Antarctica to minimise these impacts is only possible through cooperation. The Environmental Protocol sets out clear rules for activities in Antarctica, including strict environmental assessment procedures and pre-assessment of environmental impacts of activities. Minimising the footprint of research in Antarctica requires good communication between all levels of management and activity, from individuals active in Antarctica, to station leaders and facilities managers, to the CEP and the Parties to the Antarctic Treaty.

The procedures and tools used to protect the environment in Antarctica are generally successful. While, due to the very different structures of governance and national sovereignty in the north, not all Antarctic instruments for minimising the footprint of research are possible in the Arctic, there are nonetheless examples that could successfully be implemented at different scales.

In Antarctic research management, environmental awareness and consideration is much more strongly developed than in the Arctic, where rules for activity are less strict and heterogeneous across the region. Antarctic researchers are required to complete environmental pre-assessments for their work as part of applications for permits, without which their work is not possible. In the Arctic, impact assessments for research should also include assessment of social impacts where necessary.

While the framework for managing environmental impacts is very different between the two poles, the principle of cooperation between Arctic and Antarctic operators and international bodies is well-established. Furthermore, due to the physical similarities between the Arctic and Antarctica, many of the environmental impacts from research being dealt with are the same in both regions.

As in the Arctic, new and emerging technologies in science and support activities will be essential for continued minimisation of environmental footprints in Antarctica, reducing the need for physical presence in the field to conduct research, and lessening the footprint of research where a physical field presence by scientists is unavoidable. Research operations in Antarctica are moving more towards remote access, utilising new technologies, such as automation, unmanned vehicles and remote sensing. This change in approach is driven both by the need to minimise environmental risks and to reduce the high costs of polar research.

A key lesson from Antarctica that could be successfully adopted in the Arctic, is the requirement for research projects to complete thorough environmental pre-assessments prior to their

commencement. For projects that may impact local communities, social impact assessments should be conducted also.

Minimising physical field presence by virtual and remote access, and by using existing data – Hannele Savela

Perhaps the most effective approach to minimise the footprint of Arctic research is to avoid physical field presence. Two ways in which this can be achieved are through remote and virtual access to research stations. INTERACT's remote access scheme allows researchers to connect with Arctic field station staff, and have them collect data or samples on their behalf. This greatly reduces the need for researchers themselves to travel to remote field stations, reducing field presence and associated impacts, minimising travel costs and emissions, and increasing efficiency of research. Virtual access, also offered by INTERACT, gives researchers access to existing data and observations collected at Arctic research stations, including metadata. By making use of existing data and observations, researchers can avoid duplications of effort, and complete new research without the need for additional field campaigns. Since the introduction of the virtual access programme, INTERACT has seen an increase in the use of data and access to databases from Arctic stations.

To maximise the success of virtual and remote access to Arctic stations, it is necessary to overcome many challenges of the use of data and observations. These challenges are, in many cases, the same as faced by global data and observation initiatives, tackling issues including discoverability, accessibility, interoperability, and reusability of data and metadata. Global efforts to address these challenges, through the increase uptake of broad open data policies, through global and region initiatives such as GEOSS, SAON and GEO-CRI, and through the better coordination of the polar data management community, are leading to more efficient use of Arctic data and observations, and ultimately reduced field presence and environmental impacts from Arctic research. Access to and sharing of data between Parties from Antarctic research are fundamental aspects of the Antarctic Treaty.

While remote access to Arctic research stations has been successful and increasingly utilised by researchers, there is currently not an equivalent scheme for research vessels operating in the Arctic. Similarly in Antarctica, there is no such formal programme for remote access to stations. Alternatively researchers often make use of trusted personal contacts between individuals, with scientists often coordinating to collect data and samples with informal arrangements.

While the uptake of remote and virtual access to Arctic stations has grown, INTERACT has not seen the level of engagement with these schemes as expected. This may be because researchers wish to collect their data personally in order to maintain full control over it. Further, the sense of exploration remains significant in polar research, and researchers may be unwilling to give up the experience of working in the field themselves.

Research impacts on Arctic communities – Annette Scheepstra

When research activity affects Arctic communities, efforts should be aimed at optimising, rather than minimising impacts. The impacts of research activities in the Arctic can be both positive and negative on communities living in the region. It is important to minimise the negative impacts of research, but also to work towards maximising the positive impacts for research communities.

