# FARO session March 28, 2025, during ASSW in Boulder

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## Minutes

Arctic science is essential to documenting and understanding climate and ecosystem changes and their implications for societies at local, regional, and global levels. When developing the ICARP IV research priorities for the next decade, it is crucial to ensure that the necessary infrastructures and logistical services are in place to achieve the scientific goals. This will help provide the knowledge needed to support sustainable development in a region already profoundly impacted by climate change.

**Introduction Purpose of the session and overview.**

**Speaker: Dirk Mengedoht (FARO Chair)**

This session focused on the critical need to improve linkages between science organizations, infrastructure and logistics providers, and funders, to establish a circumarctic platform that facilitates access to key Arctic environments. By aligning these efforts, the aim is to enable representative sampling across the Arctic, in dept understanding of ecosystem interactions and support the scientific objectives set by ICARP IV, the Arctic Council working groups, and other scientific networks.

The session featured presentations that explore current science-infrastructure linkages, followed by a panel discussion addressing challenges and opportunities in aligning science and infrastructure services to facilitate the implementation of ICARP IV science priorities.

The discussion focused on the future of Arctic research infrastructure and the importance of international collaboration between science and infrastructure: Infrastructure should support science needs – How do we align science demands and infrastructure development, and what are the tools to get there?

**Infrastructure and Logistical Services**

***FARO's Role in Arctic Research Infrastructure***  
Speaker: Dirk Mengedoht (FARO Chair), AWI

FARO is an international umbrella organization for countries operating research infrastructures in the Arctic. FARO is an international forum for information exchange and cooperation among national operators of research infrastructure. Any country engaged in Arctic research is encouraged to join FARO and participate in its activities.

Emphasis is on developing an infrastructure that follow science needs: How can infrastructure and logistics partnerships and tools help meet evolving research needs? Strengthening infrastructure-science linkages is essential for Arctic research sustainability of operations and addressing societal challenges.

New FARO member interest in 2025: Turkey and India.

FARO’s new 2024–2028 strategy, with three primary focus areas:

1. Knowledge Sharing - engaging member countries and operators  
    Existing infrastructure and development  
    Best practices on infrastructure operations  
    New technologies for use in polar operations

2. Networking - engaging Arctic and Antarctic science and logistics organizations  
 To influence science policy  
 To train the next generation

3. Facilitating Access – engaging scientists  
 Provide overview of existing infrastructure   
 Link science networks and infrastructure  
 Optimized use of infrastructure

In this session, FARO is addressing Priority 2 of its strategy—Networking—by engaging Arctic and Antarctic science and logistics organizations and ICARP IV science related Research Priority Teams.

***INPA and POLARIN - Offering Access to Arctic and Polar Research Infrastructures. Access opportunities and the role of Transnational Access programs.***  
Speaker: Hannele Savela (Transnational Access Coordinator), University of Oulu, Finland.

Transnational Access (TA) is an EU-funded mechanism providing researchers with free access to international research infrastructures (RIs), including support for travel and logistics. TA is either in-person, remote, or virtual. INTERACT has been active since 2011, covering up to 52 Arctic research stations. INTERACT I–III has now evolved to the INTERACT Non-Profit Association (INPA). An access call will open in Spring 2025, prioritizing early-career researchers.

POLARIN is a Horizon Europe-funded initiative (five years access programme 2024-2029), with 52 partners and 64 infrastructures across both Poles. POLARIN offers access to diverse RI types including stations, vessels, observatories, and data centers. Upcoming access calls in September–October 2025.

Trends, opportunities and challenges in TA provision: Importance of learning from past disruptions (e.g., COVID-19, geopolitical issues). Push for more remote and virtual access to reduce environmental impact. Strengthening alignment of RI access with research priorities and societal needs. Enhancing collaboration between Arctic and Antarctic initiatives.