Optimising impacts of research on Arctic communities requires communication and trust-building between researchers and communities in the areas where they work. This takes time and effort on behalf of researchers, but is essential. Individual researchers, research groups, stations, institutes and programme management must find the best way to communicate and work together with communities in the areas where research is carried out or has an impact.

Best practice guidelines for research and logistics, sharing resources, new technologies – Elmer Topp-Jørgensen

The INTERACT Station Managers Forum and the Forum of Arctic Research Operators (FARO) are two venues for the coordination of research infrastructure management in the Arctic, where facilities and programme managers are able to share information and cooperate to reduce environmental impacts of Arctic research, including impacts relating to transport, emissions, waste, invasive species and the impact of physical field presence on species, ecosystems and landscapes. Via these fora, facilities managers are able to share experience, and together develop best practice guidelines for the management of research infrastructure in the Arctic.

(1) Reduce redundancy/duplication – researchers should always look to avoid the necessity of physical field presences where possible, this can be achieved using existing data, automated monitoring and remote sensing, among other approaches. If work in the field is unavoidable, researchers should make efforts to conduct their work in the most environmentally friendly manner possible, and share the data produced from field campaigns, enabling other researchers to benefit without revisiting the same sites.
(2) Achieve aims by being well prepared – researchers should ensure they are fully prepared for their work in the field, minimising the risk of failure and the need to repeat field campaigns. Failed field campaigns may have the same or greater environmental impacts as successful fieldwork, without the benefits for research. Preparations should include assessment of all risks of fieldwork failure, and efforts to mitigate these, including factors outside the control of the research team. INTERACT is, in early 2019, publishing a field work planning handbook for scientists working in the Arctic and other cold environments. This handbook aims to make scientists better prepared and induce environmentally friendly awareness and behaviour. It contains sections on all aspects of a research project from project development, to application to access stations, logistics and transport, risk assessments, how work is conducted in the field, and follow-up activities after the field campaign is complete.
(3) Reduce impacts from station operations and field work – INTERACT has developed a management planning book (2014) for stationer managers including issues related to reducing environmental and climate impacts of station operations, sharing logistics, setting up regulations of field activities to minimise impacts on environment and science results, use environmentally friendly technologies and materials, as well as data handling and sharing. Stations are also encouraged to develop their own local guidelines for researchers working at their facilities and in surround areas that consider specific local conditions and sensitive species, features, ecology, landscapes and delicate sites. INTERACT also works with managers of Arctic research stations to support the upgrading of facilities to improve their efficiency and reduce their environmental impacts. This includes upgrading of energy sources and retrofitting existing facilities at stations.

Many individual Arctic research infrastructures and institutes develop rules, procedures and guidelines to reduce environmental impacts, improve preparedness and safety, data sharing and both FARO and INTERACT are forums for sharing information and documents to continuously facilitate the develop and implementation of best practices across the Arctic and other cold regions.

Further discussion points

Utilising other non-research infrastructure present in the Arctic is an additional way in which the footprint of Arctic research could be reduced. For example, ships of opportunity schemes, whereby non-research vessels operating the Arctic are used as platforms for data collection and observations. Community-based monitoring can be another useful tool for Arctic research, with multiple benefits: field presence by researchers can be reduced, and community engagement and involvement in research projects can be increased.

A certification system for Arctic and Antarctic research facilities is suggested as a way to promote and standardise environmental protections in both polar regions, using internationally agreed best practices. Such a system could be developed with the collaboration of relevant regional and international organisations, including FARO, INTERACT, COMNAP, IASC, SCAR and the EPB.

Recommendations from panellists to minimise the footprint of Arctic research

- Better sharing of information, experience and best practices for management of polar research and research infrastructure, including between the Arctic and Antarctic.
- Improved open sharing of existing data and observations to avoid duplication of effort.
- Minimisation of physical field presence through use of new technologies, remote and virtual access to facilities, and through thorough preparation for field work to maximise the probability of success.
- Increased efficiency of research activities and of polar research infrastructures, particularly to reduce emissions.
- Combined environmental and social impact assessments for Arctic research activities, to optimise impacts (which can be both positive and negative) on Arctic communities.
- Improved communication, trust-building and engagement between researchers and logistics operators, and local communities at all stages of and throughout research projects and operations, recognising communities as rights holders, and including active participation in monitoring and research itself.
- Both bottom-up and top-down approaches are needed to managing the footprint of polar research, working with local communities and researchers to co-develop standards and guidelines, while also seeking political support for broad open data policies, and policy enable better management of research impacts in the Arctic.
- Strengthened communication within the polar research and logistics communities to better coordinate global research efforts, avoid duplications and develop standardisation, including between the Arctic and Antarctic.
- Require environmental pre-assessments as a component of research projects in all areas of the Arctic as standard, as is the case for Antarctic research campaigns.

Speaker profiles:

Brenda Konar – University of Alaska Fairbanks
Brenda Konar is the Associate Dean of Research at the College of Fisheries and Ocean Sciences, University of Alaska Fairbanks and is also the Research Representative on the Arctic Waterways Safety Committee. Dr. Konar's responsibilities include ensuring that research done on the university's 261' Polar Class 5 Research Vessel, R/V Sikuliaq, can be accomplished without disrupting local community activities. She was recently the lead author of a Marine Policy manuscript entitled "Development of best practices for scientific research vessel operations in a changing Arctic: A case study for R/V Sikuliaq". This document provides guidance to identify/communicate/mitigate potential impacts on, or time/area conflicts with, maritime subsistence harvest areas, activities, and resources.

Birgit Njåstad – Norwegian Polar Institute
Birgit Njåstad is Senior Environmental and Policy Adviser in the environment and mapping department of the Norwegian Polar Institute. Njåstad has had various positions at the Institute over two decades, and has throughout this period worked extensively and broadly with Antarctic management and policy related issues. She has participated and/or represented Norway in the Committee for Environmental Protection since 1998. She was at the annual meeting of the Committee in May 2018 elected Chair of the Committee where she earlier has served as vice chair. Njåstad has also worked extensively with Arctic environmental management issues, primarily focused on the Norwegian Arctic in general and the Svalbard archipelago specifically. Njåstad has a master in natural resource management from the University of Alaska Fairbanks.

Hannele Savela - INTERACT/University of Oulu
Hannele Savela works as the Transnational Access Coordinator for INTERACT, the International Network for Terrestrial Research and Monitoring in the Arctic. In the field of international and arctic research collaboration and science policy, her activities include representation of INTERACT in the Group on Earth Observations (GEO) Cold Regions Initiative (GEOCRI), where she is one of the co-leads. Hannele is also the co-chair of the Sustaining Arctic Observing Networks (SAON) Committee of Observations and Networks (SAON CON). Co-operation in the University of the Arctic (UArctic) network and in the EU-PolarNet project are also close to her heart.

Annette Scheepstra – Arctic Centre, University of Groningen
Annette Scheepstra has a background in social sciences and works as a coordinator of the Arctic Centre, University of Groningen Netherlands. She has represented the Netherlands in the Sustainable Development Working Group of the Arctic Council for many years. In the EU-PolarNet project she works on stakeholder engagement and makes sure that social sciences and humanities are well represented in the project. She has a lot of experience as a knowledge broker and working on the interface between science and communities. Besides her job at the university she also works as an expedition guide in Svalbard.

Elmer Topp-Jørgensen – INTERACT/Forum of Arctic Research Operators (FARO)/Aarhus University

Elmer Topp-Jørgensen is an experienced coordinator of national and international science and logistics cooperations. He is heading the FARO Secretariat where over 20 countries share

information on Arctic research infrastructure developments and logistics. As a coordinator of the INTERACT Station Managers' Forum he has worked with managers of over 80 research stations to produce books on best practices of station management and the science that goes on at these stations. He also runs the secretariat of GEM (Greenland Ecosystem Monitoring), coordinating research, monitoring and logistics of one of the most comprehensive long-term climate and ecosystem monitoring initiatives in the Arctic.

Kirsi Latola (Chair) – European Polar Board/University of Oulu

Kirsi Latola works as a research coordinator at the Thule Institute, University of Oulu, Finland where her duties relate to Arctic national and international projects on research and knowledge sharing. She has managed the University of the Arctic (UArctic) Thematic Networks strategic area since 2005 and is now acting as a Director of Thematic Networks. As part of her polar activities she is a chair of the European Polar Board and partner in INTERACT - International Network for Terrestrial Research and Monitoring in the Arctic and at the EU-PolarNet project on Polar Research coordination.