***INTERACT: Representativeness of Terrestrial Research Stations***  
Insights from the INTERACT Station Managers’ Forum on how well research stations represent change at an arctic scale. Speaker: Elmer Topp-Jørgensen

A previous study conducted last year, focused on the representativeness of Arctic research stations in relation to assessing eight ecosystem variables (selected from AMAP Arctic Climate Change update 2021). The INTERACT network is consistently biased for some ecosystem variables and is thus not fully representative of the ecosystem conditions across the pan-Arctic domain. INTERACT stations are generally located in warmer and wetter parts of the Arctic with deeper snowpacks, lower vegetation biomass, and soil carbon than the Arctic region. Excluding Russian stations lowers representativeness across almost all ecosystem variables, with biases in some cases being of the same magnitude as the expected shifts caused by climate change by the end of the century. A new study within POLARIN, focus on aboveground biomass and soil organic carbon, comparing Remote sensing products and upscaled models with in situ observations to identify knowledge gaps and the potential for POLARIN infrastructure to fill these (examples shown for the two variables).

The analytical framework can be scaled up with any model variables available (atmospheric, terrestrial, marine, etc.) and more CMIP6 ESMs to increase the robustness of the analysis and learn about uncertainties. This approach can be used to synthesize the state of knowledge, quantifying potential biases and identifying gaps to guide empirical studies. It can inform:

* Station managers about ecologically/scientifically significant variables to monitor,
* Researchers about geographical gaps in monitoring efforts, and
* Policymakers about geographical gaps in infrastructure and monitoring efforts.

Question: Is there a need for more infrastructure/observation sites and how quickly do station provide access to data?

Response: It depends on the variable in question. New installations or local community involvement may be needed. Many stations span ecological gradients and the gap analysis can help guide in-situ observation planning towards relevant habitats. The data used in the analysis is from freely available data repositories, not specific to particular stations. Data can be collected by stations or external scientists working at the station. The availability of data thus depends on the station/scientist and their procedures for sharing.

**Science Support**

***ICARP IV Research Priority Team 2: Observing, Reconstructing, and Predicting Future Climate Dynamics***

Overview of science priorities for climate dynamics and ecosystem response research and potential linkages to infrastructure. Speaker: Syndonia Bret-Harte (RP2 Co-chair), University of Alaska Fairbanks.

RPT2 Scope: Focuses on ecosystem responses to climate change in the Arctic, supporting integrated observations and modeling.

Recommendations to Implement Priorities:

* Co-develop frameworks with Indigenous Peoples, focusing on remote sensing, in situ measurements, and indigenous knowledge.
* Understand nonlinear feedback in cryosphere-climate interactions with shared infrastructure and AI-enhanced systems for data collection.
* Assess Arctic Ocean circulation with long-term funding and integrated datasets.
* Understand Arctic disturbances with long-term observations and remote sensing.
* Couple models and observations of atmospheric patterns with enhanced networks and data integration.

Cross-cutting priorities emphasize supporting Indigenous-led research protocols and ethics frameworks, fostering partnerships between research institutions and Indigenous communities, funding long-term data collection programs and emphasizing data sharing, and improving modeling capabilities for Arctic ecosystems and the cryosphere.

Question: Did you discuss where there is a need for infrastructure?  
Response: We did not address the implementation specifically. However, we could use the gap analysis and consider local variability and gradients. This requires significant funding thought, as continuity over time is crucial.

***ICARP IV Research Priority Team 7: Collaborative Efforts on Research Infrastructure.***  
The role of infrastructure in facilitating implementation of ICARP IV science priorities (Research Priority Teams 1-6).  
Speaker: Dariusz Ignatiuk (RP7 Co-chair), President of the Polish Polar Consortium and University of Silesia in Katowice.

ICARP IV Research Priority Team 7 focuses on collaborative efforts for research infrastructure to implement ICARP IV science priorities.

Infrastructure plays a crucial role in implementing ICARP IV priorities, but faces obstacles such as national policies, internal strategies, and research priorities.

Solutions include forming national and international consortia and engaging funding agencies.

The Svalbard Integrated Arctic Earth Observing System (SIOS) coordinates and optimizes distributed research infrastructure, promoting cost savings, maximizing research opportunities, and minimizing environmental impact.

Shared infrastructure on Svalbard supports strategic collaboration, improved logistics, and long-term environmental and scientific goals. The BERA Centre on Svalbard supports environmental monitoring and research activities, provides logistical and fieldwork assistance, and promotes education and networking. It was established through cooperation among several Polish institutions and aims to normalize logistical and scientific research activities in Longyearbyen. Challenges include the green transformation of infrastructure, remote and virtual access, and the need for collaborative environmental monitoring systems. Benefits of shared infrastructure include cost savings, access to state-of-the-art facilities, environmental protection, strategic collaboration, improved logistics, and support for long-term monitoring networks.

**Panel discussion**

Panel discussion featuring all presenters, plus Gerlis Fugmann IASC Executive Secretary and Nicole Biebow POLARIN Coordinator(AWI).

Question on FARO’s current role and potential future contributions:

POLARIN and INTERACT serve as intermediaries between users and infrastructures, highlighting the need for robust infrastructure networks for knowledge sharing to facilitate and build services required by the science community. FARO should take a stronger role in ICARP IV, and involve other infrastructure communities and observing platforms, e.g. INTERACT.

The ICARP process is crucial for ensuring that both prominent and quieter voices are heard, particularly through tools like Mentimeter in RPT 2 or the online surveys. While there are networks of research stations and other observing platforms, there is a lack of a comprehensive overview of the full infrastructure, necessitating better communication with infrastructure sites. Registry of Polar Observing Networks (RoPON) is an initiative under the Sustained Arctic Observing Network WG under Arctic Council, and FARO should connect to explore synergies.

Facilitating cooperation is essential, but understanding the capacity of the infrastructure is equally important. FARO has the network and the potential to coordinate, addressing the many needs and wishes emerging from RPTs. ICARP IV recommendations need to be implemented, and should also consider IPY priorities and projects. Infrastructure requires coordination and resources, and FARO can help facilitate dialogue and lack funding for a larger coordinating role.

FARO could focus on infrastructure and logistics, while POLARIN could concentrate on TA and facilitation of access. Mapping current efforts to identify who does what in relation to providing an infrastructure overview and find a way for a dialogue between infrastructure/service and science would support mutual efforts of ICARP IV and IPY. Shared infrastructure, particularly in marine contexts, is challenging due to current national priorities and limited flexibility. FARO could play a role in bringing people together to share spare berths, by creating a platform for free spare berths, enhancing community access.

Like FARO, COMNAP/SCAR is operated by membership fees, but there are also examples of infrastructure/science initiatives developed through a sponsoring system, initiated by a few polar programs, serving as a good example of a bottom-up initiative. FARO has existed for 27 years, with representatives central science or government bodies, who often can relay information to funding bodies. While it is difficult for FARO to approach national funding agencies directly, it might be feasible to approach the European Commission and invite funding agencies into a dialogue with FARO. The Arctic Founders Forum (AFF) could be approached to discuss infrastructure/science implementation, by presenting cases and show infrastructure needs. AFF has representatives in funding agencies, and IASC is part of AFF, which could be leveraged.

EU PolarNet has attempted similar initiatives. Creativity in seeking other funding opportunities, such as the Prince Albert of Monaco Fund, and working towards IPY is encouraged. FARO should collaborate with IASC or other organizations to strengthen its position, possibly with close ties to AFF. IASC should organize more co-chair meetings to foster cooperation across ICARP RPTs.

FARO can learn from COMNAP, which has a different mandate and is closer connected to the Scientific Committee on Antarctic Research (SCAR). FARO could (given a sufficient budget is available) become more active in informing and coordinating access, implementing action groups, overseeing station upgrades, and managing vessel schedules. An overview of vessels, airplanes, etc., would benefit the research community. FARO should implement topics to work on, learn from COMNAP action groups, and enhance collaboration, cooperation, and communication with COMNAP leading up to the IPY.

Strategically, FARO should determine which working groups to start, the added value for FARO members, and the specific needs of FARO members and the science community. Selecting one or two focus areas and learning from COMNAP would be beneficial. SAON had similar discussions on information collection, and better input from other networks through increased cooperation with others, like SIOS and INTERACT.

Key take home message from the session was that there is a need for increased dialogue between infrastructure and science RPTs to facilitate implementation of ICARP priorities (and IPY). FARO can play a key role but should work with other organisations. IASC could play a key role in facilitating these dialogues across organisations and RPTs.